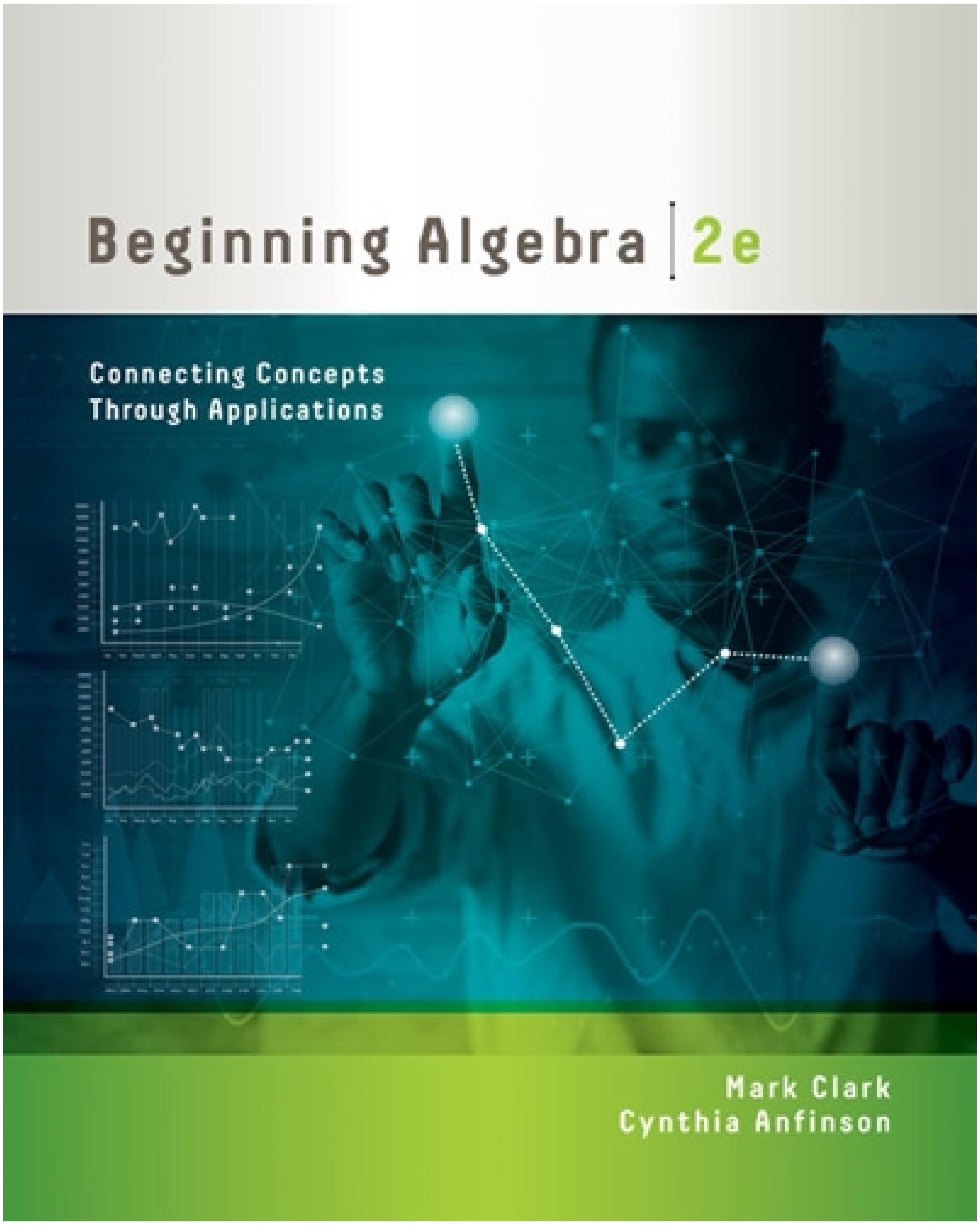
Solutions for Beginning Algebra Connecting Concepts through Applications 2nd Edition by Clark



Solutions

Section 2.1 Addition and Subtraction Properties of Equality

1. This is an expression. There is no equal sign.

2. This is an expression. There is no equal sign.

3. This is an equation. There is an equal sign.

4. This is an equation. There is an equal sign.

5. This is an expression. There is no equal sign.

6. This is an expression. There is no equal sign.

7. This is an equation. There is an equal sign.

8. This is an equation. There is an equal sign.

9. This is an equation. There is an equal sign.

10. This is an equation. There is an equal sign.

11. This is an expression. There is no equal sign.

12. This is an expression. There is no equal sign.

13. **a.** Using the given equation $S = 10.75h$ replace h with 20 and solve for S.

$$S = 10.75h$$
$$S = 10.75 \cdot 20$$
$$S = 215$$

If Joe works 20 hours in a week, his salary will be \$215.00.

b. Evaluate each side of the equation and see if the two sides are equal.

$S = 10.75h$ Original equation.

$376.25 \stackrel{?}{=} 10.75(35)$ Substitute values for S and h.

$376.25 = 376.25$ This statement is true.

Because the final statement is true, $h = 35$ and $S = 376.25$ is a solution to the equation $S = 10.75h$. If Joe works 35 hours, then he will earn a salary of \$376.25 for the week.

c. Evaluate each side of the equation and see if the two sides are equal.

$S = 10.75h$ Original equation.

$260 \stackrel{?}{=} 10.75(25)$ Substitute values for S and h.

$260 \neq 268.75$ The statement is not true.

Because the final results are not equal, $h = 25$ and $S = 260$ do not give a solution to the equation $S = 10.75h$. These values state that if Joe works 25 hours in a week, then his salary would be \$260. These values do not make the equation true.

d. Evaluate each side of the equation and see if the two sides are equal.

$S = 10.75h$ Original equation.

$430 \stackrel{?}{=} 10.75(40)$ Substitute values for S and h.

$430 = 430$ This statement is true.

Because the final statement is true, $h = 40$ and $S = 430$ is a solution to the equation $S = 10.75h$. If Joe works 40 hours, then he will earn a salary of \$430 for the week.

14. **a.** Using the given equation $t = 7g$ replace g with 45 and solve for t.

$$t = 7g$$
$$t = 7 \cdot 45$$
$$t = 315$$

It will take Danny 315 minutes, or 5.25 hours, to assemble 45 golf clubs.

b. Evaluate each side of the equation and see if the two sides are equal.

$t = 7g$ Original equation.

$340 \stackrel{?}{=} 7(50)$ Substitute values for t and g.

$340 \stackrel{?}{=} 350$ The statement is not true.

$340 \neq 350$

Because the final results are not equal, $g = 50$ and $t = 340$ do not give a solution to the equation $t = 7g$. These values state that if Danny assembles 50 golf clubs, then he spent 340 minutes assembling those clubs. These values do not make the equation true.

c. Evaluate each side of the equation and see if the two sides are equal.

$t = 7g$ Original equation.

$329 \stackrel{?}{=} 7(47)$ Substitute values for t and g.

$329 = 329$ This statement is true.

Because the final statement is true, $g = 47$ and $t = 329$ is a solution to the equation $t = 7g$. If Danny assembles 47 golf clubs, then he spent 329 minutes assembling those clubs.

15. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} d &= 60t && \text{Original equation.} \\ 240 &\stackrel{?}{=} 60(4) && \text{Substitute values for } d \text{ and } t. \\ 240 &= 240 && \text{This statement is true.} \end{aligned}$$

Because the final statement is true, $t = 4$ and $d = 240$ is a solution to the equation $d = 60t$.

b. These values represent that 240 miles is the distance traveled when driving for 4 hours.

16. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} d &= 65t && \text{Original equation.} \\ 1950 &\stackrel{?}{=} 65(30) && \text{Substitute values for } d \text{ and } t. \\ 1950 &= 1950 && \text{This statement is true.} \end{aligned}$$

Because the final statement is true, $t = 30$ and $d = 1950$ is a solution to the equation $d = 65t$.

b. These values represent that 1950 miles is the distance traveled when driving for 30 hours.

17. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} C &= 2\pi r && \text{Original equation.} \\ 37.7 &\stackrel{?}{=} 2(3.14)(6) && \text{Substitute values for } C \text{ and } r. \\ & && \text{Substitue 3.14 for } \pi \text{ and round} \\ & && \text{answer to one decimal place.} \\ 37.7 &= 37.7 && \text{This statement is true.} \end{aligned}$$

Because the final statement is true, $r = 6$ and $C = 37.7$ is a solution to the equation $C = 2\pi r$.

b. These values represent that a circle with a radius of 6 has a circumference of 37.7 (rounded to one decimal place).

18. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} C &= 2\pi r && \text{Original equation.} \\ 163.4 &\stackrel{?}{=} 2(\pi)(26) && \text{Substitute values for } C \text{ and } r. \\ & && \text{Use the } \pi \text{ button on your calculator} \\ & && \text{and multiply w/o approximating.} \\ 163.4 &\stackrel{?}{=} 163.3628 && \text{Round to one decimal place.} \\ 163.4 &= 163.4 && \text{This statement is true.} \end{aligned}$$

Because the final statement is true, $r = 26$ and $C = 163.4$ is a solution to the equation $C = 2\pi r$.

b. These values represent that a circle with a radius of 26 has a circumference of 163.4 (rounded to one decimal place).

19. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} F &= 15L && \text{Original equation.} \\ 4500 &\stackrel{?}{=} 15(300) && \text{Substitute values for } F \text{ and } L. \\ 4500 &= 4500 && \text{This statement is true.} \end{aligned}$$

Because the final statement is true, $L = 300$ and $F = 4500$ is a solution to the equation $F = 15L$.

b. These values represent that a loan of $300,000.00 would have an origination fee of $4,500.00.

20. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} F &= 20L && \text{Original equation.} \\ 9000 &\stackrel{?}{=} 20(450) && \text{Substitute values for } F \text{ and } L. \\ 9000 &= 9000 && \text{This statement is true.} \end{aligned}$$

Because the final statement is true, $L = 450$ and $F = 9000$ is a solution to the equation $F = 20L$.

b. These values represent that a loan of $450,000.00 would have an origination fee of $9,000.00.

21. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{aligned} F &= 10L && \text{Original equation.} \\ 2000 &\stackrel{?}{=} 10(225) && \text{Substitute values for } F \text{ and } L. \\ 2000 &\stackrel{?}{=} 2250 && \text{This statement is not true.} \\ 2000 &\neq 2250 && \end{aligned}$$

Because the final results are not equal, $L = 225$ and $F = 2000$ do not give a solution to the equation $F = 10L$.

b. These values state that a loan of $225,000.00 would have an origination fee of $2,000.00. These values do not make the equation true, so they do not make sense in this situation.

22. **a.** Evaluate each side of the equation and see if the two sides are equal.

$F = 12.5L$ Original equation.

$4500 \stackrel{?}{=} 12.5(400)$ Substitute values for F and L.

$4500 \stackrel{?}{=} 5000$ This statement is not true.

$4500 \neq 5000$

Because the final results are not equal, $L = 400$ and $F = 4500$ do not give a solution to the equation $F = 12.5L$.

b. These values state that a loan of $400,000.00 would have an origination fee of $4,500.00. These values do not make the equation true, so they do not make sense in this situation.

23. **a.** Evaluate each side of the equation and see if the two sides are equal.

$S = 77.8f$ Original equation.

$155.6 \stackrel{?}{=} 77.8(2)$ Substitute values for S and f.

$155.6 = 155.6$ This statement is true.

Because the final statement is true, $f = 2$ and $S = 155.6$ is a solution to the equation $S = 77.8f$.

b. These values represent that it would require 155.6 cubic yards of sand to fill a volleyball court 2 feet deep.

24. **a.** Evaluate each side of the equation and see if the two sides are equal.

$S = 77.8f$ Original equation.

$200 \stackrel{?}{=} 77.8(3)$ Substitute values for S and f.

$200 \stackrel{?}{=} 233.4$ This statement is not true.

$200 \neq 233.4$

Because the final results are not equal, $f = 3$ and $S = 200$ do not give a solution to the equation $S = 77.8f$.

b. These values state that it would require 200 cubic yards of sand to fill a volleyball court 3 feet deep. These values do not make the equation true, so they do not make sense in this situation.

25. Evaluate each side of the equation and see if the two sides are equal.

$2x + 8 = 30$ Original equation.

$2(11) + 8 \stackrel{?}{=} 30$ Substitute $x = 11$.

$22 + 8 \stackrel{?}{=} 30$ Simplify both sides.

$30 = 30$ This statement is true.

Because the final statement is true, $x = 11$ is a solution to the equation $2x + 8 = 30$.

26. Evaluate each side of the equation and see if the two sides are equal.

$4g + 23 = 80$ Original equation.

$4(10) + 23 \stackrel{?}{=} 80$ Substitute $g = 10$.

$40 + 23 \stackrel{?}{=} 80$ Simplify both sides.

$63 \stackrel{?}{=} 80$ This statement is not true.

$63 \neq 80$

Because the final results are not equal, $g = 10$ is not a solution to the equation $4g + 23 = 80$.

27. Evaluate each side of the equation and see if the two sides are equal.

$7m + 15 = 10m$ Original equation.

$7(8) + 15 \stackrel{?}{=} 10(8)$ Substitute $m = 8$.

$56 + 15 \stackrel{?}{=} 80$ Simplify both sides.

$71 \stackrel{?}{=} 80$ This statement is not true.

$71 \neq 80$

Because the final results are not equal, $m = 8$ is not a solution to the equation $7m + 15 = 10m$.

28. Evaluate each side of the equation and see if the two sides are equal.

$-4y + 7 = -25$ Original equation.

$-4(-6) + 7 \stackrel{?}{=} -25$ Substitute $y = -6$.

$24 + 7 \stackrel{?}{=} -25$ Simplify both sides.

$31 \stackrel{?}{=} -25$ This statement is not true.

$31 \neq -25$

Because the final results are not equal, $y = -6$ is not a solution to the equation $-4y + 7 = -25$.

29. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} \frac{3}{4}x - 13 = 8 & \text{Original equation.} \\ \frac{3}{4}(28) - 13 \stackrel{?}{=} 8 & \text{Substitute } x = 28. \\ 21 - 13 \stackrel{?}{=} 8 & \text{Simplify both sides.} \\ 8 = 8 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = 28$ is a solution to the equation $\frac{3}{4}x - 13 = 8$.

30. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 7 = -\frac{5}{3}y + \frac{1}{3} & \text{Original equation.} \\ 7 \stackrel{?}{=} -\frac{5}{3}(-4) + \frac{1}{3} & \text{Substitute } y = -4. \\ 7 \stackrel{?}{=} \frac{20}{3} + \frac{1}{3} & \text{Simplify both sides.} \\ 7 \stackrel{?}{=} \frac{21}{3} & \\ 7 = 7 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $y = -4$ is a solution to the equation $7 = -\frac{5}{3}y + \frac{1}{3}$.

31. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} \frac{1}{2}x - 10 = -\frac{15}{2} & \text{Original equation.} \\ \frac{1}{2}(5) - 10 \stackrel{?}{=} -\frac{15}{2} & \text{Substitute } x = 5. \\ \frac{5}{2} - 10 \stackrel{?}{=} -\frac{15}{2} & \text{Simplify both sides.} \\ \frac{5}{2} - \frac{20}{2} \stackrel{?}{=} -\frac{15}{2} & \\ -\frac{15}{2} = -\frac{15}{2} & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = 5$ is a solution to the equation $\frac{1}{2}x - 10 = -\frac{15}{2}$.

32. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} -1 = \frac{2}{3}x + 1 & \text{Original equation.} \\ -1 \stackrel{?}{=} \frac{2}{3}(-3) + 1 & \text{Substitute } x = -3. \\ -1 \stackrel{?}{=} -2 + 1 & \text{Simplify both sides.} \\ -1 = -1 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = -3$ is a solution to the equation $-1 = \frac{2}{3}x + 1$.

33. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 0.15x + 1.2 = 1.35 & \text{Original equation.} \\ 0.15(1) + 1.2 \stackrel{?}{=} 1.35 & \text{Substitute } x = 1. \\ 0.15 + 1.2 \stackrel{?}{=} 1.35 & \text{Simplify both sides.} \\ 1.35 = 1.35 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = 1$ is a solution to the equation $0.15x + 1.2 = 1.35$.

34. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} -1.4x - 6 = -14.4 & \text{Original equation.} \\ -1.4(5) - 6 \stackrel{?}{=} -14.4 & \text{Substitute } x = 5. \\ -7 - 6 \stackrel{?}{=} -14.4 & \text{Simplify both sides.} \\ -13 \stackrel{?}{=} -14.4 & \text{This statement is not true.} \\ -13 \neq -14.4 & \end{array}$$

Because the final results are not equal, $x = 5$ is not a solution to the equation $-1.4x - 6 = -14.4$.

35. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 0.5t + 3.2 = 1.7 & \text{Original equation.} \\ 0.5(3) + 3.2 \stackrel{?}{=} 1.7 & \text{Substitute } t = 3. \\ 1.5 + 3.2 \stackrel{?}{=} 1.7 & \text{Simplify both sides.} \\ 4.7 \stackrel{?}{=} 1.7 & \text{This statement is not true.} \\ 4.7 \neq 1.7 & \end{array}$$

Because the final results are not equal, $t = 3$ is not a solution to the equation $0.5t + 3.2 = 1.7$.

36. Evaluate each side of the equation and see if the two sides are equal.

$-6.1+3y=-10.3$ Original equation.

$-6.1+3(1.4)\stackrel{?}{=}-10.3$ Substitute $y=1.4$.

$-6.1+4.2\stackrel{?}{=}-10.3$ Simplify both sides.

$-1.9\stackrel{?}{=}-10.3$ This statement is not true.

$-1.9\neq-10.3$

Because the final results are not equal, $y=1.4$ is not a solution to the equation $-6.1+3y=-10.3$.

37. Evaluate each side of the equation and see if the two sides are equal.

$3x+5y=20$ Original equation.

$3(5)+5(1)\stackrel{?}{=}20$ Substitute $x=5$ and $y=1$.

$15+5\stackrel{?}{=}20$ Simplify both sides.

$20=20$ This statement is true.

Because the final statement is true, $x=5$ and $y=1$ is a solution to the equation $3x+5y=20$.

38. Evaluate each side of the equation and see if the two sides are equal.

$4x-9y=30$ Original equation.

$4(3)-9(-2)\stackrel{?}{=}30$ Substitute $x=3$ and $y=-2$.

$12+18\stackrel{?}{=}30$ Simplify both sides.

$30=30$ This statement is true.

Because the final statement is true, $x=3$ and $y=-2$ is a solution to the equation $4x-9y=30$.

39. Evaluate each side of the equation and see if the two sides are equal.

$-x+2y=4$ Original equation.

$-(-4)+2(0)\stackrel{?}{=}4$ Substitute $x=-4$ and $y=0$.

$4+0\stackrel{?}{=}4$ Simplify both sides.

$4=4$ This statement is true.

Because the final statement is true, $x=-4$ and $y=0$ is a solution to the equation $-x+2y=4$.

40. Evaluate each side of the equation and see if the two sides are equal.

$-3x+4y=-12$ Original equation.

$-3(0)+4(-3)\stackrel{?}{=}-12$ Substitute $x=0$ and $y=-3$.

$0-12\stackrel{?}{=}-12$ Simplify both sides.

$-12=-12$ This statement is true.

Because the final statement is true, $x=0$ and $y=-3$ is a solution to the equation $-3x+4y=-12$.

41. Evaluate each side of the equation and see if the two sides are equal.

$25m+15=10n+40$ Original equation.

$25(3)+15=10(5)+40$ Substitute $m=3$ and $n=5$.

$75+15\stackrel{?}{=}50+40$ Simplify both sides.

$90=90$ This statement is true.

Because the final statement is true, $m=3$ and $n=5$ is a solution to the equation $25m+15=10n+40$.

42. Evaluate each side of the equation and see if the two sides are equal.

$-3x+7=4y+9$ Original equation.

$-3(0)+7\stackrel{?}{=}4(-2)+9$ Substitute $x=0$ and $y=-2$.

$0+7\stackrel{?}{=}-8+9$ Simplify both sides.

$7\stackrel{?}{=}1$ This statement is not true.

$7\neq1$

Because the final results are not equal, $x=0$ and $y=-2$ is not a solution to the equation $-3x+7=4y+9$.

43. Evaluate each side of the equation and see if the two sides are equal.

$-5x+3y=-15$ Original equation.

$-5(0)+3(5)\stackrel{?}{=}-15$ Substitute $x=0$ and $y=5$.

$0+15\stackrel{?}{=}-15$ Simplify both sides.

$15\stackrel{?}{=}-15$ This statement is not true.

$15\neq-15$

Because the final results are not equal, $x=0$ and $y=5$ is not a solution to the equation $-5x+3y=-15$.

44. Evaluate each side of the equation and see if the two sides are equal.

$4x+3y=-12$ Original equation.

$4(-4)+3(1)\stackrel{?}{=}-12$ Substitute $x=-4$ and $y=1$.

$-16+3\stackrel{?}{=}-12$ Simplify both sides.

$-13\stackrel{?}{=}-12$ This statement is not true.

$-13\neq-12$

Because the final results are not equal, $x=-4$ and $y=1$ is not a solution to the equation $4x+3y=-12$.

45. a. Using the equation $s+l+c=220$ substitute $s=75$ for the weight of the cargo storage system and $l=100$ for the weight of the luggage, then solve for c to find the number of pounds of other cargo you can store on the roof of the car.

$s+l+c=220$	Given equation.
$(75)+(100)+c=220$	Substitute $s=75$ and $l=100$.
$175+c=220$	Simplify on left side.
$\underline{-175 \quad -175}$	Subtract 175 from both sides.
$c=45$	

The solution is $c=45$ which represents that an additional 45 pounds of other cargo could be stored on the roof of the car.

b. Using the equation $s+l+c=220$ substitute $s=75$ for the weight of the cargo storage system and $c=60$ for the weight of the luggage, then solve for c to find the number of pounds of other cargo you can store on the roof of the car.

$s+l+c=220$	Given equation.
$(75)+l+60=220$	Substitute $s=75$ and $c=60$.
$135+l=220$	Simplify on left side.
$\underline{-135 \quad -135}$	Subtract 135 from both sides.
$l=85$	

The solution is $l=85$ which represents that 85 pounds of luggage could be stored on the roof of the car.

46. a. Using the equation $E=r+b+e$ substitute $E=1200$ for the amount Alex has this month for expenses, $r=600$ for rent, and $b=230$ for bills, then solve for e to find how much he has left for entertainment.

$E=r+b+e$	Given equation.
$(1200)=(600)+(230)+e$	Substitute value of variables.
$1200=830+e$	Simplify on right side.
$\underline{-830 \quad -830}$	Subtract 830 from both sides.
$370=e$	

The solution is $e=370$ which represents that Alex has \$370 left for entertainment.

b. Using the equation $E=r+b+e$ substitute $E=1000$ for the amount Alex has this month for expenses, $r=600$ for rent, and $b=350$ for bills, then solve for e to find how much he has left for entertainment.

$E=r+b+e$	Given equation.
$(1000)=(600)+(350)+e$	Substitute value of variables.
$1000=950+e$	Simplify on right side.
$\underline{-950 \quad -950}$	Subtract 950 from both sides.
$50=e$	

The solution is $e=50$ which represents that Alex has \$50 left for entertainment.

47. Using the equation $P=R-C$ substitute $R=47000$ for the revenue, $C=39000$ for costs, then solve for P to find the company's profit.

$P=R-C$	Given equation.
$P=(47000)-(39000)$	Substitute value of variables.
$P=8000$	Simplify on right side.

The solution is $P=8000$ which represents that the company has a monthly profit of \$8,000.

48. Using the equation $P=R-C$ substitute $R=180000$ for the revenue, $C=165000$ for costs, then solve for P to find the company's profit.

$P=R-C$	Given equation.
$P=(180000)-(165000)$	Substitute value of variables.
$P=15000$	Simplify on right side.

The solution is $P=15000$ which represents that the company has monthly profit of \$15,000.

49. Using the equation $P=R-C$ substitute $R=38000$ for the revenue, $C=41000$ for costs, then solve for P to find the company's profit.

$P=R-C$	Given equation.
$P=(38000)-(41000)$	Substitute value of variables.
$P=-3000$	Simplify on right side.

The solution is $P=-3000$ which represents that the company has monthly profit of $-\$3,000$, representing that the company is operating at a loss.

50. Using the equation $P=R-C$ substitute $R=430000$ for the revenue, $C=500000$ for costs, then solve for P to find the company's profit.

$P=R-C$	Given equation.
$P=(430000)-(500000)$	Substitute value of variables.
$P=-70000$	Simplify on right side.

The solution is $P=-70000$ which represents that the company has monthly profit of $-\$70,000$, representing that the company is operating at a loss.

51. Using the equation $P = R - C$ substitute $P = 4000$ for the revenue, $C = 25000$ for costs, then solve for R to find the company's revenue.

$$\begin{array}{ll} P = R - C & \text{Given equation.} \\ (4000) = R - (25000) & \text{Substitute value of variables.} \\ \underline{+25000 \qquad +25000} & \text{Add 25000 to both sides.} \\ 29000 = R & \end{array}$$

The solution is $R = 29000$ which represents that the company would need to generate \$29,000 in revenue to earn the desired profit.

52. Using the equation $P = R - C$ substitute $P = 11000$ for the revenue, $C = 156000$ for costs, then solve for R to find the company's revenue.

$$\begin{array}{ll} P = R - C & \text{Given equation.} \\ (11000) = R - (156000) & \text{Substitute value of variables.} \\ \underline{+156000 \qquad +156000} & \text{Add 156000 to both sides.} \\ 167000 = R & \end{array}$$

The solution is $R = 167000$ which represents that the company would need to generate \$167,000 in revenue to earn the desired profit.

Exercises 53-82: Answers are to be checked.

53.

$$\begin{array}{ll} \boxed{x} + 5 = 30 & \text{Identify the variable term.} \\ \underline{\quad -5 \quad -5 \quad} & \text{Subtract 5 from both sides.} \\ x = 25 & \\ (25) + 5 \stackrel{?}{=} 30 & \text{Check the answer.} \\ 30 = 30 & \text{The answer works.} \end{array}$$

54.

$$\begin{array}{ll} \boxed{w} + 12 = 28 & \text{Identify the variable term.} \\ \underline{\quad -12 \quad -12 \quad} & \text{Subtract 5 from both sides.} \\ w = 16 & \\ (16) + 12 \stackrel{?}{=} 28 & \text{Check the answer.} \\ 28 = 28 & \text{The answer works.} \end{array}$$

55.

$$\begin{array}{ll} \boxed{x} + 20.5 = 45 & \text{Identify the variable term.} \\ \underline{\quad -20.5 \quad -20.5} & \text{Subtract 20.5 from both sides.} \\ x = 24.5 & \\ (24.5) + 20.5 \stackrel{?}{=} 45 & \text{Check the answer.} \\ 45 = 45 & \text{The answer works.} \end{array}$$

56.

$$\begin{array}{ll} 4.2 + \boxed{t} = -7.3 & \text{Identify the variable term.} \\ \underline{-4.2 \qquad -4.2} & \text{Subtract 4.2 from both sides.} \\ t = -11.5 & \\ 4.2 + (-11.5) \stackrel{?}{=} -7.3 & \text{Check the answer.} \\ -7.3 = -7.3 & \text{The answer works.} \end{array}$$

57.

$$\begin{array}{ll} \boxed{m} - 14 = 5 & \text{Identify the variable term.} \\ \underline{\quad +14 \quad +14} & \text{Add 14 to both sides.} \\ m = 19 & \\ (19) - 14 \stackrel{?}{=} 5 & \text{Check the answer.} \\ 5 = 5 & \text{The answer works.} \end{array}$$

58.

$$\begin{array}{ll} \boxed{k} - 8 = 22 & \text{Identify the variable term.} \\ \underline{\quad +8 \quad +8} & \text{Add 8 to both sides.} \\ k = 30 & \\ (30) - 8 \stackrel{?}{=} 22 & \text{Check the answer.} \\ 22 = 22 & \text{The answer works.} \end{array}$$

59.

$$\begin{array}{ll} -4 + \boxed{p} = 23 & \text{Identify the variable term.} \\ \underline{+4 \qquad +4} & \text{Add 4 to both sides.} \\ p = 27 & \\ -4 + (27) \stackrel{?}{=} 23 & \text{Check the answer.} \\ 23 = 23 & \text{The answer works.} \end{array}$$

60.

$$\begin{array}{ll} -4 + \boxed{y} = 9 & \text{Identify the variable term.} \\ \underline{+4 \qquad +4} & \text{Add 4 to both sides.} \\ y = 13 & \\ -4 + (13) \stackrel{?}{=} 9 & \text{Check the answer.} \\ 9 = 9 & \text{The answer works.} \end{array}$$

61.

$$\begin{array}{ll} -1 + \boxed{k} = -16 & \text{Identify the variable term.} \\ \underline{+1 \qquad +1} & \text{Add 1 to both sides.} \\ k = -15 & \\ -1 + (-15) \stackrel{?}{=} -16 & \text{Check the answer.} \\ -16 = -16 & \text{The answer works.} \end{array}$$

62.

$$\begin{array}{ll} -3 + \boxed{w} = -9 & \text{Identify the variable term.} \\ \underline{+3 \qquad +3} & \text{Add 3 to both sides.} \\ w = -6 & \\ -3 + (-6) \stackrel{?}{=} -9 & \text{Check the answer.} \\ -9 = -9 & \text{The answer works.} \end{array}$$

63.

$5=-3+\boxed{x}$ Identify the variable term.
$\underline{+3\ \ +3}$ Add 3 to both sides.
$8=x$

$5\overset{?}{=}-3+(8)$ Check the answer.
$5=5$ The answer works.

64.

$-8=-2+\boxed{r}$ Identify the variable term.
$\underline{+2\ \ \ +2}$ Add 2 to both sides.
$-6=r$

$-8\overset{?}{=}-2+(-6)$ Check the answer.
$-8=-8$ The answer works.

65.

$\boxed{a}+0.25=2.75$ Identify the variable term.
$\underline{-0.25\ \ \ -0.25}$ Subtract 0.25 from both sides.
$a=2.5$

$(2.5)+0.25\overset{?}{=}2.75$ Check the answer.
$2.75=2.75$ The answer works.

66.

$-1.35+\boxed{b}=7.60$ Identify the variable term.
$\underline{+1.35\ \ \ \ \ \ +1.35}$ Add 1.35 to both sides.
$b=8.95$

$-1.35+(8.95)\overset{?}{=}7.60$ Check the answer.
$7.60=7.60$ The answer works.

67.

$\frac{3}{2}=\frac{1}{2}+\boxed{x}$ Identify the variable term.

$\underline{-\frac{1}{2}\ \ -\frac{1}{2}}$ Subtract $\frac{1}{2}$ from both sides.

$\frac{2}{2}=x$

$1=x$

$\frac{3}{2}\overset{?}{=}\frac{1}{2}+1$ Check the answer.

$\frac{3}{2}\overset{?}{=}\frac{1}{2}+\frac{2}{2}$

$\frac{3}{2}=\frac{3}{2}$ The answer works.

68.

$\frac{5}{3}=-\frac{1}{3}+\boxed{y}$ Identify the variable term.

$\underline{+\frac{1}{3}\ \ +\frac{1}{3}}$ Add $\frac{1}{3}$ to both sides.

$\frac{6}{3}=y$

$2=y$

$\frac{5}{3}\overset{?}{=}-\frac{1}{3}+(2)$ Check the answer.

$\frac{5}{3}\overset{?}{=}-\frac{1}{3}+\frac{6}{3}$

$\frac{5}{3}=\frac{5}{3}$ The answer works.

69.

$\boxed{m}+\frac{2}{3}=\frac{7}{3}$ Identify the variable term.

$\underline{-\frac{2}{3}\ \ -\frac{2}{3}}$ Subtract $\frac{2}{3}$ from both sides.

$m=\frac{5}{3}$

$\left(\frac{5}{3}\right)+\frac{2}{3}\overset{?}{=}\frac{7}{3}$ Check the answer.

$\frac{7}{3}=\frac{7}{3}$ The answer works.

70.

$\boxed{t}-\frac{9}{5}=\frac{6}{5}$ Identify the variable term.

$\underline{+\frac{9}{5}\ \ +\frac{9}{5}}$ Add $\frac{9}{5}$ to both sides.

$t=\frac{15}{5}$

$t=3$

$(3)-\frac{9}{5}\overset{?}{=}\frac{6}{5}$ Check the answer.

$\frac{15}{5}-\frac{9}{5}=\frac{6}{5}$

$\frac{6}{5}=\frac{6}{5}$ The answer works.

71.

$\frac{4}{9}+\boxed{m}=\frac{5}{9}$ Identify the variable term.

$\underline{-\frac{4}{9}\ \ \ \ -\frac{4}{9}}$ Subtract $\frac{4}{9}$ from both sides.

$m=\frac{1}{9}$

$\frac{4}{9}+\left(\frac{1}{9}\right)\overset{?}{=}\frac{5}{9}$ Check the answer.

$\frac{5}{9}=\frac{5}{9}$ The answer works.

72.

$\frac{1}{3}+\boxed{y}=\frac{5}{3}$ Identify the variable term.

$\underline{-\frac{1}{3}\ \ \ -\frac{1}{3}}$ Subtract $\frac{1}{3}$ from both sides.

$y=\frac{4}{3}$

$\frac{1}{3}+\left(\frac{4}{3}\right)\stackrel{?}{=}\frac{5}{3}$ Check the answer.

$\frac{5}{3}=\frac{5}{3}$ The answer works.

73.

$5+\boxed{x}=14$ Identify the variable term.

$-5 \quad -5$ Subtract 5 from both sides.

$x=9$

$5+(9)\stackrel{?}{=}14$ Check the answer.

$14=14$ The answer works.

74.

$7+\boxed{z}=5$ Identify the variable term.

$-7 \quad -7$ Subtract 7 from both sides.

$z=-2$

$7+(-2)\stackrel{?}{=}5$ Check the answer.

$5=5$ The answer works.

75.

$\boxed{d}-1.75=6.5$ Identify the variable term.

$+1.75 \quad +1.75$ Add 1.75 to both sides.

$d=8.25$

$(8.25)-1.75\stackrel{?}{=}6.5$ Check the answer.

$6.5=6.5$ The answer works.

76.

$-2.8+\boxed{k}=12.3$ Identify the variable term.

$+2.8 \quad +2.8$ Add 2.8 to both sides.

$k=15.1$

$-2.8+(15.1)\stackrel{?}{=}12.3$ Check the answer.

$12.3=12.3$ The answer works.

77.

$-1.3+\boxed{x}=-4.7$ Identify the variable term.

$+1.3 \quad +1.3$ Add 1.3 to both sides.

$x=-3.4$

$-1.3+(-3.4)\stackrel{?}{=}-4.7$ Check the answer.

$-4.7=-4.7$ The answer works.

78.

$13.5=-7.8+\boxed{y}$ Identify the variable term.

$+7.8 \quad +7.8$ Add 7.8 to both sides.

$21.3=y$

$13.5\stackrel{?}{=}-7.8+(21.3)$ Check the answer.

$13.5=13.5$ The answer works.

79.

$\frac{2}{5}+\boxed{x}=\frac{3}{7}$ Identify the variable term.

$-\frac{2}{5} \quad -\frac{2}{5}$ Subtract $\frac{2}{5}$ from both sides.

$x=\frac{3}{7}-\frac{2}{5}$ Find LCD = 35.

$x=\frac{15}{35}-\frac{14}{35}$ Rewrite over LCD.

$x=\frac{1}{35}$

$\frac{2}{5}+\left(\frac{1}{35}\right)\stackrel{?}{=}\frac{3}{7}$ Check the answer.

$\frac{14}{35}+\frac{1}{35}\stackrel{?}{=}\frac{3}{7}$ Find LCD = 35.

$\frac{15}{35}\stackrel{?}{=}\frac{3}{7}$ Reduce on left side.

$\frac{3}{7}=\frac{3}{7}$ The answer works.

80.

$\frac{1}{2}+\boxed{x}=\frac{2}{3}$ Identify the variable term.

$-\frac{1}{2} \quad -\frac{1}{2}$ Subtract $\frac{1}{2}$ from both sides.

$x=\frac{2}{3}-\frac{1}{2}$ Find LCD = 6.

$x=\frac{4}{6}-\frac{3}{6}$ Rewrite over LCD.

$x=\frac{1}{6}$

$\frac{1}{2}+\left(\frac{1}{6}\right)\stackrel{?}{=}\frac{2}{3}$ Check the answer.

$\frac{3}{6}+\frac{1}{6}\stackrel{?}{=}\frac{2}{3}$ Find LCD = 6.

$\frac{4}{6}\stackrel{?}{=}\frac{2}{3}$ Reduce on left side.

$\frac{2}{3}=\frac{2}{3}$ The answer works.

81.

$\frac{4}{5}+\boxed{y}=\frac{3}{10}$ Identify the variable term.

$-\frac{4}{5} \quad -\frac{4}{5}$ Subtract $\frac{4}{5}$ from both sides.

$y=\frac{3}{10}-\frac{4}{5}$ Find LCD = 10.

$x=\frac{3}{10}-\frac{8}{10}$ Rewrite over LCD.

$x=-\frac{5}{10}$ Reduce.

$x=-\frac{1}{2}$

$$\frac{4}{5}+\left(-\frac{1}{2}\right)\stackrel{?}{=}\frac{3}{10}$$ Check the answer.

$$\frac{8}{10}-\frac{5}{10}\stackrel{?}{=}\frac{3}{10}$$ Find LCD = 10.

$$\frac{3}{10}=\frac{3}{10}$$ The answer works.

82.

$$\frac{6}{11}+\boxed{a}=\frac{1}{22}$$ Identify the variable term.

$$-\frac{6}{11} \qquad -\frac{6}{11}$$ Subtract $\frac{6}{11}$ from both sides.

$$a=\frac{1}{22}-\frac{6}{11}$$ Find LCD = 22.

$$a=\frac{1}{22}-\frac{12}{22}$$ Rewrite over LCD.

$$x=-\frac{11}{22}$$ Reduce.

$$x=-\frac{1}{2}$$

$$\frac{6}{11}+\left(-\frac{1}{2}\right)\stackrel{?}{=}\frac{1}{22}$$ Check the answer.

$$\frac{12}{22}-\frac{11}{22}\stackrel{?}{=}\frac{1}{22}$$ Find LCD = 22.

$$\frac{1}{22}=\frac{1}{22}$$ The answer works.

83.

$$P=\boxed{R}-C$$ Identify the variable term to isolate.

$$+C \qquad +C$$ Add C to both sides.

$C+P=R$ or $R=C+P$

84.

$$S=\boxed{P}-D$$ Identify the variable term to isolate.

$$+D \qquad +D$$ Add D to both sides.

$D+S=P$ or $P=D+S$

85.

$$s+\boxed{l}+c=220$$ Identify the variable term to isolate.

$$-s \qquad -s$$ Subtract s from both sides.

$$l+c=220-s$$

$$-c \qquad -c$$ Subtract c from both sides.

$$l=220-c-s$$

86.

$$R=\boxed{C}+M$$ Identify the variable term to isolate.

$$-M \qquad -M$$ Subtract M from both sides.

$R-M=C$ or $C=R-M$

87.

$$\boxed{A}+B+90^\circ=180^\circ$$ Identify the variable term to isolate.

$$-B \qquad -B$$ Subtract B from both sides.

$$A+90^\circ=180^\circ-B$$

$$-90^\circ \quad -90^\circ$$ Subtract 90 from both sides.

$$A=90^\circ-B$$

88.

$$A+B+\boxed{C}+D=360^\circ$$ Identify the variable term to isolate.

$$-A \qquad -A$$ Subtract A from both sides.

$$B+C+D=360^\circ-A$$

$$-B \qquad -B$$ Subtract B from both sides.

$$C+D=360^\circ-A-B$$

$$-D \qquad -D$$ Subtract D from both sides.

$$C=360^\circ-A-B-D$$

89.

$$T=45+\boxed{M}$$ Identify the variable term to isolate.

$$-45 \quad -45$$ Subtract 45 from both sides.

$T-45=M$ or $M=T-45$

90.

$$g=3f+\boxed{h}$$ Identify the variable term to isolate.

$$-3f \quad -3f$$ Subtract $3f$ from both sides.

$g-3f=h$ or $h=g-3f$

91.

$$x+\boxed{y}=-4$$ Identify the variable term to isolate.

$$-x \qquad -x$$ Subtract x from both sides.

$$y=-x-4$$

92.

$$2x+\boxed{y}=7$$ Identify the variable term to isolate.

$$-2x \qquad -2x$$ Subtract x from both sides.

$$y=-2x+7$$

93.

$$D+10=3F+\boxed{G}-20$$ Identify variable term to isolate.

$$-3F \qquad -3F$$ Subtract $3F$ from both sides.

$$D-3F+10=\boxed{G}-20$$

$$+20 \qquad +20$$ Add 20 to both sides.

$D-3F+30=G$ or $G=D-3F+30$

94.

$$\begin{array}{ll} 5a-8=\boxed{b}+2c+15 & \text{Identify variable term to isolate.} \\ \underline{-2c-15 \qquad -2c-15} & \text{Subtract } 2c \text{ and } 15 \text{ from both sides.} \end{array}$$

$5a-2c-23=b$ or $b=5a-2c-23$

95.

$$\begin{array}{ll} t=-3u+\boxed{w} & \text{Identify variable term to isolate.} \\ \underline{+3u \quad +3u} & \text{Add } 3u \text{ to both sides.} \end{array}$$

$t+3u=w$ or $w=t+3u$

96.

$$\begin{array}{ll} y=-4x+\boxed{z}-20 & \text{Identify variable term to isolate.} \\ \underline{+4x+20 \quad +4x \qquad +20} & \text{Add } 4x \text{ and } 20 \text{ to both sides.} \end{array}$$

$4x+y+20=x$ or $x=4x+y+20$

97.

$$\begin{array}{ll} P=a+b+c & \text{Identify variable term to isolate.} \\ \underline{-a-c \quad -a \quad\ -c} & \text{Subtract } a \text{ and } c \text{ from both sides.} \end{array}$$

$P-a-c=b$ or $b=P-a-c$

98.

$$\begin{array}{ll} P=a+b+c+d & \text{Identify variable term to isolate.} \\ \underline{-a-b-c \quad -a-b-c} & \\ & \text{Subtract } a,\ b \text{ and } c \text{ from both sides.} \end{array}$$

$P-a-b-c=d$ or $d=P-a-b-c$

99.

$$\begin{array}{ll} 3y=\boxed{x}-5 & \text{Identify variable term to isolate.} \\ \underline{+5 \qquad\quad +5} & \text{Add 5 to both sides.} \end{array}$$

$3y+5=x$ or $x=3y+5$

100.

$$\begin{array}{ll} -4y=\boxed{x}+9 & \text{Identify variable term to isolate.} \\ \underline{-9 \qquad\quad -9} & \text{Subtract 9 from both sides.} \end{array}$$

$-4y-9=x$ or $x=-4y-9$

101. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} 23=\boxed{x}+9 & \text{Identify variable term to isolate.} \\ \underline{-9 \qquad -9} & \text{Subtract 9 from both sides.} \\ 14=x & \\ x=14 & \end{array}$$

102. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} 14+\boxed{m}=45 & \text{Identify variable term to isolate.} \\ \underline{-14 \qquad\quad -14} & \text{Subtract 14 from both sides.} \\ m=31 & \end{array}$$

103. The statement does not have an equal sign, therefore it is an expression. Simplify:

$$\begin{array}{ll} \boxed{5x}+7\boxed{-3x} & \text{Combine like terms} \\ 2x+7 & \end{array}$$

104. The statement does not have an equal sign, therefore it is an expression. Simplify:

$$\begin{array}{ll} \boxed{8h}\boxed{-3h}+14+\boxed{2h} & \text{Combine like terms} \\ 7h+14 & \end{array}$$

105. The statement does not have an equal sign, therefore it is an expression. Simplify:

$$\begin{array}{ll} \boxed{20a^2}+6a\boxed{-3a^2}+10 & \text{Combine like terms} \\ 17a^2+6a+10 & \end{array}$$

106. The statement does not have an equal sign, therefore it is an expression. Simplify:

$$\begin{array}{ll} \boxed{-11n^2}+8\boxed{-5n^2}+7n & \text{Combine like terms} \\ -16n^2+7n+8 & \text{Order in conventional form} \end{array}$$

107. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} -14+\boxed{c}=-10 & \text{Identify variable term to isolate.} \\ \underline{+14 \qquad\quad +14} & \text{Add 14 to both sides.} \\ c=4 & \end{array}$$

108. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} -16+\boxed{y}=-4 & \text{Identify variable term to isolate.} \\ \underline{+16 \qquad\quad +16} & \text{Add 16 to both sides.} \\ y=12 & \end{array}$$

109. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} \boxed{p}-14=20 & \text{Identify variable term to isolate.} \\ \underline{\quad +14 \quad +14} & \text{Add 14 to both sides.} \\ p=34 & \end{array}$$

110. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{rl} \boxed{r}-27=41 & \text{Identify variable term to isolate.} \\ \underline{+27 \quad +27} & \text{Add 27 to both sides.} \\ r=68 & \end{array}$$

111. The statement does not have an equal sign, therefore it is an expression. Simplify:

$p\boxed{-14}+\boxed{20}$ Combine like terms.

$p+6$

112. The statement does not have an equal sign, therefore it is an expression. Simplify:

$r\boxed{-27}+\boxed{41}$ Combine like terms.

$r+14$

113. P represents the population of South America, in millions, t years since 1960. Therefore, when t = 35, we have $1960+35=1995$. P = 321.05 millions means $321.05\cdot 1000000=321050000$. These values mean that in the year 1995, the population of South America was 321,050,000.

114. P represents the population of South America, in millions, t years since 1960. Therefore, when t = 47, we have $1960+47=2007$. P = 380.93 millions means $380.93\cdot 1000000=380930000$. These values mean that in the year 2007, the population of South America was 380,930,000.

115.P represents the population of South America, in millions, t years since 1960. Therefore, when t = 58, we have $1960+58=2018$. P = 435.82 millions means $435.82\cdot 1000000=435820000$. These values mean that in the year 2018, the population of South America was 435,820,000.

116. P represents the population of South America, in millions, t years since 1960. Therefore, when t = 25, we have $1960+25=1985$. P = 271.15 millions means $271.15\cdot 1000000=271150000$. These values mean that in the year 1985, the population of South America was 271,150,000.

117. a. To find the number of years since 1985, subtract the year from 1960: $1985-1960=25$

The year 1985 corresponds to 25 years since 1960.

b. The variable t represents the number of years since 1960. Therefore, since 1985 is 25 years since 1960, t = 25.

c. The value of P represents the population of South America, in millions. To determine the population in the year 1985, substitute t = 25 into the equation $P=4.99t+146.4$.

$$P=4.99(25)+146.4$$
$$P=124.75+146.4$$
$$P=271.15$$

The population of South America in the year 1985 was about 271.15 million.

118. a. To find the number of years since 1998, subtract the year from 1960: $1998-1960=38$

The year 1998 corresponds to 38 years since 1960.

b. The variable t represents the number of years since 1960. Therefore, since 1998 is 38 years since 1960, t = 38.

c. The value of P represents the population of South America, in millions. To determine the population in the year 1998, substitute t = 38 into the equation $P=4.99t+146.4$.

$$P=4.99(38)+146.4$$
$$P=189.62+146.4$$
$$P=336.02$$

The population of South America in the year 1998 was about 336.02 million.

119. a. To find the number of years since 2016, subtract the year from 1960: $2016-1960=56$

The year 2016 corresponds to 56 years since 1960.

b. The variable t represents the number of years since 1960. Therefore, since 2016 is 56 years since 1960, t = 56.

c. The value of P represents the population of South America, in millions. To determine the population in the year 2016, substitute $t = 56$ into the equation $P = 4.99t + 146.4$.

$$P = 4.99(56) + 146.4$$
$$P = 279.44 + 146.4$$
$$P = 425.84$$

The population of South America in the year 2016 was about 425.84 million.

120. a. To find the number of years since 2012, subtract the year from 1960: $2012 - 1960 = 52$

The year 2012 corresponds to 52years since 1960.

b. The variable t represents the number of years since 1960. Therefore, since 2012 is 52 years since 1960, $t = 52$.

c. The value of P represents the population of South America, in millions. To determine the population in the year 2012, substitute $t = 52$ into the equation $P = 4.99t + 146.4$.

$$P = 4.99(52) + 146.4$$
$$P = 259.48 + 146.4$$
$$P = 405.88$$

The population of South America in the year 2012 was about 405.88 million.

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Section 2.2 Multiplication and Division Properties of Equality

Exercises 1-22: Answers are to be checked. Exercises 1-5 are completed as examples.

1. Divide both sides of the equation by 3.

$3x = -81$ Variable term is isolated.

$\frac{3x}{3} = \frac{-81}{3}$ Divide both sides by 3.

$\frac{\cancel{3}x}{\cancel{3}} = -27$

$x = -27$

$3(-27) \stackrel{?}{=} -81$ Check the answer.

$-81 = -81$ The answer works.

2. Divide both sides of the equation by 4.

$4x = -48$ Variable term is isolated.

$\frac{4x}{4} = \frac{-48}{4}$ Divide both sides by 4.

$\frac{\cancel{4}x}{\cancel{4}} = -12$

$x = -12$

$4(-12) \stackrel{?}{=} -48$ Check the answer.

$-48 = -48$ The answer works.

3. Divide both sides of the equation by -10.

$-10y = -55$ Variable term is isolated.

$\frac{-10y}{-10} = \frac{-55}{-10}$ Divide both sides by -10.

$\frac{-\cancel{10}y}{-\cancel{10}} = \frac{11}{2}$

$y = 5\frac{1}{2}$

$-10\left(5\frac{1}{2}\right) \stackrel{?}{=} -55$ Check the answer.

$-10\left(\frac{11}{2}\right) \stackrel{?}{=} -55$

$-55 = -55$ The answer works.

4. Divide both sides of the equation by -6.

$-6y = -27$ Variable term is isolated.

$\frac{-6y}{-6} = \frac{-27}{-6}$ Divide both sides by -6.

$\frac{-\cancel{6}y}{-\cancel{6}} = \frac{9}{2}$

$y = 4\frac{1}{2}$

$-6\left(4\frac{1}{2}\right) \stackrel{?}{=} -27$ Check the answer.

$-6\left(\frac{9}{2}\right) \stackrel{?}{=} -27$

$-27 = -27$ The answer works.

5. Divide both sides of the equation by 7.

$7g = 91$ Variable term is isolated.

$\frac{7g}{7} = \frac{91}{7}$ Divide both sides by 7.

$\frac{\cancel{7}g}{\cancel{7}} = 13$

$g = 13$

$7(13) \stackrel{?}{=} 91$ Check the answer.

$91 = 91$ The answer works.

6. Divide both sides of the equation by 14.

$14k = 84$ Variable term is isolated.

$\frac{14k}{14} = \frac{84}{14}$ Divide both sides by 14.

$\frac{\cancel{14}k}{\cancel{14}} = 6$

$k = 6$

7. Divide both sides of the equation by -1.

$-x = -9$ Variable term is isolated.

$\frac{-1x}{-1} = \frac{-9}{-1}$ Divide both sides by -1.

$x = 9$

8. Divide both sides of the equation by -1.

$17 = -n$ Variable term is isolated.

$\frac{17}{-1} = \frac{-1n}{-1}$ Divide both sides by -1.

$-17 = n$

9. Divide both sides of the equation by 2.8.

$42 = 2.8x$ Variable term is isolated.

$\frac{42}{2.8} = \frac{2.8x}{2.8}$ Divide both sides by 2.8.

$15 = \frac{\cancel{2.8}x}{\cancel{2.8}}$

$15 = x$

10. Divide both sides of the equation by 3.7.

$3.7m = 31.45$ Variable term is isolated.

$\frac{3.7m}{3.7} = \frac{31.45}{3.7}$ Divide both sides by 3.7.

$\frac{\cancel{3.7}m}{\cancel{3.7}} = 8.5$

$m = 8.5$

11. Divide both sides of the equation by 6.1.

$15.25 = 6.1n$ Variable term is isolated.

$\frac{15.25}{6.1} = \frac{6.1n}{6.1}$ Divide both sides by 6.1.

$2.5 = \frac{\cancel{6.1}n}{\cancel{6.1}}$

$2.5 = n$

12. Divide both sides of the equation by 5.4.

$49.68 = 5.4n$ Variable term is isolated.

$\frac{49.68}{5.4} = \frac{5.4n}{5.4}$ Divide both sides by 5.4.

$9.2 = \frac{\cancel{5.4}n}{\cancel{5.4}}$

$9.2 = n$

13. Divide both sides of the equation by -6.

$-6c = 42$ Variable term is isolated.

$\frac{-6c}{-6} = \frac{42}{-6}$ Divide both sides by -6.

$\frac{-\cancel{6}c}{-\cancel{6}} = -7$

$c = -7$

14. Divide both sides of the equation by -4.

$-4x = 45$ Variable term is isolated.

$\frac{-4x}{-4} = \frac{45}{-4}$ Divide both sides by -4.

$\frac{-\cancel{4}x}{-\cancel{4}} = -11\frac{1}{4}$

$x = -11\frac{1}{4}$

15. Multiply both sides of the equation by 5.

$\frac{t}{5} = 14$ Variable term is isolated.

$5\left(\frac{t}{5}\right) = 5(14)$ Multiply both sides by 5.

$\cancel{5}\left(\frac{t}{\cancel{5}}\right) = 70$

$t = 70$

16. Multiply both sides of the equation by 3.

$\frac{p}{3} = 9$ Variable term is isolated.

$3\left(\frac{p}{3}\right) = 3(9)$ Multiply both sides by 3.

$\cancel{3}\left(\frac{p}{\cancel{3}}\right) = 27$

$p = 27$

17. Multiply both sides by the reciprocal.

$\frac{2}{3}x = -10$ Variable term is isolated.

$\frac{3}{2}\cdot\frac{2}{3}x = -10\cdot\frac{3}{2}$ Multiply both sides by reciprocal of $\frac{2}{3}$.

$\frac{\cancel{3}}{\cancel{2}}\cdot\frac{\cancel{2}}{\cancel{3}}x = \frac{-5\cdot\cancel{2}\cdot 3}{\cancel{2}}$ Divide out like factors.

$x = -15$

18. Multiply both sides by the reciprocal.

$-\frac{4}{5}x = 8$ Variable term is isolated.

$-\frac{5}{4}\cdot\left(-\frac{4}{5}x\right) = 8\cdot\left(-\frac{5}{4}\right)$ Multiply both sides by reciprocal of $-\frac{4}{5}$.

$-\frac{\cancel{5}}{\cancel{4}}\cdot\left(-\frac{\cancel{4}}{\cancel{5}}x\right) = -\frac{5\cdot\cancel{4}\cdot 2}{\cancel{4}}$ Divide out like factors.

$x = -10$

19. Multiply both sides by the reciprocal.

$\frac{5n}{7} = -\frac{2}{5}$ Variable term is isolated.

$\frac{7}{5}\cdot\frac{5n}{7} = -\frac{2}{5}\cdot\frac{7}{5}$ Multiply both sides by reciprocal of $\frac{5}{7}$.

$\frac{\cancel{7}}{\cancel{5}}\cdot\frac{\cancel{5}}{\cancel{7}}n = -\frac{14}{25}$ Divide out like factors.

$x = -\frac{14}{25}$

20. Multiply both sides by the reciprocal.

$$\frac{3n}{4}=-\frac{9}{5} \quad \text{Variable term is isolated.}$$
$$\frac{4}{3}\cdot\frac{3n}{4}=-\frac{9}{5}\cdot\frac{4}{3} \quad \text{Multiply both sides by reciprocal of } \frac{3}{4}.$$
$$\frac{\cancel{4}}{\cancel{3}}\cdot\frac{\cancel{3}}{\cancel{4}}n=-\frac{3\cdot\cancel{3}\cdot 4}{5\cdot\cancel{3}} \quad \text{Divide out like factors.}$$
$$n=-\frac{12}{5}$$

21. Multiply both sides of the equation by -3.5.

$$-\frac{k}{3.5}=-4 \quad \text{Variable term is isolated.}$$
$$-3.5\left(-\frac{k}{3.5}\right)=-3.5(-4) \quad \text{Multiply both sides by } -3.5.$$
$$-\cancel{3.5}\left(-\frac{k}{\cancel{3.5}}\right)=14$$
$$k=14$$

22. Multiply both sides of the equation by -7.

$$-\frac{g}{7}=4.6 \quad \text{Variable term is isolated.}$$
$$-7\left(-\frac{g}{7}\right)=-7(4.6) \quad \text{Multiply both sides by } -7.$$
$$-\cancel{7}\left(-\frac{g}{\cancel{7}}\right)=-32.2$$
$$g=-32.2$$

23. a.

$$S=17h \quad \text{Given equation.}$$
$$S=17(80) \quad \text{Substitute } h=80.$$
$$S=1360 \quad \text{Multiply and solve for } S.$$

If Victoria works 80 hours, her salary will be $1360.

b.

$$S=17h \quad \text{Given equation.}$$
$$2040=17h \quad \text{Substitute } S=2040 \text{ and solve for } h.$$
$$\frac{2040}{17}=\frac{17h}{17} \quad \text{Divide both sides by 17.}$$
$$120=\frac{\cancel{17}h}{\cancel{17}}$$
$$120=h$$

Victoria has to work 120 hours to make $2040 a month.

c.

$$S=17h \quad \text{Given equation.}$$
$$700=17h \quad \text{Substitute } S=700 \text{ and solve for } h.$$
$$\frac{700}{17}=\frac{17h}{17} \quad \text{Divide both sides by 17.}$$
$$41.18\approx\frac{\cancel{17}h}{\cancel{17}}$$
$$41.18\approx h$$

Victoria has to work approximately 41.18 hours to earn $700.

24. a.

$$D=60t \quad \text{Given equation.}$$
$$D=60(12) \quad \text{Substitute } t=12.$$
$$D=720 \quad \text{Multiply and solve for } D.$$

Emily will travel 720 miles in a day if she drives for 12 hours.

b.

$$D=60t \quad \text{Given equation.}$$
$$450=60t \quad \text{Substitute } D=450.$$
$$\frac{450}{60}=\frac{60t}{60} \quad \text{Divide both sides by 60.}$$
$$7.5=\frac{\cancel{60}t}{\cancel{60}}$$
$$7.5=t$$

Emily will have to drive for 7.5 hours to travel 450 miles a day.

c.

$$D=60t \quad \text{Given equation.}$$
$$2450=60t \quad \text{Substitute } D=2450.$$
$$\frac{2450}{60}=\frac{60t}{60} \quad \text{Divide both sides by 60.}$$
$$40.8\overline{3}=\frac{\cancel{60}t}{\cancel{60}}$$
$$40.83\approx t$$

It will take Emily approximately 40.83 hours to drive the approximate 2450 miles.

25. a.

$$F=0.02L \quad \text{Given equation.}$$
$$F=0.02(250000) \quad \text{Substitute } L=250000.$$
$$F=5000 \quad \text{Multiply and solve for } F.$$

The loan fees will be $5000 for a loan of $250,000.

b.

$$\begin{aligned} F &= 0.02L && \text{Given equation.} \\ 4000 &= 0.02L && \text{Substitute } F = 4000. \\ \frac{4000}{0.02} &= \frac{0.02L}{0.02} && \text{Divide both sides by 0.02.} \\ 200000 &= \frac{\cancel{0.02}L}{\cancel{0.02}} \\ 200000 &= L \end{aligned}$$

Pablo can suggest a maximum loan amount of approximately \$200,000 to keep the fees down to only \$4000.

26. a.

$$\begin{aligned} F &= 0.025L && \text{Given equation.} \\ F &= 0.025(300000) && \text{Substitute } L = 300000. \\ F &= 7500 && \text{Multiply and solve for } F. \end{aligned}$$

Rachel will pay \$7500 in fees if her home loan is for \$300,000.

b.

$$\begin{aligned} F &= 0.025L && \text{Given equation.} \\ 5000 &= 0.025L && \text{Substitute } F = 5000. \\ \frac{5000}{0.025} &= \frac{0.025L}{0.025} && \text{Divide both sides by 0.025.} \\ 200000 &= \frac{\cancel{0.025}L}{\cancel{0.025}} \\ 200000 &= L \end{aligned}$$

The most Rachel can borrow through this broker is \$200,000.

27. a.

$$\begin{aligned} D &= 18b && \text{Given equation.} \\ D &= 18(500) && \text{Substitute } b = 500. \\ D &= 9000 && \text{Multiply and solve for } D. \end{aligned}$$

There will be 9000 bricks that do not meet the quality standards.

b.

$$\begin{aligned} D &= 18b && \text{Given equation.} \\ D &= 18(40.8) && \text{Substitute } b = 40.8. \\ D &= 734.4 && \text{Multiply and solve for } D. \end{aligned}$$

Rounding to the nearest whole number, approximately 734 bricks will not meet the quality standards of the 40.8 million bricks produced in a day.

c.

$$\begin{aligned} D &= 18b && \text{Given equation.} \\ 21600 &= 18b && \text{Substitute } D = 21600. \\ \frac{21600}{18} &= \frac{18b}{18} && \text{Divide both sides by 18.} \\ 1200 &= \frac{\cancel{18}b}{\cancel{18}} \\ 1200 &= b \end{aligned}$$

LEGO produced 1200 million (or 1.2 billion) bricks if there are 21,600 bricks that do not meet the company's quality standards.

28. a.

$$\begin{aligned} B &= 429m && \text{Given equation.} \\ B &= 429(1) && \text{Substitute } m = 1. \\ B &= 429 && \text{Multiply and solve for } B. \end{aligned}$$

The machine can make 429 bricks in 1 minute.

b. Convert hours to minutes (1 hour = 60 minutes) then substitute $m=60$ into the equation $B=429m$ and solve for B.

$$\begin{aligned} B &= 429m && \text{Given equation.} \\ B &= 429(60) && \text{Substitute } m = 60. \\ B &= 25740 && \text{Multiply and solve for } B. \end{aligned}$$

The machine can make 25,740 bricks in 1 hour.

c.

$$\begin{aligned} B &= 429m && \text{Given equation.} \\ 15000000 &= 429m && \text{Substitute } B = 15{,}000{,}000. \\ \frac{15000000}{429} &= \frac{429m}{429} && \text{Divide both sides by 429.} \\ 34965 &\approx \frac{\cancel{429}m}{\cancel{429}} \\ 34965 &\approx m \end{aligned}$$

It will take this machine approximately 34,965 minutes, which is approximately 24.28 days.

29. a.

$$\begin{aligned} B &= \frac{P}{60} && \text{Given equation.} \\ B &= \frac{300}{60} && \text{Substitute } P = 300. \text{ Solve for } B. \\ B &= 5 \end{aligned}$$

A total of 5 buses would be needed to transport 300 people.

b.

$$B = \frac{P}{60} \quad \text{Given equation.}$$
$$350 = \frac{P}{60} \quad \text{Substitute } B = 350.$$
$$60 \cdot 350 = \frac{P}{60} \cdot 60 \quad \text{Multiply both sides by 60.}$$
$$21000 = \frac{P}{\cancel{60}} \cdot \cancel{60} \quad \text{Solve for } P.$$
$$21000 = P$$

Public transportation can handle 21,000 people at a time with 350 city buses.

c.

$$B = \frac{P}{60} \quad \text{Given equation.}$$
$$600 = \frac{P}{60} \quad \text{Substitute } B = 600.$$
$$60 \cdot 600 = \frac{P}{60} \cdot 60 \quad \text{Multiply both sides by 60.}$$
$$36000 = \frac{P}{\cancel{60}} \cdot \cancel{60} \quad \text{Solve for } P.$$
$$36000 = P$$

The city can transport 36,000 people at a time with 600 school and city buses.

30. a.

$$C = \frac{w}{13} \quad \text{Given equation.}$$
$$C = \frac{39}{13} \quad \text{Substitute } w = 39.$$
$$C = 3 \quad \text{Divide and solve for } C.$$

The rated maximum capacity for a bus seat that is 39 inches wide is 3 persons.

b.

$$C = \frac{w}{13} \quad \text{Given equation.}$$
$$2 = \frac{w}{13} \quad \text{Substitute } C = 2.$$
$$13 \cdot 2 = \frac{w}{13} \cdot 13 \quad \text{Multiply both sides by 13; solve for } w.$$
$$26 = \frac{w}{\cancel{13}} \cdot \cancel{13}$$
$$26 = w$$

The smallest width would be 26 inches.

c.

$$C = \frac{w}{13} \quad \text{Given equation.}$$
$$4 = \frac{w}{13} \quad \text{Substitute } C = 4.$$
$$13 \cdot 4 = \frac{w}{13} \cdot 13 \quad \text{Multiply both sides by 13; solve for } w.$$
$$52 = \frac{w}{\cancel{13}} \cdot \cancel{13}$$
$$52 = w$$

The smallest width would be 52 inches.

d. First find the maximum capacity per seat. Substitute $w=39$ into the equation $C=\frac{w}{13}$ and solve for C. We know from part a that the solution is $C=3$. Now multiply this by the total number of seats in the bus, which is 24, to find the total maximum capacity for the bus.

$$3 \cdot 24 = 72$$

The total maximum capacity is 72 people for a bus with 24 seats in it that are 39 inches wide.

31. a. 2018 is 8 years since 2010, so $t = 6$.

$$M = 75270.9t + 712058.6 \quad \text{Given equation.}$$
$$M = 75270.9(8) + 712058.6 \quad \text{Substitute } t = 8.$$
$$M = 602167.2 + 712058.6 \quad \text{Multiply and solve for } M.$$
$$M = 1314225.8$$

The total amount of mortgage debt for multifamily homes in the United States is $1,314,225.8 million.

b.

$$M = 75270.9t + 712058.6 \quad \text{Given equation.}$$
$$1464767.6 = 75270.9t + 712058.6 \quad \text{Substitute } M = 1464767.6.$$
$$\underline{-712058.6 \qquad\qquad -712058.6} \quad \text{Isolate variable term.}$$
$$752709 = 75270.9t$$
$$\frac{752709}{75270.9} = \frac{\cancel{75270.9}}{\cancel{75270.9}}t \quad \text{Divide both sides by 75270.9.}$$
$$10 = t$$

In the year 2018 the total amount of mortgage debt for multifamily homes in the United States was $1,464,767.6 million.

32. a.

$C = 2.99 + 0.99n$ Given equation.
$C = 2.99 + 0.99(5)$ Substitute $n = 5$.
$C = 2.99 + 4.95$ Multiply & solve for C.
$C = 7.94$

The cost to ship 5 items via USPS is $7.94.

b.

$C = 2.99 + 0.99n$ Given equation.
$5.96 = 2.99 + 0.99n$ Substitute $C = 5.96$.
$\underline{-2.99 \quad -2.99}$ Isolate variable term.
$2.97 = 0.99n$
$\frac{2.97}{0.99} = \frac{\cancel{0.99}n}{\cancel{0.99}}$ Divide both sides by 0.99.
$3 = n$

Three items were shipped.

c.

$C = 2.99 + 0.99n$ Given equation.
$12.89 = 2.99 + 0.99n$ Substitute $C = 12.89$.
$\underline{-2.99 \quad -2.99}$ Isolate variable term.
$9.9 = 0.99n$
$\frac{9.9}{0.99} = \frac{\cancel{0.99}n}{\cancel{0.99}}$ Divide both sides by 0.99.
$10 = n$

Ten items were shipped.

33. a.

$f = 0.08p + 20$ Given equation.
$f = 0.08(17900) + 20$ Substitute $p = 17900$.
$f = 1432 + 20$ Multiply & solve for f.
$f = 1452$

The fee will be $1,452.

b.

$f = 0.08p + 20$ Given equation.
$104 = 0.08p + 20$ Substitute $f = 104$.
$\underline{-20 \qquad -20}$ Isolate variable term.
$84 = 0.08p$
$\frac{84}{0.08} = \frac{\cancel{0.08}p}{\cancel{0.08}}$ Divide both sides by 0.08.
$1050 = p$

The final price of the log splitter was $1,050.

c.

$f = 0.08p + 20$ Given equation.
$1100 = 0.08p + 20$ Substitute $f = 1100$.
$\underline{-20 \qquad -20}$ Isolate variable term.
$1080 = 0.08p$
$\frac{1080}{0.08} = \frac{\cancel{0.08}p}{\cancel{0.08}}$ Divide both sides by 0.08.
$60000 = p$

The final price of the tractor was $60,000.

34. a.

$C = 4.95 + 0.65n$ Given equation.
$C = 4.95 + 0.65(20)$ Substitute $n = 20$.
$C = 4.95 + 13$ Multiply and solve for C.
$C = 17.95$

The commission charged will be $17.95.

b.

$C = 4.95 + 0.65n$ Given equation.
$102.45 = 4.95 + 0.65n$ Substitute $C = 102.45$.
$\underline{-4.95 \quad -4.95}$ Isolate variable term.
$97.5 = 0.65n$
$\frac{97.5}{0.65} = \frac{\cancel{0.65}n}{\cancel{0.65}}$ Divide both sides by 0.65.
$150 = n$

The customer ordered 150 contracts.

c.

$C = 4.95 + 0.65n$ Given equation.
$66.70 = 4.95 + 0.65n$ Substitute $C = 66.70$.
$\underline{-4.95 \quad -4.95}$ Isolate variable term.
$61.75 = 0.65n$
$\frac{61.75}{0.65} = \frac{\cancel{0.65}n}{\cancel{0.65}}$ Divide both sides by 0.65.
$95 = n$

The customer ordered 95 contracts.

35. a.

$F = 0.30 + 0.029p$ Given equation.
$F = 0.30 + 0.029(100)$ Substitute $p = 100$.
$F = 0.30 + 2.9$ Multiply and solve for F.
$F = 3.2$

The fee for a $100 transaction is $3.20.

b.

$$\begin{aligned} F &= 0.30+0.029p && \text{Given equation.} \\ 10.74 &= 0.30+0.029p && \text{Substitute } F=10.74. \\ -0.30 & \quad -0.30 && \text{Isolate variable term.} \\ 10.44 &= 0.029p \\ \frac{10.44}{0.029} &= \frac{\cancel{0.029}p}{\cancel{0.029}} && \text{Divide both sides by 0.029.} \\ 360 &= p \end{aligned}$$

The total transaction was \$360 if the fee charged was \$10.74.

c.

$$\begin{aligned} F &= 0.30+0.029p && \text{Given equation.} \\ 43.80 &= 0.30+0.029p && \text{Substitute } F=43.80. \\ -0.30 & \quad -0.30 && \text{Isolate variable term.} \\ 43.5 &= 0.029p \\ \frac{43.5}{0.029} &= \frac{\cancel{0.029}p}{\cancel{0.029}} && \text{Divide both sides by 0.029.} \\ 1500 &= p \end{aligned}$$

The total transaction was \$1500.

36. a.

$$\begin{aligned} C &= 1500+0.015p && \text{Given equation.} \\ C &= 1500+0.015(325000) && \text{Substitute } p=325000. \\ C &= 1500+4875 && \text{Multiply and solve for } C. \\ C &= 6375 \end{aligned}$$

The commission would be \$6,375.

b.

$$\begin{aligned} C &= 1500+0.015p && \text{Given equation.} \\ 5625 &= 1500+0.015p && \text{Substitute } C=5625. \\ -1500 & \quad -1500 && \text{Isolate variable term.} \\ 4125 &= 0.015p \\ \frac{4125}{0.015} &= \frac{\cancel{0.015}p}{\cancel{0.015}} && \text{Divide both sides by 0.015.} \\ 275000 &= p \end{aligned}$$

The sales price of the home was \$275,000.

c.

$$\begin{aligned} C &= 1500+0.015p && \text{Given equation.} \\ 7875 &= 1500+0.015p && \text{Substitute } C=7875. \\ -1500 & \quad -1500 && \text{Isolate variable term.} \\ 6375 &= 0.015p \\ \frac{6375}{0.015} &= \frac{\cancel{0.015}p}{\cancel{0.015}} && \text{Divide both sides by 0.015.} \\ 425000 &= p \end{aligned}$$

The sales price of the home was \$425,000.

37. Step 1 Reason: Isolate the variable term by subtracting 15 from both sides.

$$-2.5c = -20$$

Step 2 Algebraic Step: $\dfrac{-2.5c}{-2.5} = \dfrac{-20}{-2.5}$

$$c = 8$$

38. Step 1 Algebraic Step:

$$\begin{aligned} -6.5h - 64 &= -93.25 \\ -15 & \quad -15 \end{aligned}$$

Step 1 Reason: Isolate the variable by using the division property of equality.

Exercises 39-64: Answers are to be checked.

Exercises 39-42 are completed as examples.

39.

$$\begin{aligned} \boxed{5x}+20 &= 60 && \text{Identify variable term to isolate.} \\ -20 & \quad -20 && \text{Subtract 20 from both sides.} \\ 5x &= 40 \\ \frac{\cancel{5}x}{\cancel{5}} &= \frac{40}{5} && \text{Divide both sides by 5.} \\ x &= 8 \end{aligned}$$

$$\begin{aligned} 5(8)+20 &\stackrel{?}{=} 60 && \text{Check the answer.} \\ 40+20 &\stackrel{?}{=} 60 \\ 60 &= 60 && \text{The answer works.} \end{aligned}$$

40.

$$\begin{aligned} \boxed{8m}+34 &= 154 && \text{Identify variable term to isolate.} \\ -34 & \quad -34 && \text{Subtract 34 from both sides.} \\ 8m &= 120 \\ \frac{\cancel{8}m}{\cancel{8}} &= \frac{120}{8} && \text{Divide both sides by 8.} \\ m &= 15 \end{aligned}$$

$$\begin{aligned} 8(15)+34 &\stackrel{?}{=} 154 && \text{Check the answer.} \\ 120+34 &\stackrel{?}{=} 154 \\ 154 &= 154 && \text{The answer works.} \end{aligned}$$

41.

$$\begin{aligned} \boxed{-3p}+50 &= -85 && \text{Identify variable term to isolate.} \\ -50 & \quad -50 && \text{Subtract 50 from both sides.} \\ -3p &= -135 \\ \frac{\cancel{-3}p}{\cancel{-3}} &= \frac{-135}{-3} && \text{Divide both sides by } -3. \\ p &= 45 \end{aligned}$$

$$\begin{aligned} -3(45)+50 &\overset{?}{=} -85 && \text{Check the answer.} \\ -135+50 &\overset{?}{=} -85 \\ -85 &= -85 && \text{The answer works.} \end{aligned}$$

42.

$$\begin{aligned} \boxed{-2q}+25 &= -45 && \text{Identify variable term to isolate.} \\ -25 \quad -25 & && \text{Subtract 25 from both sides.} \\ -2q &= -70 \\ \frac{\cancel{-2}q}{\cancel{-2}} &= \frac{-70}{-2} && \text{Divide both sides by } -2. \\ q &= 35 \end{aligned}$$

$$\begin{aligned} -2(35)+25 &\overset{?}{=} -45 && \text{Check the answer.} \\ -70+25 &\overset{?}{=} -45 \\ -45 &= -45 && \text{The answer works.} \end{aligned}$$

43.

$$\begin{aligned} \boxed{-2.3t}+20 &= 26.9 && \text{Identify variable term to isolate.} \\ -20 \quad -20 & && \text{Subtract 20 from both sides.} \\ -2.3t &= 6.9 \\ \frac{\cancel{-2.3}t}{\cancel{-2.3}} &= \frac{6.9}{-2.3} && \text{Divide both sides by } -2.3. \\ t &= -3 \end{aligned}$$

44.

$$\begin{aligned} 21.2 &= \boxed{4.8k}+50 && \text{Identify variable term to isolate.} \\ -50 \quad & \quad -50 && \text{Subtract 50 from both sides.} \\ -28.8 &= 4.8k \\ \frac{-28.8}{4.8} &= \frac{\cancel{4.8}k}{\cancel{4.8}} && \text{Divide both sides by 4.8.} \\ -6 &= k \end{aligned}$$

45.

$$\begin{aligned} 20.1 &= \boxed{\frac{w}{8}}+17 && \text{Identify variable term to isolate.} \\ -17 \quad & \quad -17 && \text{Subtract 17 from both sides.} \\ 3.1 &= \frac{w}{8} \\ 3.1(8) &= \frac{w}{\cancel{8}}(\cancel{8}) && \text{Mulitply both sides by 8.} \\ 24.8 &= w \end{aligned}$$

46.

$$\begin{aligned} -8.75 &= -14\boxed{-\frac{b}{2}} && \text{Identify variable term to isolate.} \\ +14 \quad & +14 && \text{Add 14 to both sides.} \\ 5.25 &= \frac{b}{2} \\ 5.25(2) &= \frac{b}{\cancel{2}}(\cancel{2}) && \text{Mulitply both sides by 2.} \\ 10.5 &= b \end{aligned}$$

47.

$$\begin{aligned} 48 &= \boxed{12m}-30 && \text{Identify variable term to isolate.} \\ +30 \quad & \quad +30 && \text{Add 30 to both sides.} \\ 78 &= 12m \\ \frac{78}{12} &= \frac{\cancel{12}m}{\cancel{12}} && \text{Divide both sides by 12.} \\ 6.5 &= m \end{aligned}$$

48.

$$\begin{aligned} -20 &= \boxed{8d}-56 && \text{Identify variable term to isolate.} \\ +56 \quad & \quad +56 && \text{Add 56 to both sides.} \\ 36 &= 8d \\ \frac{36}{8} &= \frac{\cancel{8}d}{\cancel{8}} && \text{Divide both sides by 8.} \\ 4.5 &= d \end{aligned}$$

49.

$$\begin{aligned} -251.8 &= \boxed{-8.6h}+14.8 && \text{Identify variable term to isolate.} \\ -14.8 \quad & \quad -14.8 && \text{Subtract 14.8 from both sides.} \\ -266.6 &= -8.6h \\ \frac{-266.6}{-8.6} &= \frac{\cancel{-8.6}h}{\cancel{-8.6}} && \text{Divide both sides by } -8.6. \\ 31 &= h \end{aligned}$$

50.

$$\begin{aligned} -46.8 &= \boxed{-2.3y}-12.3 && \text{Identify variable term to isolate.} \\ +12.3 \quad & \quad +12.3 && \text{Add 12.3 to both sides.} \\ -34.5 &= -2.3y \\ \frac{-34.5}{-2.3} &= \frac{\cancel{-2.3}y}{\cancel{-2.3}} && \text{Divide both sides by } -2.3. \\ 15 &= y \end{aligned}$$

51.

$$\begin{aligned} -134.0 &= \boxed{-4.7x}-16.5 && \text{Identify variable term to isolate.} \\ +16.5 \quad & \quad +16.5 && \text{Add 16.5 to both sides.} \\ -117.5 &= -4.7x \\ \frac{-117.5}{-4.7} &= \frac{\cancel{-4.7}x}{\cancel{-4.7}} && \text{Divide both sides by } -4.7. \\ 25 &= x \end{aligned}$$

52.

$$\begin{aligned} &\boxed{4v}-52.2=-3 && \text{Identify variable term to isolate.}\\ &\underline{\quad+52.2\ +52.2} && \text{Add 52.2 to both sides.}\\ &4v=49.2 \\ &\frac{\cancel{4}v}{\cancel{4}}=\frac{49.2}{4} && \text{Divide both sides by 4.}\\ &v=12.3 \end{aligned}$$

53.

$$\begin{aligned} &\boxed{-2n}+3.8=4.85 && \text{Identify variable term to isolate.}\\ &\underline{\quad-3.8\ -3.8} && \text{Subtract 3.8 from both sides.}\\ &-2n=1.05 \\ &\frac{\cancel{-2}n}{\cancel{-2}}=\frac{1.05}{-2} && \text{Divide both sides by} -2.\\ &n=-0.525 && \text{Round answer to 2 decimal places.}\\ &n\approx-0.53 \end{aligned}$$

54.

$$\begin{aligned} &-5+\boxed{2.5m}=-16.25 && \text{Identify variable term to isolate.}\\ &\underline{+5\qquad\qquad +5} && \text{Add 5 to both sides.}\\ &2.5m=-11.25 \\ &\frac{\cancel{2.5}m}{\cancel{2.5}}=\frac{-11.25}{2.5} && \text{Divide both sides by 2.5.}\\ &m=-4.5 \end{aligned}$$

55.

$$\begin{aligned} &\boxed{7m}+8=31.8 && \text{Identify variable term to isolate.}\\ &\underline{\quad-8\ \ -8} && \text{Subtract 8 from both sides.}\\ &7m=23.8 \\ &\frac{\cancel{7}m}{\cancel{7}}=\frac{23.8}{7} && \text{Divide both sides by 7.}\\ &m=3.4 \end{aligned}$$

56.

$$\begin{aligned} &\boxed{6k}-56=-11.6 && \text{Identify variable term to isolate.}\\ &\underline{\quad+56\ \ +56} && \text{Add 56 to both sides.}\\ &6k=44.4 \\ &\frac{\cancel{6}k}{\cancel{6}}=\frac{44.4}{6} && \text{Divide both sides by 6.}\\ &k=7.4 \end{aligned}$$

57.

$$\begin{aligned} &\boxed{-5z}+16=32 && \text{Identify variable term to isolate.}\\ &\underline{\quad-16\ -16} && \text{Subtract 16 from both sides.}\\ &-5z=16 \\ &\frac{\cancel{-5}z}{\cancel{-5}}=\frac{16}{-5} && \text{Divide both sides by} -5.\\ &z=-3.2 \end{aligned}$$

58.

$$\begin{aligned} &\boxed{-4x}+26=84 && \text{Identify variable term to isolate.}\\ &\underline{\quad-26\ -26} && \text{Subtract 26 from both sides.}\\ &-4x=58 \\ &\frac{\cancel{-4}x}{\cancel{-4}}=\frac{58}{-4} && \text{Divide both sides by} -4.\\ &x=-14.5 \end{aligned}$$

59.

$$\begin{aligned} &\boxed{\frac{x}{4}}+6=9 && \text{Identify variable term to isolate.}\\ &\underline{\quad-6\ -6} && \text{Subtract 6 from both sides.}\\ &\frac{x}{4}=3 \\ &\cancel{4}\cdot\frac{x}{\cancel{4}}=3\cdot4 && \text{Multiply both sides by 4.}\\ &x=12 \end{aligned}$$

60.

$$\begin{aligned} &\boxed{\frac{t}{3}}+14=-8 && \text{Identify variable term to isolate.}\\ &\underline{\quad-14\ -14} && \text{Subtract 14 from both sides.}\\ &\frac{t}{3}=-22 \\ &\cancel{3}\cdot\frac{t}{\cancel{3}}=-22\cdot3 && \text{Multiply both sides by 3.}\\ &t=-66 \end{aligned}$$

61.

$$\begin{aligned} &\boxed{-\frac{x}{16}}+5=2.5 && \text{Identify variable term to isolate.}\\ &\underline{\quad-5\ \ -5} && \text{Subtract 5 from both sides.}\\ &-\frac{x}{16}=-2.5 \\ &\cancel{-16}\cdot\left(-\frac{x}{\cancel{16}}\right)=-2.5\cdot(-16) && \text{Multiply both sides by} -16.\\ &x=40 \end{aligned}$$

62.

$$\begin{aligned} &\boxed{\frac{s}{1.5}}-6=-3 && \text{Identify variable term to isolate.}\\ &\underline{\quad+6\ \ +6} && \text{Add 6 to both sides.}\\ &\frac{s}{1.5}=3 \\ &\cancel{1.5}\cdot\frac{s}{\cancel{1.5}}=3\cdot1.5 && \text{Multiply both sides by 1.5.}\\ &s=4.5 \end{aligned}$$

63.

$$\boxed{\frac{2x}{3}}+\frac{1}{5}=\frac{4}{5} \quad \text{Identify variable term to isolate.}$$
$$-\frac{1}{5}\quad -\frac{1}{5} \quad \text{Subtract } \frac{1}{5} \text{ from both sides.}$$
$$\frac{2x}{3}=\frac{3}{5} \quad \text{Multiply by reciprocal of coefficient.}$$
$$\frac{\cancel{3}}{\cancel{2}}\cdot\frac{\cancel{2}x}{\cancel{3}}=\frac{3}{5}\cdot\frac{3}{2} \quad \text{Multiply both sides by } \frac{3}{2}.$$
$$x=\frac{9}{10}$$

64.

$$\boxed{-\frac{5x}{7}}-\frac{2}{3}=\frac{5}{3} \quad \text{Identify variable term to isolate.}$$
$$+\frac{2}{3}\quad +\frac{2}{3} \quad \text{Add } \frac{2}{3} \text{ to both sides.}$$
$$-\frac{5x}{7}=\frac{7}{3} \quad \text{Multiply by reciprocal of coefficient.}$$
$$-\frac{\cancel{7}}{\cancel{5}}\cdot\left(-\frac{\cancel{5}x}{\cancel{7}}\right)=\frac{7}{3}\cdot\left(-\frac{7}{5}\right) \quad \text{Multiply both sides by } -\frac{7}{5}.$$
$$x=-\frac{49}{15} \text{ or } x=-3\frac{4}{15}$$

65. **a.** Let n = the number of items to be shipped.

Let C = the total cost in dollars for shipping.

$$C=6.99+1.99n$$

b. Substitute $n=5$ into the equation from part a, then solve for C.

$$\begin{aligned} C &= 6.99+1.99n && \text{Given equation.}\\ C &= 6.99+1.99(5) && \text{Substitute } n=5.\\ C &= 6.99+9.95 && \text{Simplify.}\\ C &= 16.94 \end{aligned}$$

It costs \$16.94 to ship 5 items UPS Ground.

c. Substitute $C=12.96$ into the equation from part a, then solve for n.

$$\begin{aligned} C &= 6.99+1.99n && \text{Substitute } C=12.96.\\ 12.96 &= 6.99+1.99n && \text{Isolate variable term.}\\ -6.99 &\quad -6.99 && \text{Subtract 6.99 from both sides.}\\ 5.97 &= 1.99n && \text{Divide both sides by 1.99.}\\ \frac{5.97}{1.99} &= \frac{\cancel{1.99}n}{\cancel{1.99}}\\ 3 &= n \end{aligned}$$

A total of 3 items can be shipped UPS Ground for \$12.96.

66. **a.** Let n = the number of option contracts.

Let C = the commissions charged in dollars.

$$C=7+1n$$

b. Substitute $n=20$ into the equation from part a, then solve for C.

$$\begin{aligned} C &= 7+1n && \text{Given equation.}\\ C &= 7+1(20) && \text{Substitute } n=20.\\ C &= 7+20 && \text{Simplify.}\\ C &= 27 \end{aligned}$$

A Silver-level customer will be charged \$27.00 for an order of 20 option contracts.

c. Substitute $C=92.00$ into the equation from part a, then solve for n.

$$\begin{aligned} C &= 7+1n && \text{Substitute } C=92.00.\\ 92.00 &= 7+n && \text{Isolate variable term.}\\ -7 &\quad -7 && \text{Subtract 7 from both sides.}\\ 85 &= n \end{aligned}$$

This customer has ordered 85 option contracts.

67. **a.** Let c = the number of cranks to be produced.

Let T = the total time in minutes it will take the machine shop to produce the cranks.

$$T=360+5c$$

b. Substitute $c=50$ into the equation from part a, then solve for T.

$$\begin{aligned} T &= 360+5c && \text{Given equation.}\\ T &= 360+5(50) && \text{Substitute } n=50.\\ T &= 360+250 && \text{Simplify.}\\ T &= 610 \end{aligned}$$

It will take 610 minutes, or 10 hours and 10 minutes, to produce 50 cranks.

c. Substitute $T=1175$ into the equation from part a, then solve for c.

$$\begin{aligned} T &= 360+5c && \text{Substitute } T=1175.\\ 1175 &= 360+5c && \text{Isolate variable term.}\\ -360 &\quad -360 && \text{Subtract 360 from both sides.}\\ 815 &= 5c && \text{Divide both sides by 5.}\\ \frac{815}{5} &= \frac{\cancel{5}c}{\cancel{5}}\\ 163 &= c \end{aligned}$$

The machine shop made 163 cranks.

68. **a.** Let c = the number of EPs requested.

Let T = the time it takes to burn the EPs.

$$T = 12c$$

b. Substitute $c = 250$ into the equation from part a, then solve for T.

$$\begin{aligned} T &= 12c && \text{Given equation.} \\ T &= 12(250) && \text{Substitute } n = 250. \\ T &= 3000 && \text{Simplify.} \end{aligned}$$

It will take Richard 3000 minutes, or 50 hours.

c. Substitute $T = 240$ (4 hours = 240 minutes) into the equation from part a, then solve for c.

$$\begin{aligned} T &= 12c && \text{Given equation.} \\ 240 &= 12c && \text{Substitute } T = 240. \\ \frac{240}{12} &= \frac{\cancel{12}c}{\cancel{12}} && \text{Divide both sides by 12.} \\ 20 &= c \end{aligned}$$

He can create 20 EPs.

d. Substitute $T = 1800$ (6 hours = 360 minutes times 5 days) into the equation from part a, then solve for c.

$$\begin{aligned} T &= 12c && \text{Given equation.} \\ 1800 &= 12c && \text{Substitute } T = 1800. \\ \frac{1800}{12} &= \frac{\cancel{12}c}{\cancel{12}} && \text{Divide both sides by 12.} \\ 150 &= c \end{aligned}$$

Richard can create 150 EPs in a week if he works 6 hours a day, 5 days a week.

Exercises 69-86: Answers are to be checked.

Exercises 69-72 are completed as examples.

69. Let $x =$ a number. "Times" means to multiply so we have $3x$, and "is" translates to "equals" so the equation is

$$3x = 45$$

Solve the equation as follows

$$\begin{aligned} 3x &= 45 && \text{Divide both sides by 3.} \\ \frac{\cancel{3}x}{\cancel{3}} &= \frac{45}{3} \\ x &= 15 \end{aligned}$$

$$\begin{aligned} 3(15) &\overset{?}{=} 45 && \text{Check the answer.} \\ 45 &= 45 && \text{The answer works.} \end{aligned}$$

The number is 15. The answer is reasonable.

70. Let $x =$ a number. "Sum" means to add and we are adding 20 to 4 times a number. "Is equal to" translates to the equal sign so the equation is

$$20 + 4x = 44$$

Solve the equation as follows

$$\begin{aligned} 20 + \boxed{4x} &= 44 && \text{Isolate variable term.} \\ -20 \qquad &-20 && \text{Subtract 20 from both sides.} \\ 4x &= 24 && \text{Divide both sides by 4.} \\ \frac{\cancel{4}x}{\cancel{4}} &= \frac{24}{4} \\ x &= 6 \end{aligned}$$

$$\begin{aligned} 20 + 4(6) &\overset{?}{=} 44 && \text{Check the answer.} \\ 20 + 24 &\overset{?}{=} 44 \\ 44 &= 44 && \text{The answer works.} \end{aligned}$$

The number is 6. The answer is reasonable.

71. Recall that the perimeter of a rectangle can be calculated using the formula $P = 2l + 2w$ where P is the perimeter of the rectangle with length, l, and width, w. Substitute $P = 56$ and $w = 8$. Solve the equation for l.

$$\begin{aligned} 56 &= 2l + 2(8) && \text{Substitute in known values.} \\ 56 &= \boxed{2l} + 16 && \text{Simplify \& isolate variable term.} \\ -16 & \quad -16 && \text{Subtract 16 from both sides.} \\ 40 &= 2l && \text{Divide both sides by 2.} \\ \frac{40}{2} &= \frac{\cancel{2}l}{\cancel{2}} \\ 20 &= l \end{aligned}$$

$$\begin{aligned} 56 &\overset{?}{=} 2(20) + 16 && \text{Check the answer.} \\ 56 &\overset{?}{=} 40 + 16 \\ 56 &= 56 && \text{The answer works.} \end{aligned}$$

The length of the garden is 20 feet. The answer is reasonable.

72. Recall that the perimeter of a rectangle can be calculated using the formula $P = 2l + 2w$ where P is the perimeter of the rectangle with length, l, and width, w. Substitute $P = 180$ and $w = 30$ into the equation to find the perimeter of a rectangle. Solve the equation for l.

$$\begin{aligned} 180 &= 2l + 2(30) && \text{Substitute in known values.} \\ 180 &= \boxed{2l} + 60 && \text{Simplify \& isolate variable term.} \\ -60 & \quad -60 && \text{Subtract 60 from both sides.} \\ 120 &= 2l && \text{Divide both sides by 2.} \\ \frac{120}{2} &= \frac{\cancel{2}l}{\cancel{2}} \\ 60 &= l \end{aligned}$$

$$
\begin{aligned}
180 &\stackrel{?}{=} 2(60)+60 && \text{Check the answer.}\\
180 &\stackrel{?}{=} 120+60\\
180 &= 180 && \text{The answer works.}
\end{aligned}
$$

The length of the volleyball court is 60 feet. The answer is reasonable.

73. Recall that the area of a triangle can be calculated using the formula $A=\frac{1}{2}bh$ where A is the area of the triangle with base, b, and height, h. Substitute $A=40$ and $b=8$. Solve the equation for h.

$$
\begin{aligned}
40 &= \frac{1}{2}(8)h && \text{Substitute in known values.}\\
40 &= \boxed{4h} && \text{Simplify \& isolate variable term.}\\
\frac{40}{4} &= \frac{\cancel{4}h}{\cancel{4}} && \text{Divide both sides by 4.}\\
10 &= h
\end{aligned}
$$

The height of the triangle is 10 inches. The answer is reasonable.

74. Recall that the area of a triangle can be calculated using the formula $A=\frac{1}{2}bh$ where A is the area of the triangle with base, b, and height, h. Substitute $A=75$ and $h=15$ into the equation to find the area of a triangle. After substituting in these values, solve the equation for b.

$$
\begin{aligned}
75 &= \frac{1}{2}b(15) && \text{Substitute in known values.}\\
75 &= \frac{15}{2}b && \text{Multiply by reciprocal of coefficient.}\\
\frac{2}{\cancel{15}}\cdot {}^{5}\cancel{75} &= \frac{\cancel{15}}{\cancel{2}}b\cdot\frac{\cancel{2}}{\cancel{15}}\\
10 &= b
\end{aligned}
$$

The base of the triangle is 10 inches. The answer is reasonable.

75. Let $x=$ a number. "Quotient" represents division and "is" represents the equals sign. Remember that the order of division is important. Read from left to right. Write the quotient in the same order as it is read. The equation translates as

$$\frac{x}{7}=13$$

Solve the equation as follows

$$
\begin{aligned}
\frac{x}{7} &= 13 && \text{Multiply both sides by 7.}\\
\cancel{7}\cdot\frac{x}{\cancel{7}} &= 13\cdot 7\\
x &= 91
\end{aligned}
$$

The number is 91. The answer is reasonable.

76. Let $x=$ a number. The equation translates as

$$12+\frac{x}{5}=19.2$$

Solve the equation as follows

$$
\begin{aligned}
12+\boxed{\frac{x}{5}} &= 19.2 && \text{Isolate variable term.}\\
-12 \quad & \quad -12 && \text{Subtract 12 from both sides.}\\
\frac{x}{5} &= 7.2\\
\cancel{5}\cdot\frac{x}{\cancel{5}} &= 7.2\cdot 5 && \text{Multiply both sides by 5.}\\
x &= 36
\end{aligned}
$$

The number is 36. The answer is reasonable.

77. Let $x=$ a number. "Plus" means to add and "product" tells us to multiply. We are adding to 7 times a number. "Is equal to" translates to the equal sign so the equation is

$$6+7x=62$$

Solve the equation as follows

$$
\begin{aligned}
6+\boxed{7x} &= 62 && \text{Isolate variable term.}\\
-6 \quad & \quad -6 && \text{Subtract 6 from both sides.}\\
7x &= 56 && \text{Divide both sides by 7.}\\
\frac{\cancel{7}x}{\cancel{7}} &= \frac{56}{7}\\
x &= 8
\end{aligned}
$$

The number is 8. The answer is reasonable.

78. Let $x=$ a number. "Times" means to multiply and "times the sum" means to multiply an addition that has already been done. To show the addition, include a set of parentheses around the sum.

$$4(x+3)=68$$

Solve the equation as follows

$$\begin{aligned}
4(x+3) &= 68 && \text{Distribute 4 on left side.}\\
\boxed{4x}+12 &= 68 && \text{Now isolate variable term.}\\
-12\quad -12 & && \text{Subtract 12 from both sides.}\\
4x &= 56 && \text{Divide both sides by 7.}\\
\frac{\cancel{4}x}{\cancel{4}} &= \frac{56}{4} &&\\
x &= 14 &&
\end{aligned}$$

The number is 14. The answer is reasonable.

79. Let $x =$ a number. "Of" means to multiply so we will multiply $\frac{1}{3}$ times x, subtract 8 then set it equal to 28.

$$\frac{1}{3}x-8=28$$

Solve the equation as follows

$$\begin{aligned}
\boxed{\frac{1}{3}x}-8 &= 28 && \text{Isolate variable term.}\\
+8\quad +8 & && \text{Add 8 to both sides.}\\
\frac{1}{3}x &= 36 && \text{Multiply both sides by reciprocal.}\\
\frac{\cancel{3}}{1}\cdot\frac{1}{\cancel{3}}x &= 36\cdot\frac{3}{1} &&\\
x &= 108 &&
\end{aligned}$$

The number is 108. The answer is reasonable.

80. Let $x =$ a number. "Half a number" means to multiply x by $\frac{1}{2}$, we then add 18 and set it equal to 15.

$$\frac{1}{2}x+18=15$$

Solve the equation as follows

$$\begin{aligned}
\boxed{\frac{1}{2}x}+18 &= 15 && \text{Isolate variable term.}\\
-18\quad -18 & && \text{Subtract 18 from both sides.}\\
\frac{1}{2}x &= -3 && \text{Multiply both sides by reciprocal.}\\
\frac{\cancel{2}}{1}\cdot\frac{1}{\cancel{2}}x &= -3\cdot\frac{2}{1} &&\\
x &= -6 &&
\end{aligned}$$

The number is –6. The answer is reasonable.

81. Let $x =$ a number. "Difference" represents subtraction, "twice a number" means to multiply x by 2, and "is" represents the equal sign. The equation translates as

$$2x-15=40$$

Solve the equation as follows

$$\begin{aligned}
\boxed{2x}-15 &= 40 && \text{Isolate variable term.}\\
+15\quad +15 & && \text{Add 15 to both sides}\\
2x &= 55 &&\\
\frac{\cancel{2}x}{\cancel{2}} &= \frac{55}{2} && \text{Divide both sides by 2.}\\
x &= 27.5 &&
\end{aligned}$$

The number is 27.5. The answer is reasonable.

82. Let $x =$ a number. "Difference" represents subtraction, "three times a number" means to multiply x by 3, and "is" represents the equal sign. The equation translates as

$$3x-7=17$$

Solve the equation as follows

$$\begin{aligned}
\boxed{3x}-7 &= 17 && \text{Isolate variable term.}\\
+7\quad +7 & && \text{Add 7 to both sides}\\
3x &= 24 &&\\
\frac{\cancel{3}x}{\cancel{3}} &= \frac{24}{3} && \text{Divide both sides by 3.}\\
x &= 8 &&
\end{aligned}$$

The number is 8. The answer is reasonable.

83. Let $x =$ an unknown number. We will subtract the unknown number from 8 then set it equal to 19.

$$8-x=19$$

Solve the equation as follows

$$\begin{aligned}
8\boxed{-x} &= 19 && \text{Isolate variable term.}\\
-8\quad -8 & && \text{Subtract 8 from both sides}\\
-x &= 11 &&\\
-1\cdot(-x) &= 11\cdot(-1) && \text{Multiply both sides by} -1.\\
x &= -11 &&
\end{aligned}$$

The unknown number is –11. The answer is reasonable.

84. Let $x=$ an unknown number. We will subtract the unknown number from 36 then set it equal to -5.

$$36-x=-5$$

Solve the equation as follows

$36\boxed{-x}=-5$ Isolate variable term.

$-36 \quad -36$ Subtract 36 from both sides

$-x=-41$

$-1\cdot(-x)=-41\cdot(-1)$ Multiply both sides by -1.

$x=41$

The unknown number is 41. The answer is reasonable.

85. Let $x=$ a number. "Less than" translates to subtraction so we will subtract 7 from twice (2 times) a number then set it equal to 11.

$$2x-7=11$$

Solve the equation as follows

$\boxed{2x}-7=11$ Isolate variable term.

$+7 \quad +7$ Add 7 to both sides

$2x=18$

$\frac{\cancel{2}x}{\cancel{2}}=\frac{18}{2}$ Divide both sides by 2.

$x=9$

The number is 9. The answer is reasonable.

86. Let $x=$ a number. "Less than" translates to subtraction so we will subtract 8 from 3 times a number then set it equal to -23.

$$3x-8=-23$$

Solve the equation as follows

$\boxed{3x}-8=-23$ Isolate variable term.

$+8 \quad +8$ Add 8 to both sides.

$3x=-15$

$\frac{\cancel{3}x}{\cancel{3}}=\frac{-15}{3}$ Divide both sides by 3.

$x=-5$

The number is –5. The answer is reasonable.

87.

$P=\boxed{2l}+2w$ Identify variable term to isolate.

$-2w \quad -2w$ Subtract $2w$ from both sides.

$P-2w=2\boxed{l}$ Identify variable to isolate

$\frac{P-2w}{2}=\frac{\cancel{2}l}{\cancel{2}}$ Divide both sides by 2.

$\frac{P-2w}{2}=l$

OR

$\frac{P}{2}-\frac{\cancel{2}w}{\cancel{2}}=l$ Simplify on left side.

$\frac{P}{2}-w=l$

88.

$C=2\pi\boxed{r}$ Identify variable to isolate.

$\frac{C}{2\pi}=\frac{\cancel{2}\cancel{\pi}r}{\cancel{2}\cancel{\pi}}$ Divide both sides by 2π.

$\frac{C}{2\pi}=r$

89.

$V=\pi r^2\boxed{h}$ Identify variable to isolate.

$\frac{V}{\pi r^2}=\frac{\cancel{\pi}\cancel{r^2}h}{\cancel{\pi}\cancel{r^2}}$ Divide both sides by πr^2.

$\frac{V}{\pi r^2}=h$

90.

$V=\frac{1}{3}\pi r^2\boxed{h}$ Identify variable to isolate.

$3\cdot V=\frac{1}{\cancel{3}}\pi r^2 h\cdot\cancel{3}$ Multiply both sides by 3.

$3V=\pi r^2\boxed{h}$

$\frac{3V}{\pi r^2}=\frac{\cancel{\pi}\cancel{r^2}h}{\cancel{\pi}\cancel{r^2}}$ Divide both sides by πr^2.

$\frac{3V}{\pi r^2}=h$

91.

$A = \frac{1}{2}\boxed{b}h$ Identify variable to isolate.

$2 \cdot A = \frac{1}{\cancel{2}}bh \cdot \cancel{2}$ Multiply both sides by 2.

$2A = \boxed{b}h$

$\frac{2A}{h} = \frac{b\cancel{h}}{\cancel{h}}$ Divide both sides by h.

$\frac{2A}{h} = b$

92.

$A = \frac{1}{2}\boxed{h}(b_1 + b_2)$ Identify variable to isolate.

$2 \cdot A = \frac{1}{\cancel{2}}h(b_1 + b_2) \cdot \cancel{2}$ Multiply both sides by 2.

$2A = \boxed{h}(b_1 + b_2)$ h is multiplied by $(b_1 + b_2)$ so divide.

$\frac{2A}{(b_1 + b_2)} = \frac{h\cancel{(b_1 + b_2)}}{\cancel{(b_1 + b_2)}}$ Divide both sides by $(b_1 + b_2)$.

$\frac{2A}{b_1 + b_2} = h$

93.

$W = \boxed{3t} - 20$ Identify variable term to isolate.

$\underline{+20 \qquad +20}$ Add 20 to both sides.

$W + 20 = 3\boxed{t}$ Identify variable to isolate.

$\frac{W+20}{3} = \frac{\cancel{3}t}{\cancel{3}}$ Divide both sides by 3.

$\frac{W+20}{3} = t$

94.

$H = \boxed{rt} + 50$ Identify variable term to isolate.

$\underline{-50 \qquad -50}$ Subtract 50 from both sides.

$H - 50 = \boxed{r}t$ Identify variable to isolate.

$\frac{H-50}{t} = \frac{r\cancel{t}}{\cancel{t}}$ Divide both sides by t.

$\frac{H-50}{t} = r$

95.

$P = 2b + \boxed{2B}$ Identify variable term to isolate.

$\underline{-2b \quad -2b}$ Subtract $2b$ from both sides.

$P - 2b = 2\boxed{B}$ Identify variable to isolate

$\frac{P-2b}{2} = \frac{\cancel{2}B}{\cancel{2}}$ Divide both sides by 2.

$\frac{P-2b}{2} = B$ *OR*

$\frac{P}{2} - \frac{\cancel{2}b}{\cancel{2}} = B$ Simplify on left side.

$\frac{P}{2} - b = B$

96.

$V = l\boxed{w}h$ Identify variable to isolate.

$\frac{V}{lh} = \frac{\cancel{l}w\cancel{h}}{\cancel{l}\cancel{h}}$ Divide both sides by lh.

$\frac{V}{lh} = w$

97.

$5x\boxed{-3y} = -15$ Identify variable term to isolate.

$\underline{-5x \qquad -5x}$ Subtract $5x$ from both sides.

$-3\boxed{y} = -5x - 15$ Identify variable to isolate

$\frac{\cancel{-3}y}{\cancel{-3}} = \frac{-5x-15}{-3}$ Divide both sides by -3.

$y = \frac{-5x}{-3} - \frac{15}{-3}$ Simplify on right side.

$y = \frac{5}{3}x + 5$

98.

$-3x + \boxed{4y} = 24$ Identify variable term to isolate.

$\underline{+3x \qquad +3x}$ Add $3x$ to both sides.

$4\boxed{y} = 3x + 24$ Identify variable to isolate

$\frac{\cancel{4}y}{\cancel{4}} = \frac{3x+24}{4}$ Divide both sides by 4.

$y = \frac{3x}{4} + \frac{24}{4}$ Simplify on right side.

$y = \frac{3}{4}x + 6$

99.

$x\boxed{-5y}=9$ Identify variable term to isolate.

$\underline{-x \quad\quad -x}$ Subtract x from both sides.

$-5\boxed{y}=-x+9$ Identify variable to isolate

$\dfrac{\cancel{-5}y}{\cancel{-5}}=\dfrac{-x+9}{-5}$ Divide both sides by -5.

$y=\dfrac{x-9}{5}$ or $y=\dfrac{x}{5}-\dfrac{9}{5}$

100.

$\dfrac{1}{3}x+\boxed{6y}=-4$ Identify variable term to isolate.

$(3)\dfrac{1}{3}x+(3)6y=-4(3)$

Multiply each term by 3 to clear fraction.

$x+18y=-12$

$\underline{-x \quad\quad -x}$ Subtract x from both sides.

$18\boxed{y}=-x-12$ Identify variable to isolate

$\dfrac{\cancel{18}y}{\cancel{18}}=\dfrac{-x-12}{18}$ Divide both sides by 18.

$y=-\dfrac{x}{18}-\dfrac{\cancel{12}^{2}}{\cancel{18}^{3}}$ Simplify on right side.

$y=-\dfrac{x}{18}-\dfrac{2}{3}$

101.

$y-2=3\left(\boxed{x}+7\right)$ Identify variable to isolate.

$y-2=\boxed{3x}+21$ Distribute on right side.

$\underline{-21 \quad\quad -21}$ Subtract 21 from both sides.

$y-23=3\boxed{x}$ Identify variable to isolate

$\dfrac{y-23}{3}=\dfrac{\cancel{3}x}{\cancel{3}}$ Divide both sides by 3.

$\dfrac{y}{3}-\dfrac{23}{3}=x$ or $x=\dfrac{y-23}{3}$

102.

$y-3=-2\left(\boxed{x}-5\right)$ Identify variable to isolate.

$y-3=\boxed{-2x}+10$ Distribute on right side.

$\underline{-10 \quad\quad -10}$ Subtract 10 from both sides.

$y-13=-2\boxed{x}$ Identify variable to isolate

$\dfrac{y-13}{-2}=\dfrac{\cancel{-2}x}{\cancel{-2}}$ Divide both sides by -2.

$-\dfrac{y}{2}+\dfrac{13}{2}=x$ or $x=\dfrac{-y+13}{2}$

103.

$y+1=\dfrac{3}{4}\left(\boxed{12x}+8\right)$ Identify variable term to isolate.

$y+1=\dfrac{3}{\cancel{4}}\left({}^{3}\cancel{12}x+{}^{2}\cancel{8}\right)$ Distribute on right side.

$y+1=9x+6$ Distribute on right side.

$\underline{-6 \quad\quad -6}$ Subtract 6 from both sides.

$y-5=9\boxed{x}$ Identify variable to isolate

$\dfrac{y-5}{9}=\dfrac{\cancel{9}x}{\cancel{9}}$ Divide both sides by 9.

$\dfrac{y}{9}-\dfrac{5}{9}=x$ or $x=\dfrac{y-5}{9}$

104.

$y-6=\dfrac{1}{6}(12x+6)$ Identify variable term to isolate.

$y-6=\dfrac{1}{\cancel{6}}\left({}^{2}\cancel{12}x+{}^{1}\cancel{6}\right)$ Distribute on right side.

$y-6=2x+1$ Distribute on right side.

$\underline{-1 \quad\quad -1}$ Subtract 1 from both sides.

$y-7=2\boxed{x}$ Identify variable to isolate

$\dfrac{y-7}{2}=\dfrac{\cancel{2}x}{\cancel{2}}$ Divide both sides by 2.

$\dfrac{y}{2}-\dfrac{7}{2}=x$ or $x=\dfrac{y-7}{2}$

105.

$I=P\boxed{r}t$ Identify variable to isolate.

$\dfrac{I}{Pt}=\dfrac{\cancel{P}r\cancel{t}}{\cancel{P}\cancel{t}}$ Divide both sides by Pt.

$\dfrac{I}{Pt}=r$

106.

$I=Pr\boxed{t}$ Identify variable to isolate.

$\dfrac{I}{Pr}=\dfrac{\cancel{P}\cancel{r}t}{\cancel{P}\cancel{r}}$ Divide both sides by Pr.

$\dfrac{I}{Pr}=t$

107. The statement does not have an equal sign; therefore, it is an expression.

$5a^2+\boxed{6a}\boxed{-8}+\boxed{12a}+\boxed{3}$ Identify like terms.

$5a^2+18a-5$ Combine like terms.

108. The statement does not have an equal sign; therefore, it is an expression.

$\boxed{10m^2} - 3n + \boxed{\boxed{10}}\boxed{-4m^2} + \boxed{\boxed{4}}$ Identify like terms.

$6m^2 - 3n + 14$ Combine like terms.

109. The statement has an equal sign; therefore, it is an equation.

$$\begin{array}{rl} \boxed{2x} + 7 = 21 & \text{Isolate variable term.} \\ -7 \quad -7 & \text{Subtract 7 from both sides.} \\ \hline 2x = 14 & \text{Divide both sides by 2.} \end{array}$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{14}{2}$$
$$x = 7$$

110. The statement has an equal sign; therefore, it is an equation.

$$\begin{array}{rl} \boxed{-6x} + 14 = -46 & \text{Isolate variable term.} \\ -14 \quad -14 & \text{Subtract 14 from both sides.} \\ \hline -6x = -60 & \text{Divide both sides by } -6. \end{array}$$

$$\frac{\cancel{-6}x}{\cancel{-6}} = \frac{60}{-6}$$
$$x = -10$$

111. The statement has an equal sign; therefore, it is an equation.

$\boxed{\frac{1}{3}r} + 8\boxed{-\frac{5}{6}r} = -2$ Combine like terms on left side.

$\frac{2}{6}r - \frac{5}{6}r + 8 = -2$ Rewrite fraction with LCD.

$-\frac{3}{6}r + 8 = -2$ Reduce fraction.

$$\begin{array}{rl} \boxed{-\frac{1}{2}r} + 8 = -2 & \text{Now isolate variable term.} \\ -8 \quad -8 & \text{Subtract 8 from both sides.} \\ \hline -\frac{1}{2}r = -10 & \text{Multiply both sides by reciprocal.} \end{array}$$

$$-\frac{\cancel{2}}{1}\cdot\left(-\frac{1}{\cancel{2}}r\right) = -10\cdot\left(-\frac{2}{1}\right)$$
$$r = 20$$

112. The statement has an equal sign; therefore, it is an equation.

$\boxed{\frac{3}{10}d} + 15\boxed{-\frac{4}{5}d} = -8$ Combine like terms on left side.

$\frac{3}{10}d - \frac{8}{10}d + 15 = -8$ Rewrite fraction with LCD.

$-\frac{5}{10}d + 15 = -8$ Reduce fraction.

$$\begin{array}{rl} \boxed{-\frac{1}{2}d} + 15 = -8 & \text{Now isolate variable term.} \\ -15 \quad -15 & \text{Subtract 15 from both sides.} \\ \hline -\frac{1}{2}d = -23 & \text{Multiply both sides by reciprocal.} \end{array}$$

$$-\frac{\cancel{2}}{1}\cdot\left(-\frac{1}{\cancel{2}}d\right) = -23\cdot\left(-\frac{2}{1}\right)$$
$$d = 46$$

113. The statement does not have an equal sign; therefore, it is an expression.

$\boxed{5n} + \boxed{\boxed{7}}\boxed{-8n} + 20m + \boxed{\boxed{4}}$ Identify like terms.

$20m - 3n + 11$ Combine like terms.

Arrange in conventional form.

114. The statement does not have an equal sign; therefore, it is an expression.

$\boxed{8w}\boxed{\boxed{-6}} + 4v\boxed{-14w} + \boxed{\boxed{23}}$ Identify like terms.

$4v - 6w + 17$ Combine like terms.

Arrange in conventional form.

115. The statement has an equal sign; therefore, it is an equation.

$\boxed{3.4y} + 4\boxed{-2.1y} = 11.28$ Combine like terms on left side.

$$\begin{array}{rl} \boxed{1.3y} + 4 = 11.28 & \text{Isolate variable term.} \\ -4 \quad -4 & \text{Subtract 4 from both sides.} \\ \hline 1.3y = 7.28 & \text{Divide both sides by 1.3.} \end{array}$$

$$\frac{1.3y}{1.3} = \frac{7.28}{1.3}$$
$$y = 5.6$$

116. The statement has an equal sign; therefore, it is an equation.

$\boxed{-4.6h} - 8.7 + \boxed{1.2h} = -32.84$

Combine like terms on left side.

$$\begin{array}{rl} -3.4h - 8.7 = -32.84 & \text{Isolate variable term.} \\ +8.7 \quad +8.7 & \text{Add 8.7 to both sides.} \\ \hline -3.4h = -24.14 & \text{Divide both sides by } -3.4. \end{array}$$

$$\frac{-3.4h}{-3.4} = \frac{-24.14}{-3.4}$$
$$h = 7.1$$

Section 2.3 Solving Equations with Variables on Both Sides

Exercises 1-16: Answers are to be checked. Exercises 1-5 are completed as examples.

1. $4x = x + 33$

$\boxed{4x} = \boxed{x} + 33$ Identify variable terms.

$\underline{-x \quad -x}$ Subtract x from both sides

$3x = 33$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{33}{3}$ Divide both sides by 3.

$x = 11$

$4(11) \stackrel{?}{=} (11) + 33$ Check the answer.

$44 = 44$ The answer works.

2. $8 + x = 5x$

$8 + \boxed{x} = \boxed{5x}$ Identify variable terms.

$\underline{\;-x \quad -x}$ Subtract x from both sides

$8 = 4x$

$\frac{8}{4} = \frac{\cancel{4}x}{\cancel{4}}$ Divide both sides by 4.

$2 = x$

$8 + (2) \stackrel{?}{=} 5(2)$ Check the answer.

$10 = 10$ The answer works.

3. $5x + 8 = 3x - 4$

$\boxed{5x} + \boxed{\boxed{8}} = \boxed{3x}\boxed{\boxed{-4}}$ Identify like terms.

$\underline{-3x \qquad -3x}$ Subtract $3x$ from both sides.

$2x + 8 = -4$

$\underline{\quad -8 \quad -8}$ Subtract 8 from both sides.

$2x = -12$ Divide both sides by 2.

$\frac{\cancel{2}x}{\cancel{2}} = \frac{-12}{2}$

$x = -6$

$5(-6) + 8 \stackrel{?}{=} 3(-6) - 4$ Check the answer.

$-30 + 8 \stackrel{?}{=} -18 - 4$

$-22 = -22$ The answer works.

4. $7x + 10 = 4x - 18$

$\boxed{7x} + \boxed{\boxed{10}} = \boxed{4x}\boxed{\boxed{-18}}$ Identify like terms.

$\underline{-4x \qquad -4x}$ Subtract $4x$ from both sides.

$3x + 10 = -18$

$\underline{\quad -10 \quad -10}$ Subtract 10 from both sides.

$3x = -28$ Divide both sides by 3.

$\frac{\cancel{3}x}{\cancel{3}} = \frac{-28}{3}$

$x = \frac{-28}{3}$ or $-9\frac{1}{3}$

$7\left(\frac{-28}{3}\right) + 10 \stackrel{?}{=} 4\left(\frac{-28}{3}\right) - 18$ Check the answer.

$\frac{-196}{3} + 10 \stackrel{?}{=} \frac{-112}{3} - 18$

$\frac{-196}{3} + \frac{30}{3} \stackrel{?}{=} \frac{-112}{3} - \frac{54}{3}$

$\frac{-166}{3} = \frac{-166}{3}$ The answer works.

5. $2x = 5(x + 6)$

$2x = 5(x + 6)$ Distribute on the right side.

$\boxed{2x} = \boxed{5x} + 30$ Identify like terms.

$\underline{-5x \quad -5x}$ Subtract $5x$ from both sides.

$-3x = 30$

$\frac{\cancel{-3}x}{\cancel{-3}} = \frac{30}{-3}$ Divide both sides by 3.

$x = -10$

$2(-10) \stackrel{?}{=} 5([-10] + 6)$ Check the answer.

$-20 \stackrel{?}{=} 5(-4)$

$-20 = -20$ The answer works.

6. $7x = 2(x - 5)$

$7x = 2(x - 5)$ Distribute on the right side.

$\boxed{7x} = \boxed{2x} - 10$ Identify like terms.

$\underline{-2x \quad -2x}$ Subtract $2x$ from both sides.

$5x = -10$

$\frac{\cancel{5}x}{\cancel{5}} = \frac{-10}{5}$ Divide both sides by 5.

$x = -2$

7. $20-3x=4x-22$

$\boxed{20}\boxed{-3x}=\boxed{4x}\boxed{-22}$ Identify like terms.

$\underline{\quad -4x \quad -4x}$ Subtract $4x$ from both sides.

$20-7x=-22$

$\underline{-20 \qquad -20}$ Subtract 20 from both sides.

$-7x=-42$ Divide both sides by -7.

$\frac{\cancel{-7}x}{\cancel{-7}}=\frac{-42}{-7}$

$x=6$

8. $2(x-6)=3(x+2)$

$2(x-6)=3(x+2)$ Distribute on the right side.

$\boxed{2x}\boxed{-12}=\boxed{3x}\boxed{+6}$ Identify like terms.

$\underline{-3x \qquad -3x}$ Subtract $3x$ from both sides.

$-x-12=6$

$\underline{\quad +12 \quad +12}$ Add 12 to both sides.

$-x=18$ Multiply both sides by -1.

$-1\cdot(-x)=18\cdot(-1)$

$x=-18$

9. $\frac{1}{2}x=x+5$

$(\cancel{2})\frac{1}{\cancel{2}}x=(2)x+5(2)$

$\boxed{x}=\boxed{2x}+10$ Identify like terms.

$\underline{-2x \quad -2x}$ Subtract $2x$ from both sides.

$-x=10$

$-1\cdot(-x)=10\cdot(-1)$ Multiply both sides by -1.

$x=-10$

10. $\frac{1}{3}x+5=x-7$

Multiply each term by 3 to clear fraction.

$(\cancel{3})\frac{1}{\cancel{3}}x+(3)5=(3)x-7(3)$

$\boxed{x}+\boxed{15}=\boxed{3x}\boxed{-21}$ Identify like terms.

$\underline{-3x \qquad -3x}$ Subtract $3x$ from both sides.

$-2x+15=-21$

$\underline{\quad -15 \quad -15}$ Subtract 15 from both sides.

$-2x=-36$

$\frac{\cancel{-2}x}{\cancel{-2}}=\frac{-36}{-2}$ Divide both sides by -2.

$x=18$

11. $5+\frac{x}{2}=x-7$

Multiply each term by 2 to clear fraction.

$(2)5+(\cancel{2})\frac{x}{\cancel{2}}=(2)x-7(2)$

$\boxed{10}+\boxed{x}=\boxed{2x}\boxed{-14}$ Identify like terms.

$\underline{\quad -2x \quad -2x}$ Subtract $2x$ from both sides.

$10-x=-14$

$\underline{-10 \qquad -10}$ Subtract 10 from both sides.

$-x=-24$

$-1\cdot(-x)=-24\cdot(-1)$ Multiply both sides by -1.

$x=24$

12. $\frac{x}{3}=5x+28$

Multiply each term by 3 to clear fraction.

$(\cancel{3})\frac{x}{\cancel{3}}=(3)5x+28(3)$

$\boxed{x}=\boxed{15x}+84$ Identify like terms.

$\underline{-15x \quad -15x}$ Subtract $15x$ from both sides.

$-14x=84$

$\frac{\cancel{-14}x}{\cancel{-14}}=\frac{84}{-14}$ Divide both sides by -14.

$x=-6$

13. $x-8=5x+4$

$\boxed{x}\boxed{-8}=\boxed{5x}+\boxed{4}$ Identify like terms.

$\underline{-5x \qquad -5x}$ Subtract $5x$ from both sides.

$-4x-8=4$

$\underline{\quad +8 \quad +8}$ Add 8 to both sides.

$-4x=12$ Divide both sides by -7.

$\frac{\cancel{-4}x}{\cancel{-4}}=\frac{12}{-4}$

$x=-3$

14. $29=2x-7$

$\boxed{29}=2x\boxed{-7}$ Identify like terms.

$\underline{+7 \qquad +7}$ Add 7 to both sides.

$36=2x$

$\frac{36}{2}=\frac{\cancel{2}x}{\cancel{2}}$ Divide both sides by 2.

$18=x$

15. $\frac{1}{4}x-8=2x-29$

Multiply each term by 4 to clear fraction.

$$(\cancel{4})\frac{1}{\cancel{4}}x-(4)8=(4)2x-29(4)$$

$$\boxed{x}\boxed{\boxed{-32}}=\boxed{8x}\boxed{\boxed{-116}}$$ Identify like terms.

$$\underline{-8x \qquad -8x}$$ Subtract $8x$ from both sides.

$$-7x-32=-116$$

$$\underline{+32 \quad +32}$$ Add 32 to both sides.

$$-7x=-84$$

$$\frac{\cancel{-7}x}{\cancel{-7}}=\frac{-84}{-7}$$ Divide both sides by -7.

$$x=12$$

16. $\frac{1}{2}x+20=3x+5$

Multiply each term by 2 to clear fraction.

$$(\cancel{2})\frac{1}{\cancel{2}}x+(2)20=(2)3x+5(2)$$

$$\boxed{x}+\boxed{\boxed{40}}=\boxed{6x}+\boxed{\boxed{10}}$$ Identify like terms.

$$\underline{-6x \qquad -6x}$$ Subtract $6x$ from both sides.

$$-5x+40=10$$

$$\underline{-40 \quad -40}$$ Subtract 40 from both sides.

$$-5x=-30$$

$$\frac{\cancel{-5}x}{\cancel{-5}}=\frac{-30}{-5}$$ Divide both sides by -5.

$$x=6$$

17. Step 1 Reason: Distribute to simplify.

Step 2 Algebraic Step: $2x-11=-5x-18$

Step 3 Reason: Combine like variable terms by adding $5x$ to both sides.

Step 4 Algebraic Step: $\begin{array}{r} 7x-11=-18 \\ \underline{+11 \qquad +11} \end{array}$

Step 5 Reason: Divide both sides by 7 to isolate the variable.

18. Step 1 Algebraic Step:

$$15\left(\frac{1}{3}x+2\right)=15\left(\frac{2}{5}x-4\right)$$

$$15\left(\frac{1}{3}x\right)+15(2)=15\left(\frac{2}{5}x\right)+15(-4)$$

$$5x+30=6x-60$$

Step 2 Reason: Combine like variable terms by subtracting $5x$ from both sides.

Step 3 Reason: Isolate the variable by adding 60 to both sides.

Exercises 19-30: Answers are to be checked.

Exercises 19-22 are completed as examples.

19.

$$\boxed{3x}+12=\boxed{7x}-28$$ Combine like terms across = sign.

$$\underline{-7x \qquad -7x}$$ Subtract $7x$ from both sides.

$$-4x+12=-28$$

$$\underline{-12 \quad -12}$$ Subtract 12 from both sides.

$$-4x=-40$$ Divide both sides by -4.

$$\frac{\cancel{-4}x}{\cancel{-4}}=\frac{-40}{-4}$$

$$x=10$$

$$3(10)+12\stackrel{?}{=}7(10)-28$$ Check the answer.

$$30+12\stackrel{?}{=}70-28$$

$$42=42$$ The answer works.

20.

$$\boxed{6x}+20=\boxed{10x}-36$$ Combine like terms across = sign.

$$\underline{-10x \qquad -10x}$$ Subtract $10x$ from both sides.

$$-4x+20=-36$$

$$\underline{-20 \quad -20}$$ Subtract 20 from both sides.

$$-4x=-56$$ Divide both sides by -4.

$$\frac{\cancel{-4}x}{\cancel{-4}}=\frac{-56}{-4}$$

$$x=14$$

$$6(14)+20\stackrel{?}{=}10(14)-36$$ Check the answer.

$$84+20\stackrel{?}{=}140-36$$

$$104=104$$ The answer works.

21.

$$\boxed{12t}-50=\boxed{4t}+14$$ Combine like terms across = sign.

$$\underline{-4t \qquad -4t}$$ Subtract $4t$ from both sides.

$$8t-50=14$$

$$\underline{+50 \quad +50}$$ Add 50 to both sides.

$$8t=64$$ Divide both sides by 8.

$$\frac{\cancel{8}t}{\cancel{8}}=\frac{64}{8}$$

$$t=8$$

$$12(8)-50\stackrel{?}{=}4(8)+14$$ Check the answer.

$$96-50\stackrel{?}{=}32+14$$

$$46=46$$ The answer works.

22.

$\boxed{7m}-30=\boxed{3m}-10$ Combine like terms across = sign.

$\underline{-3m \quad -3m}$ Subtract $3m$ from both sides.

$4m-30=-10$

$\underline{+30 \quad +30}$ Add 30 to both sides.

$4m=20$ Divide both sides by 4.

$$\frac{\cancel{4}m}{\cancel{4}}=\frac{20}{4}$$

$m=5$

$7(5)-30\overset{?}{=}3(5)-10$ Check the answer.

$35-30\overset{?}{=}15-10$

$5=5$ The answer works.

23.

$\boxed{4b}+36=\boxed{9b}+66$ Combine like terms across = sign.

$\underline{-9b \quad -9b}$ Subtract $9b$ from both sides.

$-5b+36=66$

$\underline{-36 \quad -36}$ Subtract 36 from both sides.

$-5b=30$ Divide both sides by -5.

$$\frac{\cancel{-5}b}{\cancel{-5}}=\frac{30}{-5}$$

$b=-6$

22.

$\boxed{15p}-20=\boxed{4p}-64$ Combine like terms across = sign.

$\underline{-4p \quad -4p}$ Subtract $4p$ from both sides.

$11p-20=-64$

$\underline{+20 \quad +20}$ Add 20 to both sides.

$11p=-44$ Divide both sides by 11.

$$\frac{\cancel{11}p}{\cancel{11}}=\frac{-44}{11}$$

$p=-4$

23.

$\boxed{2c}+5+\boxed{c}=3c-4$ Combine like terms on left side.

$3c+5=3c-4$ Combine like terms across = sign.

$\underline{-3c \quad -3c}$ Subtract $3c$ from both sides.

$5\overset{?}{=}-4$ This is a false statement.

This equation has no solution.

24.

$5f-7=\boxed{8f}+2\boxed{-3f}$ Combine like terms on right side.

$\boxed{5f}-7=\boxed{5f}+2$ Combine like terms across = sign.

$\underline{-5f \quad -5f}$ Subtract $5f$ from both sides.

$-7\overset{?}{=}2$ This is a false statement.

This equation has no solution.

27.

$3(2x+5)-7=2(4x-6)$ Distribute to simplify.

$6x-2=8x-12$ Combine like terms on left side.

$\boxed{6x}-2=\boxed{8x}-12$ Combine like terms across = sign.

$\underline{-8x \quad -8x}$ Subtract $8x$ from both sides.

$-2x-2=-12$

$-2x-2=-12$ Isolate the variable term by adding 2 to both sides.

$\underline{+2 \quad +2}$

$-2x=-10$

$$\frac{-2x}{-2}=\frac{-10}{-2}$$ Divide both sides by -2 to isolate the variable.

$x=5$

28.

$5(x-3)-9=6(2x-8)+3$ Distribute to simplify.

$5x-15-9=12x-48+3$ Combine like terms on both sides.

$\boxed{5x}-24=\boxed{12x}-45$ Combine like terms across = sign.

$\underline{-12x \quad -12x}$ Subtract $12x$ from both sides.

$-7x-24=-45$

$-7x-24=-45$ Isolate the variable term by adding 24 to both sides.

$\underline{+24 \quad +24}$

$-7x=-21$

$$\frac{-7x}{-7}=\frac{-21}{-7}$$ Divide both sides by -7 to isolate the variable.

$x=3$

29.

$\frac{2}{3}x+4=5x-22$ Multiply by 3 to remove the fraction.

$$3\left(\frac{2}{3}x\right)+3(4)=3(5x)+3(-22)$$

$$\cancel{3}\left(\frac{2}{\cancel{3}}x\right)+12=15x-33$$

$\boxed{2x}+12=\boxed{15x}-66$ Combine like terms across = sign.

$\underline{-2x \quad -2x}$

$12=13x-66$

$\underline{+66 \quad +66}$ Add 66 to both sides.

$78=13x$ Divide both sides by 13.

$$\frac{78}{13}=\frac{\cancel{13}x}{\cancel{13}}$$

$x=6$

30.

$\frac{1}{4}x-6=\frac{2}{7}x-5$ Multiply by the LCD, 28, to remove the fraction.

$28\left(\frac{1}{4}x\right)+28(-6)=28\left(\frac{2}{7}x\right)+28(-5)$

$\cancel{28}^{7}\left(\frac{1}{\cancel{4}}x\right)-168=\cancel{28}^{4}\left(\frac{2}{\cancel{7}}x\right)-140$

$\boxed{7x}-168=\boxed{8x}-140$ Combine like terms across = sign.

$\underline{-7x \qquad -7x}$

$-168=x-140$

$\underline{+140 \qquad +140}$ Add 140 to both sides.

$-28=x$

Exercises 31-52: Answers are to be checked.

Exercises 31 and 32 are completed as examples.

31.

$4t+5=\boxed{3t}+5+\boxed{t}$ Combine like terms on right side.

$\boxed{4t}+5=\boxed{4t}+5$ Combine like terms across = sign.

$\underline{-4t \qquad -4t}$ Subtract $4t$ from both sides.

$5=5$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

Substitute two random numbers to check.

$4(-4)+5\overset{?}{=}3(-4)+5+(-4)$ Check the answer using -4.

$-16+5\overset{?}{=}-12+5-4$

$-11=-11$ The answer works.

$4(11)+5\overset{?}{=}3(11)+5+(11)$ Check the answer using 11.

$44+5\overset{?}{=}33+5+11$

$49=49$ The answer works.

32.

$\boxed{2z}+8\boxed{-5z}=-3z+8$ Combine like terms on left side.

$\boxed{-3z}+8=\boxed{-3z}+8$ Combine like terms across = sign.

$\underline{-3z \qquad -3z}$ Subtract $3z$ from both sides.

$8=8$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

Substitute two random numbers to check.

$2(-7)+8-5(-7)\overset{?}{=}-3(-7)+8$ Check the answer using -7.

$-14+8+35\overset{?}{=}21+8$

$29=29$ The answer works.

$2(0)+8-5(0)\overset{?}{=}-3(0)+8$ Check the answer using 0.

$0+8-0\overset{?}{=}0+8$

$8=8$ The answer works.

33.

$\boxed{3.5h}=\boxed{2h}-12$ Combine like terms across = sign.

$\underline{-2h \quad -2h}$ Subtract $2h$ from both sides.

$1.5h=-12$ Divide both sides by 1.5.

$\frac{\cancel{1.5}h}{\cancel{1.5}}=\frac{-12}{1.5}$

$h=-8$

34.

$\boxed{4.8d}+20=\boxed{7.3d}$ Combine like terms across = sign.

$\underline{-4.8d \qquad -4.8d}$ Subtract $4.8d$ from both sides.

$20=2.5d$ Divide both sides by 2.5.

$\frac{20}{2.5}=\frac{\cancel{2.5}d}{\cancel{2.5}}$

$8=d$

35.

$15\boxed{-x}=8$ Isolate variable.

$\underline{-15 \quad -15}$ Subtract 15 from both sides.

$-x=-7$ Multiply both sides by -1.

$-1\cdot(-x)=-7\cdot(-1)$

$x=7$

36.

$\boxed{8x}+5\boxed{-9x}=20$ Combine like terms on left side.

$\boxed{-x}+5=20$ Isolate variable.

$\underline{-5 \quad -5}$ Subtract 5 from both sides.

$-x=15$

$-1\cdot(-x)=15\cdot(-1)$ Multiply both sides by -1.

$x=-15$

37.

$\boxed{3h}+8\boxed{-4h}=13$ Combine like terms on left side.

$\boxed{-h}+8=13$ Isolate variable.

$\underline{-8 \quad -8}$ Subtract 8 from both sides.

$-h=5$

$-1\cdot(-h)=5\cdot(-1)$ Multiply both sides by -1.

$h=-5$

38.

$14 = \boxed{5m} - 8\boxed{-6m}$ Combine like terms on right side.

$14 = \boxed{-m} - 8$ Isolate variable.

$\underline{+8 \qquad +8}$ Add 8 to both sides.

$22 = -m$

$-1 \cdot 22 = -m \cdot (-1)$ Multiply both sides by -1.

$-22 = m$

39.

$2(3x+5) = 4x + 22$ Distribute to simplify on the left.

$\boxed{6x} + 10 = \boxed{4x} + 22$ Combine like terms across = sign.

$\underline{-4x \qquad -4x}$ Subtract $4x$ from both sides.

$2x + 10 = 22$

$\underline{-10 \; -10}$ Subtract 10 from both sides.

$2x = 12$ Divide both sides by 2.

$\frac{\cancel{2}x}{\cancel{2}} = \frac{12}{2}$

$x = 6$

40.

$3(8x-9) = 30x - 99$ Simplify on left - distribute.

$\boxed{24x} - 27 = \boxed{30x} - 99$ Combine like terms across = sign.

$\underline{-30x \qquad -30x}$ Subtract $30x$ from both sides.

$-6x - 27 = -99$

$\underline{+27 \quad +27}$ Add 27 to both sides.

$-6x = -72$ Divide both sides by -6.

$\frac{\cancel{-6}x}{\cancel{-6}} = \frac{-72}{-6}$

$x = 12$

41.

$5(2c+3) - 8 = 3(4c+2) - 2c$ Distribute on both sides.

$10c + \boxed{15}\boxed{-8} = \boxed{12c} + 6\boxed{-2c}$ Simplify on both sides.

$\boxed{10c} + 7 = \boxed{10c} + 6$ Combine like terms across = sign.

$\underline{-10c \qquad -10c}$ Subtract $10c$ from both sides.

$7 \stackrel{?}{=} 6$ This is a false statement.

This equation has no solution.

42.

$2(6w-5) = 3(4w-2) - 7$ Distribute on both sides.

$12w - 10 = 12w\boxed{-6}\boxed{-7}$ Simplify on right side.

$\boxed{12w} - 10 = \boxed{12w} - 13$ Combine like terms across = sign.

$\underline{-12w \qquad -12w}$ Subtract $12w$ from both sides.

$-10 \stackrel{?}{=} -13$ This is a false statement.

This equation has no solution.

43.

$\boxed{7d} + 20\boxed{-3d} = 9d + 50$ Combine like terms on left side.

$\boxed{4d} + 20 = \boxed{9d} + 50$ Combine like terms across = sign.

$\underline{-9d \qquad -9d}$ Subtract $9d$ from both sides.

$-5d + 20 = 50$

$\underline{-20 \; -20}$ Subtract 20 from both sides.

$-5d = 30$ Divide both sides by -5.

$\frac{\cancel{-5}d}{\cancel{-5}} = \frac{30}{-5}$

$d = -6$

44.

$\boxed{12r} - 15\boxed{-5r} = 3r - 51$ Combine like terms on left side.

$-15 + \boxed{7r} = \boxed{3r} - 51$ Combine like terms across = sign.

$\underline{-3r \quad -3r}$ Subtract $3r$ from both sides.

$-15 + 4r = -51$

$\underline{+15 \qquad +15}$ Add 15 to both sides.

$4r = -36$ Divide both sides by 4.

$\frac{\cancel{4}r}{\cancel{4}} = \frac{-36}{4}$

$r = -9$

45.

$\frac{1}{2}x + 5 = 3x - 45$ Multiply by 2 to remove fraction.

$(\cancel{2})\frac{1}{\cancel{2}}x + (2)5 = (2)3x - 45(2)$

$\boxed{x} + 10 = \boxed{6x} - 90$ Combine like terms across = sign.

$\underline{-6x \qquad -6x}$ Subtract $6x$ from both sides.

$-5x + 10 = -90$

$\underline{-10 \quad -10}$ Subtract 10 from both sides.

$-5x = -100$ Divide both sides by -5.

$\frac{\cancel{-5}x}{\cancel{-5}} = \frac{-100}{-5}$

$x = 20$

46.

$\frac{1}{2}z - 4 = 5z - 31$ Multiply by 2 to remove fraction.

$(\cancel{2})\frac{1}{\cancel{2}}z - (2)4 = (2)5z - 31(2)$

$\boxed{z} - 8 = \boxed{10z} - 62$ Combine like terms across = sign.

$\underline{-10z \qquad -10z}$ Subtract $10z$ from both sides.

$-9z - 8 = -62$

$\underline{+8 \quad +8}$ Add 8 to both sides.

$-9z = -54$ Divide both sides by -5.

$\frac{\cancel{-9}x}{\cancel{-9}} = \frac{-54}{-9}$

$x = 6$

47.

$$\frac{1}{3}x+20=2x+20 \quad \text{Multiply by 3 to remove fraction.}$$

$$(\cancel{3})\frac{1}{\cancel{3}}x+(3)20=2x(3)+20(3)$$

$$\boxed{x}+60=\boxed{6x}+60 \quad \text{Combine like terms across = sign.}$$

$$\underline{-x \qquad -x} \quad \text{Subtract } x \text{ from both sides.}$$

$$60=5x+60$$

$$\underline{-60 \qquad -60} \quad \text{Subtract 60 from both sides.}$$

$$0=5x \quad \text{Divide both sides by 5.}$$

$$\frac{0}{5}=\frac{\cancel{5}x}{\cancel{5}}$$

$$0=x$$

48.

$$\frac{1}{7}h+8=8 \quad \text{Multiply by 7 to remove fraction.}$$

$$(\cancel{7})\frac{1}{\cancel{7}}h+(7)8=8(7)$$

$$h+56=56 \quad \text{Isolate variable.}$$

$$\underline{-56 \quad -56} \quad \text{Subtract 56 from both sides.}$$

$$h=0$$

49.

$$\boxed{9y}-2.1=\boxed{5y}+3.5 \quad \text{Combine like terms across = sign.}$$

$$\underline{-5y \qquad -5y} \quad \text{Subtract } 5y \text{ from both sides.}$$

$$4y-2.1=3.5$$

$$\underline{+2.1 \quad +2.1} \quad \text{Add 2.1 to both sides.}$$

$$4y=5.6 \quad \text{Divide both sides by 4.}$$

$$\frac{\cancel{4}y}{\cancel{4}}=\frac{5.6}{4}$$

$$y=1.4$$

50.

$$\boxed{15y}+3.6=\boxed{8y}-11.8 \quad \text{Combine like terms across = sign.}$$

$$\underline{-8y \qquad -8y} \quad \text{Subtract } 8y \text{ from both sides.}$$

$$7y+3.6=-11.8$$

$$\underline{-3.6 \quad -3.6} \quad \text{Subtract 3.6 from both sides.}$$

$$7y=-15.4 \quad \text{Divide both sides by 4.}$$

$$\frac{\cancel{7}y}{\cancel{7}}=\frac{-15.4}{7}$$

$$y=-2.2$$

51.

$$\boxed{35t}+10.2=\boxed{5t}+9.9 \quad \text{Combine like terms across = sign.}$$

$$\underline{-5t \qquad -5t} \quad \text{Subtract } 5t \text{ from both sides.}$$

$$30t+10.2=9.9$$

$$\underline{-10.2 \quad -10.2} \quad \text{Subtract 10.2 from both sides.}$$

$$30y=-0.3 \quad \text{Divide both sides by 4.}$$

$$\frac{\cancel{30}y}{\cancel{30}}=\frac{-0.3}{30}$$

$$y=-0.01$$

52.

$$\boxed{3w}-7.9=-4.75\boxed{-4w} \quad \text{Combine like terms across = sign.}$$

$$\underline{+4w \qquad +4w} \quad \text{Add } 4w \text{ to both sides.}$$

$$7w-7.9=-4.75$$

$$\underline{+7.9 \quad +7.9} \quad \text{Add 7.9 to both sides.}$$

$$7w=3.15 \quad \text{Divide both sides by 7.}$$

$$\frac{\cancel{7}w}{\cancel{7}}=\frac{3.15}{7}$$

$$w=0.45$$

53. Add the measures of the given angles and set them equal to $180°$ then solve for x.

$$x+2x+5x=180 \quad \text{Combine like terms.}$$

$$8x=180 \quad \text{Divide both sides by 8.}$$

$$\frac{\cancel{8}x}{\cancel{8}}=\frac{180}{8}$$

$$x=22.5$$

Substitute $x=22.5$ into the expressions that represent the. The measures of the 3 angles are $22.5°$, $45°$, and $112.5°$.

To check the solution, the measures of the angles should add up to 180.

$$22.5°+45°+112.5° \stackrel{?}{=} 180° \quad \text{Check the answer.}$$

$$180°=180° \quad \text{The answer works.}$$

54. Add the measures of the given angles and set them equal to $180°$ then solve for y.

$$y+3y+6y=180 \quad \text{Combine like terms.}$$

$$10y=180 \quad \text{Divide both sides by 10.}$$

$$\frac{\cancel{10}y}{\cancel{10}}=\frac{180}{10}$$

$$y=18$$

Substitute $x=18$ into the expressions that represent the angles. The measures of the 3 angles are $18°,\ 54°,\ \text{and}\ 108°$.

To check the solution, the measures of the angles should add up to 180.

$$18°+54°+108° \stackrel{?}{=} 180° \quad \text{Check the answer.}$$
$$180°=180° \quad \text{The answer works.}$$

55. Substitute $P=66$, $l=3x+1$, and $w=5x$ into the formula for perimeter and solve for x.

$$\begin{aligned}
P&=2l+2w && \text{Formula for perimeter.}\\
66&=2(3x+1)+2(5x) && \text{Substitute in values.}\\
66&=6x+2+10x && \text{Distribute/mulitply on right side.}\\
66&=\boxed{16x}+2 && \text{Simplify \& isolate variable term.}\\
-2&\quad\ \ -2 && \text{Subtract 2 from both sides.}\\
64&=16x && \text{Divide both sides by 16.}\\
\frac{64}{16}&=\frac{\cancel{16}x}{\cancel{16}}\\
4&=x
\end{aligned}$$

Now substitute $x=4$ into the expressions for length and width.

$$\begin{aligned}
l&=3(4)+1 & w&=5(4) && \text{Substitute } x = 4.\\
l&=12+1 & w&=20 && \text{Simplify each equation.}\\
l&=13
\end{aligned}$$

The length and width of the yard measure 13 ft and 20 ft.

To check the solution, substitute these values into the formula for perimeter and set it equal to 66.

$$\begin{aligned}
P&=2l+2w\\
66&\stackrel{?}{=}2(13)+2(20) && \text{Check the answer.}\\
66&\stackrel{?}{=}26+40\\
66&=66 && \text{The answer works.}
\end{aligned}$$

56. Substitute $P=88$, $l=4x+2$, and $w=3x$ into the formula for perimeter and solve for x.

$$\begin{aligned}
P&=2l+2w && \text{Formula for perimeter.}\\
88&=2(4x+2)+2(3x) && \text{Substitute in values.}\\
88&=8x+4+6x && \text{Distribute/mulitply on right side.}\\
88&=\boxed{14x}+4 && \text{Simplify \& isolate variable term.}\\
-4&\quad\ \ -4 && \text{Subtract 4 from both sides.}\\
84&=14x && \text{Divide both sides by 14.}\\
\frac{84}{14}&=\frac{\cancel{14}x}{\cancel{14}}\\
6&=x
\end{aligned}$$

Now substitute $x=6$ into the expressions for length and width.

$$\begin{aligned}
l&=4(6)+2 & w&=3(6) && \text{Substitute } x = 6.\\
l&=24+2 & w&=18 && \text{Simplify each equation.}\\
l&=26
\end{aligned}$$

The length and width of the yard measure 26 ft and 18 ft.

To check the solution, substitute these values into the formula for perimeter and set it equal to 88.

$$\begin{aligned}
P&=2l+2w\\
88&\stackrel{?}{=}2(26)+2(18) && \text{Check the answer.}\\
88&\stackrel{?}{=}52+36\\
88&=88 && \text{The answer works.}
\end{aligned}$$

57. Substitute $P=83$, and $s=3x-2$ into the formula for perimeter and solve for x.

$$\begin{aligned}
P&=4s && \text{Formula for perimeter.}\\
83&=4(3x-2) && \text{Substitute in value for } s.\\
83&=\boxed{12x}-8 && \text{Distribute/mulitply on right side.}\\
+8&\quad\ \ +8 && \text{Add 8 to both sides.}\\
91&=12x && \text{Divide both sides by 12.}\\
\frac{91}{12}&=\frac{\cancel{12}x}{\cancel{12}}\\
7\frac{7}{12}&=x \ \text{ or } \ x=\frac{91}{12}
\end{aligned}$$

Now substitute $x=\frac{91}{12}$ into the expression for the length of each side.

$$\begin{aligned}
s&=3\left(\frac{91}{12}\right)-2 && \text{Substitute } x=\frac{91}{12}.\\
s&=22\frac{3}{4}-2 && \text{Simplify.}\\
s&=20\frac{3}{4} \ \text{ or } \ 20.75
\end{aligned}$$

The length of each side of the yard measures 20.75 feet.

To check the solution, substitute this value into the formula for perimeter and set it equal to 83.

$$\begin{aligned}
P&=4s\\
83&\stackrel{?}{=}4(20.75) && \text{Check the answer.}\\
83&=83 && \text{The answer works.}
\end{aligned}$$

58. Substitute $P = 60$, and $s = 6x - 3$ into the formula for perimeter and solve for x.

$P = 4s$	Formula for perimeter.
$60 = 4(6x-3)$	Substitute in value for s.
$60 = \boxed{24x} - 12$	Distribute/mulitply on right side.
$+12 \qquad +12$	Add 8 to both sides.
$72 = 24x$	Divide both sides by 12.
$\frac{72}{24} = \frac{\cancel{24}x}{\cancel{24}}$	
$3 = x$	

Now substitute $x = 3$ into the expression for the length of each side.

$s = 6(3) - 3$	Substitute $x = 3$.
$s = 18 - 3$	Simplify.
$s = 15$	

The length of each side of the yard measures 15 feet. To check the solution, substitute this value into the formula for perimeter and set it equal to 60.

$P = 4s$	
$60 \stackrel{?}{=} 4(15)$	Check the answer.
$60 = 60$	The answer works.

59. Substitute $P = 100$, $l = x - 5$, and $w = 4x$ into the formula for perimeter and solve for x.

$P = 2l + 2w$	Formula for perimeter.
$100 = 2(x-5) + 2(4x)$	Substitute in values.
$100 = 2x - 10 + 8x$	Distribute/mulitply on right side.
$100 = \boxed{10x} - 10$	Simplify and isolate variable term.
$+10 \qquad +10$	Add 10 to both sides.
$110 = 10x$	Divide both sides by 10.
$\frac{110}{10} = \frac{\cancel{10}x}{\cancel{10}}$	
$11 = x$	

Now substitute $x = 11$ into the expressions for length and width.

$l = (11) - 5$	$w = 4(11)$	Substitute $x = 11$.
$l = 6$	$w = 44$	Simplify each equation.

The length and width of the lawn measure 6 feet and 44 feet.

To check the solution, substitute these values into the formula for perimeter and set it equal to 100.

$P = 2l + 2w$	
$100 \stackrel{?}{=} 2(6) + 2(44)$	Check the answer.
$100 \stackrel{?}{=} 12 + 88$	
$100 = 100$	The answer works.

60. Substitute $P = 58$, $l = x - 7$, and $w = 3x$ into the formula for perimeter and solve for x.

$P = 2l + 2w$	Formula for perimeter.
$58 = 2(x-7) + 2(3x)$	Substitute in values.
$58 = 2x - 14 + 6x$	Distribute/mulitply on right side.
$58 = \boxed{8x} - 14$	Simplify and isolate variable term.
$+14 \qquad +14$	Add 14 to both sides.
$72 = 8x$	Divide both sides by 10.
$\frac{72}{8} = \frac{\cancel{8}x}{\cancel{8}}$	
$9 = x$	

Now substitute $x = 9$ into the expressions for length and width.

$l = (9) - 7$	$w = 3(9)$	Substitute $x = 9$.
$l = 2$	$w = 27$	Simplify each equation.

The length and width of the lawn measure 2 feet and 27 feet.

To check the solution, substitute these values into the formula for perimeter and set it equal to 58.

$P = 2l + 2w$	
$58 \stackrel{?}{=} 2(2) + 2(27)$	Check the answer.
$58 \stackrel{?}{=} 4 + 54$	
$58 = 58$	The answer works.

61.

$x + 2x + 2x = 180$	Combine like terms.
$5x = 180$	Divide both sides by 5.
$\frac{\cancel{5}x}{\cancel{5}} = \frac{180}{5}$	
$x = 36$	

Now substitute $x = 36$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $36°,\ 72°,$ and $72°$.

To check the solution, the measures of the angles should add up to 180.

$36° + 72° + 72° \stackrel{?}{=} 180°$	Check the answer.
$180° = 180°$	The answer works.

62.

$$\begin{aligned} x+2x+3x&=180 && \text{Combine like terms.}\\ 6x&=180 && \text{Divide both sides by 6.}\\ \frac{\cancel{6}x}{\cancel{6}}&=\frac{180}{6}\\ x&=30 \end{aligned}$$

Now substitute $x=30$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $30°,\ 60°,\ \text{and}\ 90°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 30°+60°+90°&\overset{?}{=}180° && \text{Check the answer.}\\ 180°&=180° && \text{The answer works.} \end{aligned}$$

Exercises 63-76: Answers are to be checked.

63.

$$\begin{aligned} 3(x-0.5)+1&=3x-0.5 && \text{Distribute to simplify on the left.}\\ 3x-1.5+1&=3x-0.5 && \text{Combine like terms on left side.}\\ \boxed{3x}-0.5&=\boxed{3x}-0.5 && \text{Combine like terms across = sign.}\\ -3x\qquad&\quad\ -3x && \text{Subtract } 3x \text{ from both sides.}\\ -0.5&=-0.5 && \text{This is a true statement.} \end{aligned}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -2 and 2, and substitute these into the equation.

$$\begin{aligned} 3([-2]-0.5)+1&\overset{?}{=}3(-2)-0.5 && \text{Check the answer using } -2.\\ 3(-2.5)+1&\overset{?}{=}-6-0.5\\ -7.5+1&\overset{?}{=}-6.5\\ -6.5&=-6.5 && \text{The answer works.} \end{aligned}$$

$$\begin{aligned} 3([2]-0.5)+1&\overset{?}{=}3(2)-0.5 && \text{Check the answer using 2.}\\ 3(1.5)+1&\overset{?}{=}6-0.5\\ 4.5+1&\overset{?}{=}5.5\\ 5.5&=5.5 && \text{The answer works.} \end{aligned}$$

64.

$$\begin{aligned} 2.1(x+2)-3&=2.1x+1.2 && \text{Distribute to simplify on the left.}\\ 2.1x+4.2-3&=2.1x+1.2 && \text{Combine like terms on left side.}\\ \boxed{2.1x}+1.2&=\boxed{2.1x}+1.2 && \text{Combine like terms across = sign.}\\ -2.1x\qquad&\quad\ -2.1x && \text{Subtract } 2.1x \text{ from both sides.}\\ 1.2&=1.2 && \text{This is a true statement.} \end{aligned}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -9 and 8, and substitute these into the equation.

$$\begin{aligned} 2.1([-9]+2)-3&\overset{?}{=}2.1(-9)+1.2 && \text{Check the answer using } -9.\\ 2.1(-7)-3&\overset{?}{=}-18.9+1.2\\ -14.7-3&\overset{?}{=}-17.7\\ -17.7&=-17.7 && \text{The answer works.} \end{aligned}$$

$$\begin{aligned} 2.1([8]+2)-3&\overset{?}{=}2.1(8)+1.2 && \text{Check the answer using 8.}\\ 2.1(10)-3&\overset{?}{=}16.8+1.2\\ 21-3&\overset{?}{=}18\\ 18&=18 && \text{The answer works.} \end{aligned}$$

65.

$$\begin{aligned} 0.3x+0.3&=\boxed{0.5x}+0.1\boxed{-0.2x} && \text{Simplify on right side.}\\ \boxed{0.3x}+0.3&=\boxed{0.3x}+0.1 && \text{Combine like terms across = sign.}\\ -0.3x\qquad&\quad\ -0.3x && \text{Subtract } 0.3x \text{ from both sides.}\\ 0.3&\overset{?}{=}0.1 && \text{This is a false statement.} \end{aligned}$$

This equation has no solution.

66.

$$\begin{aligned} 0.9x-0.2&=0.5(3x+1)-0.6x && \text{Simplify on right side.}\\ 0.9x-0.2&=1.5x+0.5-0.6x\\ \boxed{0.9x}-0.2&=\boxed{0.9x}+0.5 && \text{Combine like terms across = sign.}\\ -0.9x\qquad&\quad\ -0.9x && \text{Subtract } 0.9x \text{ from both sides.}\\ -0.2&\overset{?}{=}0.5 && \text{This is a false statement.} \end{aligned}$$

This equation has no solution.

67.

$$\frac{1}{2}r+5=\frac{7}{5}r+5 \quad \text{Multiply by 10 } (5\cdot 2) \text{ to clear fractions.}$$
$$(10)\frac{1}{2}r+(10)5=(10)\frac{7}{5}r+5(10)$$
$$(\overset{5}{\cancel{10}})\frac{1}{\cancel{2}}r+50=(\overset{2}{\cancel{10}})\frac{7}{\cancel{5}}r+50$$
$$\boxed{5r}+50=\boxed{14r}+50 \quad \text{Combine like terms across = sign.}$$
$$\underline{-14r \qquad -14r} \quad \text{Subtract } 14r \text{ from both sides.}$$
$$-9r+50=50$$
$$\underline{-50 \quad -50} \quad \text{Subtract 50 from both sides.}$$
$$-9r=0 \quad \text{Divide both sides by } -9.$$
$$\frac{\cancel{-9}r}{\cancel{-9}}=\frac{0}{-9}$$
$$r=0$$

$$\frac{1}{2}(0)+5\overset{?}{=}\frac{7}{5}(0)+5 \quad \text{Check the answer.}$$
$$0+5\overset{?}{=}0+5$$
$$5=5 \quad \text{The answer works.}$$

68.

$$\frac{1}{4}w+50=3w+50 \quad \text{Multiply by 4 to clear fraction.}$$
$$(\cancel{4})\frac{1}{\cancel{4}}w+(4)50=(4)3w+50(4)$$
$$\boxed{w}+200=\boxed{12w}+200 \quad \text{Combine like terms across = sign.}$$
$$\underline{-12w \qquad -12w} \quad \text{Subtract } 12w \text{ from both sides.}$$
$$-11w+200=200$$
$$\underline{-200 \quad -200} \quad \text{Subtract 200 from both sides.}$$
$$-11w=0 \quad \text{Divide both sides by } -11.$$
$$\frac{\cancel{-11}w}{\cancel{-11}}=\frac{0}{-11}$$
$$w=0$$

$$\frac{1}{4}(0)+50\overset{?}{=}3(0)+50 \quad \text{Check the answer.}$$
$$0+50\overset{?}{=}0+50$$
$$50=50 \quad \text{The answer works.}$$

69.

$$\frac{3}{5}d-1=\frac{1}{10}(6d-10) \quad \text{Multiply by 10 to clear fractions.}$$
$$(\overset{2}{\cancel{10}})\frac{3}{\cancel{5}}d-(10)1=(\cancel{10})\frac{1}{\cancel{10}}(6d-10)$$
$$\boxed{6d}-10=\boxed{6d}-10 \quad \text{Combine like terms across = sign.}$$
$$\underline{-6d \qquad -6d} \quad \text{Subtract } 6d \text{ from both sides.}$$
$$-10=-10 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -20 and 10, and substitute these into the equation.

$$\frac{3}{5}(-20)-1\overset{?}{=}\frac{1}{10}(6[-20]-10) \quad \text{Check the answer using } -20.$$
$$-12-1\overset{?}{=}\frac{1}{10}(-120-10)$$
$$-13\overset{?}{=}\frac{1}{10}(-130)$$
$$-13=-13 \quad \text{The answer works.}$$
$$\frac{3}{5}(10)-1\overset{?}{=}\frac{1}{10}(6[10]-10) \quad \text{Check the answer using 10.}$$
$$6-1\overset{?}{=}\frac{1}{10}(60-10)$$
$$5\overset{?}{=}\frac{1}{10}(50)$$
$$5=5 \quad \text{The answer works.}$$

70.

$$\frac{2}{3}n+6=\frac{1}{3}(2n+18) \quad \text{Multiply by 3 to clear fractions.}$$
$$(\cancel{3})\frac{2}{\cancel{3}}n+(3)6=(\cancel{3})\frac{1}{\cancel{3}}(2n+18)$$
$$\boxed{2n}+18=\boxed{2n}+18 \quad \text{Combine like terms across = sign.}$$
$$\underline{-2n \qquad -2n} \quad \text{Subtract } 2n \text{ from both sides.}$$
$$18=18 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -12 and 6, and substitute these into the equation.

$$\frac{2}{3}(-12)+6\overset{?}{=}\frac{1}{3}(2[-12]+18) \quad \text{Check the answer using } -12.$$
$$-8+6\overset{?}{=}\frac{1}{3}(-24+18)$$
$$-2\overset{?}{=}\frac{1}{3}(-6)$$
$$-2=-2 \quad \text{The answer works.}$$
$$\frac{2}{3}(6)+6\overset{?}{=}\frac{1}{3}(2[6]+18) \quad \text{Check the answer using 6.}$$
$$4+6\overset{?}{=}\frac{1}{3}(12+18)$$
$$10\overset{?}{=}\frac{1}{3}(30)$$
$$10=10 \quad \text{The answer works.}$$

71.

$\frac{1}{5}g+7=2+\frac{2}{5}g$ Multiply by 5 to clear fractions.

$(\cancel{5})\frac{1}{\cancel{5}}g+(5)7=(5)2+\frac{2}{\cancel{5}}g(\cancel{5})$

$\boxed{g}+35=10+\boxed{2g}$ Combine like terms across = sign.

$-2g \qquad -2g$ Subtract $2g$ from both sides.

$-g+35=10$

$-35 \quad -35$ Subtract 35 from both sides.

$-g=-25$ Multiply both sides by -1.

$-1\cdot(-g)=-25\cdot(-1)$

$g=25$

$\frac{1}{5}(25)+7\overset{?}{=}2+\frac{2}{5}(25)$ Check the answer.

$5+7\overset{?}{=}2+10$

$12=12$ The answer works.

72.

$\frac{2}{7}t-5=15-\frac{3}{7}t$ Multiply by 7 to clear fractions.

$(\cancel{7})\frac{2}{\cancel{7}}t-(7)5=(7)15-\frac{3}{\cancel{7}}t(\cancel{7})$

$\boxed{2t}-35=105\boxed{-3t}$ Combine like terms across = sign.

$+3t \qquad +3t$ Add $3t$ to both sides.

$5t-35=105$

$+35 \quad +35$ Add 35 to both sides.

$5t=140$ Divide both sides by 5.

$\frac{\cancel{5}t}{\cancel{5}}=\frac{140}{5}$

$t=28$

$\frac{2}{7}(28)-5\overset{?}{=}15-\frac{3}{7}(28)$ Check the answer.

$8-5\overset{?}{=}15-12$

$3=3$ The answer works.

73.

$\frac{1}{2}x+7=\frac{2}{5}x+9$ Multiply by 10 $(5\cdot 2)$ to clear fractions.

$({}^{5}\cancel{10})\frac{1}{\cancel{2}}x+(10)7=({}^{2}\cancel{10})\frac{2}{\cancel{5}}x+9(10)$

$\boxed{5x}+70=\boxed{4x}+90$ Combine like terms across = sign.

$-4x \qquad -4x$ Subtract $4x$ from both sides.

$x+70=90$

$-70 \quad -70$ Subtract 70 from both sides.

$x=20$

$\frac{1}{2}(20)+7\overset{?}{=}\frac{2}{5}(20)+9$ Check the answer.

$10+7\overset{?}{=}8+9$

$17=17$ The answer works.

74.

$\frac{1}{3}v+4=\frac{1}{4}v+\frac{9}{2}$ Multiply by 12 (LCD) to clear fractions.

$({}^{4}\cancel{12})\frac{1}{\cancel{3}}v+(12)4=({}^{3}\cancel{12})\frac{1}{\cancel{4}}v+\frac{9}{\cancel{2}}({}^{6}\cancel{12})$

$\boxed{4v}+48=\boxed{3v}+54$ Combine like terms across = sign.

$-3v \qquad -3v$ Subtract $3v$ from both sides.

$v+48=54$

$-48 \quad -48$ Subtract 48 from both sides.

$v=6$

$\frac{1}{3}(6)+4\overset{?}{=}\frac{1}{4}(6)+\frac{9}{2}$ Check the answer.

$2+4\overset{?}{=}\frac{3}{2}+\frac{9}{2}$

$6\overset{?}{=}\frac{12}{2}$

$6=6$ The answer works.

75.

$\frac{1}{2}x+5=\frac{1}{2}x+3$ Multiply by 2 to clear fractions.

$(\cancel{2})\frac{1}{\cancel{2}}x+(2)5=(\cancel{2})\frac{1}{\cancel{2}}x+3(2)$

$\boxed{x}+10=\boxed{x}+6$ Combine like terms across = sign.

$-x \qquad -x$ Subtract x from both sides.

$10\overset{?}{=}6$ This is a false statement.

This equation has no solution.

76.

$\frac{1}{3}(3x+6)=2\left(\frac{1}{2}x+4\right)$ Simplify on each side - distribute.

$\boxed{x}+2=\boxed{x}+8$ Combine like terms across = sign.

$-x \qquad -x$ Subtract x from both sides.

$2\overset{?}{=}8$ This is a false statement.

This equation has no solution.

77.

$$\begin{aligned} 75 + x + (x-5) &= 180 && \text{Combine like terms.}\\ 2x + 70 &= 180 \\ -70 \quad -70 & && \text{Subtract 70 from both sides.}\\ 2x &= 110 \\ \frac{\cancel{2}x}{\cancel{2}} &= \frac{110}{2} && \text{Divide both sides by 2.}\\ x &= 55 \end{aligned}$$

Now substitute $x = 55$ into the expressions that represent the angles. The measures of the three angles are $75°$, $55°$, and $50°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 75° + 55° + 50° &\stackrel{?}{=} 180° && \text{Check the answer.}\\ 180° &= 180° && \text{The answer works.} \end{aligned}$$

78.

$$\begin{aligned} 80 + (x+10) + (x-20) &= 180 && \text{Combine like terms.}\\ 2x + 70 &= 180 \\ -70 \quad -70 & && \text{Subtract 70 from both sides.}\\ 2x &= 110 \\ \frac{\cancel{2}x}{\cancel{2}} &= \frac{110}{2} && \text{Divide both sides by 2.}\\ x &= 55 \end{aligned}$$

Now substitute $x = 55$ into the expressions that represent the angles to find the measure of each angle. The measures of the three angles are $80°$, $65°$, and $35°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 80° + 65° + 35° &\stackrel{?}{=} 180° && \text{Check the answer.}\\ 180° &= 180° && \text{The answer works.} \end{aligned}$$

79.

$$\begin{aligned} x + (x+5) + (x-14) &= 180 && \text{Combine like terms.}\\ 3x - 9 &= 180 \\ +9 \quad +9 & && \text{Add 9 to both sides.}\\ 3x &= 189 \\ \frac{\cancel{3}x}{\cancel{3}} &= \frac{189}{3} && \text{Divide both sides by 3.}\\ x &= 63 \end{aligned}$$

Now substitute $x = 63$ into the expressions that represent the angles. The measures of the three angles are $63°$, $68°$, and $49°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 63° + 68° + 49° &\stackrel{?}{=} 180° && \text{Check the answer.}\\ 180° &= 180° && \text{The answer works.} \end{aligned}$$

80.

$$\begin{aligned} 2x + (x+30) + (x-10) &= 180 && \text{Combine like terms.}\\ 4x + 20 &= 180 \\ -20 \quad -20 & && \text{Subtract 20 from both sides.}\\ 4x &= 160 \\ \frac{\cancel{4}x}{\cancel{4}} &= \frac{160}{4} && \text{Divide both sides by 4.}\\ x &= 40 \end{aligned}$$

Now substitute $x = 40$ into the expressions that represent the angles. The measures of the three angles are $80°$, $70°$, and $30°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 80° + 70° + 30° &\stackrel{?}{=} 180° && \text{Check the answer.}\\ 180° &= 180° && \text{The answer works.} \end{aligned}$$

81. The sum of the measures of the angles in a quadrilateral must equal $360°$. Add the measures of the given angles and set them equal to $360°$ then solve for *x*.

$$\begin{aligned} x + (x-25) + 65 + (x+20) &= 360 \\ 3x + 60 &= 360 && \text{Combine like terms.}\\ -60 \quad -60 & && \text{Subtract 60 from both sides.}\\ 3x &= 300 \\ \frac{\cancel{3}x}{\cancel{3}} &= \frac{300}{3} && \text{Divide both sides by 3.}\\ x &= 100 \end{aligned}$$

Now substitute $x = 100$ into the expressions that represent the angles. The measures of the four angles are $100°$, $75°$, $65°$, and $120°$.

To check the solution, the measures of the angles should add up to 360.

$$100°+75°+65°+120° \stackrel{?}{=} 360° \quad \text{Check the answer.}$$
$$360° = 360° \quad \text{The answer works.}$$

82.

$$(2x-10)+(2x-5)+(3x+15)+x=360$$
$$8x = 360 \quad \text{Combine like terms.}$$
$$\frac{\cancel{8}x}{\cancel{8}} = \frac{360}{8} \quad \text{Divide both sides by 8.}$$
$$x = 45$$

Now substitute $x = 45$ into the expressions that represent the angles. The measures of the four angles are $80°,\ 85°,\ 150°,\ \text{and}\ 45°.$

To check the solution, the measures of the angles should add up to 360.

$$80°+85°+150°+45° \stackrel{?}{=} 360° \quad \text{Check the answer.}$$
$$360° = 360° \quad \text{The answer works.}$$

83. Add the given expressions for side lengths, set them equal to 342, and solve for p.

$$(p-3)+(p+20)+p+(p+5)=342$$
$$4p+22=342 \quad \text{Combine like terms on left side.}$$
$$\underline{-22 \quad -22} \quad \text{Subtract 22 from both sides.}$$
$$4p=320 \quad \text{Divide both sides by 4.}$$
$$\frac{\cancel{4}p}{\cancel{4}} = \frac{320}{4}$$
$$p=80$$

Now substitute $p = 80$ into the expressions that represent the lengths of each side. The lengths of the sides are 77 ft, 100 ft, 80 ft, and 85 ft.

To check the solution, the sum of the lengths of the sides should equal 342.

$$77+100+80+85 \stackrel{?}{=} 342 \quad \text{Check the answer.}$$
$$342 = 342 \quad \text{The answer works.}$$

84. Add the given expressions for side lengths, set them equal to 335, and solve for m.

$$(m-5)+m+(m+10)=335$$
$$3m+5=335 \quad \text{Combine like terms on left side.}$$
$$\underline{-5 \quad -5} \quad \text{Subtract 5 from both sides.}$$
$$3m=330 \quad \text{Divide both sides by 3.}$$
$$\frac{\cancel{3}m}{\cancel{3}} = \frac{330}{3}$$
$$m=110$$

Now substitute $m = 110$ into the expressions that represent the lengths of each side. The lengths of the sides are 105 feet, 110 feet, and 120 feet.

To check the solution, the sum of the lengths of the sides should equal 335.

$$105+110+120 \stackrel{?}{=} 335 \quad \text{Check the answer.}$$
$$335 = 335 \quad \text{The answer works.}$$

85. Add the given expressions for side lengths, set them equal to 345, and solve for s.

$$s+2s+(s-5)+(2s-10)=345$$
$$6s-15=345 \quad \text{Combine like terms on left side.}$$
$$\underline{+15 \quad +15} \quad \text{Add 15 to both sides.}$$
$$6s=360 \quad \text{Divide both sides by 6.}$$
$$\frac{\cancel{6}s}{\cancel{6}} = \frac{360}{6}$$
$$s=60$$

Now substitute $s = 60$ into the expressions that represent the lengths of each side. The lengths of the sides are 60 feet, 120 feet, 55 feet, and 110 feet.

To check the solution, the sum of the lengths of the sides should equal 345.

$$60+120+55+110 \stackrel{?}{=} 345 \quad \text{Check the answer.}$$
$$345 = 345 \quad \text{The answer works.}$$

86. Add the given expressions for side lengths, set them equal to 500, and solve for x.

$$(x+20)+(3x+5)+x+(3x+10)+(x-30)=500$$
$$9x+5=500 \quad \text{Combine like terms on left side.}$$
$$\underline{-5 \quad -5} \quad \text{Subtract 5 from both sides.}$$
$$9x=495 \quad \text{Divide both sides by 9.}$$
$$\frac{\cancel{9}x}{\cancel{9}} = \frac{495}{9}$$
$$x=55$$

Now substitute $x = 55$ into the expressions that represent the lengths of each side. The lengths of the sides are 75 feet, 170 feet, 55 feet, 175 feet, and 25 feet.

To check the solution, the sum of the lengths of the sides should equal 500.

$$\begin{aligned} 75+170+55+175+25 &\stackrel{?}{=} 500 && \text{Check the answer.} \\ 500 &= 500 && \text{The answer works.} \end{aligned}$$

87. Let $s =$ the number of students going on the bike tour.

- $210(s)$ dollars for the bikes
- $2(2s)$ dollars for the water bottles
- $8.50(3s)$ dollars for the food sacks

We write out the following equation equal to Carlotta's budget of $2275.00

$$210s+2(2s)+8.50(3s)=7664$$

Now solve the equation for *s*.

$$\begin{aligned} 210s+2(2s)+8.50(3s) &= 7664 && \text{Multiply on left side.} \\ 210s+4s+25.5s &= 7664 && \text{Combine like terms on left side.} \\ 239.5s &= 7664 \\ \frac{\cancel{239.5}s}{\cancel{239.5}} &= \frac{7664}{239.5} && \text{Divide both sides by 239.5.} \\ s &= 32 \end{aligned}$$

Carlotta can supply 32 students for the tour.

88. Let $c =$ the number of Alphabet Cars Bill is going to build.

Bill will need to buy the following:

- $4c$ wheels, 4 for each car.
- $2c$ axles, two for each car.
- $5c$ hubcaps, 5 for each car.

Now we multiply each of these expressions by how much they cost and then add those costs together to get the total of $14,700.

- $1.00(4c)$ dollars for the wheels
- $0.39(2c)$ dollars for the axles
- $0.06(5c)$ dollars for the hubcaps

We write out the following equation equal to Bill's budget of $12,192.00

$$1.00(4c)+0.39(2c)+0.06(5c)=12192$$

Now solve the equation for *c*.

$$\begin{aligned} 1.00(4c)+0.39(2c)+0.06(5c) &= 12192 \\ 4c+0.78c+0.3c &= 12192 \\ 5.08c &= 12192 && \text{Combine like terms on left side.} \\ \frac{\cancel{5.08}c}{\cancel{5.08}} &= \frac{12192}{5.08} && \text{Divide both sides by 5.08.} \\ c &= 2400 \end{aligned}$$

Bill can build 2400 Alphabet Cars.

89. **a.** First consider how many of each item is needed for *k* kids.

- $k+8$ pine 2x2, 1foot for each kid plus 8 extra feet.
- $1.5k+10$ pine 1x3, 1.5 feet for each kid plus 10 extra feet.
- $k+12$ sets of nails, 1 set for each kid plus 12 extra sets.

Now we multiply each of these expressions by how much they cost.

- $1.22(k+8)$ dollars for pine 2x2
- $1.34(1.5k+10)$ dollars for pine 1x3
- $0.05(k+12)$ dollars for nails

Let $S =$ the total amount in dollars needed for supplies.

$$\begin{aligned} S &= 1.22(k+8)+1.34(1.5k+10)+0.05(k+12) \\ S &= 1.22k+9.76+2.01k+13.4+0.05k+0.6 && \text{Distribute.} \\ S &= 3.28k+23.76 && \text{Combine like terms.} \end{aligned}$$

b. Substitute $k = 75$ into the equation and solve for *S*.

$$\begin{aligned} S &= 3.28(75)+23.76 && \text{Substitute } k=75. \\ S &= 246+23.76 && \text{Multiply then add.} \\ S &= 269.76 \end{aligned}$$

The cost would be $269.76.

c. Substitute $S = 417.36$ into the equation and solve for *k*.

$$\begin{aligned} 417.36 &= 3.28k+23.76 && \text{Substitute } S = 417.36. \\ -23.76 &\quad\ \ -23.76 && \text{Subtract 23.76 from both sides.} \\ 393.6 &= 3.28k && \text{Divide both sides by 3.28.} \\ \frac{300.3}{3.28} &= \frac{\cancel{3.28}k}{\cancel{3.28}} \\ 91.55 &\approx k && \text{Rounded to hundredths} \end{aligned}$$

The manager can buy supplies for 91 projects. Round down as there would not be enough money for 92 projects.

90. **a.** First consider how many of each item is needed for y yards.

- $12y+15$ 10-ft PVC pipes, 12 for each yard plus 15 extra.
- $9y+6$ sprinkler heads, 9 for each yard plus 6 extra.
- $y+2$ sets of misc. PVC parts, 1 set for each yard plus 2 extra sets.

Now we multiply each of these expressions by how much they cost.

- $1.50(12y+15)$ dollars for 10-ft PVC pipes
- $2.50(9y+6)$ dollars for sprinkler heads
- $15(y+2)$ dollars for misc. PVC parts

Let S = the total amount in dollars needed for supplies.

$$S=1.50(12y+15)+2.50(9y+6)+15(y+2)$$
$$S=18y+22.5+22.5y+15+15y+30 \quad \text{Distribute.}$$
$$S=55.5y+67.5 \quad \text{Combine like terms.}$$

b. Substitute $y=12$ into the equation and solve for S.

$$S=55.5(12)+67.5 \quad \text{Substitute } t=12.$$
$$S=666+67.5 \quad \text{Multiply then add.}$$
$$S=733.5$$

It will cost \$733.50 for supplies.

c. Substitute $S=6006$ into the equation and solve for y.

$$6006=55.5y+67.5 \quad \text{Substitute } S=6006.$$
$$\underline{-67.5 \qquad -67.5} \quad \text{Subtract 67.5 from both sides.}$$
$$5938.5=55.5y \quad \text{Divide both sides by 55.5.}$$
$$\frac{5938.5}{55.5}=\frac{\cancel{55.5}y}{\cancel{55.5}}$$
$$107=y \quad \text{Rounded to hundredths}$$

107 sprinkler systems can be installed.

91. In order to determine the sales price, the markup must be determined, then added to the wholesale cost.

Markup rate: $r=30\%=0.3$

Wholesale cost is the original price: $P=\$120$

Markup: M

Use the formula $M=rP$.

$$M=0.3(120)$$
$$M=36$$

Sales price, S, is the original price plus the markup.

$$S=P+M$$
$$S=120+36$$
$$S=156$$

The sales price of the book is \$156.

92. In order to determine the sales price, the markup must be determined, then added to the wholesale cost.

Markup rate: $r=3\%=0.03$

Wholesale cost is the original price: $P=\$1.50$

Markup: M

Use the formula $M=rP$.

$$M=0.03(1.50)$$
$$M=0.045$$

Sales price, S, is the original price plus the markup.

$$S=P+M$$
$$S=1.50+0.045$$
$$S=1.545\approx 1.55$$

The sales price of a pound of grapes is \$1.55.

93. The discount is found by using the formula $D=rA$, where D is the discount, or decrease, r is the percent decrease, and A is the original amount.

Decrease: D

Percent decrease: $r=35\%=0.35$

Original amount: $A=20$

$$D=0.35(20)$$
$$D=7$$

The discount is \$7.00.

In order to determine the sales price, S, the discount is subtracted from the original price.

$$S=A-D$$
$$S=20-7$$
$$S=13$$

The sales price of a set of headphones is \$13.

94. The discount is found by using the formula $D = rA$, where D is the decrease, or discount, r is the percent decrease, and A is the original amount.

Decrease: D

Percent decrease: $r = 15\% = 0.15$

Original amount: $A = 22$

$$D = 0.15(22)$$
$$D = 3.3$$

The discount is \$3.30.

In order to determine the sales price, S, the discount is subtracted from the original price.

$$S = A - D$$
$$S = 22 - 3.3$$
$$S = 18.7$$

The sales price of a storage container is \$18.70.

95. To find the percent decrease, use the formula $D = rA$. After 1 year, the current value of the car is \$26,158, whereas, originally the car was purchased for \$31,900, so $A = 31900$.The decrease is found by subtracting the current value from the original value.

$$D = A - \text{Current Amount}$$
$$D = 31900 - 26158$$
$$D = 12942$$

Substitute $D = 12942$ and $A = 31900$ into the formula $D = rA$ and solve for r.

$$12942 = r(31900)$$
$$\frac{12942}{31900} = \frac{\cancel{31900}r}{\cancel{31900}}$$
$$0.4057 \approx r$$

The percent drease in the value of the car after 1 year is approximately 40.6%.

96. To find the percent decrease, use the formula $D = rA$. After 1 year, the current value of the car is \$11,470, whereas, originally the car was purchased for \$15,500, so $A = 15500$.The decrease is found by subtracting the current value from the original value.

$$D = A - \text{Current Amount}$$
$$D = 15500 - 11470$$
$$D = 4030$$

Substitute $D = 4030$ and $A = 15500$ into the formula $D = rA$ and solve for r.

$$4030 = r(15500)$$
$$\frac{4030}{15500} = \frac{\cancel{15500}r}{\cancel{15500}}$$
$$0.26 = r$$

The percent drease in the value of the car after 1 year is 26%.

97. To find the percent increase, use the formula $I = rA$. The current value of the house is \$512,000, whereas, originally the house was originally \$456,000, so $A = 456000$.The increase is found by subtracting the original value from the current value.

$$I = \text{Current Amount} - A$$
$$I = 512000 - 456000$$
$$I = 56000$$

Substitute $I = 56000$ and $A = 456000$ into the formula $I = rA$ and solve for r.

$$56000 = r(456000)$$
$$\frac{56000}{456000} = \frac{\cancel{456000}r}{\cancel{456000}}$$
$$0.1228 \approx r$$

The percent increase in the value of the house is approximately 12.3%.

98. To find the percent increase, use the formula $I = rA$. The current value of the house is \$462,000, whereas, originally the house was originally \$345,000, so $A = 345000$.The increase is found by subtracting the original value from the current value.

$$I = \text{Current Amount} - A$$
$$I = 462000 - 345000$$
$$I = 117000$$

Substitute $I = 117000$ and $A = 345000$ into the formula $I = rA$ and solve for r.

$$117000 = r(345000)$$
$$\frac{117000}{345000} = \frac{\cancel{345000}r}{\cancel{345000}}$$
$$0.3391 \approx r$$

The percent increase in the value of the house is approximately 33.9%.

99. The statement does not have an equal sign; therefore, it is an expression.

$\boxed{5ab}+6a^2-4a+\boxed{12ab}+3$ Identify like terms.

$6a^2-4a+17ab+3$ Arrange in conventional form.

100. The statement does not have an equal sign; therefore, it is an expression.

$\boxed{10mn^2}+9n+\boxed{\boxed{1}}\boxed{-7mn^2}+\boxed{\boxed{4}}$ Identify like terms.

$3mn^2+9n+5$ Arrange in conventional form.

101. The statement has an equal sign; therefore, it is an equation.

$\boxed{0.5x}\boxed{\boxed{-4}}=\boxed{2x}+\boxed{\boxed{7}}$ Identify like terms.

$\underline{-2x \qquad -2x}$ Subtract $2x$ from both sides.

$-1.5x-4=7$

$\underline{+4 \quad +4}$ Add 4 to both sides.

$-1.5x=11$ Divide both sides by -1.5.

$$\frac{\cancel{-1.5}x}{\cancel{-1.5}}=\frac{11}{-1.5}$$

$$x=-7.\overline{3}$$

102. The statement has an equal sign; therefore, it is an equation.

$\boxed{-0.25r}+\boxed{\boxed{12}}=\boxed{4.5r}\boxed{\boxed{-15}}$ Identify like terms.

$\underline{-4.5r \qquad -4.5r}$ Subtract $4.5r$ from both sides.

$-4.75r+12=-15$

$\underline{-12 \quad -12}$ Subtract 12 from both sides.

$-4.75r=-27$ Divide both sides by -4.75.

$$\frac{\cancel{-4.75}x}{\cancel{-4.75}}=\frac{-27}{-4.75}$$

$$x\approx 5.68$$

103. The statement has an equal sign; therefore, it is an equation.

Multiply each term by 24 to clear fractions.

$$\frac{1}{8}n+12=\frac{3}{24}n-2$$

$$(^3\cancel{24})\frac{1}{\cancel{8}}n+(24)12=(\cancel{24})\frac{3}{\cancel{24}}n-2(24)$$

$\boxed{3n}+\boxed{\boxed{288}}=\boxed{3n}\boxed{\boxed{-48}}$ Identify like terms.

$\underline{-3n \qquad -3n}$ Subtract $3n$ from both sides.

$288\overset{?}{=}-48$ This is a false statement.

This equation has no solution.

104. The statement has an equal sign; therefore, it is an equation.

Multiply each term by 16 to clear fractions.

$$\frac{3}{4}d+14=\frac{12}{16}d-20$$

$$(^4\cancel{16})\frac{3}{\cancel{4}}d+(16)14=(\cancel{16})\frac{12}{\cancel{16}}d-20(16)$$

$\boxed{12d}+\boxed{\boxed{224}}=\boxed{12d}\boxed{\boxed{-320}}$ Identify like terms.

$\underline{-12d \qquad -12d}$ Subtract $12d$ from both sides.

$224\overset{?}{=}-320$ This is a false statement.

This equation has no solution.

105. The statement does not have an equal sign; therefore, it is an expression.

$\boxed{2x}+\boxed{\boxed{11}}\boxed{-4x}+\boxed{\boxed{8}}$ Identify like terms.

$-2x+19$ Arrange in conventional form.

106. The statement does not have an equal sign; therefore, it is an expression. Simplify as follows

$7y^3\boxed{-10y}+3y^2+\boxed{2y}$ Identify like terms.

$7y^3+3y^2-8y$ Arrange in conventional form.

107. The statement has an equal sign; therefore, it is an equation.

Multiply each term by 6 to clear fractions.

$$\frac{1}{2}(3x+4)=\frac{1}{3}x+20$$

$$(^3\cancel{6})\frac{1}{\cancel{2}}(3x+4)=(^2\cancel{6})\frac{1}{\cancel{3}}x+20(6)$$

$3(3x+4)=2x+120$ Distribute on left side.

$\boxed{9x}+\boxed{\boxed{12}}=\boxed{2x}+\boxed{\boxed{120}}$ Identify like terms.

$\underline{-2x \qquad -2x}$ Subtract $2x$ from both sides.

$7x+12=120$

$\underline{-12 \quad -12}$ Subtract 12 from both sides.

$7x=108$ Divide both sides by 7.

$$\frac{\cancel{7}x}{\cancel{7}}=\frac{108}{7}$$

$$x=15\frac{3}{7}$$

108. The statement has an equal sign; therefore, it is an equation.

Multiply each term by 36 to clear fractions.

$$\frac{1}{4}(5w+2)=11-\frac{5}{18}w$$

$$(\overset{9}{\cancel{36}})\frac{1}{\cancel{4}}(5w+2)=(36)11-\frac{5}{\cancel{18}}w(\overset{2}{\cancel{36}})$$

$9(5w+2)=396-10w$ Distribute on left side.

$\boxed{45w}+\boxed{\boxed{18}}=\boxed{\boxed{396}}\boxed{-10w}$ Identify like terms.

$+10w \qquad\qquad +10w$ Add $10w$ to both sides.

$55w+18=396$

$-18 \quad -18$ Subtract 18 from both sides.

$55w=378$ Divide both sides by 55.

$$\frac{\cancel{55}w}{\cancel{55}}=\frac{378}{55}$$

$$x=6\frac{48}{55}$$

Section 2.4 Solving and Graphing Linear Inequalities on a Number Line

Exercises 1-22: Answers are to be checked. Exercises 1-5 are completed as examples.

1.

$3x \geq 21$ Divide both sides by 3.

$\frac{\cancel{3}x}{\cancel{3}} \geq \frac{21}{3}$

$x \geq 7$

$3(7) \stackrel{?}{=} 21$ Check the answer.
$21 = 21$ The answer works.

Check a number greater than 7 ($x = 8$) to test the direction of the inequality symbol.

$3(8) \stackrel{?}{\geq} 21$ Check the direction of the inequality.
$24 \geq 21$ The direction of the inequality works.

2.

$5w \geq 300$ Divide both sides by 5.

$\frac{\cancel{5}w}{\cancel{5}} \geq \frac{300}{5}$

$w \geq 60$

$5(60) \stackrel{?}{=} 300$ Check the answer.
$300 = 300$ The answer works.

Check a number greater than 60 ($w = 61$) to test the direction of the inequality symbol.

$5(61) \stackrel{?}{\geq} 300$ Check the direction of the inequality.
$305 \geq 300$ The direction of the inequality works.

3.

$2d < 15$ Divide both sides by 2.

$\frac{\cancel{2}d}{\cancel{2}} < \frac{15}{2}$

$d < 7.5$

$2(7.5) \stackrel{?}{=} 15$ Check the answer.
$15 = 15$ The answer works.

Check a number less than 7.5 ($d = 7$) to test the direction of the inequality symbol.

$2(7) \stackrel{?}{<} 15$ Check the direction of the inequality.
$14 < 15$ The direction of the inequality works.

4.

$8z < 56$ Divide both sides by 8.

$\frac{\cancel{8}z}{\cancel{8}} < \frac{56}{8}$

$z < 7$

$8(7) \stackrel{?}{=} 56$ Check the answer.
$56 = 56$ The answer works.

Check a number less than 7 ($z = 6$) to test the direction of the inequality symbol.

$8(6) \stackrel{?}{<} 56$ Check the direction of the inequality.
$48 < 56$ The direction of the inequality works.

5.

$-\frac{1}{4}x \geq 48$ Multiply both sides by -4.

$-4\left(-\frac{1}{4}x\right) \leq -4(48)$ Multiply by neg., reverse inequality.

$x \leq -192$

$-\frac{1}{4}(-192) \stackrel{?}{=} 48$ Check the answer.

$48 = 48$ The answer works.

Check a number less than -192 ($x = -200$) to test the direction of the inequality symbol.

$-\frac{1}{4}(-200) \stackrel{?}{\geq} 48$ Check the direction of the inequality.

$50 \geq 48$ The direction of the inequality works.

6.

$-\frac{1}{3}y \leq 15$ Multiply both sides by -3.

$-3\left(-\frac{1}{3}y\right) \geq -3(15)$ Multiply by neg., reverse inequality.

$y \geq -45$

7.

$-a < -61$ Divide both sides by -1.

$\frac{-a}{-1} > \frac{-61}{-1}$ Divide by neg., reverse inequality.

$a > 61$

8.

$-x > -55$ Divide both sides by -1.

$\frac{-x}{-1} < \frac{-55}{-1}$ Divide by neg., reverse inequality.

$x < 55$

9.

$$\begin{aligned} 2g+5 &\le 35 \\ -5 \quad -5 & \qquad \text{Subtract 5 from both sides.} \\ 2g &\le 30 \qquad \text{Divide both sides by 2.} \\ \frac{\cancel{2}g}{\cancel{2}} &\le \frac{30}{2} \\ g &\le 15 \end{aligned}$$

10.

$$\begin{aligned} 3x-8 &\ge 4 \\ +8 \quad +8 & \qquad \text{Add 8 to both sides.} \\ 3x &\ge 12 \qquad \text{Divide both sides by 3.} \\ \frac{\cancel{3}x}{\cancel{3}} &\ge \frac{12}{3} \\ x &\ge 4 \end{aligned}$$

11.

$$\begin{aligned} \frac{1}{5}m-2 &> -7 \\ +2 \quad +2 & \qquad \text{Add 2 to both sides.} \\ \frac{1}{5}m &> -5 \qquad \text{Multiply both sides by 5.} \\ 5\left(\frac{1}{5}m\right) &> 5(-5) \\ m &> -25 \end{aligned}$$

12.

$$\begin{aligned} \frac{1}{5}x+8 &< -1 \\ -8 \quad -8 & \qquad \text{Subtract 8 from both sides.} \\ \frac{1}{5}x &< -9 \qquad \text{Multiply both sides by 5.} \\ 5\left(\frac{1}{5}x\right) &< 5(-9) \\ x &< -45 \end{aligned}$$

13.

$$\begin{aligned} -2x+9 &\le 25 \\ -9 \quad -9 & \qquad \text{Subtract 9 from both sides.} \\ -2x &\le 16 \qquad \text{Divide both sides by} -2. \\ \frac{\cancel{-2}x}{\cancel{-2}} &\ge \frac{16}{-2} \qquad \text{Divide by neg., reverse inequality} \\ x &\ge -8 \end{aligned}$$

14.

$$\begin{aligned} 4-3y &\ge -13 \\ -4 \qquad -4 & \qquad \text{Subtract 4 from both sides.} \\ -3y &\ge -17 \qquad \text{Divide both sides by} -3. \\ \frac{\cancel{-3}y}{\cancel{-3}} &\le \frac{-17}{-3} \qquad \text{Divide by neg., reverse inequality} \\ x &\le \frac{17}{3} \text{ or } 5\frac{2}{3} \end{aligned}$$

15.

$$\begin{aligned} 4x+7 &> 6x+3 \\ -6x \qquad -6x & \qquad \text{Subtract } 6x \text{ from both sides.} \\ -2x+7 &> 3 \\ -7 \quad -7 & \qquad \text{Subtract 7 from both sides.} \\ -2x &> -4 \qquad \text{Divide both sides by} -2. \\ \frac{\cancel{-2}x}{\cancel{-2}} &< \frac{-4}{-2} \qquad \text{Divide by neg., reverse inequality} \\ x &< 2 \end{aligned}$$

16.

$$\begin{aligned} 3t-14 &< 4t-20 \\ -4t \qquad -4t & \qquad \text{Subtract } 4t \text{ from both sides.} \\ -t-14 &< -20 \\ +14 \quad +14 & \qquad \text{Add 14 to both sides.} \\ -t &< -6 \qquad \text{Divide both sides by} -1. \\ \frac{-t}{-1} &> \frac{-6}{-1} \qquad \text{Divide by neg., reverse inequality} \\ t &> 6 \end{aligned}$$

17.

$$\begin{aligned} -4x+7 &\ge 5x+25 \\ -5x \qquad -5x & \qquad \text{Subtract } 5x \text{ from both sides.} \\ -9x+7 &\ge 25 \\ -7 \quad -7 & \qquad \text{Subtract 7 from both sides.} \\ -9x &\ge 18 \qquad \text{Divide both sides by} -9. \\ \frac{\cancel{-9}x}{\cancel{-9}} &\le \frac{18}{-9} \qquad \text{Divide by neg., reverse inequality} \\ x &\le -2 \end{aligned}$$

18.

$$\begin{aligned} 2-5y &\le y+20 \\ -y \quad -y & \qquad \text{Subtract } y \text{ from both sides.} \\ 2-6y &\le 20 \\ -2 \qquad -2 & \qquad \text{Subtract 2 from both sides.} \\ -6y &\le 18 \qquad \text{Divide both sides by} -6. \\ \frac{\cancel{-6}y}{\cancel{-6}} &\ge \frac{18}{-6} \qquad \text{Divide by neg., reverse inequality} \\ y &\ge -3 \end{aligned}$$

19.

$$2(k+5)-3<k+18 \quad \text{Distribute on left side.}$$
$$2k+10-3<k+18$$
$$2k+7<k+18$$
$$\underline{-k \qquad -k} \quad \text{Subtract } k \text{ from both sides.}$$
$$k+7<18$$
$$\underline{\quad -7 \ \ -7} \quad \text{Subtract 7 from both sides.}$$
$$k<11$$

20.

$$4(z-3)+8\geq 7z+20 \quad \text{Distribute on left side.}$$
$$4z-12+8\geq 7z+20$$
$$4z-4\geq 7z+20$$
$$\underline{-7z \qquad -7z} \quad \text{Subtract } 7z \text{ from both sides.}$$
$$-3z-4\geq 20$$
$$\underline{\quad +4 \ \ +4} \quad \text{Add 4 to both sides.}$$
$$-3z\geq 24 \quad \text{Divide both sides by } -3.$$
$$\frac{\cancel{-3}z}{\cancel{-3}}\leq\frac{24}{-3} \quad \text{Divide by neg., reverse inequality}$$
$$z\leq -8$$

21.

$$7(x-2)+1>8x-6 \quad \text{Distribute on left side.}$$
$$7x-14+1>8x-6$$
$$7x-13>8x-6$$
$$\underline{-8x \qquad -8x} \quad \text{Subtract } 8x \text{ from both sides.}$$
$$-x-13>-6$$
$$\underline{\quad +13 \ \ +13} \quad \text{Add 13 to both sides.}$$
$$-x>7 \quad \text{Divide both sides by } -1.$$
$$\frac{-x}{-1}<\frac{7}{-1} \quad \text{Divide by neg., reverse inequality}$$
$$x<-7$$

22.

$$9(x+2)-3<10x+13 \quad \text{Distribute on left side.}$$
$$9x+18-3<10x+13$$
$$9x+15<10x+13$$
$$\underline{-10x \qquad -10x} \quad \text{Subtract } 10x \text{ from both sides.}$$
$$-x+15<13$$
$$\underline{\quad -15 \ \ -15} \quad \text{Subtract 15 from both sides.}$$
$$-x<-2 \quad \text{Divide both sides by } -1.$$
$$\frac{-x}{-1}>\frac{-2}{-1} \quad \text{Divide by neg., reverse inequality}$$
$$x>2$$

23. a. Write the inequality as follows:

$$11h\geq 275$$

b. $11h\geq 275$ Divide both sides by 11.

$$\frac{\cancel{11}h}{\cancel{11}}\geq\frac{275}{11}$$
$$h\geq 25$$

Kati needs to work at least 25 hours this week.

c. Rewrite the inequality and solve as follows:

$$11h\geq 400 \quad \text{Divide both sides by 11.}$$
$$\frac{\cancel{11}h}{\cancel{11}}\geq\frac{400}{11}$$
$$h\geq 36.\overline{36}$$

Kati must work at least 36.36 hours.

24. a. Write the inequality as follows:

$$11.25h<225$$

b.

$$11.25h<225 \quad \text{Divide both sides by 11.25.}$$
$$\frac{\cancel{11.25}h}{\cancel{11.25}}<\frac{225}{11.25}$$
$$h<20 \quad \text{Answer rounded to hundredths.}$$

Tyler must work less than 20 hours.

c. Rewrite the inequality and solve:

$$11.25h\geq 180 \quad \text{Divide both sides by 11.25.}$$
$$\frac{\cancel{11.25}h}{\cancel{11.25}}\geq\frac{180}{11.25}$$
$$h\geq 16 \quad \text{Answer rounded to hundredths.}$$

Tyler must work at least 16 hours a week.

25. a. Pro Floors charges are given by the expression $25+3s$. The inequality that represents Kevin keeping the refinishing charge to at most \$5000 is:

$$25+3s\leq 5000$$

b.

$$25+3s\leq 5000 \quad \text{Isolate variable term.}$$
$$\underline{-25 \qquad -25} \quad \text{Subtract 25 from both sides.}$$
$$3s\leq 4975$$
$$\frac{\cancel{3}s}{\cancel{3}}\leq\frac{4975}{3} \quad \text{Divide both sides by 3.}$$
$$s\leq 1658.33$$

Kevin can have no more that 1658 square feet of wood floors professionally refinished.

c.

$$\begin{array}{ll} 25+3s \le 4000 & \text{Isolate variable term.} \\ \underline{-25 \qquad -25} & \text{Subtract 25 from both sides.} \\ 3s \le 3975 & \\ \frac{\cancel{3}s}{\cancel{3}} \le \frac{3975}{3} & \text{Divide both sides by 3.} \\ s \le 1325 & \end{array}$$

Kevin can have no more that 1325 square feet of wood floors professionally refinished.

26. **a.** Add the costs in an inequality less than or equal to 220.

$100 + 40n \le 220$

b.

$$\begin{array}{ll} 100+40n \le 220 & \text{Isolate variable term.} \\ \underline{-100 \qquad -100} & \text{Subtract 100 from both sides.} \\ 40n \le 120 & \\ \frac{\cancel{40}n}{\cancel{40}} \le \frac{120}{40} & \text{Divide both sides by 40.} \\ n \le 3 & \end{array}$$

Ricardo can have up to a total of 6 rooms cleaned (the initial 3 rooms then 3 more).

27. **a.** The inequality that represents Eddie keeping his flat-bed truck rental cost to at most \$119 is:

$19 + 20h \le 119$

b.

$$\begin{array}{ll} 19+20h \le 119 & \text{Distribute to simplify.} \\ 19+20h \le 119 & \text{Isolate variable term.} \\ \underline{-19 \qquad -19} & \text{Subtract 19 from both sides.} \\ 20h \le 100 & \\ \frac{\cancel{20}h}{\cancel{20}} \le \frac{100}{20} & \text{Divide both sides by 20.} \\ h \le 5 & \end{array}$$

To stay within his budget, Eddie can rent a flat-bed truck for up to 5 hours, over the intial 1.5 hours.

c.

$$\begin{array}{ll} 19+20h \le 89 & \text{Distribute to simplify.} \\ 19+20h \le 89 & \text{Isolate variable term.} \\ \underline{-19 \qquad -19} & \text{Subtract 19 from both sides.} \\ 20h \le 70 & \\ \frac{\cancel{20}h}{\cancel{20}} \le \frac{70}{20} & \text{Divide both sides by 20.} \\ h \le 3.5 & \end{array}$$

To stay within his budget, Eddie can rent a flat-bed truck for up to 3.5 hours, over the initial 1.5 hours.

28. **a.** The inequality that represents Steven keeping his Bobcat rental cost to at most \$224 is:

$19 + 25h \le 244$

b.

$$\begin{array}{ll} 19+25h \le 244 & \text{Distribute to simplify.} \\ 19+25h \le 244 & \text{Isolate variable term.} \\ \underline{-19 \qquad -19} & \text{Add 19 to both sides.} \\ 25h \le 225 & \\ \frac{\cancel{25}h}{\cancel{25}} \le \frac{225}{25} & \text{Divide both sides by 25.} \\ h \le 9 & \end{array}$$

To stay within his budget, Steve can rent a Bobcat rental for up to 9 hours, over the initial 1.5 hours.

c.

$$\begin{array}{ll} 19+25h \le 169 & \text{Distribute to simplify.} \\ 19+25h \le 169 & \text{Isolate variable term.} \\ \underline{-19 \qquad -19} & \text{Add 19 to both sides.} \\ 25h \le 150 & \\ \frac{\cancel{25}h}{\cancel{25}} \le \frac{150}{25} & \text{Divide both sides by 25.} \\ h \le 6 & \end{array}$$

To stay within his budget, Steve can rent a Bobcat rental for up to 6 hours, over the initial 1.5 hours.

29. **a.** Add the costs in an inequality less than or equal to 115.

$75 + 3m \le 115$

b.

$$\begin{array}{ll} 75+3m \le 115 & \text{Isolate variable term.} \\ \underline{-75 \qquad -75} & \text{Subtract 75 from both sides.} \\ 3m \le 40 & \\ \frac{\cancel{3}m}{\cancel{3}} \le \frac{40}{3} & \text{Divide both sides by 3.} \\ m \le 13\frac{1}{3} & \end{array}$$

Alicia can have her car towed up to 13 miles, over the initial 10 miles.

30. **a.** Add the costs in an inequality less than or equal to 95.

$20 + 0.6m \le 95$

b.

$$\begin{array}{rl} 20+0.6m \le 95 & \text{Isolate variable term.} \\ \underline{-20 \qquad -20} & \text{Subtract 20 from both sides.} \\ 0.6m \le 75 & \\ \dfrac{\cancel{0.6}m}{\cancel{0.6}} \le \dfrac{75}{0.6} & \text{Divide both sides by 0.6.} \\ m \le 125 & \end{array}$$

Amy can drive the rental truck up to 125 miles on the day she rents it.

c.

$$\begin{array}{rl} 20+0.6m \le 125 & \text{Isolate variable term.} \\ \underline{-20 \qquad -20} & \text{Subtract 20 from both sides.} \\ 0.6m \le 105 & \\ \dfrac{\cancel{0.6}m}{\cancel{0.6}} \le \dfrac{105}{0.6} & \text{Divide both sides by 0.6.} \\ m \le 175 & \end{array}$$

Amy can drive the rental truck up to 175 miles on the day she rents it.

31.

$$\begin{array}{rl} 0.01t+2.93 \ge 3 & \text{Isolate variable term.} \\ \underline{-2.93 \quad -2.93} & \text{Subtract 2.93 from both sides.} \\ 0.01t \ge 0.07 & \\ \dfrac{\cancel{0.01}t}{\cancel{0.01}} \ge \dfrac{0.07}{0.01} & \text{Divide both sides by 0.01.} \\ t \ge 7 & \end{array}$$

The population of Arkansas is projected to be 3 million or more after the year 2017.

32.

$$\begin{array}{rl} 0.09t+19.41 \ge 20.3 & \text{Isolate variable term.} \\ \underline{-19.41 \quad -19.41} & \text{Subtract 19.41 from both sides.} \\ 0.09t \ge 0.89 & \\ \dfrac{\cancel{0.09}t}{\cancel{0.09}} \ge \dfrac{0.89}{0.09} & \text{Divide both sides by 0.09.} \\ t \ge 9.89 & \text{Rounded to hundredths.} \end{array}$$

The population of New York is projected to be 20.3 million or more in the year 2019.

33.

$$\begin{array}{rl} 0.26t+18.84 \ge 21 & \text{Isolate variable term.} \\ \underline{-18.84 \quad -18.84} & \text{Subtract 18.84 from both sides.} \\ 0.26t \ge 2.16 & \\ \dfrac{\cancel{0.26}t}{\cancel{0.26}} \ge \dfrac{2.16}{0.26} & \text{Divide both sides by 0.26.} \\ t \ge 8.31 & \text{Rounded to hundredths.} \end{array}$$

The population of Florida is projected to be 21 million or more in the year 2018.

34.

$$\begin{array}{rl} 2p-400 > 0 & \text{Isolate variable term.} \\ \underline{+400 \quad +400} & \text{Add 400 to both sides.} \\ 2p > 400 & \\ \dfrac{\cancel{2}p}{\cancel{2}} > \dfrac{400}{2} & \text{Divide both sides by 2.} \\ p > 200 & \end{array}$$

Juanita must sell more than 200 pieces of jewelry in order to make a profit.

35. If $4 > x$, then x must be less than 4. This means we can rewrite the inequality as

$x < 4$

36. If $5 > y$, then y must be less than 5. This means we can rewrite the inequality as

$y < 5$

37. If $-9 < n$, then n must be greater than -9. This means we can rewrite the inequality as

$n > -9$

38. If $-16 > m$, then m must be less than -16. This means we can rewrite the inequality as

$m < -16$

39. If $0 \ge t$, then t must be less than or equal to 0. This means we can rewrite the inequality as

$t \le 0$

40. If $10 \le t$, then t must be greater than or equal to 10. This means we can rewrite the inequality as

$t \ge 10$

41. If $6 > 2x$, then $2x$ must be less than 6. This means we can rewrite the inequality as

$2x < 6$

To solve, divide both sides by 2.

$$\dfrac{\cancel{2}x}{\cancel{2}} < \dfrac{6}{2}$$

$$x < 3$$

42. If $4 < -8x$, then $-8x$ must be greater than 4. This means we can rewrite the inequality as

$$-8x > 4$$

To solve, divide both sides by -8.

$$\frac{\cancel{-8}x}{\cancel{-8}} < \frac{4}{-8}$$
$$x < -\frac{1}{2}$$

43. If $5 \le 2x+1$, then $2x+1$ must be greater than or equal to 5. This means we can rewrite the inequality as

$$2x+1 \ge 5$$

To solve, isolate the variable as follows:

$$2x+1 \ge 5 \quad \text{Isolate variable term.}$$
$$\underline{-1 \quad -1} \quad \text{Subtract 1 from both sides.}$$
$$2x \ge 4$$
$$\frac{\cancel{2}x}{\cancel{2}} \ge \frac{4}{2} \quad \text{Divide both sides by 2.}$$
$$x \ge 2$$

44. If $-3 \ge 3x+6$, then $3x+6$ must be less than or equal to -3. This means we can rewrite the inequality as

$$3x+6 \le -3$$

To solve, isolate the variable as follows:

$$3x+6 \le -3 \quad \text{Isolate variable term.}$$
$$\underline{-6 \quad -6} \quad \text{Subtract 6 from both sides.}$$
$$3x \le -9$$
$$\frac{\cancel{3}x}{\cancel{3}} \le \frac{-9}{3} \quad \text{Divide both sides by 3.}$$
$$x \le -3$$

Exercises 45-62: Answers are to be checked.

Exercises 45-47 are completed as examples.

45.

$$4x > 20 \quad \text{Divide both sides by 4.}$$
$$\frac{\cancel{4}x}{\cancel{4}} > \frac{20}{4}$$
$$x > 5$$

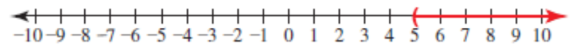
$$4(5) \stackrel{?}{=} 20 \quad \text{Check the answer.}$$
$$20 = 20 \quad \text{The answer works.}$$

Check a number greater than 5 ($x = 6$) to test the direction of the inequality symbol.

$$4(6) \stackrel{?}{>} 20 \quad \text{Check the direction of the inequality.}$$
$$24 > 20 \quad \text{The direction of the inequality works.}$$

Using interval notation, the answer is written as $(5, \infty)$.

Using a number line:



46.

$$2x > 16 \quad \text{Divide both sides by 2.}$$
$$\frac{\cancel{2}x}{\cancel{2}} > \frac{16}{2}$$
$$x > 8$$

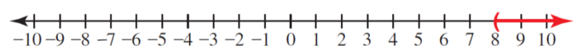
$$2(8) \stackrel{?}{=} 16 \quad \text{Check the answer.}$$
$$16 = 16 \quad \text{The answer works.}$$

Check a number greater than 8 ($x = 9$) to test the direction of the inequality symbol.

$$2(9) \stackrel{?}{>} 16 \quad \text{Check the direction of the inequality.}$$
$$18 > 16 \quad \text{The direction of the inequality works.}$$

Using interval notation, the answer is written as $(8, \infty)$.

Using a number line:



47.

$$\frac{m}{3} < -2 \quad \text{Multiply both sides by 3.}$$
$$\cancel{3} \cdot \frac{m}{\cancel{3}} < -2 \cdot 3$$
$$m < -6$$

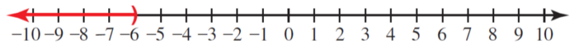
$$\frac{(-6)}{3} \stackrel{?}{=} -2 \quad \text{Check the answer.}$$
$$-2 = -2 \quad \text{The answer works.}$$

Check a number less than -6 ($m = -9$) to test the direction of the inequality symbol.

$$\frac{(-9)}{3} \stackrel{?}{<} -2 \quad \text{Check the direction of the inequality.}$$
$$-3 < -2 \quad \text{The direction of the inequality works.}$$

Using interval notation, the answer is written as $(-\infty, -6)$.

Using a number line:

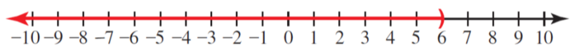


48.

$$\frac{h}{4}<1.5 \qquad \text{Multiply both sides by 4.}$$
$$\cancel{4}\cdot\frac{h}{\cancel{4}}<1.5\cdot 4$$
$$h<6$$

Using interval notation, the answer is written as $(-\infty,6)$.

Using a number line:

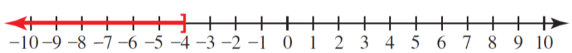


49.

$$-3x\ge 12 \qquad \text{Divide both sides by } -3.$$
$$\frac{\cancel{-3}x}{\cancel{-3}}\le\frac{12}{-3} \qquad \text{Divide by neg., reverse inequality.}$$
$$x\le -4$$

Using interval notation, the answer is written as $(-\infty,-4]$.

Using a number line:

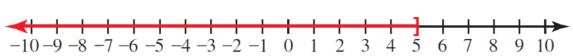


50.

$$-6x\ge -30 \qquad \text{Divide both sides by } -6.$$
$$\frac{\cancel{-6}x}{\cancel{-6}}\le\frac{-30}{-6} \qquad \text{Divide by neg., reverse inequality.}$$
$$x\le 5$$

Using interval notation, the answer is written as $(-\infty,5]$.

Using a number line:

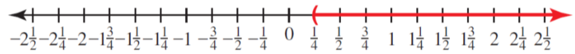


51.

$$-\frac{2}{5}x<-\frac{1}{10} \qquad \text{Multiply both sides by } -\frac{5}{2}.$$
$$-\frac{\cancel{5}}{\cancel{2}}\cdot\left(-\frac{\cancel{2}}{\cancel{5}}x\right)>-\frac{1}{\cancel{10}_2}\cdot\left(-\frac{\cancel{5}}{2}\right) \qquad \text{Multiply by neg., reverse inequality.}$$
$$x>\frac{1}{4}$$

Using interval notation, the answer is written as $\left(\frac{1}{4},\infty\right)$.

Using a number line:

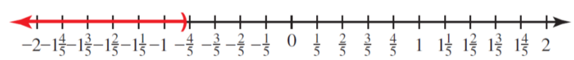


52.

$$-\frac{5y}{7}>\frac{3}{5} \qquad \text{Multiply both sides by } -\frac{7}{5}.$$
$$-\frac{\cancel{7}}{\cancel{5}}\cdot\left(-\frac{\cancel{5}y}{\cancel{7}}\right)<\frac{3}{5}\cdot\left(-\frac{7}{5}\right) \qquad \text{Multiply by neg., reverse inequality.}$$
$$y<-\frac{21}{25}$$

Using interval notation, the answer is written as $\left(-\infty,-\frac{21}{25}\right)$.

Using a number line:

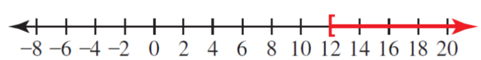


53.

$$-\frac{a}{3}\le -4 \qquad \text{Multiply both sides by } -3.$$
$$-\cancel{3}\cdot\left(-\frac{a}{\cancel{3}}\right)\ge -4\cdot(-3) \qquad \text{Multiply by neg., reverse inequality.}$$
$$a\ge 12$$

Using interval notation, the answer is written as $[12,\infty)$.

Using a number line:

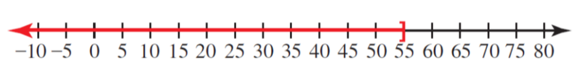


54.

$$-\frac{b}{5}\ge -11 \qquad \text{Multiply both sides by } -5.$$
$$-\cancel{5}\cdot\left(-\frac{b}{\cancel{5}}\right)\le -11\cdot(-5) \qquad \text{Multiply by neg., reverse inequality.}$$
$$b\le 55$$

Using interval notation, the answer is written as $(-\infty,55]$.

Using a number line:

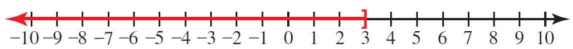


55.

$$\begin{array}{ll}
2(k+5)\le k+13 & \text{Distribute on left side.}\\
2k+10\le k+13 & \\
\underline{-k \qquad -k} & \text{Subtract } k \text{ from both sides.}\\
k+10\le 13 & \\
\underline{\quad -10\ \ -10} & \text{Subtract 10 from both sides.}\\
k\le 3 &
\end{array}$$

Using interval notation, the answer is written as $(-\infty,3]$.

Using a number line:

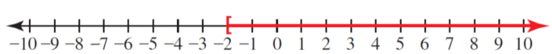


56.

$$\begin{array}{ll}
-(p+4)+5\le 3p+9 & \text{Distribute on left side.}\\
-p-4+5\le 3p+9 & \text{Simplify on left side.}\\
-p+1\le 3p+9 & \\
\underline{-3p \quad -3p} & \text{Subtract } 3p \text{ from both sides.}\\
-4p+1\le 9 & \\
\underline{\quad -1\ -1} & \text{Subtract 1 from both sides.}\\
-4p\le 8 & \\
\dfrac{\cancel{-4}p}{\cancel{-4}}\ge\dfrac{8}{-4} & \text{Divide by neg., reverse inequality.}\\
p\ge -2 &
\end{array}$$

Using interval notation, the answer is written as $[-2,\infty)$.

Using a number line:

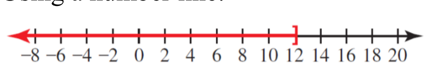


57.

$$\begin{array}{ll}
2.5z+8\ge 3.5z-4 & \\
\underline{-3.5z \qquad -3.5z} & \text{Subtract } 3.5z \text{ from both sides.}\\
-z+8\ge -4 & \\
\underline{\quad -8\ \ -8} & \text{Subtract 8 from both sides.}\\
-z\ge -12 & \text{Divide both sides by } -1.\\
\dfrac{-z}{-1}\le\dfrac{-12}{-1} & \text{Divide by neg., reverse inequality.}\\
z\le 12 &
\end{array}$$

Using interval notation, the answer is written as $(-\infty,12]$.

Using a number line:



58.

$$\begin{array}{ll}
-0.5x+11\ge -x-4 & \\
\underline{+x \qquad +x} & \text{Add } x \text{ to both sides.}\\
0.5x+11\ge -4 & \\
\underline{\quad -11\ \ -11} & \text{Subtract 11 from both sides.}\\
0.5x\ge -15 & \text{Divide both sides by 0.5.}\\
\dfrac{0.5x}{0.5}\ge\dfrac{-15}{0.5} & \\
x\ge -30 &
\end{array}$$

Using interval notation, the answer is written as $[-30,\infty)$.

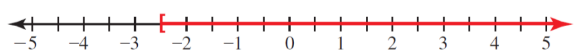
Using a number line:

59.

$$\begin{array}{ll}
2c+7\le 6c+17 & \\
\underline{-6c \qquad -6c} & \text{Subtract } 6c \text{ from both sides.}\\
-4c+7\le 17 & \\
\underline{\quad -7\ \ -7} & \text{Subtract 7 from both sides.}\\
-4c\le 10 & \text{Divide both sides by } -4.\\
\dfrac{\cancel{-4}c}{\cancel{-4}}\ge\dfrac{10}{-4} & \text{Divide by neg., reverse inequality}\\
c\ge -2.5 &
\end{array}$$

Using interval notation, the answer is written as $[-2.5,\infty)$.

Using a number line:

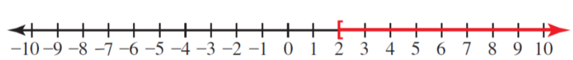


60.

$$\begin{array}{ll}
-5z-16\le 9z-44 & \\
\underline{-9z \qquad -9z} & \text{Subtract } 9z \text{ from both sides.}\\
-14z-16\le -44 & \\
\underline{\quad +16\ \ +16} & \text{Add 16 to both sides.}\\
-14z\le -28 & \text{Divide both sides by } -14.\\
\dfrac{\cancel{-14}z}{\cancel{-14}}\ge\dfrac{-28}{-14} & \text{Divide by neg., reverse inequality}\\
z\ge 2 &
\end{array}$$

Using interval notation, the answer is written as $[2,\infty)$.

Using a number line:

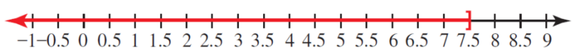


61.

$$\begin{array}{ll}
5w-12\ge 2(5w-10)-30 & \text{Distribute on right side.}\\
5w-12\ge 10w-20-30 & \text{Simplify on right side}\\
5w-12\ge 10w-50 & \\
\underline{-10w \qquad -10w} & \text{Subtract } 10w \text{ from both sides.}\\
-5w-12\ge -50 & \\
\underline{\quad +12 \quad +12} & \text{Add 12 to both sides.}\\
-5w\ge -38 & \text{Divide both sides by} -14.\\
\dfrac{\cancel{-5}w}{\cancel{-5}}\le\dfrac{-38}{-5} & \text{Divide by neg., reverse inequality}\\
w\le 7.6 &
\end{array}$$

Using interval notation, the answer is written as $(-\infty, 7.6]$.

Using a number line:

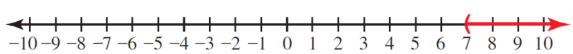


62.

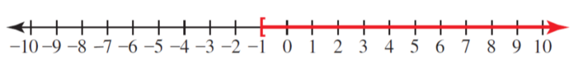
$$\begin{array}{ll}
4(3g+8)<5(4g-10)+26 & \text{Distribute on both sides.}\\
12g+32<20g-50+26 & \text{Simplify on right side}\\
12g+32<20g-24 & \\
\underline{-20g \qquad -20g} & \text{Subtract } 20g \text{ from both sides.}\\
-8g+32<-24 & \\
\underline{\quad -32 \quad -32} & \text{Subtract 32 from both sides.}\\
-8g<-56 & \text{Divide both sides by} -8.\\
\dfrac{\cancel{-8}g}{\cancel{-8}}>\dfrac{-56}{-8} & \text{Divide by neg., reverse inequality}\\
g>7 &
\end{array}$$

Using interval notation, the answer is written as $(7, \infty)$.

Using a number line:

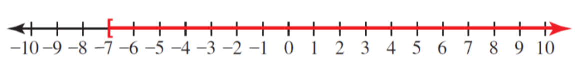


63.



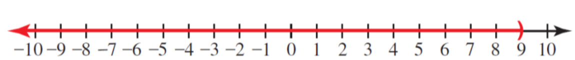
This is equivalent to the inequality $x \ge -1$.

64.



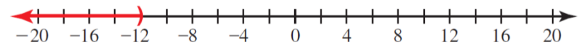
This is equivalent to the inequality $x \ge -7$.

65.



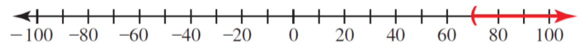
This is equivalent to the inequality $x < 9$.

66.



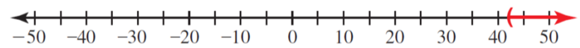
This is equivalent to the inequality $x < -12$.

67.



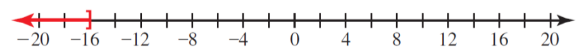
This is equivalent to the inequality $x > 69$.

68.



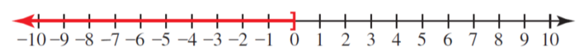
This is equivalent to the inequality $x > 42$.

69.



This is equivalent to the inequality $x \le -16$.

70.



This is equivalent to the inequality $x \le 0$.

71. Let $s =$ the number of students enrolled in the beginning algebra class.

$16 \le s \le 38$

72. Let $p =$ the number of passengers that can be on the Boeing 717-200.

$0 \le p \le 106$

73. Let $s =$ the number of students that can ride on school bus 12.

$0 \le s \le 71$

74. Let $p =$ the number of people the camp can accommodate.

$0 \le p \le 177$

75. Let $p =$ the number of people the camp can accommodate.

$200 \le p \le 450$

76. Let $c =$ the amount in dollars this accountant charges to prepare tax returns.

$150 \le c \le 500$

77. Let $h =$ the height requirements in inches for children to ride on some attractions at LEGOLAND with an adult.

$42 \le h \le 52$

78. Let $n =$ the course number.

$100 \le n < 300$

79. Let $r =$ the average adult's resting heart rate in beats per minute.

$66 \le r \le 100$

80. Let $r =$ the average newborn baby's resting heart rate in beats per minute.

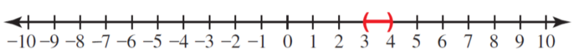
$100 \le r \le 160$

81.

$$\begin{aligned} 6 &< 2x < 8 && \text{Isolate } x \text{ by dividing all sides by 2.} \\ \frac{6}{2} &< \frac{2x}{2} < \frac{8}{2} \\ 3 &< x < 4 \end{aligned}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(3,4)$.

Using a number line:

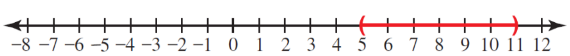


82.

$$\begin{aligned} 25 &< 5x < 55 && \text{Isolate } x \text{ by dividing all sides by 5.} \\ \frac{25}{5} &< \frac{5x}{5} < \frac{55}{5} \\ 5 &< x < 11 \end{aligned}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(5,11)$.

Using a number line:

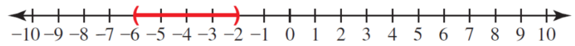


83.

$$\begin{aligned} -7 &< y-1 < -3 && \text{Isolate } y. \\ \underline{+1} & \quad \underline{+1 \quad +1} && \text{Add 1 to all sides.} \\ -6 &< y < -2 \end{aligned}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(-6,-2)$.

Using a number line:

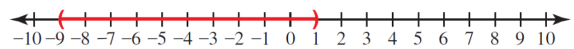


84.

$$\begin{aligned} -4 &< b+5 < 6 && \text{Isolate } b. \\ \underline{-5} & \quad \underline{-5 \quad -5} && \text{Subtract 5 from all sides.} \\ -9 &< b < 1 \end{aligned}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(-9,1)$.

Using a number line:

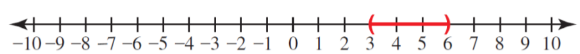


85.

$$\begin{aligned} 12 &< 3x+3 < 21 && \text{Isolate } x. \\ \underline{-3} & \quad \underline{-3 \quad -3} && \text{Subtract 3 from all sides.} \\ 9 &< 3x < 18 && \text{Divide all sides by 3.} \\ \frac{9}{3} &< \frac{3x}{3} < \frac{18}{3} \\ 3 &< x < 6 \end{aligned}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(3,6)$.

Using a number line:



86.

$$\begin{aligned} 20 &< 2x+10 < 36 && \text{Isolate } x. \\ \underline{-10} & \quad \underline{-10 \quad -10} && \text{Subtract 10 from all sides.} \\ 10 &< 2x < 26 && \text{Divide all sides by 2.} \\ \frac{10}{2} &< \frac{2x}{2} < \frac{26}{2} \\ 5 &< x < 13 \end{aligned}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(5,13)$.

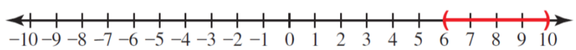
Using a number line:

87.

$$3<\frac{k}{2}<5 \quad \text{Isolate } k \text{ by multiplying all sides by 2.}$$
$$(2)3<(2)\frac{k}{2}<(2)5$$
$$6<k<10$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(6,10)$.

Using a number line:

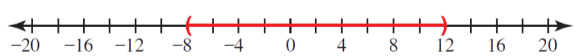


88.

$$-2<\frac{n}{4}<3 \quad \text{Isolate } n \text{ by multiplying all sides by 4.}$$
$$-2(4)<(4)\frac{n}{4}<(4)3$$
$$-8<n<12$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(-8,12)$.

Using a number line:

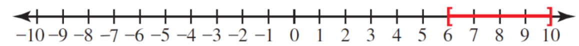


89.

$$40\le 6x+4\le 64 \quad \text{Isolate } x.$$
$$\underline{-4 \quad -4 \quad -4} \quad \text{Subtract 4 from all sides.}$$
$$36\le 6x\le 60 \quad \text{Divide all sides by 6.}$$
$$\frac{36}{6}\le\frac{6x}{6}\le\frac{60}{6}$$
$$6\le x\le 10$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[6,10]$.

Using a number line:



90.

$$-25\le 8x-1\le 15 \quad \text{Isolate } x.$$
$$\underline{+1 \quad +1 \quad +1} \quad \text{Add 1 to all sides.}$$
$$-24\le 8x\le 16 \quad \text{Divide all sides by 8.}$$
$$\frac{-24}{8}\le\frac{8x}{8}\le\frac{16}{8}$$
$$-3\le x\le 2$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-3,2]$.

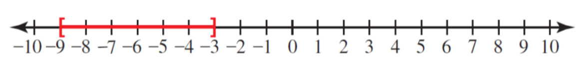
Using a number line:

91.

$$-1.5\le\frac{m}{6}\le -0.5 \quad \text{Isolate } m.$$
$$-1.5(6)\le(6)\frac{m}{6}\le -0.5(6) \quad \text{Multiply all sides by 6.}$$
$$-9\le m\le -3$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-9,-3]$.

Using a number line:

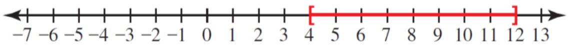


92.

$$3\le\frac{w}{4}+2\le 5 \quad \text{Isolate } w.$$
$$\underline{-2 \quad -2 \quad -2} \quad \text{Subtract 2 from all sides.}$$
$$1\le\frac{w}{4}\le 3 \quad \text{Multiply all sides by 4.}$$
$$(4)1\le(4)\frac{w}{4}\le(4)3$$
$$4\le w\le 12$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[4,12]$.

Using a number line:



93.

$$-12 \le \frac{1}{2}x - 2 \le 0 \qquad \text{Isolate } x.$$
$$\underline{+2 \qquad +2 \;\; +2} \qquad \text{Add 2 to all sides.}$$
$$-10 \le \frac{1}{2}x \le 2 \qquad \text{Multiply all sides by 2.}$$
$$-10(2) \le (2)\frac{1}{2}x \le (2)2$$
$$-20 \le x \le 4$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-20,4]$.

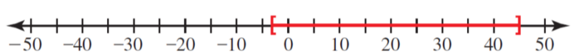
Using a number line:

94.

$$0 \le \frac{1}{3}x + 1 \le 16 \qquad \text{Isolate } x.$$
$$\underline{-1 \qquad -1 \;\; -1} \qquad \text{Subtract 1 from all sides.}$$
$$-1 \le \frac{1}{3}x \le 15 \qquad \text{Multiply all sides by 3.}$$
$$-1(3) \le (3)\frac{1}{3}x \le (3)15$$
$$-3 \le x \le 45$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-3,45]$.

Using a number line:



95.

$$4 < \frac{x}{2} < 30 \qquad \text{Isolate } x \text{ by multiplying all sides by 2.}$$
$$(2)4 < (2)\frac{x}{2} < (2)30$$
$$8 < x < 60$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(8,60)$.

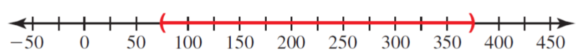
Using a number line:

96.

$$5 < \frac{x}{15} < 25 \qquad \text{Isolate } x \text{ by multiplying all sides by 15.}$$
$$(15)5 < (15)\frac{x}{15} < (15)25$$
$$75 < x < 375$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(75,375)$.

Using a number line:

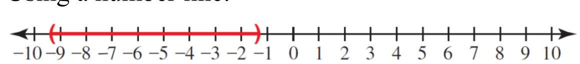


97.

$$-7 < \frac{3x}{4} < -1 \qquad \text{Isolate } x.$$
$$\left(\frac{4}{3}\right)(-7) < \left(\frac{4}{3}\right)\frac{3x}{4} < \left(\frac{4}{3}\right)(-1) \quad \text{Multiply by } \frac{4}{3}.$$
$$-\frac{28}{3} < x < -\frac{4}{3}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $\left(-\frac{28}{3}, -\frac{4}{3}\right)$.

Using a number line:



98.

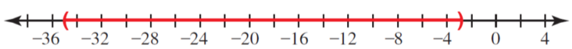
$$-25<\frac{5x}{7}<-2 \qquad \text{Isolate } x.$$

$$\left(\frac{7}{5}\right)(-25)<\left(\frac{7}{5}\right)\frac{5x}{7}<\left(\frac{7}{5}\right)(-2) \qquad \text{Multiply by } \frac{7}{5}.$$

$$-35<x<-\frac{14}{5}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $\left(-35,-\frac{14}{5}\right)$.

Using a number line:



99.

$$3.5\le 2x-2\le 8.5 \qquad \text{Isolate } x.$$

$$\underline{+2 \qquad +2\ +2} \qquad \text{Add 2 to all sides.}$$

$$5.5\le 2x\le 10.5 \qquad \text{Divide all sides by 2.}$$

$$\frac{5.5}{2}\le\frac{2x}{2}\le\frac{10.5}{2}$$

$$2.75\le x\le 5.25$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[2.75, 5.25]$.

Using a number line:

100.

$$-12.3\le 6x+4\le 6.6 \qquad \text{Isolate } x.$$

$$\underline{-4 \qquad -4\ -4} \qquad \text{Subtract 4 from all sides.}$$

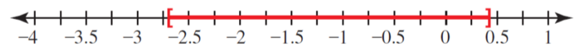
$$-16.3\le 6x\le 2.6 \qquad \text{Divide all sides by 2.}$$

$$\frac{-16.3}{6}\le\frac{6x}{6}\le\frac{2.6}{6}$$

$$-2.72\le x\le 0.43 \qquad \text{Answers rounded to hundredths.}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-2.72, 0.43]$.

Using a number line:



101.

$$-9\le 3v+6<3 \qquad \text{Isolate } x.$$

$$\underline{-6 \qquad -6\ -6} \qquad \text{Subtract 6 from all sides.}$$

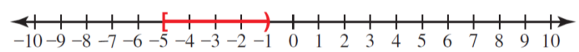
$$-15\le 3v<-3 \qquad \text{Divide all sides by 3.}$$

$$\frac{-15}{3}\le\frac{3v}{3}<\frac{-3}{3}$$

$$-5\le v<-1$$

In interval notation, the solution set will have a bracket on the left side, since it is less than or equal to, and a parenthesis on the right side, since it is less than. This gives us the interval $[-5,-1)$.

Using a number line:



102.

$$5<2x-4\le 8 \qquad \text{Isolate } x.$$

$$\underline{+4 \qquad +4\ +4} \qquad \text{Add 4 to all sides.}$$

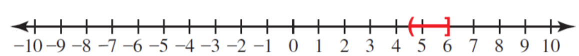
$$9<2x\le 12 \qquad \text{Divide all sides by 2.}$$

$$\frac{9}{2}<\frac{2x}{2}\le\frac{12}{2}$$

$$4.5<x\le 6$$

In interval notation, the solution set will have a parenthesis on the left side, since it is less than, and a bracket on the right side, since it is less than or equal to. This gives us the interval $(4.5, 6]$.

Using a number line:



103.

$$-7<\frac{5a}{3}-8\le 3 \qquad \text{Isolate } a.$$

$$\underline{+8 \qquad +8\ +8} \qquad \text{Add 8 to all sides.}$$

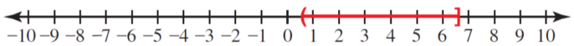
$$1<\frac{5a}{3}\le 11 \qquad \text{Multiply all sides by } \frac{3}{5}.$$

$$\left(\frac{3}{5}\right)1<\left(\frac{3}{5}\right)\frac{5a}{3}\le\left(\frac{3}{5}\right)11$$

$$\frac{3}{5}<a\le\frac{33}{5}$$

In interval notation, the solution set will have a parenthesis on the left side, since it is less than, and a bracket on the right side, since it is less than or equal to. This gives us the interval $\left(\frac{3}{5}, \frac{33}{5}\right]$.

Using a number line:

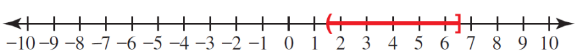


104.

$$\begin{array}{ll} -3 < 4x - 9 \le 17 & \text{Isolate } x. \\ \underline{+9 \quad\quad +9 \;\; +9} & \text{Add 9 to all sides.} \\ 6 < 4x \le 26 & \text{Divide all sides by 4.} \\ \frac{6}{4} < \frac{4x}{4} \le \frac{26}{4} & \\ 1.5 < x \le 6.5 & \end{array}$$

In interval notation, the solution set will have a parenthesis on the left side, since it is less than, and a bracket on the right side, since it is less than or equal to. This gives us the interval $(1.5, 6.5]$.

Using a number line:



105. The statement has an inequality symbol; therefore, it is an inequality.

$$\begin{array}{ll} 2x + 7 > 41 & \text{Isolate variable term.} \\ \underline{\quad -7 \;\; -7} & \text{Subtract 7 from both sides.} \\ 2x > 34 & \\ \frac{\cancel{2}x}{\cancel{2}} > \frac{34}{2} & \text{Divide both sides by 2.} \\ x > 17 & \end{array}$$

Using interval notation, the answer is written as $(17, \infty)$. Use a parenthesis next to the 17 because the inequality is not also "equal to" 17. Always use a parenthesis next to the infinity symbol.

106. The statement has an inequality symbol; therefore, it is an inequality.

$$\begin{array}{ll} 6c - 10 < 32 & \text{Isolate variable term.} \\ \underline{\quad +10 \;\; +10} & \text{Add 10 to both sides.} \\ 6c < 42 & \\ \frac{\cancel{6}c}{\cancel{6}} < \frac{42}{6} & \text{Divide both sides by 6.} \\ c < 7 & \end{array}$$

Using interval notation, the answer is written as $(-\infty, 7)$. Use a parenthesis next to the 7 because the inequality is not also "equal to" 7. Always use a parenthesis next to the infinity symbol.

107. The statement does not have an equal sign or an inequality symbol, therefore, it is an expression.

$$\begin{array}{ll} \boxed{4x} + 7 \boxed{-12x} & \text{Combine like terms.} \\ -8x + 7 & \end{array}$$

108. The statement does not have an equal sign or an inequality symbol, therefore, it is an expression.

$$\begin{array}{ll} \boxed{2m^2} + 3 - 4m \boxed{-7m^2} & \text{Combine like terms.} \\ -5m^2 - 4m + 3 & \text{Write in conventional form.} \end{array}$$

109. The statement has an equal sign; therefore, it is an equation.

$$\begin{array}{ll} 5h + 12 = 3h - 16 & \text{Isolate variable term.} \\ \underline{-3h \quad -3h} & \text{Subtract } 3h \text{ from both sides.} \\ 2h + 12 = -16 & \\ \underline{\quad -12 \quad -12} & \text{Subtract 12 from both sides.} \\ 2h = -28 & \\ \frac{\cancel{2}h}{\cancel{2}} = \frac{-28}{2} & \text{Divide both sides by 2.} \\ h = -14 & \end{array}$$

110. The statement has an equal sign; therefore, it is an equation.

$$\begin{array}{ll} 2(4n - 7) = -5n + 19 & \text{Distribute on left side.} \\ 8n - 14 = -5n + 19 & \text{Isolate variable term.} \\ \underline{+5n \quad\quad +5n} & \text{Add } 5n \text{ to both sides.} \\ 13n - 14 = 19 & \\ \underline{\quad +14 \;\; +14} & \text{Add 14 to both sides.} \\ 13n = 33 & \\ \frac{\cancel{13}n}{\cancel{13}} = \frac{33}{13} & \text{Divide both sides by 13.} \\ n = \frac{33}{13} & \end{array}$$

111. The statement has an inequality symbol; therefore, it is an inequality.

$$\begin{array}{ll} 3a + 4 \ge 7a - 20 & \text{Isolate variable term.} \\ \underline{-7a \quad -7a} & \text{Subtract } 7a \text{ from both sides.} \\ -4a + 4 \ge -20 & \\ \underline{\quad -4 \quad -4} & \text{Subtract 4 from both sides.} \\ -4a \ge -24 & \text{Divide both sides by} -4. \\ \frac{\cancel{-4}a}{\cancel{-4}} \le \frac{-24}{-4} & \text{Divide by neg. reverse inequality.} \\ a \le 6 & \end{array}$$

Using interval notation, the answer is written as $(-\infty, 6]$. Use a bracket next to the 6 because the inequality is also "equal to" 6. Always use a parenthesis next to the infinity symbol.

112. The statement has an inequality symbol; therefore, it is an inequality.

$$\begin{array}{ll}
-5t-14 \le 3t+2 & \text{Isolate variable term.} \\
\underline{-3t \qquad -3t} & \text{Subtract } 3t \text{ from both sides.} \\
-8t-14 \le 2 & \\
\underline{\quad +14 \quad +14} & \text{Add 14 to both sides.} \\
-8t \le 16 & \text{Divide both sides by } -8. \\
\dfrac{\cancel{-8}t}{\cancel{-8}} \ge \dfrac{16}{-8} & \text{Divide by neg. reverse inequality.} \\
t \ge -2 &
\end{array}$$

Using interval notation, the answer is written as $[-2, \infty)$.

113. The statement has an equal sign; therefore, it is an equation. Multiply each term by 3 first to clear the denominators.

$$\begin{array}{ll}
\dfrac{2}{3}x+\dfrac{4}{3}=\dfrac{1}{3}x+7 & \text{Multiply by 3.} \\
(\cancel{3})\dfrac{2}{\cancel{3}}x+(\cancel{3})\dfrac{4}{\cancel{3}}=(\cancel{3})\dfrac{1}{\cancel{3}}x+7(3) & \\
2x+4=x+21 & \text{Isolate variable term.} \\
\underline{-x \qquad -x} & \text{Subtract } x \text{ from both sides.} \\
x+4=21 & \\
\underline{\quad -4 \quad -4} & \text{Subtract 4 from both sides.} \\
x=17 &
\end{array}$$

114. The statement has an equal sign; therefore, it is an equation. Multiply each term by 7 first to clear the denominators.

$$\begin{array}{ll}
(\cancel{7})\dfrac{4}{\cancel{7}}d-(\cancel{7})\dfrac{2}{\cancel{7}}=(7)2d+\dfrac{3}{\cancel{7}}(\cancel{7}) & \\
4d-2=14d+3 & \text{Isolate variable term.} \\
\underline{-14d \qquad -14d} & \text{Subtract } 14d \text{ from both sides.} \\
-10d-2=3 & \\
\underline{\quad +2 \quad +2} & \text{Add 2 to both sides.} \\
-10d=5 & \\
\dfrac{-10d}{-10}=\dfrac{5}{-10} & \text{Divide both sides by } -10. \\
d=-\dfrac{1}{2} &
\end{array}$$

115. The statement has an inequality symbol; therefore, it is an inequality.

$$\begin{array}{ll}
-20 < 4a+2 < 12 & \text{Isolate } a. \\
\underline{-2 \qquad -2 \quad -2} & \text{Subtract 2 from all sides.} \\
-22 < 4a < 10 & \text{Divide all sides by 4.} \\
\dfrac{-22}{4} < \dfrac{4a}{4} < \dfrac{10}{4} & \\
-5.5 < a < 2.5 &
\end{array}$$

The answer in interval notation is $(-5.5, 2.5)$.

116. The statement has an inequality symbol; therefore, it is an inequality. Multiply each term by 4 first to clear the denominator.

$$\begin{array}{ll}
8 \le \dfrac{y}{4}+10 < 16 & \text{Multiply by 4.} \\
(4)8 \le (4)\dfrac{y}{4}+(4)10 < 16(4) & \\
32 \le y+40 < 64 & \text{Isolate } y. \\
\underline{-40 \qquad -40 \quad -40} & \text{Subtract 40 from all sides.} \\
-8 \le y < 24 &
\end{array}$$

The answer in interval notation is $[-8, 24)$.

117. The statement does not have an equal sign or an inequality symbol, therefore, it is an expression.

$$\begin{array}{ll}
\boxed{\dfrac{2}{3}b}+\boxed{\boxed{5}}+\boxed{\dfrac{4}{9}b}\boxed{\boxed{-2}} & \text{Combine like terms.} \\
\dfrac{6}{9}b+\dfrac{4}{9}b+3 & \text{Rewrite fractions with LCD} = 9. \\
\dfrac{10}{9}b+3 & \text{Write in conventional form.}
\end{array}$$

118. The statement does not have an equal sign or an inequality symbol, therefore, it is an expression.

$$\begin{array}{ll}
\boxed{\dfrac{3}{5}x}\boxed{\boxed{-8}}+\boxed{\dfrac{3}{10}x}+\boxed{\boxed{\dfrac{1}{2}}} & \text{Combine like terms.} \\
\dfrac{6}{10}x+\dfrac{3}{10}x-8+\dfrac{1}{2} & \text{Rewrite } x\text{-term fractions with LCD} = 10. \\
\dfrac{9}{10}x-\dfrac{16}{2}+\dfrac{1}{2} & \text{Rewrite constant-term fractions with LCD} = 2. \\
\dfrac{9}{10}x-\dfrac{15}{2} \quad \text{or} \quad \dfrac{9}{10}x-7\dfrac{1}{2} &
\end{array}$$

119. The statement has an inequality symbol; therefore, it is an inequality.

$4 < -\frac{g}{2} \le 7$ Isolate g.

$(-2)4 > (-2)-\frac{g}{2} \ge 7(-2)$ Multiply all sides by -2.

$-8 > g \ge -14$ Multiply by neg., reverse inequalities.

$-14 \le g < -8$ Reorder compound inequality from smallest to greatest.

The answer, in interval notation, is $[-14,-8)$.

120. The statement has an inequality symbol; therefore, it is an inequality.

$-8 \le \frac{x}{3} \le 4$ Isolate x.

$(3)-8 \le (3)\frac{x}{3} \le 4(3)$ Multiply all sides by 3.

$-24 \le x \le 12$

The answer in interval notation is $[-24,12]$.

Chapter 2 Review

1. **a.** To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} D = 75t & \text{Original equation.} \\ 262.5 \stackrel{?}{=} 75(3.5) & \text{Substitute values for } D \text{ and } t. \\ 262.5 = 262.5 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $t = 3.5$ and $D = 262.5$ is a solution to the equation $D = 75t$.

b. These values represent that 262.5 miles is the distance traveled when driving for 3.5 hours.

2. **a.** To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} F = 11.5L & \text{Original equation.} \\ 6900 \stackrel{?}{=} 11.5(600) & \text{Substitute values for } F \text{ and } L. \\ 6900 = 6900 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $L = 600$ and $F = 6900$ is a solution to the equation $F = 11.5L$.

b. These values represent that a loan of $600,000.00 would have an origination fee of $6,900.00.

3. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} -2x + 4y = -8 & \text{Original equation.} \\ -2(-2) + 4(3) \stackrel{?}{=} -8 & \text{Substitute } x = -2 \text{ and } y = 3. \\ 4 + 12 \stackrel{?}{=} -8 & \text{Simplify left side.} \\ 16 \stackrel{?}{=} -8 & \text{This statement is not true.} \\ 16 \neq -8 & \end{array}$$

Because the final results are not equal, $x = -2$ and $y = 3$ is not a solution to the equation $-2x + 4y = -8$.

4. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} y = -3x + 5 & \text{Original equation.} \\ (14) \stackrel{?}{=} -3(-3) + 5 & \text{Substitute } x = -3 \text{ and } y = 14. \\ 14 \stackrel{?}{=} 9 + 5 & \text{Simplify both sides.} \\ 14 = 14 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = -3$ and $y = 14$ is a solution to the equation $y = -3x + 5$.

5. Using the equation $P = R - C$ substitute $R = 49000$ for the revenue, $C = 26000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P = R - C & \text{Given equation.} \\ P = (49000) - (26000) & \text{Substitute value of variables.} \\ P = 23000 & \text{Simplify on right side.} \end{array}$$

The solution is $P = 23000$ which represents that the company has monthly profit of $23,000.

6. Using the equation $P = R - C$ substitute $R = 225000$ for the revenue, $C = 186000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P = R - C & \text{Given equation.} \\ P = (225000) - (186000) & \text{Substitute value of variables.} \\ P = 39000 & \text{Simplify on right side.} \end{array}$$

The solution is $P = 39000$ which represents that the company has monthly profit of $39,000.

Exercises 7-14: Answers are to be checked.

7.

$$\begin{array}{ll} x - 3 = -9 & \\ \underline{\;+3 \quad +3\;} & \text{Add 3 to both sides.} \\ x = -6 & \end{array}$$

$$\begin{array}{ll} (-6) - 3 \stackrel{?}{=} -9 & \text{Check the answer.} \\ -9 = -9 & \text{The answer works.} \end{array}$$

8.

$$\begin{array}{ll} p - 16 = -9 & \\ \underline{\;+16 \quad +16\;} & \text{Add 16 to both sides.} \\ p = 7 & \end{array}$$

$$\begin{array}{ll} (7) - 16 \stackrel{?}{=} -9 & \text{Check the answer.} \\ -9 = -9 & \text{The answer works.} \end{array}$$

9.

$$\begin{array}{l} -8 = a + 9 \\ \underline{-9 \quad\ -9} \\ -17 = a \end{array}$$ Subtract 9 from both sides.

$$-8 \overset{?}{=} (-17) + 9$$ Check the answer.
$$-8 = -8$$ The answer works.

10.

$$\begin{array}{l} -16 = b + 7 \\ \underline{\ -7 \quad\ -7} \\ -23 = b \end{array}$$ Subtract 7 from both sides.

$$-16 \overset{?}{=} (-23) + 7$$ Check the answer.
$$-16 = -16$$ The answer works.

11.

$$\begin{array}{l} k - \frac{1}{2} = \frac{3}{2} \\ \underline{+\frac{1}{2} \quad +\frac{1}{2}} \\ k = \frac{4}{2} \\ k = 2 \end{array}$$ Add $\frac{1}{2}$ to both sides.

$$(2) - \frac{1}{2} \overset{?}{=} \frac{3}{2}$$ Check the answer.
$$\frac{4}{2} - \frac{1}{2} \overset{?}{=} \frac{3}{2}$$
$$\frac{3}{2} = \frac{3}{2}$$ The answer works.

12.

$$\begin{array}{l} \frac{-2}{5} + x = \frac{4}{5} \\ \underline{+\frac{2}{5} \qquad +\frac{2}{5}} \\ x = \frac{6}{5} \end{array}$$ Add $\frac{2}{5}$ to both sides.

$$\frac{-2}{5} + \left(\frac{6}{5}\right) \overset{?}{=} \frac{4}{5}$$ Check the answer.
$$\frac{4}{5} = \frac{4}{5}$$ The answer works.

13.

$$\begin{array}{l} y - 9.8 = 4.6 \\ \underline{\quad +9.8 \ \ +9.8} \\ y = 14.4 \end{array}$$ Add 9.8 to both sides.

$$(14.4) - 9.8 \overset{?}{=} 4.6$$ Check the answer.
$$4.6 = 4.6$$ The answer works.

14.

$$\begin{array}{l} 0.02 + h = 1.04 \\ \underline{-0.02 \qquad -0.02} \\ h = 1.02 \end{array}$$ Subtract 0.02 from both sides.

$$0.02 + (1.02) \overset{?}{=} 1.04$$ Check the answer.
$$1.04 = 1.04$$ The answer works.

15. To solve for q means to isolate q on one side of the equal sign.

$$2p + \boxed{q} = 9$$ Identify the variable term to isolate.
$$\underline{-2p \qquad -2p}$$ Subtract $2p$ from both sides.
$$q = -2p + 9$$

16. To solve for x means to isolate x on one side of the equal sign.

$$\boxed{x} - y = 2$$ Identify the variable term to isolate.
$$\underline{\ +y \ \ +y}$$ Add y to both sides.
$$x = y + 2$$

17. To solve for y means to isolate y on one side of the equal sign.

$$8x \boxed{-24y} = 48$$ Identify the variable term to isolate.
$$\underline{-8x \qquad\quad -8x}$$ Subtract $8x$ from both sides.
$$-24y = -8x + 48$$

$$\frac{-24y}{-24} = \frac{-8x + 48}{-24}$$ Divided both sides by – 24.
$$y = \frac{-8x}{-24} + \frac{48}{-24}$$
$$y = \frac{1}{3}x - 2$$

18. To solve for p means to isolate p on one side of the equal sign.

$$\boxed{3p} - 5q = -30$$ Identify the variable term to isolate.
$$\underline{\ \ +5q \ \ +5q}$$ Add $5q$ to both sides.
$$3p = 5q - 30$$
$$\frac{3p}{3} = \frac{5q - 30}{3}$$ Divided both sides by 3.
$$p = \frac{5q}{3} - \frac{30}{3}$$
$$p = \frac{5}{3}q - 10$$

Exercises 19-28: Answers are to be checked.

Exercises 19-22 are completed as examples.

19.

$$\begin{aligned} 7y &= 84 \\ \frac{7y}{7} &= \frac{84}{7} \quad \text{Divide both sides by 7.} \\ y &= 12 \end{aligned}$$

$$\begin{aligned} 7(12) &\stackrel{?}{=} 84 \quad \text{Check the answer.} \\ 84 &= 84 \quad \text{The answer works.} \end{aligned}$$

20.

$$\begin{aligned} 4x &= -64 \\ \frac{4x}{4} &= \frac{-64}{4} \quad \text{Divide both sides by 4.} \\ x &= -16 \end{aligned}$$

$$\begin{aligned} 4(-16) &\stackrel{?}{=} -64 \quad \text{Check the answer.} \\ -64 &= -64 \quad \text{The answer works.} \end{aligned}$$

21.

$$\begin{aligned} -a &= 7 \\ -1\cdot(-a) &= 7\cdot(-1) \quad \text{Multiply both sides by } -1. \\ a &= -7 \end{aligned}$$

$$\begin{aligned} -(-7) &\stackrel{?}{=} 7 \quad \text{Check the answer.} \\ 7 &= 7 \quad \text{The answer works.} \end{aligned}$$

22.

$$\begin{aligned} -8 &= -x \\ -1\cdot(-8) &= -x\cdot(-1) \quad \text{Multiply both sides by } -1. \\ 8 &= x \end{aligned}$$

$$\begin{aligned} -8 &\stackrel{?}{=} -(8) \quad \text{Check the answer.} \\ -8 &= -8 \quad \text{The answer works.} \end{aligned}$$

23.

$$\begin{aligned} -2b &= -22 \\ \frac{-2b}{-2} &= \frac{-22}{-2} \quad \text{Divide both sides by } -2. \\ b &= 11 \end{aligned}$$

24.

$$\begin{aligned} -5y &= 35 \\ \frac{-5y}{-5} &= \frac{35}{-5} \quad \text{Divide both sides by } -5. \\ y &= -7 \end{aligned}$$

25.

$$\begin{aligned} \frac{2}{3}x &= -16 \\ \frac{3}{2}\cdot\frac{2}{3}x &= -16\cdot\frac{3}{2} \quad \text{Multiply both sides by } \frac{3}{2}. \\ x &= -24 \end{aligned}$$

26.

$$\begin{aligned} -\frac{3}{4}n &= -9 \\ -\frac{4}{3}\cdot\left(-\frac{3}{4}n\right) &= -9\cdot\left(-\frac{4}{3}\right) \quad \text{Multiply both sides by } -\frac{4}{3}. \\ n &= 12 \end{aligned}$$

27.

$$\begin{aligned} 6.2t &= -8.4 \\ \frac{6.2t}{6.2} &= \frac{-8.4}{6.2} \quad \text{Divide both sides by 6.2.} \\ t &\approx -1.35 \quad \text{Answer rounded to hundredths.} \end{aligned}$$

28.

$$\begin{aligned} -0.5k &= -16.5 \\ \frac{-0.5k}{-0.5} &= \frac{-16.5}{-0.5} \quad \text{Divide both sides by } -0.5. \\ k &= 33 \end{aligned}$$

29. **a.** To find the number of airplanes that are needed to transport 520 people, substitute $P = 520$ into the equation $J = \frac{P}{126}$ and solve for J.

$$\begin{aligned} J &= \frac{P}{126} \quad \text{Substitute } P = 520. \\ J &= \frac{520}{126} \\ J &\approx 4.13 \quad \text{Answer rounded to hundredths.} \end{aligned}$$

Since you cannot have 4.13 airplanes, we round the final answer up to the nearest whole number. To transport 520 people, 5 airplanes would be needed.

b. To find the number of people that the carrier can transport at a time with 15 planes, substitute $J = 15$ into the equation $J = \frac{P}{126}$ and solve for *P*.

$$\begin{aligned} J &= \frac{P}{126} && \text{Substitute } J = 15. \\ 15 &= \frac{P}{126} \\ 126 \cdot 15 &= \frac{P}{126} \cdot 126 && \text{Multiply both sides by 126.} \\ 1890 &= P \end{aligned}$$

If the airline carrier has 15 planes, they can transport 1890 people at a time.

30. **a.** To fine Devora's monthly salary if she works 140 hours, substitute $h = 140$ into the equation $S = 14h$ and solve for *S*.

$$\begin{aligned} S &= 14h && \text{Substitute } h = 140. \\ S &= 14(140) \\ S &= 1960 \end{aligned}$$

Devora's monthly salary will be \$1960 if she works 140 hours.

b. To find the number of hours Devora needs to work a month to make \$2100 a month, substitute $S = 2100$ into the equation $S = 14h$ and solve for *h*.

$$\begin{aligned} S &= 14h && \text{Substitute } S = 2100. \\ 2100 &= 14h \\ \frac{2100}{14} &= \frac{14h}{14} && \text{Divide both sides by 14} \\ 150 &= h \end{aligned}$$

Devora has to work 150 hours a month to make \$2100 a month.

c. To find the number of hours Devora needs to work a month to earn \$1330 a month, substitute $S = 1330$ into the equation $S = 14h$ and solve for *h*.

$$\begin{aligned} S &= 14h && \text{Substitute } S = 1330. \\ 1330 &= 14h \\ \frac{1330}{14} &= \frac{14h}{14} && \text{Divide both sides by 14} \\ 95 &= h \end{aligned}$$

Devora has to work 95 hours a month to earn \$1330 a month.

Exercises 31-38: Answers are to be checked.

Exercises 31 and 32 are completed as examples.

31.

$$\begin{aligned} 6x - 9 &= -63 \\ +9 \quad &\quad +9 && \text{Add 9 to both sides.} \\ 6x &= -54 \\ \frac{6x}{6} &= \frac{-54}{6} && \text{Divide both sides by 6.} \\ x &= -9 \end{aligned}$$

$$\begin{aligned} 6(-9) - 9 &\stackrel{?}{=} -63 && \text{Check the answer.} \\ -54 - 9 &\stackrel{?}{=} -63 \\ -63 &= -63 && \text{The answer works.} \end{aligned}$$

32.

$$\begin{aligned} 5y - 17 &= 33 \\ +17 \quad &\quad +17 && \text{Add 17 to both sides.} \\ 5y &= 50 \\ \frac{5y}{5} &= \frac{50}{5} && \text{Divide both sides by 5.} \\ y &= 10 \end{aligned}$$

$$\begin{aligned} 5(10) - 17 &\stackrel{?}{=} 33 && \text{Check the answer.} \\ 50 - 17 &\stackrel{?}{=} 33 \\ 33 &= 33 && \text{The answer works.} \end{aligned}$$

33.

$$\begin{aligned} -2a + 9 &= -5 \\ -9 \quad &\quad -9 && \text{Subtract 9 from both sides.} \\ -2a &= -14 \\ \frac{-2a}{-2} &= \frac{-14}{-2} && \text{Divide both sides by } -2. \\ a &= 7 \end{aligned}$$

34.

$$\begin{aligned} -8k - 19 &= 5 \\ +19 \quad &\quad +19 && \text{Add 19 to both sides.} \\ -8k &= 24 \\ \frac{-8k}{-8} &= \frac{24}{-8} && \text{Divide both sides by } -8. \\ k &= -3 \end{aligned}$$

35.

$$\begin{aligned} \frac{x}{2} - 1 &= -11 \\ +1 \quad &\quad +1 && \text{Add 1 to both sides.} \\ \frac{x}{2} &= -10 \\ 2 \cdot \frac{x}{2} &= -10 \cdot 2 && \text{Multiply both sides by 2.} \\ x &= -20 \end{aligned}$$

36.

$$-\frac{x}{3}+2=-4$$
$$\underline{\quad -2 \quad -2} \qquad \text{Subtract 2 from both sides.}$$
$$-\frac{x}{3}=-6$$
$$-3\cdot\left(-\frac{x}{3}\right)=-6\cdot(-3) \qquad \text{Multiply both sides by } -3.$$
$$x=18$$

37.

$$-8.6-1.2x=10.6$$
$$\underline{+8.6 \qquad\quad +8.6} \qquad \text{Add 8.6 to both sides.}$$
$$-1.2x=19.2$$
$$\frac{-1.2x}{-1.2}=\frac{19.2}{-1.2} \qquad \text{Divide both sides by } -1.2.$$
$$x=-16$$

38.

$$0.25y-1=-7$$
$$\underline{\quad +1 \quad +1} \qquad \text{Add 1 to both sides.}$$
$$0.25y=-6$$
$$\frac{0.25y}{0.25}=\frac{-6}{0.25} \qquad \text{Divide both sides by 0.25.}$$
$$y=-24$$

Exercises 39-46: Answers are to be checked.

Exercises 39 and 40 are completed as examples.

39. Let $x=$ a number. The sentence translates as follows

$$9x=76$$
$$\textit{Solve}:$$
$$\frac{9x}{9}=\frac{76}{9} \qquad \text{Divide both sides by 9.}$$
$$x=8\frac{4}{9}$$

$$9\left(8\frac{4}{9}\right)\stackrel{?}{=}76 \qquad \text{Check the answer.}$$
$$9\left(\frac{76}{9}\right)\stackrel{?}{=}76$$
$$76=76 \qquad \text{The answer works.}$$

40. Let $x=$ a number. The sentence translates as follows

$$12=-2x$$
$$\textit{Solve}:$$
$$\frac{12}{-2}=\frac{-2x}{-2} \qquad \text{Divide both sides by } -2.$$
$$-6=x$$

$$12\stackrel{?}{=}-2(-6) \qquad \text{Check the answer.}$$
$$12=12 \qquad \text{The answer works.}$$

41. Let $x=$ a number. The sentence translates as follows

$$2x+16=-44$$
$$\textit{Solve}:$$
$$2x+16=-44$$
$$\underline{\quad -16 \quad -16} \qquad \text{Subtract 16 from both sides.}$$
$$2x=-60$$
$$\frac{2x}{2}=\frac{-60}{2} \qquad \text{Divide both sides by 2.}$$
$$x=-30$$

42. Let $x=$ a number. The sentence translates as follows

$$\frac{1}{2}x+4=-18$$
$$\textit{Solve}:$$
$$\frac{1}{2}x+4=-18$$
$$\underline{\quad -4 \quad -4} \qquad \text{Subtract 4 from both sides.}$$
$$\frac{1}{2}x=-22$$
$$2\cdot\frac{1}{2}x=-22\cdot 2 \qquad \text{Multiply both sides by 2.}$$
$$x=-44$$

43. Let $x=$ a number. The sentence translates as follows

$$\frac{x}{4}=0.25$$
$$\textit{Solve}:$$
$$4\cdot\frac{x}{4}=0.25\cdot 4 \qquad \text{Multiply both sides by 4.}$$
$$x=1$$

44. Let $x=$ a number. The sentence translates as follows

$$-\frac{x}{3}=0.75$$
$$\textit{Solve}:$$
$$-3\cdot\left(-\frac{x}{3}\right)=0.75\cdot(-3) \qquad \text{Multiply both sides by } -3.$$
$$x=-2.25$$

45. Let $x =$ a number. The sentence translates as follows

$$8-3x=17$$

Solve:

$$8-3x=17$$

$$\underline{-8 \qquad -8}$$ Subtract 8 from both sides.

$$-3x=9$$

$$\frac{-3x}{-3}=\frac{9}{-3}$$ Divide both sides by -3.

$$x=-3$$

46. Let $x =$ a number. The sentence translates as follows $2x-9=7$.

Solve:

$$2x-9=7$$

$$\underline{\quad +9 \quad +9}$$ Add 9 to both sides.

$$2x=16$$

$$\frac{2x}{2}=\frac{16}{2}$$ Divide both sides by 2.

$$x=8$$

47.

$$D=c\boxed{m}a$$ Identify the variable to isolate.

$$\frac{D}{ca}=\frac{\cancel{c}m\cancel{a}}{\cancel{c}\cancel{a}}$$ Divide both sides by *ca*.

$$\frac{D}{ca}=m$$

48.

$$V=lw\boxed{h}$$ Identify the variable to isolate.

$$\frac{V}{lw}=\frac{\cancel{l}\cancel{w}h}{\cancel{l}\cancel{w}}$$ Divide both sides by *lw*.

$$\frac{V}{lw}=h$$

49.

$$C=\pi\cdot\boxed{d}$$ Identify the variable to isolate.

$$\frac{C}{\pi}=\frac{\cancel{\pi}d}{\cancel{\pi}}$$ Divide both sides by π.

$$\frac{C}{\pi}=d$$

50.

$$A=\frac{1}{2}\boxed{b}\cdot h$$ Identify the variable to isolate.

$$(2)A=\frac{1}{\cancel{2}}b\cdot h(\cancel{2})$$ Multiply both sides by 2.

$$\frac{2A}{h}=\frac{b\cdot\cancel{h}}{\cancel{h}}$$ Divide both sides by *h*.

$$\frac{2A}{h}=b$$

51.

$$9x-3\boxed{y}=-12$$ Identify the variable to isolate.

$$\underline{-9x \qquad -9x}$$ Subtract $9x$ from both sides.

$$-3y=-9x-12$$ Divide both sides by -3.

$$\frac{-3y}{-3}=\frac{-9x-12}{-3}$$

$$y=\frac{-9x}{-3}-\frac{12}{-3}$$

$$y=3x+4$$

52.

$$-8x+4\boxed{y}=-24$$ Identify the variable to isolate.

$$\underline{+8x \qquad +8x}$$ Add $8x$ to both sides.

$$4y=8x-24$$ Divide both sides by -3.

$$\frac{4y}{4}=\frac{8x-24}{4}$$

$$y=\frac{8x}{4}-\frac{24}{4}$$

$$y=2x-6$$

Exercises 53-62: Answers are to be checked.

53. Let $x =$ a number. The sentence translates as follows

$$2x+1=3x-4$$

Solve:

$$2x+1=3x-4$$

$$\underline{-3x \qquad -3x}$$ Subtract $3x$ from both sides.

$$-x+1=-4$$

$$\underline{\quad -1 \quad -1}$$ Subtract 1 from both sides.

$$-x=-5$$

$$-1\cdot(-x)=-5\cdot(-1)$$ Multiply both sides by -1.

$$x=5$$

$$2(5)+1\stackrel{?}{=}3(5)-4$$ Check the answer.

$$10+1\stackrel{?}{=}15-4$$

$$11=11$$ The answer works.

54. Let $x =$ a number. The sentence translates as follows

$$\frac{1}{2}x+10=x-4$$

Solve:

$$(2)\frac{1}{2}x+(2)10=(2)x-4(2) \quad \text{Multiply each term by 2.}$$
$$x+20=2x-8$$
$$\underline{-2x \qquad -2x} \quad \text{Subtract } 2x \text{ from both sides.}$$
$$-x+20=-8$$
$$\underline{\quad -20 \quad -20} \quad \text{Subtract 20 from both sides.}$$
$$-x=-28$$
$$-1\cdot(-x)=-28\cdot(-1) \quad \text{Multiply both sides by } -1.$$
$$x=28$$

$$\frac{1}{2}(28)+10\overset{?}{=}(28)-4 \quad \text{Check the answer.}$$
$$14+10\overset{?}{=}28-4$$
$$24=24 \quad \text{The answer works.}$$

55.

$$4x-8=-3x+20$$
$$\underline{+3x \qquad +3x} \quad \text{Add } 3x \text{ to both sides.}$$
$$7x-8=20$$
$$\underline{\quad +8 \quad +8} \quad \text{Add 8 to both sides.}$$
$$7x=28$$
$$\frac{7x}{7}=\frac{28}{7} \quad \text{Divide both sides by 7.}$$
$$x=4$$

$$4(4)-8\overset{?}{=}-3(4)+20 \quad \text{Check the answer.}$$
$$16-8\overset{?}{=}-12+20$$
$$8=8 \quad \text{The answer works.}$$

56.

$$9y+12=7y+6$$
$$\underline{-7y \qquad -7y} \quad \text{Subtract } 7y \text{ from both sides.}$$
$$2y+12=6$$
$$\underline{\quad -12 \quad -12} \quad \text{Subtract 12 from both sides.}$$
$$2y=-6$$
$$\frac{2y}{2}=\frac{-6}{2} \quad \text{Divide both sides by 2.}$$
$$y=-3$$

$$9(-3)+12\overset{?}{=}7(-3)+6 \quad \text{Check the answer.}$$
$$-27+12\overset{?}{=}-21+6$$
$$-15=-15 \quad \text{The answer works.}$$

57.

$$5(a+5)=12a-13 \quad \text{Distribute on left side.}$$
$$5a+25=12a-13$$
$$\underline{-12a \qquad -12a} \quad \text{Subtract } 12a \text{ from both sides.}$$
$$-7a+25=-13$$
$$\underline{\quad -25 \quad -25} \quad \text{Subtract 25 from both sides.}$$
$$-7a=-38$$
$$\frac{-7a}{-7}=\frac{-38}{-7} \quad \text{Divide both sides by } -7.$$
$$a=\frac{38}{7} \text{ or } a=5\frac{3}{7}$$

$$5\left(\left[\frac{38}{7}\right]+5\right)=12\left(\frac{38}{7}\right)-13 \quad \text{Check the answer.}$$
$$5\left(\left[\frac{38}{7}\right]+\frac{35}{7}\right)=12\left(\frac{38}{7}\right)-\frac{91}{7}$$
$$5\left(\frac{73}{7}\right)\overset{?}{=}\frac{456}{7}-\frac{91}{7}$$
$$\frac{365}{7}=\frac{365}{7} \quad \text{The answer works.}$$

58.

$$11+7x+7=5x-2 \quad \text{Simplify on left side.}$$
$$7x+18=5x-2$$
$$\underline{-5x \qquad -5x} \quad \text{Subtract } 5x \text{ from both sides.}$$
$$2x+18=-2$$
$$\underline{\quad -18 \quad -18} \quad \text{Subtract 18 from both sides.}$$
$$2x=-20$$
$$\frac{2x}{2}=\frac{-20}{2} \quad \text{Divide both sides by 2.}$$
$$x=-10$$

$$11+7(-10)+7\overset{?}{=}5(-10)-2 \quad \text{Check the answer.}$$
$$18-70\overset{?}{=}-50-2$$
$$-52=-52 \quad \text{The answer works.}$$

59.

$$4k+1=-5k+3(3k-1) \quad \text{Distribute on right side.}$$
$$4k+1=-5k+9k-3 \quad \text{Simplify on right side.}$$
$$4k+1=4k-3$$
$$\underline{-4k \qquad -4k} \quad \text{Subtract } 4k \text{ from both sides.}$$
$$1\overset{?}{=}-3 \quad \text{This is a false statement.}$$

This equation has no solution.

60.

$$9h-7(h+1)=2h+9 \quad \text{Distribute on left side.}$$
$$9h-7h-7=2h+9 \quad \text{Simplify on left side.}$$
$$2h-7=2h+9$$
$$\underline{-2h \qquad -2h} \quad \text{Subtract } 2h \text{ from both sides.}$$
$$-7\overset{?}{=}9 \quad \text{This is a false statement.}$$

This equation has no solution.

61.

$$-5x+3=13-5(x+2) \quad \text{Distribute on right side.}$$
$$-5x+3=13-5x-10 \quad \text{Simplify on right side.}$$
$$-5x+3=-5x+3$$
$$\underline{+5x \qquad +5x} \quad \text{Add } 5x \text{ to both sides.}$$
$$3=3 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -3 and 1, and substitute these into the equation.

$$-5(-3)+3\overset{?}{=}13-5([-3]+2) \quad \text{Check the answer using} -3.$$
$$15+3\overset{?}{=}13-5(-1)$$
$$18=18 \quad \text{The answer works.}$$
$$-5(0)+3\overset{?}{=}13-5([0]+2) \quad \text{Check the answer using 0.}$$
$$0+3\overset{?}{=}13-5(2)$$
$$3=3 \quad \text{The answer works.}$$

62.

$$7y-10+2(-3y+2)=y-6 \quad \text{Distribute-left side.}$$
$$7y-10-6y+4=y-6 \quad \text{Simplify on left side.}$$
$$y-6=y-6$$
$$\underline{+y \qquad +y} \quad \text{Add } y \text{ to both sides.}$$
$$-6=-6 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -1 and 5, and substitute these into the equation.

Check the answer using -1.

$$7(-1)-10+2(-3[-1]+2)\overset{?}{=}(-1)-6$$
$$-7-10+2(3+2)\overset{?}{=}-7$$
$$-17+2(5)\overset{?}{=}-7$$
$$-7=-7 \quad \text{The answer works.}$$

Check the answer using 5.

$$7(5)-10+2(-3[5]+2)\overset{?}{=}(5)-6$$
$$35-10+2(-15+2)\overset{?}{=}-1$$
$$25+2(-13)\overset{?}{=}-1$$
$$-1=-1 \quad \text{The answer works.}$$

63. The sum of the measures of the angles in a triangle must equal $180°$. Add the measures of the given angles and set them equal to $180°$ then solve for x.

$$x+(x+6)+(x-12)=180 \quad \text{Combine like terms.}$$
$$3x-6=180$$
$$\underline{+6 \quad +6} \quad \text{Add 6 to both sides.}$$
$$3x=186$$
$$\frac{3x}{3}=\frac{186}{3} \quad \text{Divide both sides by 3.}$$
$$x=62$$

Now substitute $x=62$ into the expressions that represent the angles to find the measure of each angle. The measures of the three angles are $62°,\ 68°,\ \text{and}\ 50°.$

To check the solution, the measures of the angles should add up to 180.

$$62°+68°+50°\overset{?}{=}180° \quad \text{Check the answer.}$$
$$180°=180° \quad \text{The answer works.}$$

64. The sum of the measures of the angles in a triangle must equal $180°$. Add the measures of the given angles and set them equal to $180°$ then solve for *x*.

$$3x+(x+20)+(x-10)=180 \quad \text{Combine like terms.}$$
$$5x+10=180$$
$$\underline{-10 \quad -10} \quad \text{Subtract 10 from both sides.}$$
$$5x=170$$
$$\frac{5x}{5}=\frac{170}{5} \quad \text{Divide both sides by 5.}$$
$$x=34$$

Now substitute $x=34$ into the expressions that represent the angles to find the measure of each angle. The measures of the three angles are $102°,\ 54°,\ \text{and}\ 24°.$

To check the solution, the measures of the angles should add up to 180.

$$102°+54°+24°\overset{?}{=}180° \quad \text{Check the answer.}$$
$$180°=180° \quad \text{The answer works.}$$

Exercises 65-78: Answers are to be checked.

Exercises 65 and 66 are completed as examples.

65.

$$4x+1>49$$
$$\underline{-1 \quad -1} \quad \text{Subtract 1 from both sides.}$$
$$4x>48 \quad \text{Divide both sides by 4.}$$
$$\frac{4x}{4}>\frac{48}{4}$$
$$x>12$$

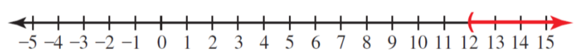
$$4(12)+1\overset{?}{=}49 \quad \text{Check the answer.}$$
$$48+1\overset{?}{=}49$$
$$49=49 \quad \text{The answer works.}$$

Check a number greater than 12 ($x=13$) to test the direction of the inequality symbol.

$$4(13)+1\overset{?}{>}49 \quad \text{Check the direction of the inequality.}$$
$$52+1\overset{?}{>}49$$
$$53>49 \quad \text{The direction of the inequality works.}$$

Using interval notation, the answer is written as $(12,\infty)$. Use a parenthesis next to the 12 because *x* is not also "equal to" 12. Always use a parenthesis next to the infinity symbol.

Using a number line:



66.

$$3x-2\le 19$$
$$\underline{+2 \quad +2} \quad \text{Add 2 to both sides.}$$
$$3x\le 21 \quad \text{Divide both sides by 3.}$$
$$\frac{3x}{3}\le\frac{21}{3}$$
$$x\le 7$$

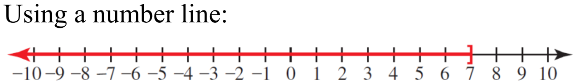
$$3(7)-2\overset{?}{=}19 \quad \text{Check the answer.}$$
$$21-2\overset{?}{=}19$$
$$19=19 \quad \text{The answer works.}$$

Check a number less than 7 ($x=6$) to test the direction of the inequality symbol.

$$3(6)-2\overset{?}{\le}19 \quad \text{Check the direction of the inequality.}$$
$$18-2\overset{?}{\le}19$$
$$16\le 19 \quad \text{The direction of the inequality works.}$$

Using interval notation, the answer is written as $(-\infty,7]$. Use a bracket next to the 7 because *x* is also "equal to" 7. This means that 7 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:



67.

$$\begin{aligned} -x &\le 7 && \text{Multiply both sides by } -1. \\ -1\cdot(-x) &\ge 7\cdot(-1) && \text{Multiply by neg., reverse inequality.} \\ x &\ge -7 \end{aligned}$$

Using interval notation, the answer is written as $[-7,\infty)$. Use a bracket next to the -7 because x is also "equal to" -7. This means that -7 is part of the solution set. Always use a parenthesis next to the infinity symbol.

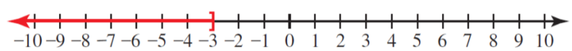
Using a number line:

68.

$$\begin{aligned} -y &\ge 3 && \text{Multiply both sides by } -1. \\ -1\cdot(-y) &\le 3\cdot(-1) && \text{Multiply by neg., reverse inequality.} \\ y &\le -3 \end{aligned}$$

Using interval notation, the answer is written as $(-\infty,-3]$. Use a bracket next to the -3 because y is also "equal to" -3. This means that -3 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:

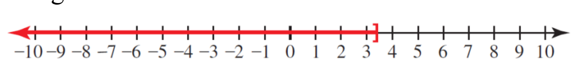


69.

$$\begin{aligned} -5y+1 &\ge -16 \\ \underline{-1 \quad\;\; -1} & && \text{Subtract 1 from both sides.} \\ -5y &\ge -17 && \text{Divide both sides by } -5. \\ \frac{-5y}{-5} &\le \frac{-17}{-5} && \text{Divide by neg., reverse inequality.} \\ y &\le \frac{17}{5} \end{aligned}$$

Using interval notation, the answer is written as $\left(-\infty,\frac{17}{5}\right]$. Use a bracket next to the $\frac{17}{5}$ because y is also "equal to" $\frac{17}{5}$. This means that $\frac{17}{5}$ is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:



70.

$$\begin{aligned} -6x-7 &< -3 \\ \underline{+7 \quad +7} & && \text{Add 7 to both sides.} \\ -6x &< 4 && \text{Divide both sides by } -6. \\ \frac{-6x}{-6} &> \frac{4}{-6} && \text{Divide by neg., reverse inequality.} \\ x &> -\frac{2}{3} \end{aligned}$$

Using interval notation, the answer is written as $\left(-\frac{2}{3},\infty\right)$. Use a parenthesis next to the $-\frac{2}{3}$ because x is not also "equal to" $-\frac{2}{3}$. Always use a parenthesis next to the infinity symbol.

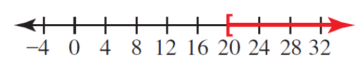
Using a number line:

71.

$$\begin{aligned} -\frac{1}{4}y+3 &\le -2 \\ \underline{-3 \quad -3} & && \text{Subtract 3 from both sides.} \\ -\frac{1}{4}y &\le -5 && \text{Multiply both sides by } -4. \\ -4\cdot\left(-\frac{1}{4}y\right) &\ge -5\cdot(-4) && \text{Multiply by neg., reverse inequality.} \\ y &\ge 20 \end{aligned}$$

Using interval notation, the answer is written as $[20,\infty)$. Use a bracket next to the 20 because y is also "equal to" 20. This means that 20 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:

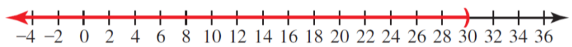


72.

$$\begin{aligned} 4-\frac{2}{5}t &> -8 \\ \underline{-4 \qquad\quad -4} & && \text{Subtract 4 from both sides.} \\ -\frac{2}{5}t &> -12 && \text{Multiply both sides by } -\frac{5}{2}. \\ -\frac{5}{2}\cdot\left(-\frac{2}{5}t\right) &< -12\cdot\left(-\frac{5}{2}\right) && \text{Multiply by neg., reverse inequality.} \\ t &< 30 \end{aligned}$$

Using interval notation, the answer is written as $(-\infty,30)$. Use a parenthesis next to the 30 because t is not also "equal to" 30. Always use a parenthesis next to the infinity symbol.

Using a number line:



73.

$$
\begin{aligned}
-3x-3 &< -2x+9 \\
\underline{+2x \qquad} & \underline{\;+2x\quad} && \text{Add } 2x \text{ to both sides.} \\
-x-3 &< 9 \\
\underline{+3} & \underline{\;+3} && \text{Add 3 to both sides.} \\
-x &< 12 && \text{Multiply both sides by } -1. \\
-1\cdot(-x) &> 12\cdot(-1) && \text{Multiply by neg., reverse inequality.} \\
x &> -12
\end{aligned}
$$

Using interval notation, the answer is written as $(-12,\infty)$. Use a parenthesis next to the -12 because x is not also "equal to" -12. Always use a parenthesis next to the infinity symbol.

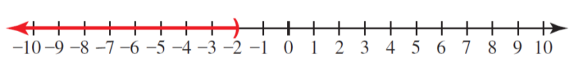
Using a number line:

74.

$$
\begin{aligned}
-8y-1 &> -3y+9 \\
\underline{+3y \qquad} & \underline{\;+3y\quad} && \text{Add } 3y \text{ to both sides.} \\
-5y-1 &> 9 \\
\underline{+1} & \underline{\;+1} && \text{Add 1 to both sides.} \\
-5y &> 10 && \text{Divide both sides by } -5. \\
\frac{-5y}{-5} &< \frac{10}{-5} && \text{Divide by neg., reverse inequality.} \\
y &< -2
\end{aligned}
$$

Using interval notation, the answer is written as $(-\infty,-2)$.

Using a number line:

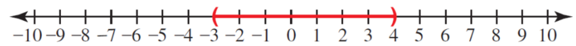


75.

$$
\begin{aligned}
&-3<2x+3<11 && \text{Isolate } x. \\
&\underline{-3 \qquad -3\;\; -3} && \text{Subtract 3 from all sides.} \\
&-6<2x<8 && \text{Divide all sides by 2.} \\
&\frac{-6}{2}<\frac{2x}{2}<\frac{8}{2} \\
&-3<x<4
\end{aligned}
$$

The solution in interval notation is $(-3,4)$.

Using a number line:

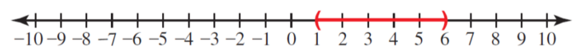


76.

$$
\begin{aligned}
&-1<5x-6<24 && \text{Isolate } x. \\
&\underline{+6 \qquad +6\;\; +6} && \text{Add 6 to all sides.} \\
&5<5x<30 && \text{Divide all sides by 5.} \\
&\frac{5}{5}<\frac{5x}{5}<\frac{30}{5} \\
&1<x<6
\end{aligned}
$$

The solution in interval notation is $(1,6)$.

Using a number line:

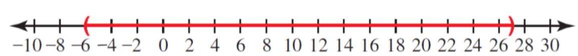


77.

$$
\begin{aligned}
&-2<\frac{x}{3}<9 && \text{Isolate } x. \\
&(3)-2<(3)\frac{x}{3}<9(3) && \text{Multiply each side by 3.} \\
&-6<x<27 \\
&-2\overset{?}{<}\frac{(3)}{3}\overset{?}{<}9 && \text{Check direction using a number between } -6 \text{ and } 27. \\
&-2<1<9 && \text{The direction of the inequality symbols works.}
\end{aligned}
$$

The solution in interval notation is $(-6,27)$.

Using a number line:

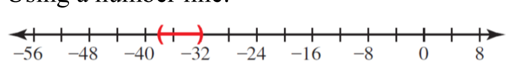


78.

$$
\begin{aligned}
&-8<\frac{y}{2}+11<-5 && \text{Isolate } x. \\
&\underline{-11 \qquad -11\;\; -11} && \text{Subtract 11 from all sides.} \\
&-19<\frac{y}{2}<-16 \\
&(2)(-19)<(2)\frac{y}{2}<-16(2) && \text{Multiply each side by 2.} \\
&-38<y<-32
\end{aligned}
$$

The solution in interval notation is $(-38,-32)$.

Using a number line:

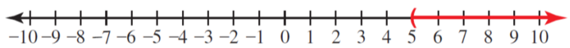


79. The graph of the interval $[-3, \infty)$ is below:

The values that are shown start at -3, include -3, and all numbers greater than -3.

This is equivalent to the inequality $x \ge -3$.

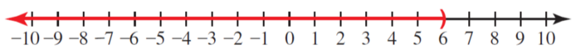
80. The graph of the interval $(5, \infty)$ is below:



The values shown start at 5, do not include 5, and include all numbers greater than 5.

This is equivalent to the inequality $x > 5$.

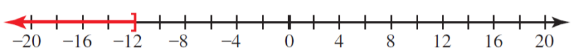
81. The graph of the interval $(-\infty, 6)$ is below:



The values that are shown start at 6, do not include 6, and include all numbers less than 6.

This is equivalent to the inequality $x < 6$.

82. The graph of the interval $(-\infty, -12]$ is below:



The values that are shown start at -12, include -12, and all numbers less than -12.

This is equivalent to the inequality $x \le -12$.

83. If $-6 > x$, then x must be less than -6. This means we can rewrite the inequality as $x < -6$.

84. If $0 \le y$, then y must be greater than or equal to 0. This means we can rewrite the inequality as $y \ge 0$.

85. $80n - 2400 > 0$ Isolate variable term.

$$\underline{\quad +2400 \; +2400} \quad \text{Add 2400 to both sides.}$$

$$80n > 2400$$

$$\frac{\cancel{80}n}{\cancel{80}} > \frac{2400}{80} \quad \text{Divide both sides by 80.}$$

$$n > 30$$

Kiano must sell more than 30 stained-glass windows in order to make a profit.

86. $32.49d + 21.65 \le 119.12$ Isolate variable term.

$$\underline{\quad -21.65 \; -21.65} \quad \text{Subtract 21.65 from both sides.}$$

$$32.49d \le 97.47$$

$$\frac{\cancel{32.49}d}{\cancel{32.49}} \le \frac{97.47}{32.49} \quad \text{Divide both sides by 32.49.}$$

$$d \le 3$$

Jessie can rent a car for 3 days or less.

87. **a.** The inequality that represents Karyn keeping the bartending bill at the wedding to at most $235 is: $135 + 40h \le 235$, where h is the number of hours after 3 hours that the bartender is working at the wedding.

b.

$$135 + 40h \le 235 \quad \text{Isolate variable term.}$$

$$\underline{-135 \qquad -135} \quad \text{Subtract 135 from both sides.}$$

$$40h \le 100$$

$$\frac{\cancel{40}h}{\cancel{40}} \le \frac{100}{40} \quad \text{Divide both sides by 40.}$$

$$h \le 2.5$$

Karyn can have the bartender work no more than 2.5 hours past the first 3 hours.

88. **a.** Add the costs in an inequality less than or equal to 65.

$$50 + 1.5m \le 65$$

b. $50 + 1.5m \le 65$ Isolate variable term.

$$\underline{-50 \qquad -50} \quad \text{Subtract 50 from both sides.}$$

$$1.5m \le 15$$

$$\frac{\cancel{1.5}m}{\cancel{1.5}} \le \frac{15}{1.5} \quad \text{Divide both sides by 1.5.}$$

$$m \le 10$$

Trey can have the TV delivered and stay within his budget for the delivery charge if he lives 10 miles or less from the store.

Chapter 2 Test

1. To check if the given value of the variable is a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 5b+8=2 & \text{Original equation.} \\ 5(-2)+8\overset{?}{=}2 & \text{Substitute } b=-2. \\ -10+8\overset{?}{=}2 & \text{Simplify both sides.} \\ -2\overset{?}{=}2 & \text{This statement is not true.} \\ -2\neq 2 & \end{array}$$

Because the final results are not equal, $b=-2$ is not a solution to the equation $5b+8=2$.

2. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} d=70t & \text{Original equation.} \\ 294\overset{?}{=}70(4.2) & \text{Substitute values for } d \text{ and } t. \\ 294=294 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $t=4.2$ and $d=294$ is a solution to the equation $d=70t$.

3.

$$\begin{array}{ll} -5+\boxed{x}=-17 & \text{Identify the variable term.} \\ \underline{+5 \qquad\quad +5} & \text{Add 5 to both sides.} \\ x=-12 & \end{array}$$

$$\begin{array}{ll} -5+(-12)\overset{?}{=}-17 & \text{Check the answer.} \\ -17=-17 & \text{The answer works.} \end{array}$$

4. To solve for c means to isolate c on one side of the equal sign.

$$\begin{array}{ll} P=a+b+\boxed{c} & \text{Identify the variable term to isolate.} \\ \underline{-a-b \quad -a-b} & \text{Subtract } a \text{ and } b \text{ from both sides.} \end{array}$$

$$P-a-b=c \text{ or } c=P-a-b$$

5. Using the equation $P=R-C$ substitute $R=250000$ for the revenue, $C=88000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P=R-C & \text{Given equation.} \\ P=(250000)-(88000) & \text{Substitute value of variables.} \\ P=162000 & \text{Simplify on right side.} \end{array}$$

The solution is $P=162000$ which represents that the company has monthly profit of $162,000.

6.

$$\begin{array}{ll} -5w=450 & \text{Variable term is isolated.} \\ \dfrac{-5w}{-5}=\dfrac{450}{-5} & \text{Divide both sides by } -5. \\ w=-90 & \end{array}$$

$$\begin{array}{ll} -5(-90)\overset{?}{=}450 & \text{Check the answer.} \\ 450=450 & \text{The answer works.} \end{array}$$

7.

$$\begin{array}{ll} \boxed{-4p}+25=-119 & \text{Identify variable term to isolate.} \\ \underline{\quad -25 \quad -25} & \text{Subtract 25 from both sides.} \\ -4p=-144 & \\ \dfrac{-4p}{-4}=\dfrac{-14}{-4} & \text{Divide both sides by } -4. \\ p=36 & \end{array}$$

$$\begin{array}{ll} -4(36)+25\overset{?}{=}-119 & \text{Check the answer.} \\ -144+25\overset{?}{=}-119 & \\ -119=-119 & \text{The answer works.} \end{array}$$

8.

$$\begin{array}{ll} \boxed{\dfrac{x}{3}}+7=-5 & \text{Identify variable term to isolate.} \\ \underline{\quad -7 \quad -7} & \text{Subtract 7 from both sides.} \\ \dfrac{x}{3}=-12 & \\ 3\cdot\dfrac{x}{3}=-12\cdot 3 & \text{Multiply both sides by 3.} \\ x=-36 & \end{array}$$

$$\begin{array}{ll} \dfrac{(-36)}{3}+7\overset{?}{=}-5 & \text{Check the answer.} \\ -12+7\overset{?}{=}-5 & \\ -5=-5 & \text{The answer works.} \end{array}$$

9.

$$\begin{array}{ll} 4(x+4)-5=4x+11 & \text{Distribute-left side.} \\ 4x+16-5=4x+11 & \text{Simplify on left side.} \\ 4x+11=4x+11 & \\ \underline{-4x \qquad -4x} & \text{Subtract } 4x \text{ from both sides.} \\ 11=11 & \text{This is a true statement.} \end{array}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -6 and 10, and substitute these into the equation.

Check the answer using -6.

$$4([-6]+4)-5\overset{?}{=}4(-6)+11$$
$$4(-2)-5\overset{?}{=}-24+11$$
$$-8-5\overset{?}{=}-13$$
$$-13=-13 \quad \text{The answer works.}$$

Check the answer using 10.

$$4([10]+4)-5\overset{?}{=}4(10)+11$$
$$4(14)-5\overset{?}{=}40+11$$
$$56-5\overset{?}{=}51$$
$$51=51 \quad \text{The answer works.}$$

10.

$$3x+20=20+3(x-5) \quad \text{Distribute on right side.}$$
$$3x+20=20+3x-15 \quad \text{Simplify on right side.}$$
$$3x+20=3x+5$$
$$\underline{-3x \qquad -3x} \quad \text{Subtract } 3x \text{ from both sides.}$$
$$20\overset{?}{=}5 \quad \text{This is a false statement.}$$

This equation has no solution.

11. Recall that the perimeter of a rectangle can be calculated using the formula $P=2l+2w$ where P is the perimeter of the rectangle with length, l, and width, w. We are given the perimeter and width of the rectangular lot, so substitute $P=330$ and $w=40$. After substituting in these values, solve the equation for l.

$$330=2l+2(40) \quad \text{Substitute in known values.}$$
$$330=\boxed{2l}+80 \quad \text{Simplify and isolate variable term.}$$
$$\underline{-80 \qquad -80} \quad \text{Subtract 80 from both sides.}$$
$$250=2l \quad \text{Divide both sides by 2.}$$
$$\frac{250}{2}=\frac{2l}{2}$$
$$125=l$$

$$330\overset{?}{=}2(125)+80 \quad \text{Check the answer.}$$
$$330\overset{?}{=}250+80$$
$$330=330 \quad \text{The answer works.}$$

The length of the building lot is 125 feet.

12. To solve for x means to isolate x on one side of the equal sign.

$$y=m\boxed{x}+b \quad \text{Identify the variable to isolate.}$$
$$\underline{-b \qquad -b} \quad \text{Subtract } b \text{ from both sides.}$$
$$y-b=mx \quad \text{Divide both sides by } m.$$
$$\frac{y-b}{m}=\frac{\cancel{m}x}{\cancel{m}}$$
$$\frac{y-b}{m}=x$$

13. Let $x=$ a number. The sentence translates as follows

$$4x+7=-17$$

Solve:

$$4x+7=-17$$
$$\underline{\quad -7 \quad -7} \quad \text{Subtract 7 from both sides.}$$
$$4x=-24$$
$$\frac{4x}{4}=\frac{-24}{4} \quad \text{Divide both sides by 4.}$$
$$x=-6$$

$$4(-6)+7\overset{?}{=}-17 \quad \text{Check the answer.}$$
$$-24+7\overset{?}{=}-17$$
$$-17=-17 \quad \text{The answer works.}$$

14.

$$10x-15=7x-9$$
$$\underline{-7x \qquad -7x} \quad \text{Subtract } 7x \text{ from both sides.}$$
$$3x-15=-9$$
$$\underline{\quad +15 \quad +15} \quad \text{Add 15 to both sides.}$$
$$3x=6$$
$$\frac{3x}{3}=\frac{6}{3} \quad \text{Divide both sides by 3.}$$
$$x=2$$

$$10(2)-15\overset{?}{=}7(2)-9 \quad \text{Check the answer.}$$
$$20-15\overset{?}{=}14-9$$
$$5=5 \quad \text{The answer works.}$$

15.

$$4x+3=4(x-1)+7 \quad \text{Distribute-right side.}$$
$$4x+3=4x-4+7 \quad \text{Simplify on right side.}$$
$$4x+3=4x+3$$
$$\underline{-4x \quad -4x} \quad \text{Subtract } 4x \text{ from both sides.}$$
$$3=3 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this, we will randomly choose two real numbers -2 and 7, and substitute these into the equation.

Check the answer using -2.

$$4(-2)+3\stackrel{?}{=}4([-2]-1)+7$$
$$-8+3\stackrel{?}{=}4(-3)+7$$
$$-5\stackrel{?}{=}-12+7$$
$$-5=-5 \quad \text{The answer works.}$$

Check the answer using 7.

$$4(7)+3\stackrel{?}{=}4([7]-1)+7$$
$$28+3\stackrel{?}{=}4(6)+7$$
$$31\stackrel{?}{=}24+7$$
$$31=31 \quad \text{The answer works.}$$

16. The sum of the measures of the angles in a triangle must equal $180°$. Add the measures of the given angles and set them equal to $180°$ then solve for x.

$$x+11x+6x=180 \quad \text{Combine like terms.}$$
$$18x=180$$
$$\frac{18x}{18}=\frac{180}{18} \quad \text{Divide both sides by 18.}$$
$$x=10$$

Now substitute $x=10$ into the expressions that represent the angles to find the measure of each angle. The measures of the three angles are $10°,\ 110°,\ \text{and}\ 60°.$

To check the solution, the measures of the angles should add up to 180.

$$10°+110°+60°\stackrel{?}{=}180° \quad \text{Check the answer.}$$
$$180°=180° \quad \text{The answer works.}$$

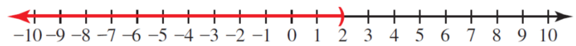
17. If $-16\le x$, then x must be greater than or equal to -16. This means we can rewrite the inequality as

$$x\ge -16$$

18.

$$2x+1>4x-3$$
$$\underline{-4x \quad\ -4x} \quad \text{Subtract } 4x \text{ from both sides.}$$
$$-2x+1>-3$$
$$\underline{\quad -1 \quad -1} \quad \text{Subtract 1 from both sides.}$$
$$-2x>-4 \quad \text{Divide both sides by } -2.$$
$$\frac{-2x}{-2}<\frac{-4}{-2} \quad \text{Multiply by neg., reverse inequality.}$$
$$x<2$$

Graphing the solution on a number line:



19.

$$5\le 2x-7\le 15 \quad \text{Isolate } x.$$
$$\underline{+7 \quad\quad +7 \quad +7} \quad \text{Add 7 to all sides.}$$
$$12\le 2x\le 22 \quad \text{Divide all sides by 2.}$$
$$\frac{12}{2}\le\frac{2x}{2}\le\frac{22}{2}$$
$$6\le x\le 11$$

20. **a.** Aiden's hourly wage, \$10.25, times the number of hours h he works in a week must be greater than \$287 in order to meet his expenses. Write the inequality as follows:

$$10.25h>287$$

b.

$$10.25h>287 \quad \text{Divide both sides by 10.25.}$$
$$\frac{10.25h}{10.25}>\frac{287}{10.25}$$
$$h>28$$

Aiden needs to work more than 28 hours a week to meet his expenses.

Cumulative Review for Chapters 1 and 2

1. The base is $\frac{9}{4}$ and we multiply $\frac{9}{4}$ by itself 6 times. So the exponent is 6. The exponential form is $\left(\frac{9}{4}\right)^6$.

$$\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}=\left(\frac{9}{4}\right)^6$$

2. The base is -4, and the exponent of 3 tells us we are multiplying -4 by itself 3 times. The expanded form is $(-4)\cdot(-4)\cdot(-4)$.

$$(-4)^3=(-4)\cdot(-4)\cdot(-4)$$

3. The base is -1 and we multiply -1 by itself 5 times.

$$(-1)\cdot(-1)\cdot(-1)\cdot(-1)\cdot(-1)=-1$$

4. The exponent on 10 is 8. Move the decimal point 8 places to the right.

$$3.045\times10^8=3.045\cdot100{,}000{,}000=304{,}500{,}000$$

Therefore, 3.045×10^8 has the standard form 304,500,000.

5. Evaluating the expression using the order of operations would be as follows:

$$\begin{aligned}
&\boxed{\frac{84}{10-6}\cdot3}\,\boxed{-2^2}\,\boxed{-(-5)}+\boxed{20\div4\cdot(-3)} && \text{Outline the terms.}\\
&=\frac{84}{10-6}\cdot3-2^2-(-5)+20\div4\cdot(-3) && \text{Simplify fraction first.}\\
&=\frac{84}{4}\cdot3-2^2-(-5)+20\div4\cdot(-3)\\
&=21\cdot3-2^2-(-5)+20\div4\cdot(-3) && \text{Evaluate exponent.}\\
&=21\cdot3-4-(-5)+20\div4\cdot(-3) && \text{Simplify within each term.}\\
&=63-4-(-5)+5\cdot(-3) && \text{Multiply in 1st term, divide in last.}\\
&=63-4+5-15 && \text{Multiply in last term.}\\
&=49 && \text{Add/subtract from left to right.}
\end{aligned}$$

6. Evaluating the expression using the order of operations would be as follows:

$$\begin{aligned}
&\boxed{18\div(-2)}+\boxed{|6-7\cdot(-2)|}+\boxed{(-3)^2} && \text{Outline the terms.}\\
&=18\div(-2)+|6+14|+(-3)^2 && \text{Evaluate absolute value.}\\
&=18\div(-2)+|20|+(-3)^2\\
&=18\div(-2)+20+9 && \text{Evaluate exponent.}\\
&=-9+20+9 && \text{Divide.}\\
&=20 && \text{Add/subtract from left to right.}
\end{aligned}$$

7. $(-16)+(3-7)=(3-7)+(-16)$

This is an example of the commutative property of addition, because the order of the terms has been changed.

8. In this problem, there are 2 quantities that can change. One quantity is the amount of money (revenue) the soccer club makes, and the second is the number of candy bars sold. Let R = the amount of revenue in dollars the soccer club makes and c = the number of candy bars sold.

9. Let x = a number. "Less than" translates as subtraction, but it is done in reverse order. So, this translates as something minus 7. "8 times a number" means to multiply a number by 8 so this translates as $8x$ and the sentence translates as $8x-7$.

10. Convert 95 feet to meters. First, form the unity fraction. We want to convert to the units of meters, so meters will go in the numerator. We want to convert from the units of feet, so feet will go in the denominator. There are 3.28 ft in 1 m, so the unity fraction is $\frac{1\text{ m}}{3.28\text{ ft}}$. Multiply 95 ft by this unity fraction and simplify the expression as follows.

$$\begin{aligned}
&95\text{ ft}\cdot\frac{1\text{ m}}{3.28\text{ ft}}\\
&=\frac{95\cancel{\text{ ft}}}{1}\cdot\frac{1\text{ m}}{3.28\cancel{\text{ ft}}}\\
&=\frac{95\text{ m}}{3.28}\approx28.96\text{ m}
\end{aligned}$$

Therefore, 95 feet is equal to approximately 28.96 m.

11. Evaluate $-\frac{x}{3}+7x$ for $x=-6$.

$$\begin{aligned}
&-\frac{x}{3}+7x && \text{Substitute in } x=-6.\\
&=-\frac{(-6)}{3}+7(-6) && \text{Simplify.}\\
&=\frac{6}{3}-42\\
&=2-42\\
&=-40
\end{aligned}$$

12.

Number of Biscuits for Scout	Number of Biscuits for Shadow
0	$50 - 0 = 50$
5	$50 - 5 = 45$
10	$50 - 10 = 40$
15	$50 - 15 = 35$
n	$50 - n$

To find number of dog biscuits Lisa will give to Shadow, subtract the number of biscuits given to Scout from 50 biscuits. The general variable expression is $50 - n$.

13. Identify like terms first. Then combine like terms and arrange in conventional form.

$$\boxed{\boxed{7xy}}\boxed{-3x^2}+\boxed{6x}\boxed{-9x^2}+\boxed{\boxed{8xy}}\boxed{-x}$$
$$=-12x^2+5x+15xy$$

14. Evaluate parentheses first. Then identify like terms, combine like terms, and arrange in conventional form.

$$\begin{aligned} &6x-(3x-5)+8 && \text{Evaluate parentheses.}\\ &=\boxed{6x}\boxed{-3x}+\boxed{\boxed{5}}+\boxed{\boxed{8}} && \text{Identify like terms.}\\ &=3x+13 && \text{Combine like terms.} \end{aligned}$$

15. Evaluate parentheses first. Then identify like terms, combine like terms, and arrange in conventional form.

$$\begin{aligned} &(3b-c)-(-b+7c) && \text{Evaluate parentheses.}\\ &=3b-c+b-7c && \text{Identify like terms.}\\ &=4b-8c && \text{Combine like terms.} \end{aligned}$$

16. To determine the coordinates of the points we need to find the values of the *x*- and *y*-coordinates. Beginning in the top right quadrant with the point on the *x*-axis, then following counterclockwise for the other points, the first point is located 4 units to the right of the *y*-axis, so the *x*-coordinate is $x = 4$. The point is located on the *x*-axis, so the *y*-coordinate is $y = 0$.

The coordinates of this point are $(4, 0)$.

The next point is located 1 unit to the right of the *y*-axis, so the *x*-coordinate is $x = 1$. The point is located 2 units above the *x*-axis, so the *y*-coordinate is $y = 2$.

The coordinates of this point are $(1, 2)$.

The next point is located 3 units to the left of the *y*-axis, so the *x*-coordinate is $x = -3$. The point is located 4 units above the *x*-axis, so the *y*-coordinate is $y = 4$.

The coordinates of this point are $(-3, 4)$.

The next point is located 3 units to the left of the *y*-axis, so the *x*-coordinate is $x = -3$. The point is located 5 units below the *x*-axis, so the *y*-coordinate is $y = -5$.

The coordinates of this point are $(-3, -5)$.

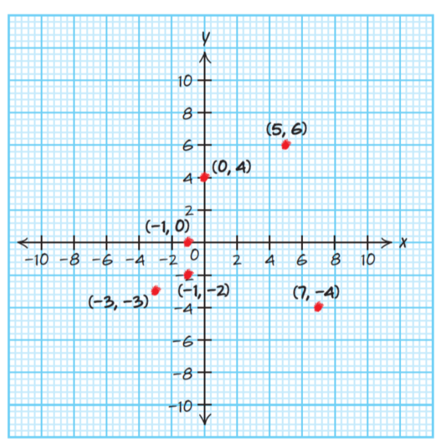
The next point is located on the *y*-axis, so the *x*-coordinate is $x = 0$. The point is located 3 units below the *x*-axis, so the *y*-coordinate is $y = -3$.

The coordinates of this point are $(0, -3)$.

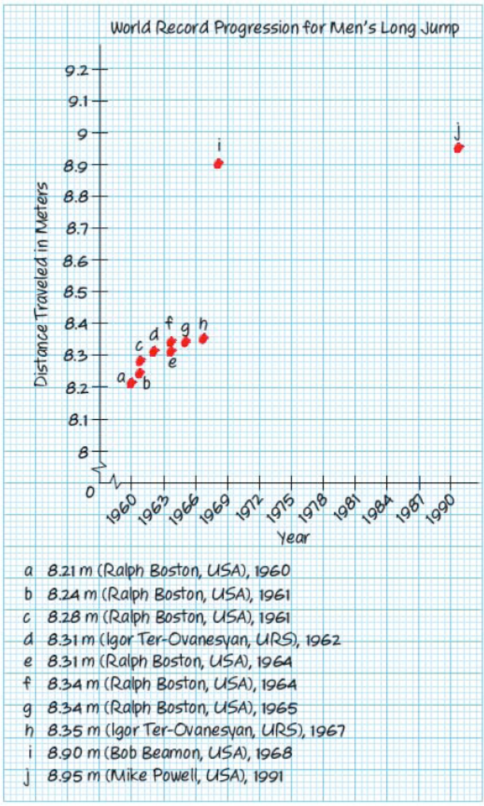
The next point is located 6 units to the right of the *y*-axis, so the *x*-coordinate is $x = 6$. The point is located 2 units below the *x*-axis, so the *y*-coordinate is $y = -2$.

The coordinates of this point are $(6, -2)$.

17. The input values range from -3 to 7. It is reasonable to scale the horizontal axis by 2's. The output values range from -3 to 6 so it will be reasonable to scale the *y*-axis by 2's. The points are plotted on the graph below.



18. A reasonable vertical axis for this data would range between 0 and 9.2 with a scale of 0.1 and a break from 0 to 8. The horizontal axis will start at 0 and end at 1990 with a scale of 3 and a break from 0 to 1960. For a scatterplot, instead of using a bar to represent the height, use a large dot. This scatterplot should have a title and would be as follows:



19. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$4x-7y=-6$	Original equation.
$4(-1.5)-7(0)\stackrel{?}{=}-6$	Substitute $x=-1.5$ and $y=0$.
$-6-0\stackrel{?}{=}-6$	Simplify both sides.
$-6=-6$	This statement is true.

Because the final statement is true, $x=-1.5$ and $y=0$ are a solution to the equation $4x-7y=-6$.

20.

$$-2+\boxed{y}=-7 \quad \text{Identify the variable term.}$$
$$\underline{+2 \qquad +2} \quad \text{Add 2 to both sides.}$$
$$y=-5$$

21.

$$\boxed{x}-\frac{1}{3}=\frac{5}{6} \quad \text{Identify the variable term.}$$
$$\underline{+\frac{1}{3} \quad +\frac{1}{3}} \quad \text{Add } \frac{1}{3} \text{ to both sides.}$$
$$x=\frac{5}{6}+\frac{2}{6} \quad \text{Find LCD} = 6.$$
$$x=\frac{7}{6} \text{ or } x=1\frac{1}{6}$$

22.

$$-0.051+\boxed{n}=4.006 \quad \text{Identify the variable term.}$$
$$\underline{+0.051 \qquad +0.051} \quad \text{Add 0.051 to both sides.}$$
$$n=4.057$$

23. We are solving for y so we want to isolate the variable y on one side of the equation.

$$3x\boxed{-5y}=-30 \quad \text{Identify variable term to isolate.}$$
$$\underline{-3x \qquad -3x} \quad \text{Subtract } 3x \text{ from both sides.}$$
$$-5\boxed{y}=-3x-30 \quad \text{Identify variable to isolate}$$
$$\frac{-5y}{-5}=\frac{-3x-30}{-5} \quad \text{Divide both sides by} -5.$$
$$y=\frac{-3x}{-5}-\frac{30}{-5} \quad \text{Simplify on right side.}$$
$$y=\frac{3}{5}x+6$$

24.

$$-7x=-21$$
$$\frac{-7x}{-7}=\frac{-21}{-7} \quad \text{Divide both sides by} -7.$$
$$x=3$$

25.

$$\frac{2}{3}n=-8$$
$$\frac{3}{2}\cdot\frac{2}{3}n=-8\cdot\frac{3}{2} \quad \text{Multiply both sides by } \frac{3}{2}.$$
$$n=-12$$

26.

$$-5z=7.95$$
$$\frac{-5z}{-5}=\frac{7.95}{-5} \quad \text{Divide both sides by} -5.$$
$$z=-1.59$$

27. **a.** Substitute $h=120$ into the equation $S=16h$ and solve for S.

$$\begin{aligned} S &= 16h && \text{Given equation.} \\ S &= 16(120) && \text{Substitute } h=120. \\ S &= 1920 && \text{Multiply and solve for } S. \end{aligned}$$

If Corinthia works 120 hours, her salary will be \$1920.

b. Substitute $S=2240$ into the equation $S=16h$ and solve for h.

$$\begin{aligned} S &= 16h && \text{Given equation.} \\ 2240 &= 16h && \text{Substitute } S=2240 \text{ and solve for } h. \\ \frac{2240}{16} &= \frac{16h}{16} && \text{Divide both sides by 16.} \\ 140 &= h \end{aligned}$$

Corinthia needs to work 140 hours in a month to make \$2240 a month.

c. Substitute $S=1600$ into the equation $S=16h$ and solve for h.

$$\begin{aligned} S &= 16h && \text{Given equation.} \\ 1600 &= 16h && \text{Substitute } S=1600 \text{ and solve for } h. \\ \frac{1600}{16} &= \frac{16h}{16} && \text{Divide both sides by 16.} \\ 100 &= h \end{aligned}$$

Corinthia needs to work 100 hours in a month if she only wants to earn \$1600 a month.

28.

$$\begin{aligned} 8y-11 &= 21 \\ +11 \quad & \; +11 && \text{Add 11 to both sides.} \\ 8y &= 32 \\ \frac{8y}{8} &= \frac{32}{8} && \text{Divide both sides by 8.} \\ y &= 4 \end{aligned}$$

29.

$$\begin{aligned} \frac{x}{5}-4 &= -9 \\ +4 \quad & \; +4 && \text{Add 4 to both sides.} \\ \frac{x}{5} &= -5 \\ 5\cdot\frac{x}{5} &= -5\cdot 5 && \text{Multiply both sides by 5.} \\ x &= -25 \end{aligned}$$

30.

$$\begin{aligned} -1.2+3.7x &= 15.45 \\ +1.2 \quad & \; +1.2 && \text{Add 1.2 to both sides.} \\ 3.7x &= 16.65 \\ \frac{3.7x}{3.7} &= \frac{16.65}{3.7} && \text{Divide both sides by 3.7.} \\ x &= 4.5 \end{aligned}$$

31. Let x = a number. The sentence translates as follows:

$$\begin{aligned} 2x+20 &= 6 \\ -20 \quad & \; -20 && \text{Subtract 20 from both sides.} \\ 2x &= -14 \\ \frac{2x}{2} &= \frac{-14}{2} && \text{Divide both sides by 8.} \\ x &= -7 \end{aligned}$$

32. Isolate the variable m.

$$\begin{aligned} P &= rg\boxed{m} && \text{Identify variable to isolate.} \\ \frac{P}{rg} &= \frac{\cancel{r}\cancel{g}m}{\cancel{r}\cancel{g}} && \text{Divide both sides by } lh. \\ \frac{P}{rg} &= m \end{aligned}$$

33. Isolate the variable y.

$$\begin{aligned} 6x\boxed{-3y} &= -30 && \text{Identify variable term to isolate.} \\ -6x \quad & \; -6x && \text{Subtract } 6x \text{ from both sides.} \\ -3\boxed{y} &= -6x-30 && \text{Identify variable to isolate} \\ \frac{-3y}{-3} &= \frac{-6x-30}{-3} && \text{Divide both sides by } -3. \\ y &= \frac{-6x}{-3}-\frac{30}{-3} && \text{Simplify on right side.} \\ y &= 2x+10 \end{aligned}$$

34. Let x = a number. The sentence translates as follows:

$$\begin{aligned} 2x+8 &= 4x-18 \\ -4x \quad & \; -4x && \text{Subtract } 4x \text{ from both sides.} \\ -2x+8 &= -18 \\ -8 \quad & \; -8 && \text{Subtract 8 from both sides.} \\ -2x &= -26 \\ \frac{-2x}{-2} &= \frac{-26}{-2} && \text{Divide both sides by } -2. \\ x &= 13 \end{aligned}$$

35.

$$\begin{array}{ll} 8y+4=12y+20 & \\ \underline{-12y \quad -12y} & \text{Subtract } 12y \text{ from both sides.} \\ -4y+4=20 & \\ \underline{\quad -4 \quad -4} & \text{Subtract 4 from both sides.} \\ -4y=16 & \\ \frac{-4y}{-4}=\frac{16}{-4} & \text{Divide both sides by } -4. \\ y=-4 & \end{array}$$

36.

$$\begin{array}{ll} 7n+8=-3n+2(4n-12) & \text{Distribute on right side.} \\ 7n+8=-3n+8n-24 & \text{Simplify on right side.} \\ 7n+8=5n-24 & \\ \underline{-5n \qquad -5n} & \text{Subtract } 5n \text{ from both sides.} \\ 2n+8=-24 & \\ \underline{\quad -8 \quad -8} & \text{Subtract 8 from both sides.} \\ 2n=-32 & \\ \frac{2n}{2}=\frac{-32}{2} & \text{Divide both sides by 2.} \\ n=-16 & \end{array}$$

37.

$$\begin{array}{ll} 5w-6+3(-4w+9)=w+5 & \text{Distribute on left side.} \\ 5w-6-12w+27=w+5 & \text{Simplify on left side.} \\ -7w+21=w+5 & \\ \underline{-w \qquad -w} & \text{Subtract } w \text{ from both sides.} \\ -8w+21=5 & \\ \underline{\quad -21 \quad -21} & \text{Subtract 21 from both sides.} \\ -8w=-16 & \\ \frac{-8w}{-8}=\frac{-16}{-8} & \text{Divide both sides by } -8. \\ w=2 & \end{array}$$

38.

$$\begin{array}{ll} x+(x+18)+(x-3)=180 & \text{Combine like terms.} \\ 3x+15=180 & \\ \underline{\qquad -15 \quad -15} & \text{Subtract 15 from both sides.} \\ \frac{3x}{3}=\frac{165}{3} & \text{Divide both sides by 3.} \\ x=55 & \end{array}$$

Now substitute $x=55$ into the expressions that represent the angles to find the measure of each angle. The measures of the three angles are $55°,\ 73°,\text{ and } 52°.$

To check the solution, the measures of the angles should add up to 180.

$$\begin{array}{ll} 55°+73°+52°\overset{?}{=}180° & \text{Check the answer.} \\ 180°=180° & \text{The answer works.} \end{array}$$

39.

$$\begin{array}{ll} 6x+1>49 & \\ \underline{\quad -1 \quad -1} & \text{Subtract 1 from both sides.} \\ 6x>48 & \text{Divide both sides by 6.} \\ \frac{6x}{6}>\frac{48}{6} & \\ x>8 & \end{array}$$

40.

$$\begin{array}{ll} -\frac{1}{7}r+5\le 9 & \\ \underline{\quad -5 \quad -5} & \text{Subtract 5 from both sides.} \\ -\frac{1}{7}r\le 4 & \text{Multiply both sides by } -7. \\ -7\cdot\left(-\frac{1}{7}r\right)\ge 4\cdot(-7) & \text{Multiply by neg., reverse inequality.} \\ r\ge -28 & \end{array}$$

41.

$$\begin{array}{ll} 14<3x+5<26 & \text{Isolate } x. \\ \underline{-5 \qquad -5 \quad -5} & \text{Subtract 5 from all sides.} \\ 9<3x<21 & \text{Divide all sides by 3.} \\ \frac{9}{3}<\frac{3x}{3}<\frac{21}{3} & \\ 3<x<7 & \end{array}$$

42.

$$\begin{array}{ll} 10-\frac{3}{8}t>-4 & \\ \underline{-10 \qquad -10} & \text{Subtract 10 from both sides.} \\ -\frac{3}{8}t>-14 & \text{Multiply both sides by } -\frac{8}{3}. \\ -\frac{8}{3}\cdot\left(-\frac{3}{8}t\right)<-14\cdot\left(-\frac{8}{3}\right) & \text{Multiply by neg., reverse inequality.} \\ t<\frac{112}{3} \text{ or } t<37\frac{1}{3} & \end{array}$$

43. The English class can have between 15 students and 25 students enrolled. The maximum enrollment is 25, so we include 25 in the interval. The class must have at least 15 students, so we include 15 in the interval. Let $s=$ the number of students enrolled in the class.

$$15\le s\le 25$$

44. The upper-division courses are numbered between 200 and 400. The problem states that 200 is included in the interval, but 400 is not included. Let $n=$ the course number.

$$200\le n<400$$

CHAPTER 2 LINEAR EQUATIONS AND INEQUALITsIES WITH ONE VARIABLE

Section 2.1 Addition and Subtraction Properties of Equality

1. This is an expression. There is no equal sign.

2. This is an expression. There is no equal sign.

3. This is an equation. There is an equal sign.

4. This is an equation. There is an equal sign.

5. This is an expression. There is no equal sign.

6. This is an expression. There is no equal sign.

7. This is an equation. There is an equal sign.

8. This is an equation. There is an equal sign.

9. This is an equation. There is an equal sign.

10. This is an equation. There is an equal sign.

11. This is an expression. There is no equal sign.

12. This is an expression. There is no equal sign.

13. a. Using the given equation $S = 9.5h$ replace h with 20 and solve for S.

$$S = 9.5h$$
$$S = 9.5 \cdot 20$$
$$S = 190$$

If Joe works 20 hours in a week, his salary will be $190.00.

b. Evaluate each side of the equation and see if the two sides are equal.

$S = 9.5h$ Original equation.

$332.50 \stackrel{?}{=} 9.5(35)$ Substitute values for S and h.

$332.50 = 332.50$ This statement is true.

Because the final statement is true, $h = 35$ and $S = 332.50$ is a solution to the equation $S = 9.5h$. If Joe works 35 hours, then he will earn a salary of $332.50 for the week.

c. Evaluate each side of the equation and see if the two sides are equal.

$S = 9.5h$ Original equation.

$240 \stackrel{?}{=} 9.5(25)$ Substitute values for S and h.

$240 \neq 237.50$ The statement is not true.

Because the final results are not equal, $h = 25$ and $S = 240$ do not give a solution to the equation $S = 9.5h$. These values state that if Joe works 25 hours in a week, then his salary would be $240. These values do not make the equation true.

d. Evaluate each side of the equation and see if the two sides are equal.

$S = 9.5h$ Original equation.

$380 \stackrel{?}{=} 9.5(40)$ Substitute values for S and h.

$380 = 380$ This statement is true.

Because the final statement is true, $h = 40$ and $S = 380$ is a solution to the equation $S = 9.5h$. If Joe works 40 hours, then he will earn a salary of $380 for the week.

14. a. Using the given equation $t = 7g$ replace g with 45 and solve for t.

$$t = 7g$$
$$t = 7 \cdot 45$$
$$t = 315$$

It will take Danny 315 minutes, or 5.25 hours, to assemble 45 golf clubs.

b. Evaluate each side of the equation and see if the two sides are equal.

$t = 7g$ Original equation.

$340 \stackrel{?}{=} 7(50)$ Substitute values for t and g.

$340 \stackrel{?}{=} 350$ The statement is not true.

$340 \neq 350$

Because the final results are not equal, $g = 50$ and $t = 340$ do not give a solution to the equation $t = 7g$. These values state that if Danny assembles 50 golf clubs, then he spent 340 minutes assembling those clubs. These values do not make the equation true.

c. Evaluate each side of the equation and see if the two sides are equal.

$t = 7g$ Original equation.

$329 \stackrel{?}{=} 7(47)$ Substitute values for t and g.

$329 = 329$ This statement is true.

Because the final statement is true, $g = 47$ and $t = 329$ is a solution to the equation $t = 7g$. If Danny assembles 47 golf clubs, then he spent 329 minutes assembling those clubs.

15. a. Evaluate each side of the equation and see if the two sides are equal.

$D = 60t$ Original equation.

$240 \overset{?}{=} 60(4)$ Substitute values for D and t.

$240 = 240$ This statement is true.

Because the final statement is true, $t = 4$ and $D = 240$ is a solution to the equation $D = 60t$.

b. These values represent that 240 miles is the distance traveled when driving for 4 hours.

16. a. Evaluate each side of the equation and see if the two sides are equal.

$D = 65t$ Original equation.

$1950 \overset{?}{=} 65(30)$ Substitute values for D and t.

$1950 = 1950$ This statement is true.

Because the final statement is true, $t = 30$ and $D = 1950$ is a solution to the equation $D = 65t$.

b. These values represent that 1950 miles is the distance traveled when driving for 30 hours.

17. a. Evaluate each side of the equation and see if the two sides are equal.

$C = 2\pi r$ Original equation.

$37.7 \overset{?}{=} 2(3.14)(6)$ Substitute values for D & t.

Substitue 3.14 for π and round answer to one decimal place.

$37.7 = 37.7$ This statement is true.

Because the final statement is true, $r = 6$ and $C = 37.7$ is a solution to the equation $C = 2\pi r$.

b. These values represent that a circle with a radius of 6 has a circumference of 37.7 (rounded to one decimal place).

18. a. Evaluate each side of the equation and see if the two sides are equal.

$C = 2\pi r$ Original equation.

$163.4 \overset{?}{=} 2(\pi)(26)$ Substitute values for D & t.

Use the π button on your calculator and multiply w/o approximating.

$163.4 \overset{?}{=} 163.3628$ Round to one decimal place.

$163.4 = 163.4$ This statement is true.

Because the final statement is true, $r = 26$ and $C = 163.4$ is a solution to the equation $C = 2\pi r$.

b. These values represent that a circle with a radius of 26 has a circumference of 163.4 (rounded to one decimal place).

19. a. Evaluate each side of the equation and see if the two sides are equal.

$F = 15L$ Original equation.

$4500 \overset{?}{=} 15(300)$ Substitute values for F and L.

$4500 = 4500$ This statement is true.

Because the final statement is true, $L = 300$ and $F = 4500$ is a solution to the equation $F = 15L$.

b. These values represent that a loan of $300,000.00 would have an origination fee of $4,500.00.

20. a. Evaluate each side of the equation and see if the two sides are equal.

$F = 20L$ Original equation.

$9000 \overset{?}{=} 20(450)$ Substitute values for F and L.

$9000 = 9000$ This statement is true.

Because the final statement is true, $L = 450$ and $F = 9000$ is a solution to the equation $F = 20L$.

b. These values represent that a loan of $450,000.00 would have an origination fee of $9,000.00.

21. a. Evaluate each side of the equation and see if the two sides are equal.

$F = 10L$ Original equation.

$2000 \overset{?}{=} 10(225)$ Substitute values for F and L.

$2000 \overset{?}{=} 2250$ This statement is not true.

$2000 \neq 2250$

Because the final results are not equal, $L = 225$ and $F = 2000$ do not give a solution to the equation $F = 10L$.

b. These values state that a loan of $225,000.00 would have an origination fee of $2,000.00. These values do not make the equation true, so they do not make sense in this situation.

22. a. Evaluate each side of the equation and see if the two sides are equal.

$F = 12.5L$ Original equation.

$4500 \overset{?}{=} 12.5(400)$ Substitute values for F and L.

$4500 \overset{?}{=} 5000$ This statement is not true.

$4500 \neq 5000$

Because the final results are not equal, $L = 400$ and $F = 4500$ do not give a solution to the equation $F = 12.5L$.

b. These values state that a loan of $400,000.00 would have an origination fee of $4,500.00. These values do not make the equation true, so they do not make sense in this situation.

23. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} S = 77.8f & \text{Original equation.} \\ 155.6 \stackrel{?}{=} 77.8(2) & \text{Substitute values for } S \text{ and } f. \\ 155.6 = 155.6 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $f = 2$ and $S = 155.6$ is a solution to the equation $S = 77.8f$.

b. These values represent that it would require 155.6 cubic yards of sand to fill a volleyball court 2 feet deep.

24. a. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} S = 77.8f & \text{Original equation.} \\ 200 \stackrel{?}{=} 77.8(3) & \text{Substitute values for } S \text{ and } f. \\ 200 \stackrel{?}{=} 233.4 & \text{This statement is not true.} \\ 200 \neq 233.4 & \end{array}$$

Because the final results are not equal, $f = 3$ and $S = 200$ do not give a solution to the equation $S = 77.8f$.

b. These values state that it would require 200 cubic yards of sand to fill a volleyball court 3 feet deep. These values do not make the equation true, so they do not make sense in this situation.

25. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 2x + 8 = 30 & \text{Original equation.} \\ 2(11) + 8 \stackrel{?}{=} 30 & \text{Substitute } x = 11. \\ 22 + 8 \stackrel{?}{=} 30 & \text{Simplify both sides.} \\ 30 = 30 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = 11$ is a solution to the equation $2x + 8 = 30$.

26. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 4g + 23 = 80 & \text{Original equation.} \\ 4(10) + 23 \stackrel{?}{=} 80 & \text{Substitute } g = 10. \\ 40 + 23 \stackrel{?}{=} 80 & \text{Simplify both sides.} \\ 63 \stackrel{?}{=} 80 & \text{This statement is not true.} \\ 63 \neq 80 & \end{array}$$

Because the final results are not equal, $g = 10$ is not a solution to the equation $4g + 23 = 80$.

27. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} 7m + 15 = 10m & \text{Original equation.} \\ 7(8) + 15 \stackrel{?}{=} 10(8) & \text{Substitute } m = 8. \\ 56 + 15 \stackrel{?}{=} 80 & \text{Simplify both sides.} \\ 71 \stackrel{?}{=} 80 & \text{This statement is not true.} \\ 71 \neq 80 & \end{array}$$

Because the final results are not equal, $m = 8$ is not a solution to the equation $7m + 15 = 10m$.

28. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} -4y + 7 = -25 & \text{Original equation.} \\ -4(-6) + 7 \stackrel{?}{=} -25 & \text{Substitute } y = -6. \\ 24 + 7 \stackrel{?}{=} -25 & \text{Simplify both sides.} \\ 31 \stackrel{?}{=} -25 & \text{This statement is not true.} \\ 31 \neq -25 & \end{array}$$

Because the final results are not equal, $y = -6$ is not a solution to the equation $-4y + 7 = -25$.

29. Evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} \frac{3}{4}x - 13 = 8 & \text{Original equation.} \\ \frac{3}{4}(28) - 13 \stackrel{?}{=} 8 & \text{Substitute } x = 28. \\ 21 - 13 \stackrel{?}{=} 8 & \text{Simplify both sides.} \\ 8 = 8 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = 28$ is a solution to the equation $\frac{3}{4}x - 13 = 8$.

30. Evaluate each side of the equation and see if the two sides are equal.

$7 = \frac{-5}{3}y + \frac{1}{3}$ Original equation.

$7 \overset{?}{=} \frac{-5}{3}(-4) + \frac{1}{3}$ Substitute $y = -4$.

$7 \overset{?}{=} \frac{20}{3} + \frac{1}{3}$ Simplify both sides.

$7 \overset{?}{=} \frac{21}{3}$

$7 = 7$ This statement is true.

Because the final statement is true, $y = -4$ is a solution to the equation $7 = \frac{-5}{3}y + \frac{1}{3}$.

31. Evaluate each side of the equation and see if the two sides are equal.

$\frac{1}{2}x - 10 = \frac{-15}{2}$ Original equation.

$\frac{1}{2}(5) - 10 \overset{?}{=} \frac{-15}{2}$ Substitute $x = 5$.

$\frac{5}{2} - 10 \overset{?}{=} \frac{-15}{2}$ Simplify both sides.

$\frac{5}{2} - \frac{20}{2} \overset{?}{=} \frac{-15}{2}$

$\frac{-15}{2} = \frac{-15}{2}$ This statement is true.

Because the final statement is true, $x = 5$ is a solution to the equation $\frac{1}{2}x - 10 = \frac{-15}{2}$.

32. Evaluate each side of the equation and see if the two sides are equal.

$-1 = \frac{2}{3}x + 1$ Original equation.

$-1 \overset{?}{=} \frac{2}{3}(-3) + 1$ Substitute $x = -3$.

$-1 \overset{?}{=} -2 + 1$ Simplify both sides.

$-1 = -1$ This statement is true.

Because the final statement is true, $x = -3$ is a solution to the equation $-1 = \frac{2}{3}x + 1$.

33. Evaluate each side of the equation and see if the two sides are equal.

$0.15x + 1.2 = 1.35$ Original equation.

$0.15(1) + 1.2 \overset{?}{=} 1.35$ Substitute $x = 1$.

$0.15 + 1.2 \overset{?}{=} 1.35$ Simplify both sides.

$1.35 = 1.35$ This statement is true.

Because the final statement is true, $x = 1$ is a solution to the equation $0.15x + 1.2 = 1.35$.

34. Evaluate each side of the equation and see if the two sides are equal.

$-1.4x - 6 = -14.4$ Original equation.

$-1.4(5) - 6 \overset{?}{=} -14.4$ Substitute $x = 5$.

$-7 - 6 \overset{?}{=} -14.4$ Simplify both sides.

$-13 \overset{?}{=} -14.4$ This statement is not true.

$-13 \neq -14.4$

Because the final results are not equal, $x = 5$ is not a solution to the equation $-1.4x - 6 = -14.4$.

35. Evaluate each side of the equation and see if the two sides are equal.

$0.5t + 3.2 = 1.7$ Original equation.

$0.5(3) + 3.2 \overset{?}{=} 1.7$ Substitute $t = 3$.

$1.5 + 3.2 \overset{?}{=} 1.7$ Simplify both sides.

$4.7 \overset{?}{=} 1.7$ This statement is not true.

$4.7 \neq 1.7$

Because the final results are not equal, $t = 3$ is not a solution to the equation $0.5t + 3.2 = 1.7$.

36. Evaluate each side of the equation and see if the two sides are equal.

$-6.1 + 3y = -10.3$ Original equation.

$-6.1 + 3(1.4) \overset{?}{=} -10.3$ Substitute $y = 1.4$.

$-6.1 + 4.2 \overset{?}{=} -10.3$ Simplify both sides.

$-1.9 \overset{?}{=} -10.3$ This statement is not true.

$-1.9 \neq -10.3$

Because the final results are not equal, $y = 1.4$ is not a solution to the equation $-6.1 + 3y = -10.3$.

37. Evaluate each side of the equation and see if the two sides are equal.

$3x + 5y = 20$ Original equation.

$3(5) + 5(1) \overset{?}{=} 20$ Substitute $x = 5$ and $y = 1$.

$15 + 5 \overset{?}{=} 20$ Simplify both sides.

$20 = 20$ This statement is true.

Because the final statement is true, $x = 5$ and $y = 1$ are a solution to the equation $3x + 5y = 20$.

38. Evaluate each side of the equation and see if the two sides are equal.

$4x-9y=30$	Original equation.
$4(3)-9(-2)\stackrel{?}{=}30$	Substitute $x=3$ and $y=-2$.
$12+18\stackrel{?}{=}30$	Simplify both sides.
$30=30$	This statement is true.

Because the final statement is true, $x=3$ and $y=-2$ are a solution to the equation $4x-9y=30$.

39. Evaluate each side of the equation and see if the two sides are equal.

$-x+2y=4$	Original equation.
$-(-4)+2(0)\stackrel{?}{=}4$	Substitute $x=-4$ and $y=0$.
$4+0\stackrel{?}{=}4$	Simplify both sides.
$4=4$	This statement is true.

Because the final statement is true, $x=-4$ and $y=0$ are a solution to the equation $-x+2y=4$.

40. Evaluate each side of the equation and see if the two sides are equal.

$-3x+4y=-12$	Original equation.
$-3(0)+4(-3)\stackrel{?}{=}-12$	Substitute $x=0$ and $y=-3$.
$0-12\stackrel{?}{=}-12$	Simplify both sides.
$-12=-12$	This statement is true.

Because the final statement is true, $x=0$ and $y=-3$ are a solution to the equation $-3x+4y=-12$.

41. Evaluate each side of the equation and see if the two sides are equal.

$25m+15=10n+40$	Original equation.
$25(3)+15=10(5)+40$	Substitute $m=3$ & $n=5$.
$75+15\stackrel{?}{=}50+40$	Simplify both sides.
$90=90$	This statement is true.

Because the final statement is true, $m=3$ and $n=5$ are a solution to the equation $25m+15=10n+40$.

42. Evaluate each side of the equation and see if the two sides are equal.

$-3x+7=4y+9$	Original equation.
$-3(0)+7\stackrel{?}{=}4(-2)+9$	Substitute $x=0$ & $y=-2$.
$0+7\stackrel{?}{=}-8+9$	Simplify both sides.
$7\stackrel{?}{=}1$	This statement is not true.
$7\neq1$	

Because the final results are not equal, $x=0$ and $y=-2$ are not a solution to the equation $-3x+7=4y+9$.

43. Evaluate each side of the equation and see if the two sides are equal.

$-5x+3y=-15$	Original equation.
$-5(0)+3(5)\stackrel{?}{=}-15$	Substitute $x=0$ & $y=5$.
$0+15\stackrel{?}{=}-15$	Simplify both sides.
$15\stackrel{?}{=}-15$	This statement is not true.
$15\neq-15$	

Because the final results are not equal, $x=0$ and $y=5$ are not a solution to the equation $-5x+3y=-15$.

44. Evaluate each side of the equation and see if the two sides are equal.

$4x+3y=-12$	Original equation.
$4(-4)+3(1)\stackrel{?}{=}-12$	Substitute $x=-4$ & $y=1$.
$-16+3\stackrel{?}{=}-12$	Simplify both sides.
$-13\stackrel{?}{=}-12$	This statement is not true.
$-13\neq-12$	

Because the final results are not equal, $x=-4$ and $y=1$ are not a solution to the equation $4x+3y=-12$.

45. a. Using the equation $s+l+c=220$ substitute $s=75$ for the weight of the cargo storage system and $l=100$ for the weight of the luggage, then solve for c to find the number of pounds of other cargo you can store on the roof of the car.

$s+l+c=220$	Given equation.
$(75)+(100)+c=220$	Substitute $s=75$ & $l=100$.
$175+c=220$	Simplify on left side.
$-175 \quad -175$	Subtract 175 from both sides.
$c=45$	

The solution is $c=45$ which represents that an additional 45 lb. of other cargo could be stored on the roof of the car.

b. Using the equation $s+l+c=220$ substitute $s=75$ for the weight of the cargo storage system and $l=60$ for the weight of the luggage, then solve for c to find the number of pounds of other cargo you can store on the roof of the car.

$$\begin{array}{rll} s+l+c=220 & & \text{Given equation.} \\ (75)+(60)+c=220 & & \text{Substitute } s=75 \ \& \ l=60. \\ 135+c=220 & & \text{Simplify on left side.} \\ \underline{-135 \qquad -135} & & \text{Subtract 135 from both sides.} \\ c=85 & & \end{array}$$

The solution is $c=85$ which represents that an additional 85 lb. of other cargo could be stored on the roof of the car.

46. a. Using the equation $E=r+b+e$ substitute $E=1200$ for the amount Alex has this month for expenses, $r=600$ for rent, and $b=230$ for bills, then solve for e to find how much he has left for entertainment.

$$\begin{array}{rl} E=r+b+e & \text{Given equation.} \\ (1200)=(600)+(230)+e & \text{Substitute value of variables.} \\ 1200=830+e & \text{Simplify on right side.} \\ \underline{-830 \quad -830} & \text{Subtract 830 from both sides.} \\ 370=e & \end{array}$$

The solution is $e=370$ which represents that Alex has \$370 left for entertainment.

b. Using the equation $E=r+b+e$ substitute $E=1000$ for the amount Alex has this month for expenses, $r=600$ for rent, and $b=350$ for bills, then solve for e to find how much he has left for entertainment.

$$\begin{array}{rl} E=r+b+e & \text{Given equation.} \\ (1000)=(600)+(350)+e & \text{Substitute value of variables.} \\ 1000=950+e & \text{Simplify on right side.} \\ \underline{-950 \quad -950} & \text{Subtract 950 from both sides.} \\ 50=e & \end{array}$$

The solution is $e=50$ which represents that Alex has \$50 left for entertainment.

47. Using the equation $P=R-C$ substitute $R=47000$ for the revenue, $C=39000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P=R-C & \text{Given equation.} \\ P=(47000)-(39000) & \text{Substitute value of variables.} \\ P=8000 & \text{Simplify on right side.} \end{array}$$

The solution is $P=8000$ which represents that the company has monthly profit of \$8,000.

48. Using the equation $P=R-C$ substitute $R=180000$ for the revenue, $C=165000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P=R-C & \text{Given equation.} \\ P=(180000)-(165000) & \text{Substitute value of variables.} \\ P=15000 & \text{Simplify on right side.} \end{array}$$

The solution is $P=15000$ which represents that the company has monthly profit of \$15,000.

49. Using the equation $P=R-C$ substitute $R=38000$ for the revenue, $C=41000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P=R-C & \text{Given equation.} \\ P=(38000)-(41000) & \text{Substitute value of variables.} \\ P=-3000 & \text{Simplify on right side.} \end{array}$$

The solution is $P=-3000$ which represents that the company has monthly profit of $-\$3,000$, representing that the company is operating at a loss.

50. Using the equation $P=R-C$ substitute $R=430000$ for the revenue, $C=500000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P=R-C & \text{Given equation.} \\ P=(430000)-(500000) & \text{Substitute value of variables.} \\ P=-70000 & \text{Simplify on right side.} \end{array}$$

The solution is $P=-70000$ which represents that the company has monthly profit of $-\$70,000$, representing that the company is operating at a loss.

51. Using the equation $P=R-C$ substitute $P=4000$ for the revenue, $C=25000$ for costs, then solve for R to find the company's revenue.

$$\begin{array}{rl} P=R-C & \text{Given equation.} \\ (4000)=R-(25000) & \text{Substitute value of variables.} \\ \underline{+25000 \qquad +25000} & \text{Add 25000 to both sides.} \\ 29000=R & \end{array}$$

The solution is $R=29000$ which represents that the company would need to generate \$29,000 in revenue to earn the desired profit.

52. Using the equation $P = R - C$ substitute $P = 11000$ for the revenue, $C = 156000$ for costs, then solve for R to find the company's revenue.

$$\begin{array}{rl} P = R - C & \text{Given equation.} \\ (11000) = R - (156000) & \text{Substitute value of variables.} \\ \underline{+156000 \qquad +156000} & \text{Add 156000 to both sides.} \\ 167000 = R & \end{array}$$

The solution is $R = 167000$ which represents that the company would need to generate \$167,000 in revenue to earn the desired profit.

53.

$$\begin{array}{rl} \boxed{x} + 5 = 30 & \text{Identify the variable term.} \\ \underline{-5 \quad -5} & \text{Subtract 5 from both sides.} \\ x = 25 & \end{array}$$

$$\begin{array}{rl} (25) + 5 \stackrel{?}{=} 30 & \text{Check the answer.} \\ 30 = 30 & \text{The answer works.} \end{array}$$

54.

$$\begin{array}{rl} \boxed{w} + 12 = 28 & \text{Identify the variable term.} \\ \underline{-12 \quad -12} & \text{Subtract 5 from both sides.} \\ w = 16 & \end{array}$$

$$\begin{array}{rl} (16) + 12 \stackrel{?}{=} 28 & \text{Check the answer.} \\ 28 = 28 & \text{The answer works.} \end{array}$$

55.

$$\begin{array}{rl} \boxed{x} + 20.5 = 45 & \text{Identify the variable term.} \\ \underline{-20.5 \quad -20.5} & \text{Subtract 20.5 from both sides.} \\ x = 24.5 & \end{array}$$

$$\begin{array}{rl} (24.5) + 20.5 \stackrel{?}{=} 45 & \text{Check the answer.} \\ 45 = 45 & \text{The answer works.} \end{array}$$

56.

$$\begin{array}{rl} 4.2 + \boxed{t} = -7.3 & \text{Identify the variable term.} \\ \underline{-4.2 \qquad -4.2} & \text{Subtract 4.2 from both sides.} \\ t = -11.5 & \end{array}$$

$$\begin{array}{rl} 4.2 + (-11.5) \stackrel{?}{=} -7.3 & \text{Check the answer.} \\ -7.3 = -7.3 & \text{The answer works.} \end{array}$$

57.

$$\begin{array}{rl} \boxed{m} - 14 = 5 & \text{Identify the variable term.} \\ \underline{+14 \quad +14} & \text{Add 14 to both sides.} \\ m = 19 & \end{array}$$

$$\begin{array}{rl} (19) - 14 \stackrel{?}{=} 5 & \text{Check the answer.} \\ 5 = 5 & \text{The answer works.} \end{array}$$

58.

$$\begin{array}{rl} \boxed{k} - 8 = 22 & \text{Identify the variable term.} \\ \underline{+8 \quad +8} & \text{Add 8 to both sides.} \\ k = 30 & \end{array}$$

$$\begin{array}{rl} (30) - 8 \stackrel{?}{=} 22 & \text{Check the answer.} \\ 22 = 22 & \text{The answer works.} \end{array}$$

59.

$$\begin{array}{rl} -4 + \boxed{p} = 23 & \text{Identify the variable term.} \\ \underline{+4 \qquad +4} & \text{Add 4 to both sides.} \\ p = 27 & \end{array}$$

$$\begin{array}{rl} -4 + (27) \stackrel{?}{=} 23 & \text{Check the answer.} \\ 23 = 23 & \text{The answer works.} \end{array}$$

60.

$$\begin{array}{rl} -4 + \boxed{y} = 9 & \text{Identify the variable term.} \\ \underline{+4 \qquad +4} & \text{Add 4 to both sides.} \\ y = 13 & \end{array}$$

$$\begin{array}{rl} -4 + (13) \stackrel{?}{=} 9 & \text{Check the answer.} \\ 9 = 9 & \text{The answer works.} \end{array}$$

61.

$$\begin{array}{rl} -1 + \boxed{k} = -16 & \text{Identify the variable term.} \\ \underline{+1 \qquad +1} & \text{Add 1 to both sides.} \\ k = -15 & \end{array}$$

$$\begin{array}{rl} -1 + (-15) \stackrel{?}{=} -16 & \text{Check the answer.} \\ -16 = -16 & \text{The answer works.} \end{array}$$

62.

$$\begin{array}{rl} -3 + \boxed{w} = -9 & \text{Identify the variable term.} \\ \underline{+3 \qquad +3} & \text{Add 3 to both sides.} \\ w = -6 & \end{array}$$

$$\begin{array}{rl} -3 + (-6) \stackrel{?}{=} -9 & \text{Check the answer.} \\ -9 = -9 & \text{The answer works.} \end{array}$$

63.

$$\begin{aligned} 5 &= -3 + \boxed{x} \\ +3 &\quad +3 \\ 8 &= x \end{aligned}$$

Identify the variable term.
Add 3 to both sides.

$$5 \overset{?}{=} -3 + (8)$$

Check the answer.

$$5 = 5$$

The answer works.

64.

$$\begin{aligned} -8 &= -2 + \boxed{r} \\ +2 &\quad +2 \\ -6 &= r \end{aligned}$$

Identify the variable term.
Add 2 to both sides.

$$-8 \overset{?}{=} -2 + (-6)$$

Check the answer.

$$-8 = -8$$

The answer works.

65.

$$\begin{aligned} \boxed{a} + 0.25 &= 2.75 \\ -0.25 &\quad -0.25 \\ a &= 2.5 \end{aligned}$$

Identify the variable term.
Subtract 0.25 from both sides.

$$(2.5) + 0.25 \overset{?}{=} 2.75$$

Check the answer.

$$2.75 = 2.75$$

The answer works.

66.

$$\begin{aligned} -1.35 + \boxed{b} &= 7.60 \\ +1.35 &\quad +1.35 \\ b &= 8.95 \end{aligned}$$

Identify the variable term.
Add 1.35 to both sides.

$$-1.35 + (8.95) \overset{?}{=} 7.60$$

Check the answer.

$$7.60 = 7.60$$

The answer works.

67.

$$\begin{aligned} \frac{3}{2} &= \frac{1}{2} + \boxed{x} \\ -\frac{1}{2} &\quad -\frac{1}{2} \\ \frac{2}{2} &= x \\ 1 &= x \end{aligned}$$

Identify the variable term.
Subtract $\frac{1}{2}$ from both sides.

$$\frac{3}{2} \overset{?}{=} \frac{1}{2} + 1$$

Check the answer.

$$\frac{3}{2} \overset{?}{=} \frac{1}{2} + \frac{2}{2}$$

$$\frac{3}{2} = \frac{3}{2}$$

The answer works.

68.

$$\begin{aligned} \frac{5}{3} &= -\frac{1}{3} + \boxed{y} \\ +\frac{1}{3} &\quad +\frac{1}{3} \\ \frac{6}{3} &= y \\ 2 &= y \end{aligned}$$

Identify the variable term.
Add $\frac{1}{3}$ to both sides.

$$\frac{5}{3} \overset{?}{=} -\frac{1}{3} + (2)$$

Check the answer.

$$\frac{5}{3} \overset{?}{=} -\frac{1}{3} + \frac{6}{3}$$

$$\frac{5}{3} = \frac{5}{3}$$

The answer works.

69.

$$\begin{aligned} \boxed{m} + \frac{2}{3} &= \frac{7}{3} \\ -\frac{2}{3} &\quad -\frac{2}{3} \\ m &= \frac{5}{3} \end{aligned}$$

Identify the variable term.
Subtract $\frac{2}{3}$ from both sides.

$$\left(\frac{5}{3}\right) + \frac{2}{3} \overset{?}{=} \frac{7}{3}$$

Check the answer.

$$\frac{7}{3} = \frac{7}{3}$$

The answer works.

70.

$$\begin{aligned} \boxed{t} - \frac{9}{5} &= \frac{6}{5} \\ +\frac{9}{5} &\quad +\frac{9}{5} \\ t &= \frac{15}{5} \\ t &= 3 \end{aligned}$$

Identify the variable term.
Add $\frac{9}{5}$ to both sides.

$$(3) - \frac{9}{5} \overset{?}{=} \frac{6}{5}$$

Check the answer.

$$\frac{15}{5} - \frac{9}{5} = \frac{6}{5}$$

$$\frac{6}{5} = \frac{6}{5}$$

The answer works.

71.

$$\frac{4}{9}+\boxed{m}=\frac{5}{9}$$ Identify the variable term.

$$-\frac{4}{9}\qquad -\frac{4}{9}$$ Subtract $\frac{4}{9}$ from both sides.

$$m=\frac{1}{9}$$

$$\frac{4}{9}+\left(\frac{1}{9}\right)\stackrel{?}{=}\frac{5}{9}$$ Check the answer.

$$\frac{5}{9}=\frac{5}{9}$$ The answer works.

72.

$$\frac{1}{3}+\boxed{y}=\frac{5}{3}$$ Identify the variable term.

$$-\frac{1}{3}\qquad -\frac{1}{3}$$ Subtract $\frac{1}{3}$ from both sides.

$$y=\frac{4}{3}$$

$$\frac{1}{3}+\left(\frac{4}{3}\right)\stackrel{?}{=}\frac{5}{3}$$ Check the answer.

$$\frac{5}{3}=\frac{5}{3}$$ The answer works.

73.

$$5+\boxed{x}=14$$ Identify the variable term.

$$-5\qquad -5$$ Subtract 5 from both sides.

$$x=9$$

$$5+(9)\stackrel{?}{=}14$$ Check the answer.

$$14=14$$ The answer works.

74.

$$7+\boxed{z}=5$$ Identify the variable term.

$$-7\qquad -7$$ Subtract 7 from both sides.

$$z=-2$$

$$7+(-2)\stackrel{?}{=}5$$ Check the answer.

$$5=5$$ The answer works.

75.

$$\boxed{d}-1.75=6.5$$ Identify the variable term.

$$+1.75\quad +1.75$$ Add 1.75 to both sides.

$$d=8.25$$

$$(8.25)-1.75\stackrel{?}{=}6.5$$ Check the answer.

$$6.5=6.5$$ The answer works.

76.

$$-2.8+\boxed{k}=12.3$$ Identify the variable term.

$$+2.8\qquad +2.8$$ Add 2.8 to both sides.

$$k=15.1$$

$$-2.8+(15.1)\stackrel{?}{=}12.3$$ Check the answer.

$$12.3=12.3$$ The answer works.

77.

$$-1.3+\boxed{x}=-4.7$$ Identify the variable term.

$$+1.3\qquad +1.3$$ Add 1.3 to both sides.

$$x=-3.4$$

$$-1.3+(-3.4)\stackrel{?}{=}-4.7$$ Check the answer.

$$-4.7=-4.7$$ The answer works.

78.

$$13.5=-7.8+\boxed{y}$$ Identify the variable term.

$$+7.8\quad +7.8$$ Add 7.8 to both sides.

$$21.3=y$$

$$13.5\stackrel{?}{=}-7.8+(21.3)$$ Check the answer.

$$13.5=13.5$$ The answer works.

79.

$$\frac{2}{5}+\boxed{x}=\frac{3}{7}$$ Identify the variable term.

$$-\frac{2}{5}\qquad -\frac{2}{5}$$ Subtract $\frac{2}{5}$ from both sides.

$$x=\frac{3}{7}-\frac{2}{5}$$ Find LCD = 35.

$$x=\frac{15}{35}-\frac{14}{35}$$ Rewrite over LCD.

$$x=\frac{1}{35}$$

$$\frac{2}{5}+\left(\frac{1}{35}\right)\stackrel{?}{=}\frac{3}{7}$$ Check the answer.

$$\frac{14}{35}+\frac{1}{35}\stackrel{?}{=}\frac{3}{7}$$ Find LCD = 35.

$$\frac{15}{35}\stackrel{?}{=}\frac{3}{7}$$ Reduce on left side.

$$\frac{3}{7}=\frac{3}{7}$$ The answer works.

80.

$$\frac{1}{2}+\boxed{x}=\frac{2}{3}$$ Identify the variable term.

$$-\frac{1}{2}\qquad -\frac{1}{2}$$ Subtract $\frac{1}{2}$ from both sides.

$$x=\frac{2}{3}-\frac{1}{2}$$ Find LCD = 6.

$$x=\frac{4}{6}-\frac{3}{6}$$ Rewrite over LCD.

$$x=\frac{1}{6}$$

$\frac{1}{2}+\left(\frac{1}{6}\right)\stackrel{?}{=}\frac{2}{3}$ Check the answer.

$\frac{3}{6}+\frac{1}{6}\stackrel{?}{=}\frac{2}{3}$ Find LCD = 6.

$\frac{4}{6}\stackrel{?}{=}\frac{2}{3}$ Reduce on left side.

$\frac{2}{3}=\frac{2}{3}$ The answer works.

81.

$\frac{4}{5}+\boxed{y}=\frac{3}{10}$ Identify the variable term.

$-\frac{4}{5}\qquad -\frac{4}{5}$ Subtract $\frac{4}{5}$ from both sides.

$y=\frac{3}{10}-\frac{4}{5}$ Find LCD = 10.

$x=\frac{3}{10}-\frac{8}{10}$ Rewrite over LCD.

$x=-\frac{5}{10}$ Reduce.

$x=-\frac{1}{2}$

$\frac{4}{5}+\left(-\frac{1}{2}\right)\stackrel{?}{=}\frac{3}{10}$ Check the answer.

$\frac{8}{10}-\frac{5}{10}\stackrel{?}{=}\frac{3}{10}$ Find LCD = 10.

$\frac{3}{10}=\frac{3}{10}$ The answer works.

82.

$\frac{6}{11}+\boxed{a}=\frac{1}{22}$ Identify the variable term.

$-\frac{6}{11}\qquad -\frac{6}{11}$ Subtract $\frac{6}{11}$ from both sides.

$a=\frac{1}{22}-\frac{6}{11}$ Find LCD = 22.

$a=\frac{1}{22}-\frac{12}{22}$ Rewrite over LCD.

$x=-\frac{11}{22}$ Reduce.

$x=-\frac{1}{2}$

$\frac{6}{11}+\left(-\frac{1}{2}\right)\stackrel{?}{=}\frac{1}{22}$ Check the answer.

$\frac{12}{22}-\frac{11}{22}\stackrel{?}{=}\frac{1}{22}$ Find LCD = 22.

$\frac{1}{22}=\frac{1}{22}$ The answer works.

83.

$P=\boxed{R}-C$ Identify the variable term to isolate.

$+C\qquad +C$ Add C to both sides.

$C+P=R$ or $R=C+P$

84.

$S=\boxed{P}-D$ Identify the variable term to isolate.

$+D\qquad +D$ Add D to both sides.

$D+S=P$ or $P=D+S$

85.

$s+\boxed{l}+c=220$ Identify the variable term to isolate.

$-s\qquad -s$ Subtract s from both sides.

$l+c=220-s$

$-c\qquad -c$ Subtract c from both sides.

$l=220-c-s$

86.

$R=\boxed{C}+M$ Identify the variable term to isolate.

$-M\qquad -M$ Subtract M from both sides.

$R-M=C$ or $C=R-M$

87.

$\boxed{A}+B+90^\circ=180^\circ$ Identify the variable term to isolate.

$-B\qquad -B$ Subtract B from both sides.

$A+90^\circ=180^\circ-B$

$-90^\circ\qquad -90^\circ$ Subtract 90 from both sides.

$A=90^\circ-B$

88.

$A+B+\boxed{C}+D=360^\circ$ Identify the variable term to isolate.

$-A\qquad -A$ Subtract A from both sides.

$B+C+D=360^\circ-A$

$-B\qquad -B$ Subtract B from both sides.

$C+D=360^\circ-A-B$

$-D\qquad -D$ Subtract D from both sides.

$C=360^\circ-A-B-D$

89.

$T=45+\boxed{M}$ Identify the variable term to isolate.

$-45\quad -45$ Subtract 45 from both sides.

$T-45=M$ or $M=T-45$

90.

$$\begin{array}{ll} g=3f+\boxed{h} & \text{Identify the variable term to isolate.} \\ \underline{-3f\ \ -3f} & \text{Subtract } 3f \text{ from both sides.} \end{array}$$

$g-3f=h$ or $h=g-3f$

91.

$$\begin{array}{ll} x+\boxed{y}=-4 & \text{Identify the variable term to isolate.} \\ \underline{-x \qquad -x} & \text{Subtract } x \text{ from both sides.} \\ y=-x-4 & \end{array}$$

92.

$$\begin{array}{ll} 2x+\boxed{y}=7 & \text{Identify the variable term to isolate.} \\ \underline{-2x \qquad -2x} & \text{Subtract } x \text{ from both sides.} \\ y=-2x+7 & \end{array}$$

93.

$$\begin{array}{ll} D+10=3F+\boxed{G}-20 & \text{Identify variable term to isolate.} \\ \underline{-3F \qquad -3F} & \text{Subtract } 3F \text{ from both sides.} \\ D-3F+10=\boxed{G}-20 & \\ \underline{\qquad +20 \qquad +20} & \text{Add 20 to both sides.} \end{array}$$

$D-3F+30=G$ or $G=D-3F+30$

94.

$$\begin{array}{ll} 5a-8=\boxed{b}+2c+15 & \text{Identify variable term to isolate.} \\ \underline{-2c-15 \qquad -2c-15} & \text{Subtract } 2c \text{ and 15 from both sides.} \end{array}$$

$5a-2c-23=b$ or $b=5a-2c-23$

95.

$$\begin{array}{ll} t=-3u+\boxed{w} & \text{Identify variable term to isolate.} \\ \underline{+3u \ \ +3u} & \text{Add } 3u \text{ to both sides.} \end{array}$$

$t+3u=w$ or $w=t+3u$

96.

$$\begin{array}{ll} y=-4x+\boxed{z}-20 & \text{Identify variable term to isolate.} \\ \underline{+4x+20 \ \ +4x \qquad +20} & \text{Add } 4x \text{ and 20 to both sides.} \end{array}$$

$4x+y+20=x$ or $x=4x+y+20$

97.

$$\begin{array}{ll} P=a+b+c & \text{Identify variable term to isolate.} \\ \underline{-a-c \ \ -a \quad -c} & \text{Subtract } a \text{ and } c \text{ from both sides.} \end{array}$$

$P-a-c=b$ or $b=P-a-c$

98.

$$\begin{array}{ll} P=a+b+c+d & \text{Identify variable term to isolate.} \\ \underline{-a-b-c \ \ -a-b-c} & \\ & \text{Subtract } a,\ b \text{ and } c \text{ from both sides.} \end{array}$$

$P-a-b-c=d$ or $d=P-a-b-c$

99.

$$\begin{array}{ll} 3y=\boxed{x}-5 & \text{Identify variable term to isolate.} \\ \underline{+5 \qquad +5} & \text{Add 5 to both sides.} \end{array}$$

$3y+5=x$ or $x=3y+5$

100.

$$\begin{array}{ll} -4y=\boxed{x}+9 & \text{Identify variable term to isolate.} \\ \underline{-9 \qquad -9} & \text{Subtract 9 from both sides.} \end{array}$$

$-4y-9=x$ or $x=-4y-9$

101. The statement has an equal sign therefore it is an equation.

$$\begin{array}{ll} 23=\boxed{x}+9 & \text{Identify variable term to isolate.} \\ \underline{-9 \qquad -9} & \text{Subtract 9 from both sides.} \\ 14=x & \\ x=14 & \end{array}$$

102. The statement has an equal sign therefore it is an equation.

$$\begin{array}{ll} 14+\boxed{m}=45 & \text{Identify variable term to isolate.} \\ \underline{-14 \qquad -14} & \text{Subtract 14 from both sides.} \\ m=31 & \end{array}$$

103. The statement does not have an equal sign, therefore it is an expression. Simplify:

$\boxed{5x}+7\boxed{-3x}$ Combine like terms

$2x+7$

104. The statement does not have an equal sign, therefore it is an expression. Simplify:

$\boxed{8h}\boxed{-3h}+14+\boxed{2h}$ Combine like terms

$7h+14$

105. The statement does not have an equal sign, therefore it is an expression. Simplify:

$\boxed{20a^2}+6a\boxed{-3a^2}+10$ Combine like terms

$17a^2+6a+10$

106. The statement does not have an equal sign, therefore it is an expression. Simplify:

$\boxed{-11n^2}+8\boxed{-5n^2}+7n$ Combine like terms

$-16n^2+7n+8$ Order in conventional form

107. The statement has an equal sign therefore it is an equation.

$$\begin{array}{rl} -14+\boxed{c}=-10 & \text{Identify variable term to isolate.} \\ \underline{+14 \qquad\quad +14} & \text{Add 14 to both sides.} \\ c=4 & \end{array}$$

108. The statement has an equal sign therefore it is an equation.

$$\begin{array}{rl} -16+\boxed{y}=-4 & \text{Identify variable term to isolate.} \\ \underline{+16 \qquad\quad +16} & \text{Add 16 to both sides.} \\ y=12 & \end{array}$$

109. The statement has an equal sign therefore it is an equation.

$$\begin{array}{rl} \boxed{p}-14=20 & \text{Identify variable term to isolate.} \\ \underline{+14 \quad +14} & \text{Add 14 to both sides.} \\ p=34 & \end{array}$$

110. The statement has an equal sign therefore it is an equation.

$$\begin{array}{rl} \boxed{r}-27=41 & \text{Identify variable term to isolate.} \\ \underline{+27 \quad +27} & \text{Add 27 to both sides.} \\ r=68 & \end{array}$$

Section 2.2 Multiplication and Division Properties of Equality

1. Divide both sides of the equation by 3.

$3x = -81$ Variable term is isolated.

$\frac{3x}{3} = \frac{-81}{3}$ Divide both sides by 3.

$\frac{\cancel{3}x}{\cancel{3}} = -27$

$x = -27$

$3(-27) \overset{?}{=} -81$ Check the answer.

$-81 = -81$ The answer works.

2. Divide both sides of the equation by 4.

$4x = -48$ Variable term is isolated.

$\frac{4x}{4} = \frac{-48}{4}$ Divide both sides by 4.

$\frac{\cancel{4}x}{\cancel{4}} = -12$

$x = -12$

$4(-12) \overset{?}{=} -48$ Check the answer.

$-48 = -48$ The answer works.

3. Divide both sides of the equation by -10.

$-10y = -55$ Variable term is isolated.

$\frac{-10y}{-10} = \frac{-55}{-10}$ Divide both sides by -10.

$\frac{-\cancel{10}y}{-\cancel{10}} = \frac{11}{2}$

$y = 5\frac{1}{2}$

$-10\left(5\frac{1}{2}\right) \overset{?}{=} -55$ Check the answer.

$-10\left(\frac{11}{2}\right) \overset{?}{=} -55$

$-55 = -55$ The answer works.

4. Divide both sides of the equation by -6.

$-6y = -27$ Variable term is isolated.

$\frac{-6y}{-6} = \frac{-27}{-6}$ Divide both sides by -6.

$\frac{-\cancel{6}y}{-\cancel{6}} = \frac{9}{2}$

$y = 4\frac{1}{2}$

$-6\left(4\frac{1}{2}\right) \overset{?}{=} -27$ Check the answer.

$-6\left(\frac{9}{2}\right) \overset{?}{=} -27$

$-27 = -27$ The answer works.

5. Divide both sides of the equation by 7.

$7g = 91$ Variable term is isolated.

$\frac{7g}{7} = \frac{91}{7}$ Divide both sides by 7.

$\frac{\cancel{7}g}{\cancel{7}} = 13$

$g = 13$

$7(13) \overset{?}{=} 91$ Check the answer.

$91 = 91$ The answer works.

6. Divide both sides of the equation by 14.

$14k = 84$ Variable term is isolated.

$\frac{14k}{14} = \frac{84}{14}$ Divide both sides by 14.

$\frac{\cancel{14}k}{\cancel{14}} = 6$

$k = 6$

Check the answer as in problems 1-5.

7. Divide both sides of the equation by -1.

$-x = -9$ Variable term is isolated.

$\frac{-1x}{-1} = \frac{-9}{-1}$ Divide both sides by -1.

$x = 9$

Check the answer as in problems 1-5

8. Divide both sides of the equation by -1.

$17 = -n$ Variable term is isolated.

$\frac{17}{-1} = \frac{-1n}{-1}$ Divide both sides by -1.

$-17 = n$

Check the answer as in problems 1-5

9. Divide both sides of the equation by 2.8.

$42 = 2.8x$ Variable term is isolated.

$\frac{42}{2.8} = \frac{2.8x}{2.8}$ Divide both sides by 2.8.

$15 = \frac{\cancel{2.8}x}{\cancel{2.8}}$

$15 = x$

Check the answer as in problems 1-5

10. Divide both sides of the equation by 3.7.

$$3.7m = 31.45 \text{ Variable term is isolated.}$$
$$\frac{3.7m}{3.7} = \frac{31.45}{3.7} \text{ Divide both sides by 3.7.}$$
$$\frac{\cancel{3.7}m}{\cancel{3.7}} = 8.5$$
$$m = 8.5$$

Check the answer as in problems 1-5

11. Divide both sides of the equation by 6.1.

$$15.25 = 6.1n \quad \text{Variable term is isolated.}$$
$$\frac{15.25}{6.1} = \frac{6.1n}{6.1} \quad \text{Divide both sides by 6.1.}$$
$$2.5 = \frac{\cancel{6.1}n}{\cancel{6.1}}$$
$$2.5 = n$$

Check the answer as in problems 1-5

12. Divide both sides of the equation by 5.4.

$$49.68 = 5.4n \quad \text{Variable term is isolated.}$$
$$\frac{49.68}{5.4} = \frac{5.4n}{5.4} \quad \text{Divide both sides by 5.4.}$$
$$9.2 = \frac{\cancel{5.4}n}{\cancel{5.4}}$$
$$9.2 = n$$

Check the answer as in problems 1-5

13. Divide both sides of the equation by -6.

$$-6c = 42 \quad \text{Variable term is isolated.}$$
$$\frac{-6c}{-6} = \frac{42}{-6} \quad \text{Divide both sides by} -6.$$
$$\frac{-\cancel{6}c}{-\cancel{6}} = -7$$
$$c = -7$$

Check the answer as in problems 1-5

14. Divide both sides of the equation by -4.

$$-4x = 45 \quad \text{Variable term is isolated.}$$
$$\frac{-4x}{-4} = \frac{45}{-4} \quad \text{Divide both sides by} -4.$$
$$\frac{-\cancel{4}x}{-\cancel{4}} = -11\frac{1}{4}$$
$$x = -11\frac{1}{4}$$

Check the answer as in problems 1-5

15. Multiply both sides of the equation by 5.

$$\frac{t}{5} = 14 \quad \text{Variable term is isolated.}$$
$$5\left(\frac{t}{5}\right) = 5(14) \text{ Multiply both sides by 5.}$$
$$\cancel{5}\left(\frac{t}{\cancel{5}}\right) = 70$$
$$t = 70$$

Check the answer as in problems 1-5

16. Multiply both sides of the equation by 3.

$$\frac{p}{3} = 9 \quad \text{Variable term is isolated.}$$
$$3\left(\frac{p}{3}\right) = 3(9) \quad \text{Multiply both sides by 3.}$$
$$\cancel{3}\left(\frac{p}{\cancel{3}}\right) = 27$$
$$p = 27$$

Check the answer as in problems 1-5

17. Multiply both sides by the reciprocal.

$$\frac{2}{3}x = -10 \quad \text{Variable term is isolated.}$$
$$\frac{3}{2}\cdot\frac{2}{3}x = -10\cdot\frac{3}{2} \quad \text{Multiply both sides by reciprocal of } \frac{2}{3}.$$
$$\frac{\cancel{3}}{\cancel{2}}\cdot\frac{\cancel{2}}{\cancel{3}}x = \frac{-5\cdot\cancel{2}\cdot 3}{\cancel{2}} \quad \text{Divide out like factors.}$$
$$x = -15$$

Check the answer as in problems 1-5

18. Multiply both sides by the reciprocal.

$$\frac{-4}{5}x = 8 \quad \text{Variable term is isolated.}$$
$$\frac{-5}{4}\cdot\frac{-4}{5}x = 8\cdot\frac{-5}{4} \quad \text{Multiply both sides by reciprocal of } \frac{-4}{5}.$$
$$\frac{-\cancel{5}}{\cancel{4}}\cdot\frac{-\cancel{4}}{\cancel{5}}x = \frac{-5\cdot\cancel{4}\cdot 2}{\cancel{4}} \quad \text{Divide out like factors.}$$
$$x = -10$$

Check the answer as in problems 1-5

19. Multiply both sides by the reciprocal.

$$\frac{5n}{7}=\frac{-2}{5} \quad \text{Variable term is isolated.}$$

$$\frac{7}{5}\cdot\frac{5n}{7}=\frac{-2}{5}\cdot\frac{7}{5} \quad \text{Multiply both sides by reciprocal of } \frac{5}{7}.$$

$$\frac{\cancel{7}}{\cancel{5}}\cdot\frac{\cancel{5}}{\cancel{7}}n=\frac{-14}{25} \quad \text{Divide out like factors.}$$

$$x=\frac{-14}{25}$$

Check the answer as in problems 1-5

20. Multiply both sides by the reciprocal.

$$\frac{3n}{4}=\frac{-9}{5} \quad \text{Variable term is isolated.}$$

$$\frac{4}{3}\cdot\frac{3n}{4}=\frac{-9}{5}\cdot\frac{4}{3} \quad \text{Multiply both sides by reciprocal of } \frac{3}{4}.$$

$$\frac{\cancel{4}}{\cancel{3}}\cdot\frac{\cancel{3}}{\cancel{4}}n=\frac{-3\cdot\cancel{3}\cdot 4}{5\cdot\cancel{3}} \quad \text{Divide out like factors.}$$

$$n=\frac{-12}{5}$$

Check the answer as in problems 1-5

21. Multiply both sides of the equation by -3.5 .

$$\frac{k}{-3.5}=-4 \quad \text{Variable term is isolated.}$$

$$-3.5\left(\frac{k}{-3.5}\right)=-3.5(-4) \quad \text{Multiply both sides by} -3.5.$$

$$\cancel{-3.5}\left(\frac{k}{\cancel{-3.5}}\right)=14$$

$$k=14$$

Check the answer as in problems 1-5

22. Multiply both sides of the equation by -7 .

$$\frac{g}{-7}=4.6 \quad \text{Variable term is isolated.}$$

$$-7\left(\frac{g}{-7}\right)=-7(4.6) \quad \text{Multiply both sides by} -7.$$

$$\cancel{-7}\left(\frac{g}{\cancel{-7}}\right)=-32.2$$

$$g=-32.2$$

Check the answer as in problems 1-5

23. a.

$S=17h$ Given equation.

$S=17(80)$ Substitute $h=80$.

$S=1360$ Multiply & solve for S.

If Victoria works 80 hours, her salary will be \$1360.

b.

$S=17h$ Given equation.

$2040=17h$ Substitute $S=2040$ & solve for h.

$$\frac{2040}{17}=\frac{17h}{17} \quad \text{Divide both sides by 17.}$$

$$120=\frac{\cancel{17}h}{\cancel{17}}$$

$$120=h$$

Victoria has to work 120 hours to make \$2040 a month.

c.

$S=17h$ Given equation.

$700=17h$ Substitute $S=700$ & solve for h.

$$\frac{700}{17}=\frac{17h}{17} \quad \text{Divide both sides by 17.}$$

$$41.18\approx\frac{\cancel{17}h}{\cancel{17}}$$

$$41.18\approx h$$

Victoria has to work approximately 41.18 hours to earn \$700.

24. a.

$D=60t$ Given equation.

$D=60(12)$ Substitute $t=12$.

$D=720$ Multiply & solve for D.

Emily will travel 720 miles in a day if she drives for 12 hours.

b.

$D=60t$ Given equation.

$450=60t$ Substitute $D=450$.

$$\frac{450}{60}=\frac{60t}{60} \quad \text{Divide both sides by 60.}$$

$$7.5=\frac{\cancel{60}t}{\cancel{60}}$$

$$7.5=t$$

Emily will have to drive for 7.5 hours to travel 450 miles a day.

c.

$$
\begin{aligned}
D &= 60t && \text{Given equation.}\\
2450 &= 60t && \text{Substitute } D = 2450.\\
\frac{2450}{60} &= \frac{60t}{60} && \text{Divide both sides by 60.}\\
40.8\overline{3} &= \frac{\cancel{60}t}{\cancel{60}}\\
40.8\overline{3} &= t
\end{aligned}
$$

It will take Emily approximately 40.83 hours to drive the approximate 2450 miles.

25. a.

$$
\begin{aligned}
F &= 0.015L && \text{Given equation.}\\
F &= 0.015(180000) && \text{Substitute } L = 180000.\\
F &= 2700 && \text{Multiply \& solve for } F.
\end{aligned}
$$

The loan fees will be \$2700 for a loan of \$180,000.

b.

$$
\begin{aligned}
F &= 0.015L && \text{Given equation.}\\
2000 &= 0.015L && \text{Substitute } F = 2000.\\
\frac{2000}{0.015} &= \frac{0.015L}{0.015} && \text{Divide both sides by 0.015.}\\
133333.33 &\approx \frac{\cancel{0.015}L}{\cancel{0.015}}\\
133333.33 &= L
\end{aligned}
$$

Pablo can suggest a maximum loan amount of approximately \$133,333.33 to keep the fees down to only \$2000.

26. a.

$$
\begin{aligned}
B &= 429m && \text{Given equation.}\\
B &= 429(1) && \text{Substitute } m = 1.\\
B &= 429 && \text{Multiply \& solve for } B.
\end{aligned}
$$

The machine can make 429 bricks in 1 minute.

b. Convert hours to minutes (1 hour = 60 minutes) then substitute $m = 60$ into the equation $B = 429m$ and solve for B.

$$
\begin{aligned}
B &= 429m && \text{Given equation.}\\
B &= 429(60) && \text{Substitute } m = 60.\\
B &= 25740 && \text{Multiply \& solve for } B.
\end{aligned}
$$

The machine can make 25,740 bricks in 1 hour.

c.

$$
\begin{aligned}
B &= 429m && \text{Given equation.}\\
15000000 &= 429m && \text{Substitute } B = 15{,}000{,}000.\\
\frac{15000000}{429} &= \frac{429m}{429} && \text{Divide both sides by 429.}\\
34965 &\approx \frac{\cancel{429}m}{\cancel{429}}\\
34965 &\approx m
\end{aligned}
$$

It will take this machine approximately 34,965 minutes, which is approximately 24.28 days.

27. a.

$$
\begin{aligned}
D &= 18b && \text{Given equation.}\\
D &= 18(500) && \text{Substitute } b = 500.\\
D &= 9000 && \text{Multiply \& solve for } D.
\end{aligned}
$$

There will be 9000 bricks that do not meet the quality standards.

b.

$$
\begin{aligned}
D &= 18b && \text{Given equation.}\\
D &= 18(40.8) && \text{Substitute } b = 40.8.\\
D &= 734.4 && \text{Multiply \& solve for } D.
\end{aligned}
$$

Rounding to the nearest whole number, approximately 734 bricks will not meet the quality standards of the 40.8 million bricks produced in a day.

c.

$$
\begin{aligned}
D &= 18b && \text{Given equation.}\\
21600 &= 18b && \text{Substitute } D = 21600.\\
\frac{21600}{18} &= \frac{18b}{18} && \text{Divide both sides by 18.}\\
1200 &= \frac{\cancel{18}b}{\cancel{18}}\\
1200 &= b
\end{aligned}
$$

LEGO produced 1200 million (or 1.2 billion) bricks if there are 21,600 bricks that do not meet the company's quality standards.

28. a.

$$
\begin{aligned}
C &= \frac{w}{13} && \text{Given equation.}\\
C &= \frac{39}{13} && \text{Substitute } w = 39.\\
C &= 3 && \text{Divide \& solve for } C.
\end{aligned}
$$

The rated maximum capacity for a bus seat that is 39 inches wide is 3 persons.

b.

$$C = \frac{w}{13} \quad \text{Given equation.}$$
$$2 = \frac{w}{13} \quad \text{Substitute } C = 2.$$
$$13 \cdot 2 = \frac{w}{13} \cdot 13 \quad \text{Multiply both sides by 13; solve for } w.$$
$$26 = \frac{w}{\cancel{13}} \cdot \cancel{13}$$
$$26 = w$$

The smallest width would be 26 inches.

c.

$$C = \frac{w}{13} \quad \text{Given equation.}$$
$$4 = \frac{w}{13} \quad \text{Substitute } C = 4.$$
$$13 \cdot 4 = \frac{w}{13} \cdot 13 \quad \text{Multiply both sides by 13; solve for } w.$$
$$52 = \frac{w}{\cancel{13}} \cdot \cancel{13}$$
$$52 = w$$

The smallest width would be 52 inches.

d. First find the maximum capacity per seat.

Substitute $w = 39$ into the equation $C = \frac{w}{13}$ and solve for C. We know from part a that the solution is $C = 3$. Now multiply this by the total number of seats in the bus, which is 24, to find the total maximum capacity for the bus.

$$3 \cdot 24 = 72$$

The total maximum capacity is 72 people for a bus with 24 seats in it that are 39 inches wide.

29. a.

$$B = \frac{P}{60} \quad \text{Given equation.}$$
$$B = \frac{300}{60} \quad \text{Substitute } P = 300. \text{ Solve for } B.$$
$$B = 5$$

A total of 5 buses would be needed to transport 300 people.

b.

$$B = \frac{P}{60} \quad \text{Given equation.}$$
$$350 = \frac{P}{60} \quad \text{Substitute } B = 350.$$
$$60 \cdot 350 = \frac{P}{60} \cdot 60 \quad \text{Multiply both sides by 60.}$$
$$21000 = \frac{P}{\cancel{60}} \cdot \cancel{60} \quad \text{Solve for } P.$$
$$21000 = P$$

Public transportation can handle 21,000 people at a time with 350 city buses.

c.

$$B = \frac{P}{60} \quad \text{Given equation.}$$
$$600 = \frac{P}{60} \quad \text{Substitute } B = 600.$$
$$60 \cdot 600 = \frac{P}{60} \cdot 60 \quad \text{Multiply both sides by 60.}$$
$$36000 = \frac{P}{\cancel{60}} \cdot \cancel{60} \quad \text{Solve for } P.$$
$$36000 = P$$

The city can transport 36,000 people at a time with 600 school and city buses.

30. a.

$$F = 0.025L \quad \text{Given equation.}$$
$$F = 0.025(300000) \quad \text{Substitute } L = 300000.$$
$$F = 7500 \quad \text{Multiply \& solve for } F.$$

Rachel will pay $7500 in fees if her home loan is for $300,000.

b.

$$F = 0.025L \quad \text{Given equation.}$$
$$5000 = 0.025L \quad \text{Substitute } F = 5000.$$
$$\frac{5000}{0.025} = \frac{0.025L}{0.025} \quad \text{Divide both sides by 0.015.}$$
$$200000 = \frac{\cancel{0.025}L}{\cancel{0.025}}$$
$$200000 = L$$

The most Rachel can borrow through this broker is $200,000.

31. a.

$M = -237t + 3796$ Given equation.
$M = -237(6) + 3796$ Substitute $t = 6$.
$M = -1422 + 3796$ Multiply & solve for M.
$M = 2374$

The total amount of money taken out is $2374 billion.

b.

$$\begin{aligned} M &= -237t + 3796 && \text{Given equation.} \\ 1900 &= -237t + 3796 && \text{Substitute } M = 1900. \\ \underline{-3796} & \quad \underline{-3796} && \text{Isolate variable term.} \\ 1896 &= -237t \\ \frac{-1896}{-237} &= \frac{\cancel{-237}}{\cancel{-237}}t && \text{Divide both sides by } -237. \\ 8 &= t \end{aligned}$$

In the year 2008 the total amount of money in mortgages for single and multi-family homes in the United States was only $1900 billion.

32. a.

$C = 2.99 + 0.99n$ Given equation.
$C = 2.99 + 0.99(5)$ Substitute $n = 5$.
$C = 2.99 + 4.95$ Multiply & solve for C.
$C = 7.94$

The cost to ship 5 items via USPS is $7.94.

b.

$$\begin{aligned} C &= 2.99 + 0.99n && \text{Given equation.} \\ 5.96 &= 2.99 + 0.99n && \text{Substitute } C = 5.96. \\ \underline{-2.99} & \quad \underline{-2.99} && \text{Isolate variable term.} \\ 2.97 &= 0.99n \\ \frac{2.97}{0.99} &= \frac{\cancel{0.99}n}{\cancel{0.99}} && \text{Divide both sides by 0.99.} \\ 3 &= n \end{aligned}$$

Three items were shipped.

c.

$$\begin{aligned} C &= 2.99 + 0.99n && \text{Given equation.} \\ 12.89 &= 2.99 + 0.99n && \text{Substitute } C = 12.89. \\ \underline{-2.99} & \quad \underline{-2.99} && \text{Isolate variable term.} \\ 9.9 &= 0.99n \\ \frac{9.9}{0.99} &= \frac{\cancel{0.99}n}{\cancel{0.99}} && \text{Divide both sides by 0.99.} \\ 10 &= n \end{aligned}$$

Ten items were shipped.

33. a.

$f = 0.01p + 20$ Given equation.
$f = 0.01(15250) + 20$ Substitute $p = 15250$.
$f = 152.5 + 20$ Multiply & solve for f.
$f = 172.5$

The fee will be $172.50.

b.

$$\begin{aligned} f &= 0.01p + 20 && \text{Given equation.} \\ 124 &= 0.01p + 20 && \text{Substitute } f = 124. \\ \underline{-20} & \quad \underline{-20} && \text{Isolate variable term.} \\ 104 &= 0.01p \\ \frac{104}{0.01} &= \frac{\cancel{0.01}p}{\cancel{0.01}} && \text{Divide both sides by 0.01.} \\ 10400 &= p \end{aligned}$$

The final price of the log splitter was $10,400.

c.

$$\begin{aligned} f &= 0.01p + 20 && \text{Given equation.} \\ 270 &= 0.01p + 20 && \text{Substitute } f = 270. \\ \underline{-20} & \quad \underline{-20} && \text{Isolate variable term.} \\ 250 &= 0.01p \\ \frac{250}{0.01} &= \frac{\cancel{0.01}p}{\cancel{0.01}} && \text{Divide both sides by 0.01.} \\ 25000 &= p \end{aligned}$$

The final price of the tractor was $25,000.

34. a.

$C = 19.95 + 0.75n$ Given equation.
$C = 19.95 + 0.75(20)$ Substitute n = 20.
$C = 19.95 + 15$ Multiply & solve for C.
$C = 34.95$

The commission charged will be $34.95.

b.

$$\begin{aligned} C &= 19.95 + 0.75n && \text{Given equation.} \\ 94.95 &= 19.95 + 0.75n && \text{Substitute } C = 94.95. \\ \underline{-19.95} & \quad \underline{-19.95} && \text{Isolate variable term.} \\ 75 &= 0.75n \\ \frac{75}{0.75} &= \frac{\cancel{0.75}n}{\cancel{0.75}} && \text{Divide both sides by 0.75.} \\ 100 &= n \end{aligned}$$

The customer ordered 100 contracts.

c.

$$\begin{aligned} C &= 19.95 + 0.75n && \text{Given equation.} \\ 46.20 &= 19.95 + 0.75n && \text{Substitute } C = 46.20. \\ \underline{-19.95} & \quad \underline{-19.95} && \text{Isolate variable term.} \\ 26.25 &= 0.75n \\ \frac{26.25}{0.75} &= \frac{\cancel{0.75}n}{\cancel{0.75}} && \text{Divide both sides by 0.75.} \\ 35 &= n \end{aligned}$$

The customer ordered 35 contracts.

35. a.

$F = 0.25 + 0.025p$ Given equation.
$F = 0.25 + 0.025(100)$ Substitute $p = 100$.
$F = 0.25 + 2.5$ Multiply & solve for f.
$F = 2.75$

The fee for a $100 transaction is $2.75.

b.

$$\begin{aligned} F &= 0.25 + 0.025p && \text{Given equation.}\\ 9.25 &= 0.25 + 0.025p && \text{Substitute } F = 9.25.\\ -0.25 & \quad -0.25 && \text{Isolate variable term.}\\ 9 &= 0.025p \\ \frac{9}{0.025} &= \frac{\cancel{0.025}p}{\cancel{0.025}} && \text{Divide both sides by 0.025.}\\ 360 &= p \end{aligned}$$

The total transaction was $360 if the fee charged was $9.25.

c.

$$\begin{aligned} F &= 0.25 + 0.025p && \text{Given equation.}\\ 37.75 &= 0.25 + 0.025p && \text{Substitute } F = 37.75.\\ -0.25 & \quad -0.25 && \text{Isolate variable term.}\\ 37.5 &= 0.025p \\ \frac{37.5}{0.025} &= \frac{\cancel{0.025}p}{\cancel{0.025}} && \text{Divide both sides by 0.025.}\\ 1500 &= p \end{aligned}$$

The total transaction was $1500.

36. a.

$C = 1500 + 0.015p$ Given equation.
$C = 1500 + 0.015(145000)$ Substitute $p = 145000$.
$C = 1500 + 2175$ Multiply & solve for C.
$C = 3675$

The commission would be $3,675.

b.

$$\begin{aligned} C &= 1500 + 0.015p && \text{Given equation.}\\ 4875 &= 1500 + 0.015p && \text{Substitute } C = 4875.\\ -1500 & \quad -1500 && \text{Isolate variable term.}\\ 3375 &= 0.015p \\ \frac{3375}{0.015} &= \frac{\cancel{0.015}p}{\cancel{0.015}} && \text{Divide both sides by 0.015.}\\ 225000 &= p \end{aligned}$$

The sales price of the home was $225,000.

c.

$$\begin{aligned} C &= 1500 + 0.015p && \text{Given equation.}\\ 9450 &= 1500 + 0.015p && \text{Substitute } C = 9450.\\ -1500 & \quad -1500 && \text{Isolate variable term.}\\ 7950 &= 0.015p \\ \frac{7950}{0.015} &= \frac{\cancel{0.015}p}{\cancel{0.015}} && \text{Divide both sides by 0.015.}\\ 530000 &= p \end{aligned}$$

The sales price of the home was $530,000.

37.

$$\begin{aligned} \boxed{5x} + 20 &= 60 && \text{Identify variable term to isolate.}\\ -20 & \quad -20 && \text{Subtract 20 from both sides.}\\ 5x &= 40 \\ \frac{\cancel{5}x}{\cancel{5}} &= \frac{40}{5} && \text{Divide both sides by 5.}\\ x &= 8 \end{aligned}$$

$$\begin{aligned} 5(8) + 20 &\stackrel{?}{=} 60 && \text{Check the answer.}\\ 40 + 20 &\stackrel{?}{=} 60 \\ 60 &= 60 && \text{The answer works.} \end{aligned}$$

38.

$$\begin{aligned} \boxed{8m} + 34 &= 154 && \text{Identify variable term to isolate.}\\ -34 & \quad -34 && \text{Subtract 34 from both sides.}\\ 8m &= 120 \\ \frac{\cancel{8}m}{\cancel{8}} &= \frac{120}{8} && \text{Divide both sides by 8.}\\ m &= 15 \end{aligned}$$

$$\begin{aligned} 8(15) + 34 &\stackrel{?}{=} 154 && \text{Check the answer.}\\ 120 + 34 &\stackrel{?}{=} 154 \\ 154 &= 154 && \text{The answer works.} \end{aligned}$$

39.

$$\begin{aligned} \boxed{-3p} + 50 &= -85 && \text{Identify variable term to isolate.}\\ -50 & \quad -50 && \text{Subtract 50 from both sides.}\\ -3p &= -135 \\ \frac{\cancel{-3}p}{\cancel{-3}} &= \frac{-135}{-3} && \text{Divide both sides by } -3.\\ p &= 45 \end{aligned}$$

$$\begin{aligned} -3(45) + 50 &\stackrel{?}{=} -85 && \text{Check the answer.}\\ -135 + 50 &\stackrel{?}{=} -85 \\ -85 &= -85 && \text{The answer works.} \end{aligned}$$

40.

$$\begin{aligned} \boxed{-2q}+25 &= -45 && \text{Identify variable term to isolate.}\\ -25 \quad & \;\; -25 && \text{Subtract 25 from both sides.}\\ -2q &= -70 \\ \frac{\cancel{-2}q}{\cancel{-2}} &= \frac{-70}{-2} && \text{Divide both sides by } -2.\\ q &= 35 \end{aligned}$$

$$\begin{aligned} -2(35)+25 &\overset{?}{=} -45 && \text{Check the answer.}\\ -70+25 &\overset{?}{=} -45 \\ -45 &= -45 && \text{The answer works.} \end{aligned}$$

41.

$$\begin{aligned} \boxed{-2.5c}+15 &= -5 && \text{Identify variable term to isolate.}\\ -15 \quad & \;\; -15 && \text{Subtract 15 from both sides.}\\ -2.5c &= -20 \\ \frac{\cancel{-2.5}c}{\cancel{-2.5}} &= \frac{-20}{-2.5} && \text{Divide both sides by } -2.5.\\ c &= 8 \end{aligned}$$

Check the answer as in problems 37-40.

42.

$$\begin{aligned} \boxed{-6.5h}-64 &= -93.25 && \text{Identify variable term to isolate.}\\ +64 \quad & \;\; +64 && \text{Add 64 to both sides.}\\ -6.5h &= -29.25 \\ \frac{\cancel{-6.5}h}{\cancel{-6.5}} &= \frac{-29.25}{-6.5} && \text{Divide both sides by } -6.5.\\ h &= 4.5 \end{aligned}$$

Check the answer as in problems 37-40.

43.

$$\begin{aligned} \boxed{-2.3t}+20 &= 26.9 && \text{Identify variable term to isolate.}\\ -20 \quad & \;\; -20 && \text{Subtract 20 from both sides.}\\ -2.3t &= 6.9 \\ \frac{\cancel{-2.3}t}{\cancel{-2.3}} &= \frac{6.9}{-2.3} && \text{Divide both sides by } -2.3.\\ t &= -3 \end{aligned}$$

Check the answer as in problems 37-40.

44.

$$\begin{aligned} 21.2 &= \boxed{4.8k}+50 && \text{Identify variable term to isolate.}\\ -50 \quad & \qquad\quad -50 && \text{Subtract 50 from both sides.}\\ -28.8 &= 4.8k \\ \frac{-28.8}{4.8} &= \frac{\cancel{4.8}k}{\cancel{4.8}} && \text{Divide both sides by 4.8.}\\ -6 &= k \end{aligned}$$

Check the answer as in problems 37-40.

45.

$$\begin{aligned} 48 &= \boxed{12m}-30 && \text{Identify variable term to isolate.}\\ +30 \quad & \qquad\quad +30 && \text{Add 30 to both sides.}\\ 78 &= 12m \\ \frac{78}{12} &= \frac{\cancel{12}m}{\cancel{12}} && \text{Divide both sides by 12.}\\ 6.5 &= m \end{aligned}$$

Check the answer as in problems 37-40.

46.

$$\begin{aligned} -20 &= \boxed{8d}-56 && \text{Identify variable term to isolate.}\\ +56 \quad & \qquad +56 && \text{Add 56 to both sides.}\\ 36 &= 8d \\ \frac{36}{8} &= \frac{\cancel{8}d}{\cancel{8}} && \text{Divide both sides by 8.}\\ 4.5 &= d \end{aligned}$$

Check the answer as in problems 37-40.

47.

$$\begin{aligned} -251.8 &= \boxed{-8.6h}+14.8 && \text{Identify variable term to isolate.}\\ -14.8 \quad & \qquad\quad -14.8 && \text{Subtract 14.8 from both sides.}\\ -266.6 &= -8.6h \\ \frac{-266.6}{-8.6} &= \frac{\cancel{-8.6}h}{\cancel{-8.6}} && \text{Divide both sides by } -8.6.\\ 31 &= h \end{aligned}$$

Check the answer as in problems 37-40.

48.

$$\begin{aligned} -46.8 &= \boxed{-2.3y}-12.3 && \text{Identify variable term to isolate.}\\ +12.3 \quad & \qquad\quad +12.3 && \text{Add 12.3 to both sides.}\\ -34.5 &= -2.3y \\ \frac{-34.5}{-2.3} &= \frac{\cancel{-2.3}y}{\cancel{-2.3}} && \text{Divide both sides by } -2.3.\\ 15 &= y \end{aligned}$$

Check the answer as in problems 37-40.

49.

$$\begin{aligned} -134.0 &= -4.7x-16.5 && \text{Identify variable term to isolate.}\\ +16.5 \quad & \qquad\quad +16.5 && \text{Add 16.5 to both sides.}\\ -117.5 &= -4.7x \\ \frac{-117.5}{-4.7} &= \frac{\cancel{-4.7}x}{\cancel{-4.7}} && \text{Divide both sides by } -4.7.\\ 25 &= x \end{aligned}$$

Check the answer as in problems 37-40.

50.

$$\begin{aligned} \boxed{4v} - 52.2 &= -3 && \text{Identify variable term to isolate.} \\ +52.2 \quad &+52.2 && \text{Add 52.2 to both sides.} \\ 4v &= 49.2 \\ \frac{\cancel{4}v}{\cancel{4}} &= \frac{49.2}{4} && \text{Divide both sides by 4.} \\ v &= 12.3 \end{aligned}$$

Check the answer as in problems 37-40.

51.

$$\begin{aligned} \boxed{-2n} + 3.8 &= 4.85 && \text{Identify variable term to isolate.} \\ -3.8 \quad &-3.8 && \text{Subtract 3.8 from both sides.} \\ -2n &= 1.05 \\ \frac{\cancel{-2}n}{\cancel{-2}} &= \frac{1.05}{-2} && \text{Divide both sides by } -2. \\ n &= -0.525 && \text{Round answer to 2 decimal places.} \\ n &\approx -0.53 \end{aligned}$$

Check the answer as in problems 37-40.

52.

$$\begin{aligned} -5 + \boxed{2.5m} &= -16.25 && \text{Identify variable term to isolate.} \\ +5 \quad &+5 && \text{Add 5 to both sides.} \\ 2.5m &= -11.25 \\ \frac{\cancel{2.5}m}{\cancel{2.5}} &= \frac{-11.25}{2.5} && \text{Divide both sides by 2.5.} \\ m &= -4.5 \end{aligned}$$

Check the answer as in problems 37-40.

53.

$$\begin{aligned} \boxed{7m} + 8 &= 31.8 && \text{Identify variable term to isolate.} \\ -8 \quad &-8 && \text{Subtract 8 from both sides.} \\ 7m &= 23.8 \\ \frac{\cancel{7}m}{\cancel{7}} &= \frac{23.8}{7} && \text{Divide both sides by 7.} \\ m &= 3.4 \end{aligned}$$

Check the answer as in problems 37-40.

54.

$$\begin{aligned} \boxed{6k} - 56 &= -11.6 && \text{Identify variable term to isolate.} \\ +56 \quad &+56 && \text{Add 56 to both sides.} \\ 6k &= 44.4 \\ \frac{\cancel{6}k}{\cancel{6}} &= \frac{44.4}{6} && \text{Divide both sides by 6.} \\ k &= 7.4 \end{aligned}$$

Check the answer as in problems 37-40.

55.

$$\begin{aligned} \boxed{-5z} + 16 &= 32 && \text{Identify variable term to isolate.} \\ -16 \quad &-16 && \text{Subtract 16 from both sides.} \\ -5z &= 16 \\ \frac{\cancel{-5}z}{\cancel{-5}} &= \frac{16}{-5} && \text{Divide both sides by } -5. \\ z &= -3.2 \end{aligned}$$

Check the answer as in problems 37-40.

56.

$$\begin{aligned} \boxed{-4x} + 26 &= 84 && \text{Identify variable term to isolate.} \\ -26 \quad &-26 && \text{Subtract 26 from both sides.} \\ -4x &= 58 \\ \frac{\cancel{-4}x}{\cancel{-4}} &= \frac{58}{-4} && \text{Divide both sides by } -4. \\ x &= -14.5 \end{aligned}$$

Check the answer as in problems 37-40.

57.

$$\begin{aligned} \boxed{\frac{x}{4}} + 6 &= 9 && \text{Identify variable term to isolate.} \\ -6 \quad &-6 && \text{Subtract 6 from both sides.} \\ \frac{x}{4} &= 3 \\ \cancel{4} \cdot \frac{x}{\cancel{4}} &= 3 \cdot 4 && \text{Multiply both sides by 4.} \\ x &= 12 \end{aligned}$$

Check the answer as in problems 37-40.

58.

$$\begin{aligned} \boxed{\frac{t}{3}} + 14 &= -8 && \text{Identify variable term to isolate.} \\ -14 \quad &-14 && \text{Subtract 14 from both sides.} \\ \frac{t}{3} &= -22 \\ \cancel{3} \cdot \frac{t}{\cancel{3}} &= -22 \cdot 3 && \text{Multiply both sides by 3.} \\ t &= -66 \end{aligned}$$

Check the answer as in problems 37-40.

59.

$$\begin{aligned} 20.1 &= \boxed{\frac{w}{8}} + 17 && \text{Identify variable term to isolate.} \\ -17 \quad &\quad -17 && \text{Subtract 17 from both sides.} \\ 3.1 &= \frac{w}{8} \\ 8 \cdot 3.1 &= \frac{w}{\cancel{8}} \cdot \cancel{8} && \text{Multiply both sides by 8.} \\ 24.8 &= w \end{aligned}$$

Check the answer as in problems 37-40.

60.

$$-8.75 = -14 - \boxed{\frac{b}{2}} \quad \text{Identify variable term to isolate.}$$
$$\underline{+14 \qquad +14} \quad \text{Add 14 to both sides.}$$
$$5.25 = -\frac{b}{2}$$
$$-2 \cdot 5.25 = -\frac{b}{\cancel{2}} \cdot -\cancel{2} \quad \text{Multiply both sides by } -2.$$
$$-10.5 = b$$

Check the answer as in problems 37-40.

61.

$$\boxed{\frac{x}{-16}} + 5 = 2.5 \quad \text{Identify variable term to isolate.}$$
$$\underline{-5 \quad -5} \quad \text{Subtract 5 from both sides.}$$
$$\frac{x}{-16} = -2.5$$
$$\cancel{-16} \cdot \frac{x}{\cancel{-16}} = -2.5 \cdot -16 \quad \text{Multiply both sides by } -16.$$
$$x = 40$$

Check the answer as in problems 37-40.

62.

$$\boxed{\frac{s}{1.5}} - 6 = -3 \quad \text{Identify variable term to isolate.}$$
$$\underline{+6 \quad +6} \quad \text{Add 6 to both sides.}$$
$$\frac{s}{1.5} = 3$$
$$\cancel{1.5} \cdot \frac{s}{\cancel{1.5}} = 3 \cdot 1.5 \quad \text{Multiply both sides by 1.5.}$$
$$s = 4.5$$

Check the answer as in problems 37-40.

63.

$$\boxed{\frac{2x}{3}} + \frac{1}{5} = \frac{4}{5} \quad \text{Identify variable term to isolate.}$$
$$\underline{-\frac{1}{5} \quad -\frac{1}{5}} \quad \text{Subtract } \frac{1}{5} \text{ from both sides.}$$
$$\frac{2x}{3} = \frac{3}{5} \quad \text{Multiply by reciprocal of coefficient.}$$
$$\frac{\cancel{3}}{\cancel{2}} \cdot \frac{\cancel{2}x}{\cancel{3}} = \frac{3}{5} \cdot \frac{3}{2} \quad \text{Multiply both sides by } \frac{3}{2}.$$
$$x = \frac{9}{10}$$

Check the answer as in problems 37-40.

64.

$$\boxed{\frac{-5x}{7}} - \frac{2}{3} = \frac{5}{3} \quad \text{Identify variable term to isolate.}$$
$$\underline{+\frac{2}{3} \quad +\frac{2}{3}} \quad \text{Add } \frac{2}{3} \text{ to both sides.}$$
$$\frac{-5x}{7} = \frac{7}{3} \quad \text{Multiply by reciprocal of coefficient.}$$
$$-\frac{\cancel{7}}{\cancel{5}} \cdot \frac{-\cancel{5}x}{\cancel{7}} = \frac{7}{3} \cdot -\frac{7}{5} \quad \text{Multiply both sides by } -\frac{7}{5}.$$
$$x = -\frac{49}{15} \text{ or } x = -3\frac{4}{15}$$

Check the answer as in problems 37-40.

65. a. Let n = the number of items to be shipped.

Let C = the total cost in dollars for shipping.

$$C = 6.99 + 1.99n$$

b. Substitute $n = 5$ into the equation from part a, then solve for C.

$$C = 6.99 + 1.99n \quad \text{Given equation.}$$
$$C = 6.99 + 1.99(5) \quad \text{Substitute } n = 5.$$
$$C = 6.99 + 9.95 \quad \text{Simplify.}$$
$$C = 16.94$$

It costs \$16.94 to ship 5 items UPS Ground.

c. Substitute $C = 12.96$ into the equation from part a, then solve for n.

$$C = 6.99 + 1.99n \quad \text{Substitute } C = 12.96.$$
$$12.96 = 6.99 + 1.99n \quad \text{Isolate variable term.}$$
$$\underline{-6.99 \quad -6.99} \quad \text{Subtract 6.99 from both sides.}$$
$$5.97 = 1.99n \quad \text{Divide both sides by 1.99.}$$
$$\frac{5.97}{1.99} = \frac{\cancel{1.99}n}{\cancel{1.99}}$$
$$3 = n$$

A total of 3 items can be shipped UPS Ground for \$12.96.

66. a. Let n = the number of option contracts.

Let C = the commissions charged in dollars.

$$C = 10.95 + 0.75n$$

b. Substitute $n = 20$ into the equation from part a, then solve for C.

$$C = 10.95 + 0.75n \quad \text{Given equation.}$$
$$C = 10.95 + 0.75(20) \quad \text{Substitute } n = 20.$$
$$C = 10.95 + 15 \quad \text{Simplify.}$$
$$C = 25.95$$

A Silver-level customer will be charged \$25.95 for an order of 20 option contracts.

c. Substitute $C = 48.45$ into the equation from part a, then solve for n.

$$\begin{array}{rll} C = 10.95 + 0.75n & & \text{Substitute } C = 48.45. \\ 48.45 = 10.95 + 0.75n & & \text{Isolate variable term.} \\ -10.95 \quad -10.95 & & \text{Subtract 10.95 from both sides.} \\ 37.5 = 0.75n & & \text{Divide both sides by 0.75.} \\ \dfrac{37.5}{0.75} = \dfrac{\cancel{0.75}n}{\cancel{0.75}} & & \\ 50 = n & & \end{array}$$

This customer has ordered 50 option contracts.

67. a. Let c = the number of cranks to be produced. Let T = the total time in minutes it will take the machine shop to produce the cranks.

$T = 360 + 5c$

b. Substitute $c = 50$ into the equation from part a, then solve for T.

$$\begin{array}{ll} T = 360 + 5c & \text{Given equation.} \\ T = 360 + 5(50) & \text{Substitute } n = 50. \\ T = 360 + 250 & \text{Simplify.} \\ T = 610 & \end{array}$$

It will take 610 minutes, or 10 hours and 10 minutes, to produce 50 cranks.

c. Substitute $T = 1175$ into the equation from part a, then solve for c.

$$\begin{array}{rl} T = 360 + 5c & \text{Substitute } T = 1175. \\ 1175 = 360 + 5c & \text{Isolate variable term.} \\ -360 \quad -360 & \text{Subtract 360 from both sides.} \\ 815 = 5c & \text{Divide both sides by 5.} \\ \dfrac{815}{5} = \dfrac{\cancel{5}c}{\cancel{5}} & \\ 163 = c & \end{array}$$

The machine shop made 163 cranks.

68. a. Let c = the number of CDs requested. Let T = the time it takes to burn the CDs.

$T = 12c$

b. Substitute $c = 250$ into the equation from part a, then solve for T.

$$\begin{array}{ll} T = 12c & \text{Given equation.} \\ T = 12(250) & \text{Substitute } n = 250. \\ T = 3000 & \text{Simplify.} \end{array}$$

It will take Richard 3000 minutes, or 50 hours.

c. Substitute $T = 240$ (4 hours = 240 minutes) into the equation from part a, then solve for c.

$$\begin{array}{rl} T = 12c & \text{Given equation.} \\ 240 = 12c & \text{Substitute } T = 240. \\ \dfrac{240}{12} = \dfrac{\cancel{12}c}{\cancel{12}} & \text{Divide both sides by 12.} \\ 20 = c & \end{array}$$

He can create 20 CDs.

d. Substitute $T = 1800$ (6 hours = 360 minutes times 5 days) into the equation from part a, then solve for c.

$$\begin{array}{rl} T = 12c & \text{Given equation.} \\ 1800 = 12c & \text{Substitute } T = 1800. \\ \dfrac{1800}{12} = \dfrac{\cancel{12}c}{\cancel{12}} & \text{Divide both sides by 12.} \\ 150 = c & \end{array}$$

Richard can create 150 CDs in a week if he works 6 hours a day, 5 days a week.

69. Let x = "a number." "Times" means to multiply so we have $3x$, and "is" translates to "equals" so the equation is

$3x = 45$

Solve the equation as follows

$$\begin{array}{ll} 3x = 45 & \text{Divide both sides by 3.} \\ \dfrac{\cancel{3}x}{\cancel{3}} = \dfrac{45}{3} & \\ x = 15 & \end{array}$$

$$\begin{array}{rl} 3(15) \stackrel{?}{=} 45 & \text{Check the answer.} \\ 45 = 45 & \text{The answer works.} \end{array}$$

70. Let x = "a number." "Sum" means to add and we are adding 20 to 4 times a number. "Is equal to" translates to the equal sign so the equation is

$20 + 4x = 44$

Solve the equation as follows

$$\begin{array}{rl} 20 + \boxed{4x} = 44 & \text{Isolate variable term.} \\ -20 \qquad -20 & \text{Subtract 20 from both sides.} \\ 4x = 24 & \text{Divide both sides by 4.} \\ \dfrac{\cancel{4}x}{\cancel{4}} = \dfrac{24}{4} & \\ x = 6 & \end{array}$$

$$20+4(6)\stackrel{?}{=}44 \quad \text{Check the answer.}$$
$$20+24\stackrel{?}{=}44$$
$$44=44 \quad \text{The answer works.}$$

71. Recall that the perimeter of a rectangle can be calculated using the formula $P=2l+2w$ where P is the perimeter of the rectangle with length, l, and width, w. Substitute $P=56$ and $w=8$. Solve the equation for l.

$$\begin{aligned} 56&=2l+2(8) && \text{Substitute in known values.}\\ 56&=\boxed{2l}+16 && \text{Simplify \& isolate variable term.}\\ -16&\quad\ -16 && \text{Subtract 16 from both sides.}\\ 40&=2l && \text{Divide both sides by 2.}\\ \frac{40}{2}&=\frac{\cancel{2}l}{\cancel{2}}\\ 20&=l \end{aligned}$$

$$\begin{aligned} 56&\stackrel{?}{=}2(20)+16 && \text{Check the answer.}\\ 56&\stackrel{?}{=}40+16\\ 56&=56 && \text{The answer works.} \end{aligned}$$

The length of the garden is 20 feet.

72. Substitute $P=180$ and $w=30$ into the equation to find the perimeter of a rectangle. Solve the equation for l.

$$\begin{aligned} 180&=2l+2(30) && \text{Substitute in known values.}\\ 180&=\boxed{2l}+60 && \text{Simplify \& isolate variable term.}\\ -60&\quad\ -60 && \text{Subtract 60 from both sides.}\\ 120&=2l && \text{Divide both sides by 2.}\\ \frac{120}{2}&=\frac{\cancel{2}l}{\cancel{2}}\\ 60&=l \end{aligned}$$

$$\begin{aligned} 180&\stackrel{?}{=}2(60)+60 && \text{Check the answer.}\\ 180&\stackrel{?}{=}120+60\\ 180&=180 && \text{The answer works.} \end{aligned}$$

The length of the volleyball court is 60 feet.

73. Recall that the area of a triangle can be calculated using the formula $A=\frac{1}{2}bh$ where A is the area of the triangle with base, b, and height, h. Substitute $A=40$ and $b=8$. Solve the equation for h.

$$\begin{aligned} 40&=\frac{1}{2}(8)h && \text{Substitute in known values.}\\ 40&=\boxed{4h} && \text{Simplify \& isolate variable term.}\\ \frac{40}{4}&=\frac{\cancel{4}h}{\cancel{4}} && \text{Divide both sides by 4.}\\ 10&=h \end{aligned}$$

Check the answer as in problems 69-72.
The height of the triangle is 10 inches.

74. Substitute $A=75$ and $h=15$ into the equation to find the area of a triangle. After substituting in these values, solve the equation for b.

$$\begin{aligned} 75&=\frac{1}{2}b(15) && \text{Substitute in known values.}\\ 75&=\frac{15}{2}b && \text{Multiply by reciprocal of coefficient.}\\ \frac{2}{\cancel{15}}\cdot{}^{5}\cancel{75}&=\frac{\cancel{15}}{\cancel{2}}b\cdot\frac{\cancel{2}}{\cancel{15}}\\ 10&=b \end{aligned}$$

Check the answer as in problems 69-72.
The base of the triangle is 10 inches.

75. Let $x=$ "a number." "Quotient" represents division and "is" represents the equals sign. Remember that the order of division is important. Read from left to right. Write the quotient in the same order as it is read. The equation translates as

$$\frac{x}{7}=13$$

Solve the equation as follows

$$\begin{aligned} \frac{x}{7}&=13 && \text{Multiply both sides by 7.}\\ \cancel{7}\cdot\frac{x}{\cancel{7}}&=13\cdot 7\\ x&=91 \end{aligned}$$

Check the answer as in problems 69-72.

76. The equation translates as

$$12+\frac{x}{5}=19.2$$

Solve the equation as follows

$$\begin{aligned} 12+\boxed{\frac{x}{5}}&=19.2 && \text{Isolate variable term.}\\ -12\quad&\ \ -12 && \text{Subtract 12 from both sides.}\\ \frac{x}{5}&=7.2\\ \cancel{5}\cdot\frac{x}{\cancel{5}}&=7.2\cdot 5 && \text{Multiply both sides by 5.}\\ x&=36 \end{aligned}$$

Check the answer as in problems 69-72.

77. Let $x =$ "a number." "Plus" means to add and "product" tells us to multiply. We are adding to 7 times a number. "Is equal to" translates to the equal sign so the equation is

$$6+7x=62$$

Solve the equation as follows

$$\begin{array}{rl} 6+\boxed{7x}=62 & \text{Isolate variable term.} \\ \underline{-6 \qquad -6} & \text{Subtract 6 from both sides.} \\ 7x=56 & \text{Divide both sides by 7.} \\ \dfrac{\cancel{7}x}{\cancel{7}}=\dfrac{56}{7} & \\ x=8 & \end{array}$$

Check the answer as in problems 69-72.

78. "Times" means to multiply and "times the sum" means to multiply an addition that has already been done. To show the addition, include a set of parentheses around the sum.

$$4(x+3)=68$$

Solve the equation as follows

$$\begin{array}{rl} 4(x+3)=68 & \text{Distribute 4 on left side.} \\ \boxed{4x}+12=68 & \text{Now isolate variable term.} \\ \underline{-12 \quad -12} & \text{Subtract 12 from both sides.} \\ 4x=56 & \text{Divide both sides by 7.} \\ \dfrac{\cancel{4}x}{\cancel{4}}=\dfrac{56}{4} & \\ x=14 & \end{array}$$

Check the answer as in problems 69-72.

79. Let $x =$ "a number." "Of" means to multiply so we will multiply $\frac{1}{3}$ times x, subtract 8 then set it equal to 28.

$$\frac{1}{3}x-8=28$$

Solve the equation as follows

$$\begin{array}{rl} \boxed{\dfrac{1}{3}x}-8=28 & \text{Isolate variable term.} \\ \underline{+8 \quad +8} & \text{Add 8 to both sides.} \\ \dfrac{1}{3}x=36 & \text{Multiply both sides by reciprocal.} \\ \dfrac{\cancel{3}}{1}\cdot\dfrac{1}{\cancel{3}}x=36\cdot\dfrac{3}{1} & \\ x=108 & \end{array}$$

Check the answer as in problems 69-72

80. Let $x =$ "a number." "Half a number" means to multiply x by $\frac{1}{2}$, we then add 18 and set it equal to 15.

$$\frac{1}{2}x+18=15$$

Solve the equation as follows

$$\begin{array}{rl} \boxed{\dfrac{1}{2}x}+18=15 & \text{Isolate variable term.} \\ \underline{-18 \quad -18} & \text{Subtract 18 from both sides.} \\ \dfrac{1}{2}x=-3 & \text{Multiply both sides by reciprocal.} \\ \dfrac{\cancel{2}}{1}\cdot\dfrac{1}{\cancel{2}}x=-3\cdot\dfrac{2}{1} & \\ x=-6 & \end{array}$$

Check the answer as in problems 69-72.

81. Let $x =$ "a number." "Difference" represents subtraction, "twice a number" means to multiply x by 2, and "is" represents the equal sign. The equation translates as

$$2x-15=40$$

Solve the equation as follows

$$\begin{array}{rl} \boxed{2x}-15=40 & \text{Isolate variable term.} \\ \underline{+15 \quad +15} & \text{Add 15 to both sides} \\ 2x=55 & \\ \dfrac{\cancel{2}x}{\cancel{2}}=\dfrac{55}{2} & \text{Divide both sides by 2.} \\ x=27.5 & \end{array}$$

Check the answer as in problems 69-72.

82. Let $x =$ "a number." "Difference" represents subtraction, "three times a number" means to multiply x by 3, and "is" represents the equal sign. The equation translates as

$$3x-7=17$$

Solve the equation as follows

$$\begin{array}{rl} \boxed{3x}-7=17 & \text{Isolate variable term.} \\ \underline{+7 \quad +7} & \text{Add 7 to both sides} \\ 3x=24 & \\ \dfrac{\cancel{3}x}{\cancel{3}}=\dfrac{24}{3} & \text{Divide both sides by 3.} \\ x=8 & \end{array}$$

Check the answer as in problems 69-72.

83. Let $x =$ " an unknown number." We will subtract the unknown number from 8 then set it equal to 19.

$8 - x = 19$

Solve the equation as follows

$8\boxed{-x} = 19$ Isolate variable term.

$\underline{-8 \quad -8}$ Subtract 8 from both sides

$-x = 11$

$-1 \cdot -x = 11 \cdot -1$ Multiply both sides by -1.

$x = -11$

Check the answer as in problems 69-72.

84. Let $x =$ "an unknown number." We will subtract the unknown number from 36 then set it equal to -5.

$36 - x = -5$

Solve the equation as follows

$36\boxed{-x} = -5$ Isolate variable term.

$\underline{-36 \quad -36}$ Subtract 36 from both sides

$-x = -41$

$-1 \cdot -x = -41 \cdot -1$ Multiply both sides by -1.

$x = 41$

Check the answer as in problems 69-72.

85. Let $x =$ "a number." "Less than" translates to subtraction so we will subtract 7 from twice (2 times) a number then set it equal to 11.

$2x - 7 = 11$

Solve the equation as follows

$\boxed{2x} - 7 = 11$ Isolate variable term.

$\underline{+7 \quad +7}$ Add 7 to both sides

$2x = 18$

$\frac{\cancel{2}x}{\cancel{2}} = \frac{18}{2}$ Divide both sides by 2.

$x = 9$

Check the answer as in problems 69-72.

86. Let $x =$ "a number." "Less than" translates to subtraction so we will subtract 8 from 3 times a number then set it equal to -23.

$3x - 8 = -23$

Solve the equation as follows

$\boxed{3x} - 8 = -23$ Isolate variable term.

$\underline{+8 \quad +8}$ Add 8 to both sides.

$3x = -15$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{-15}{3}$ Divide both sides by 3.

$x = -5$

Check the answer as in problems 69-72.

87.

$P = \boxed{2l} + 2w$ Identify variable term to isolate.

$\underline{-2w \qquad -2w}$ Subtract $2w$ from both sides.

$P - 2w = 2\boxed{l}$ Identify variable to isolate

$\frac{P - 2w}{2} = \frac{\cancel{2}l}{\cancel{2}}$ Divide both sides by 2.

$\frac{P - 2w}{2} = l$

OR

$\frac{P}{2} - \frac{\cancel{2}w}{\cancel{2}} = l$ Simplify on left side.

$\frac{P}{2} - w = l$

88.

$C = 2\pi\boxed{r}$ Identify variable to isolate.

$\frac{C}{2\pi} = \frac{\cancel{2}\cancel{\pi}r}{\cancel{2}\cancel{\pi}}$ Divide both sides by 2π.

$\frac{C}{2\pi} = r$

89.

$V = \pi r^2\boxed{h}$ Identify variable to isolate.

$\frac{V}{\pi r^2} = \frac{\cancel{\pi}\cancel{r^2}h}{\cancel{\pi}\cancel{r^2}}$ Divide both sides by πr^2.

$\frac{V}{\pi r^2} = h$

90.

$V = \frac{1}{3}\pi r^2\boxed{h}$ Identify variable to isolate.

$3 \cdot V = \frac{1}{\cancel{3}}\pi r^2 h \cdot \cancel{3}$ Multiply both sides by 3.

$3V = \pi r^2\boxed{h}$

$$\frac{3V}{\pi r^2} = \frac{\cancel{\pi}\cancel{r^2}h}{\cancel{\pi}\cancel{r^2}}$$ Divide both sides by πr^2.

$$\frac{3V}{\pi r^2} = h$$

91.

$A = \frac{1}{2}\boxed{b}h$ Identify variable to isolate.

$2 \cdot A = \frac{1}{\cancel{2}}bh \cdot \cancel{2}$ Multiply both sides by 2.

$2A = \boxed{b}h$

$\frac{2A}{h} = \frac{b\cancel{h}}{\cancel{h}}$ Divide both sides by h.

$\frac{2A}{h} = b$

92.

$A = \frac{1}{2}\boxed{h}(b_1 + b_2)$ Identify variable to isolate.

$2 \cdot A = \frac{1}{\cancel{2}}h(b_1 + b_2) \cdot \cancel{2}$ Multiply both sides by 2.

$2A = \boxed{h}(b_1 + b_2)$ h is multiplied by $(b_1 + b_2)$ so we divide.

$\frac{2A}{(b_1 + b_2)} = \frac{h\cancel{(b_1 + b_2)}}{\cancel{(b_1 + b_2)}}$ Divide both sides by $(b_1 + b_2)$.

$\frac{2A}{(b_1 + b_2)} = h$

93.

$W = \boxed{3t} - 20$ Identify variable term to isolate.

$\underline{+20 \qquad +20}$ Add 20 to both sides.

$W + 20 = 3\boxed{t}$ Identify variable to isolate.

$\frac{W + 20}{3} = \frac{\cancel{3}t}{\cancel{3}}$ Divide both sides by 3.

$\frac{W + 20}{3} = t$

94.

$H = \boxed{rt} + 50$ Identify variable term to isolate.

$\underline{-50 \qquad -50}$ Subtract 50 from both sides.

$H - 50 = \boxed{r}t$ Identify variable to isolate.

$\frac{H - 50}{t} = \frac{r\cancel{t}}{\cancel{t}}$ Divide both sides by t.

$\frac{H - 50}{t} = r$

95.

$P = 2b + \boxed{2B}$ Identify variable term to isolate.

$\underline{-2b \quad -2b}$ Subtract $2b$ from both sides.

$P - 2b = 2\boxed{B}$ Identify variable to isolate

$\frac{P - 2b}{2} = \frac{\cancel{2}B}{\cancel{2}}$ Divide both sides by 2.

$\frac{P - 2b}{2} = B$ *OR*

$\frac{P}{2} - \frac{\cancel{2}b}{\cancel{2}} = B$ Simplify on left side.

$\frac{P}{2} - b = B$

96.

$V = l\boxed{w}h$ Identify variable to isolate.

$\frac{V}{lh} = \frac{\cancel{l}w\cancel{h}}{\cancel{l}\cancel{h}}$ Divide both sides by lh.

$\frac{V}{lh} = w$

97.

$5x\boxed{-3y} = -15$ Identify variable term to isolate.

$\underline{-5x \qquad -5x}$ Subtract $5x$ from both sides.

$-3\boxed{y} = -5x - 15$ Identify variable to isolate

$\frac{\cancel{-3}y}{\cancel{-3}} = \frac{-5x - 15}{-3}$ Divide both sides by -3.

$y = \frac{-5x}{-3} - \frac{15}{-3}$ Simplify on right side.

$y = \frac{5}{3}x + 5$

98.

$-3x + \boxed{4y} = 24$ Identify variable term to isolate.

$\underline{+3x \qquad +3x}$ Add $3x$ to both sides.

$4\boxed{y} = 3x + 24$ Identify variable to isolate

$\frac{\cancel{4}y}{\cancel{4}} = \frac{3x + 24}{4}$ Divide both sides by 4.

$y = \frac{3x}{4} + \frac{24}{4}$ Simplify on right side.

$y = \frac{3}{4}x + 6$

99.

$x\boxed{-5y}=9$ Identify variable term to isolate.

$\underline{-x \qquad -x}$ Subtract x from both sides.

$-5\boxed{y}=-x+9$ Identify variable to isolate

$\frac{\cancel{-5}y}{\cancel{-5}}=\frac{-x+9}{-5}$ Divide both sides by -5.

$y=\frac{x-9}{5}$ or $y=\frac{x}{5}-\frac{9}{5}$

100.

$\frac{1}{3}x+\boxed{6y}=-4$ Identify variable term to isolate.

$(3)\frac{1}{3}x+(3)6y=-4(3)$

Multiply each term by 3 to clear fraction.

$x+18y=-12$

$\underline{-x \qquad -x}$ Subtract x from both sides.

$18\boxed{y}=-x-12$ Identify variable to isolate

$\frac{\cancel{18}y}{\cancel{18}}=\frac{-x-12}{18}$ Divide both sides by 18.

$y=-\frac{x}{18}-\frac{\cancel{12}^{2}}{\cancel{18}^{3}}$ Simplify on right side.

$y=-\frac{x}{18}-\frac{2}{3}$

101.

$y-2=3(\boxed{x}+7)$ Identify variable to isolate.

$y-2=\boxed{3x}+21$ Distribute on right side.

$\underline{-21 \qquad -21}$ Subtract 21 from both sides.

$y-23=3\boxed{x}$ Identify variable to isolate

$\frac{y-23}{3}=\frac{\cancel{3}x}{\cancel{3}}$ Divide both sides by 3.

$\frac{y}{3}-\frac{23}{3}=x$ or $x=\frac{y-23}{3}$

102.

$y-3=-2(\boxed{x}-5)$ Identify variable to isolate.

$y-3=\boxed{-2x}+10$ Distribute on right side.

$\underline{-10 \qquad -10}$ Subtract 10 from both sides.

$y-13=-2\boxed{x}$ Identify variable to isolate

$\frac{y-13}{-2}=\frac{\cancel{-2}x}{\cancel{-2}}$ Divide both sides by -2.

$-\frac{y}{2}+\frac{13}{2}=x$ or $x=\frac{-y+13}{2}$

103.

$y+1=\frac{3}{4}(\boxed{12x}+8)$ Identify variable term to isolate.

$y+1=\frac{3}{\cancel{4}}({}^{3}\cancel{12}x+{}^{2}\cancel{8})$ Distribute on right side.

$y+1=9x+6$ Distribute on right side.

$\underline{-6 \qquad -6}$ Subtract 6 from both sides.

$y-5=9\boxed{x}$ Identify variable to isolate

$\frac{y-5}{9}=\frac{\cancel{9}x}{\cancel{9}}$ Divide both sides by 9.

$\frac{y}{9}-\frac{5}{9}=x$ or $x=\frac{y-5}{9}$

104.

$y-6=\frac{1}{6}(12x+6)$ Identify variable term to isolate.

$y-6=\frac{1}{\cancel{6}}({}^{2}\cancel{12}x+{}^{1}\cancel{6})$ Distribute on right side.

$y-6=2x+1$ Distribute on right side.

$\underline{-1 \qquad -1}$ Subtract 1 from both sides.

$y-7=2\boxed{x}$ Identify variable to isolate

$\frac{y-7}{2}=\frac{\cancel{2}x}{\cancel{2}}$ Divide both sides by 2.

$\frac{y}{2}-\frac{7}{2}=x$ or $x=\frac{y-7}{2}$

105.

$I=P\boxed{r}t$ Identify variable to isolate.

$\frac{I}{Pt}=\frac{\cancel{P}r\cancel{t}}{\cancel{P}\cancel{t}}$ Divide both sides by Pt.

$\frac{I}{Pt}=r$

106.

$I=Pr\boxed{t}$ Identify variable to isolate.

$\frac{I}{Pr}=\frac{\cancel{P}\cancel{r}t}{\cancel{P}\cancel{r}}$ Divide both sides by Pr.

$\frac{I}{Pr}=t$

107. The statement does not have an equal sign, therefore it is an expression.

$5a^2+\boxed{6a}\boxed{\boxed{-8}}+\boxed{12a}+\boxed{\boxed{3}}$ Identify like terms.

$5a^2+18a-5$ Combine like terms.

108. The statement does not have an equal sign, therefore it is an expression.

$\boxed{10m^2} - 3n + \boxed{\boxed{10}}\boxed{-4m^2} + \boxed{\boxed{4}}$ Identify like terms.

$6m^2 - 3n + 14$ Combine like terms.

109. The statement has an equal sign, therefore it is an equation.

$$\begin{aligned} \boxed{2x} + 7 &= 21 && \text{Isolate variable term.} \\ -7 \quad -7 & && \text{Subtract 7 from both sides.} \\ 2x &= 14 && \text{Divide both sides by 2.} \end{aligned}$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{14}{2}$$
$$x = 7$$

110. The statement has an equal sign, therefore it is an equation.

$$\begin{aligned} \boxed{-6x} + 14 &= -46 && \text{Isolate variable term.} \\ -14 \quad -14 & && \text{Subtract 14 from both sides.} \\ -6x &= -60 && \text{Divide both sides by} -6. \end{aligned}$$

$$\frac{\cancel{-6}x}{\cancel{-6}} = \frac{60}{-6}$$
$$x = -10$$

111. The statement has an equal sign, therefore it is an equation.

$\boxed{\frac{1}{3}r} + 8\boxed{-\frac{5}{6}r} = -2$ Combine like terms on left side.

$\frac{2}{6}r - \frac{5}{6}r + 8 = -2$ Rewrite fraction with LCD.

$-\frac{3}{6}r + 8 = -2$ Reduce fraction.

$\boxed{-\frac{1}{2}r} + 8 = -2$ Now isolate variable term.

$-8 \quad -8$ Subtract 8 from both sides.

$-\frac{1}{2}r = -10$ Multiply both sides by reciprocal.

$$-\frac{\cancel{2}}{1} \cdot -\frac{1}{\cancel{2}}r = -10 \cdot -\frac{2}{1}$$
$$r = 20$$

112. The statement has an equal sign, therefore it is an equation.

$\boxed{\frac{3}{10}d} + 15\boxed{-\frac{4}{5}d} = -8$ Combine like terms on left side.

$\frac{3}{10}d - \frac{8}{10}d + 15 = -8$ Rewrite fraction with LCD.

$-\frac{5}{10}d + 15 = -8$ Reduce fraction.

$\boxed{-\frac{1}{2}d} + 15 = -8$ Now isolate variable term.

$-15 \quad -15$ Subtract 15 from both sides.

$-\frac{1}{2}d = -23$ Multiply both sides by reciprocal.

$$-\frac{\cancel{2}}{1} \cdot -\frac{1}{\cancel{2}}d = -23 \cdot -\frac{2}{1}$$
$$d = 46$$

113. The statement does not have an equal sign, therefore it is an expression.

$\boxed{5n} + \boxed{\boxed{7}}\boxed{-8n} + 20m + \boxed{\boxed{4}}$ Identify like terms.

$20m - 3n + 11$ Combine like terms.

Arrange in conventional form.

114. The statement does not have an equal sign, therefore it is an expression.

$\boxed{8w}\boxed{\boxed{-6}} + 4v\boxed{-14w} + \boxed{\boxed{23}}$ Identify like terms.

$4v - 6w + 17$ Combine like terms.

Arrange in conventional form.

115. The statement has an equal sign, therefore it is an equation.

$\boxed{3.4y} + 4\boxed{-2.1y} = 11.28$ Combine like terms on left side.

$$\begin{aligned} \boxed{1.3y} + 4 &= 11.28 && \text{Isolate variable term.} \\ -4 \quad -4 & && \text{Subtract 4 from both sides.} \\ 1.3y &= 7.28 && \text{Divide both sides by 1.3.} \end{aligned}$$

$$\frac{1.3y}{1.3} = \frac{7.28}{1.3}$$
$$y = 5.6$$

116. The statement has an equal sign, therefore it is an equation.

$\boxed{-4.6h} - 8.7 + \boxed{1.2h} = -32.84$
Combine like terms on left side.

$$\begin{aligned} -3.4h - 8.7 &= -32.84 && \text{Isolate variable term.} \\ +8.7 \quad +8.7 & && \text{Add 8.7 to both sides.} \\ -3.4h &= -24.14 && \text{Divide both sides by} -3.4. \end{aligned}$$

$$\frac{-3.4h}{-3.4} = \frac{-24.14}{-3.4}$$
$$h = 7.1$$

Section 2.3 Solving Equations with Variables on Both Sides

1. $4x = x + 33$

$\boxed{4x} = \boxed{x} + 33$ Identify variable terms.

$\underline{-x \quad -x}$ Subtract x from both sides

$3x = 33$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{33}{3}$ Divide both sides by 3.

$x = 11$

$4(11) \stackrel{?}{=} (11) + 33$ Check the answer.

$44 = 44$ The answer works.

2. $8 + x = 5x$

$8 + \boxed{x} = \boxed{5x}$ Identify variable terms.

$\underline{-x \quad -x}$ Subtract x from both sides

$8 = 4x$

$\frac{8}{4} = \frac{\cancel{4}x}{\cancel{4}}$ Divide both sides by 4.

$2 = x$

$8 + (2) \stackrel{?}{=} 5(2)$ Check the answer.

$10 = 10$ The answer works.

3. $5x + 8 = 3x - 4$

$\boxed{5x} + \boxed{\boxed{8}} = \boxed{3x}\boxed{\boxed{-4}}$ Identify like terms.

$\underline{-3x \qquad -3x}$ Subtract $3x$ from both sides.

$2x + 8 = -4$

$\underline{-8 \quad -8}$ Subtract 8 from both sides.

$2x = -12$ Divide both sides by 2.

$\frac{\cancel{2}x}{\cancel{2}} = \frac{-12}{2}$

$x = -6$

$5(-6) + 8 \stackrel{?}{=} 3(-6) - 4$ Check the answer.

$-30 + 8 \stackrel{?}{=} -18 - 4$

$-22 = -22$ The answer works.

4. $7x + 10 = 4x - 18$

$\boxed{7x} + \boxed{\boxed{10}} = \boxed{4x}\boxed{\boxed{-18}}$ Identify like terms.

$\underline{-4x \qquad -4x}$ Subtract $4x$ from both sides.

$3x + 10 = -18$

$\underline{-10 \quad -10}$ Subtract 10 from both sides.

$3x = -28$ Divide both sides by 3.

$\frac{\cancel{3}x}{\cancel{3}} = \frac{-28}{3}$

$x = \frac{-28}{3}$ or $-9\frac{1}{3}$

$7\left(\frac{-28}{3}\right) + 10 \stackrel{?}{=} 4\left(\frac{-28}{3}\right) - 18$ Check the answer.

$\frac{-196}{3} + 10 \stackrel{?}{=} \frac{-112}{3} - 18$

$\frac{-196}{3} + \frac{30}{3} \stackrel{?}{=} \frac{-112}{3} - \frac{54}{3}$

$\frac{-166}{3} = \frac{-166}{3}$ The answer works.

5. $2x = 5(x + 6)$

$2x = 5(x + 6)$ Distribute on the right side.

$\boxed{2x} = \boxed{5x} + 30$ Identify like terms.

$\underline{-5x \quad -5x}$ Subtract $5x$ from both sides.

$-3x = 30$

$\frac{\cancel{-3}x}{\cancel{-3}} = \frac{30}{-3}$ Divide both sides by 3.

$x = -10$

$2(-10) \stackrel{?}{=} 5([-10] + 6)$ Check the answer.

$-20 \stackrel{?}{=} 5(-4)$

$-20 = -20$ The answer works.

6. $7x = 2(x - 5)$

$7x = 2(x - 5)$ Distribute on the right side.

$\boxed{7x} = \boxed{2x} - 10$ Identify like terms.

$\underline{-2x \quad -2x}$ Subtract $2x$ from both sides.

$5x = -10$

$\frac{\cancel{5}x}{\cancel{5}} = \frac{-10}{5}$ Divide both sides by 5.

$x = -2$

Check the answer as in problems 1-5.

7. $20-3x=4x-22$

$\boxed{\boxed{20}}\boxed{-3x}=\boxed{4x}\boxed{\boxed{-22}}$ Identify like terms.

$\underline{\quad -4x \quad -4x}$ Subtract $4x$ from both sides.

$20-7x=-22$

$\underline{-20 \qquad -20}$ Subtract 20 from both sides.

$-7x=-42$ Divide both sides by -7.

$$\frac{\cancel{-7}x}{\cancel{-7}}=\frac{-42}{-7}$$

$x=6$

Check the answer as in problems 1-5.

8. $2(x-6)=3(x+2)$

$2(x-6)=3(x+2)$ Distribute on the right side.

$\boxed{2x}\boxed{\boxed{-12}}=\boxed{3x}\boxed{\boxed{+6}}$ Identify like terms.

$\underline{-3x \qquad -3x}$ Subtract $3x$ from both sides.

$-x-12=6$

$\underline{\quad +12 \ +12}$ Add 12 to both sides.

$-x=18$ Multiply both sides by -1.

$-1\cdot -x=18\cdot -1$

$x=-18$

Check the answer as in problems 1-5.

9. $\frac{1}{2}x=x+5$

$$(\cancel{2})\frac{1}{\cancel{2}}x=(2)x+5(2)$$

$\boxed{x}=\boxed{2x}+10$ Identify like terms.

$\underline{-2x \ -2x}$ Subtract $2x$ from both sides.

$-x=10$

$-1\cdot -x=10\cdot -1$ Multiply both sides by -1.

$x=-10$

Check the answer as in problems 1-5.

10. $\frac{1}{3}x+5=x-7$

Multiply each term by 3 to clear fraction.

$$(\cancel{3})\frac{1}{\cancel{3}}x+(3)5=(3)x-7(3)$$

$\boxed{x}+\boxed{\boxed{15}}=\boxed{3x}\boxed{\boxed{-21}}$ Identify like terms.

$\underline{-3x \qquad -3x}$ Subtract $3x$ from both sides.

$-2x+15=-21$

$\underline{\quad -15 \ -15}$ Subtract 15 from both sides.

$-2x=-36$

$$\frac{\cancel{-2}x}{\cancel{-2}}=\frac{-36}{-2}$$ Divide both sides by -2.

$x=18$

Check the answer as in problems 1-5.

11. $5+\frac{x}{2}=x-7$

Multiply each term by 2 to clear fraction.

$$(2)5+(\cancel{2})\frac{x}{\cancel{2}}=(2)x-7(2)$$

$\boxed{\boxed{10}}+\boxed{x}=\boxed{2x}\boxed{\boxed{-14}}$ Identify like terms.

$\underline{\quad -2x \ -2x}$ Subtract $2x$ from both sides.

$10-x=-14$

$\underline{-10 \qquad -10}$ Subtract 10 from both sides.

$-x=-24$

$-1\cdot -x=-24\cdot -1$ Multiply both sides by -1.

$x=24$

Check the answer as in problems 1-5.

12. $\frac{x}{3}=5x+28$

Multiply each term by 3 to clear fraction.

$$(\cancel{3})\frac{x}{\cancel{3}}=(3)5x+28(3)$$

$\boxed{x}=\boxed{15x}+84$ Identify like terms.

$\underline{-15x \ -15x}$ Subtract $15x$ from both sides.

$-14x=84$

$$\frac{\cancel{-14}x}{\cancel{-14}}=\frac{84}{-14}$$ Divide both sides by -14.

$x=-6$

Check the answer as in problems 1-5.

13. $x-8=5x+4$

$\boxed{x}\boxed{\boxed{-8}}=\boxed{5x}+\boxed{\boxed{4}}$ Identify like terms.

$\underline{-5x \qquad -5x}$ Subtract $5x$ from both sides.

$-4x-8=4$

$\underline{\quad +8 \ +8}$ Add 8 to both sides.

$-4x=12$ Divide both sides by -7.

$$\frac{\cancel{-4}x}{\cancel{-4}}=\frac{12}{-4}$$

$x=-3$

Check the answer as in problems 1-5.

14. $29 = 2x - 7$

$\boxed{29} = 2x\boxed{-7}$ Identify like terms.

$+7 \quad +7$ Add 7 to both sides.

$36 = 2x$

$\frac{36}{2} = \frac{\cancel{2}x}{\cancel{2}}$ Divide both sides by 2.

$18 = x$

Check the answer as in problems 1-5.

15. $\frac{1}{4}x - 8 = 2x - 29$

Multiply each term by 4 to clear fraction.

$(\cancel{4})\frac{1}{\cancel{4}}x - (4)8 = (4)2x - 29(4)$

$\boxed{x}\boxed{\boxed{-32}} = \boxed{8x}\boxed{\boxed{-116}}$ Identify like terms.

$-8x \quad -8x$ Subtract $8x$ from both sides.

$-7x - 32 = -116$

$+32 \quad +32$ Add 32 to both sides.

$-7x = -84$

$\frac{\cancel{-7}x}{\cancel{-7}} = \frac{-84}{-7}$ Divide both sides by -7.

$x = 12$

Check the answer as in problems 1-5.

16. $\frac{1}{2}x + 20 = 3x + 5$

Multiply each term by 2 to clear fraction.

$(\cancel{2})\frac{1}{\cancel{2}}x + (2)20 = (2)3x + 5(2)$

$\boxed{x} + \boxed{\boxed{40}} = \boxed{6x} + \boxed{\boxed{10}}$ Identify like terms.

$-6x \quad -6x$ Subtract $6x$ from both sides.

$-5x + 40 = 10$

$-40 \quad -40$ Subtract 40 from both sides.

$-5x = -30$

$\frac{\cancel{-5}x}{\cancel{-5}} = \frac{-30}{-5}$ Divide both sides by -5.

$x = 6$

Check the answer as in problems 1-5.

17.

$\boxed{3x} + 12 = \boxed{7x} - 28$ Combine like terms across = sign.

$-7x \quad -7x$ Subtract $7x$ from both sides.

$-4x + 12 = -28$

$-12 \quad -12$ Subtract 12 from both sides.

$-4x = -40$ Divide both sides by -4.

$\frac{\cancel{-4}x}{\cancel{-4}} = \frac{-40}{-4}$

$x = 10$

$3(10) + 12 \stackrel{?}{=} 7(10) - 28$ Check the answer.

$30 + 12 \stackrel{?}{=} 70 - 28$

$42 = 42$ The answer works.

18.

$\boxed{6x} + 20 = \boxed{10x} - 36$ Combine like terms across = sign.

$-10x \quad -10x$ Subtract $10x$ from both sides.

$-4x + 20 = -36$

$-20 \quad -20$ Subtract 20 from both sides.

$-4x = -56$ Divide both sides by -4.

$\frac{\cancel{-4}x}{\cancel{-4}} = \frac{-56}{-4}$

$x = 14$

$6(14) + 20 \stackrel{?}{=} 10(14) - 36$ Check the answer.

$84 + 20 \stackrel{?}{=} 140 - 36$

$104 = 104$ The answer works.

19.

$\boxed{12t} - 50 = \boxed{4t} + 14$ Combine like terms across = sign.

$-4t \quad -4t$ Subtract $4t$ from both sides.

$8t - 50 = 14$

$+50 \quad +50$ Add 50 to both sides.

$8t = 64$ Divide both sides by 8.

$\frac{\cancel{8}t}{\cancel{8}} = \frac{64}{8}$

$t = 8$

$12(8) - 50 \stackrel{?}{=} 4(8) + 14$ Check the answer.

$96 - 50 \stackrel{?}{=} 32 + 14$

$46 = 46$ The answer works.

20.

$$\boxed{7m}-30=\boxed{3m}-10 \quad \text{Combine like terms across = sign.}$$
$$\underline{-3m \qquad -3m} \quad \text{Subtract } 3m \text{ from both sides.}$$
$$4m-30=-10$$
$$\underline{+30 \quad +30} \quad \text{Add 30 to both sides.}$$
$$4m=20 \quad \text{Divide both sides by 4.}$$
$$\frac{\cancel{4}m}{\cancel{4}}=\frac{20}{4}$$
$$m=5$$

$$7(5)-30\overset{?}{=}3(5)-10 \quad \text{Check the answer.}$$
$$35-30\overset{?}{=}15-10$$
$$5=5 \quad \text{The answer works.}$$

21.

$$\boxed{4b}+36=\boxed{9b}+66 \quad \text{Combine like terms across = sign.}$$
$$\underline{-9b \qquad -9b} \quad \text{Subtract } 9b \text{ from both sides.}$$
$$-5b+36=66$$
$$\underline{-36 \quad -36} \quad \text{Subtract 36 from both sides.}$$
$$-5b=30 \quad \text{Divide both sides by } -5.$$
$$\frac{\cancel{-5}b}{\cancel{-5}}=\frac{30}{-5}$$
$$b=-6$$

Check the answer as in problems 17-20.

22.

$$\boxed{15p}-20=\boxed{4p}-64 \quad \text{Combine like terms across = sign.}$$
$$\underline{-4p \qquad -4p} \quad \text{Subtract } 4p \text{ from both sides.}$$
$$11p-20=-64$$
$$\underline{+20 \quad +20} \quad \text{Add 20 to both sides.}$$
$$11p=-44 \quad \text{Divide both sides by 11.}$$
$$\frac{\cancel{11}p}{\cancel{11}}=\frac{-44}{11}$$
$$p=-4$$

Check the answer as in problems 17-20.

23.

$$\boxed{2c}+5+\boxed{c}=3c-4 \quad \text{Combine like terms on left side.}$$
$$3c+5=3c-4 \quad \text{Combine like terms across = sign.}$$
$$\underline{-3c \quad -3c} \quad \text{Subtract } 3c \text{ from both sides.}$$
$$5\overset{?}{=}-4 \quad \text{This is a false statement.}$$

This equation has no solution.

24.

$$5f-7=\boxed{8f}+2\boxed{-3f} \quad \text{Combine like terms on right side.}$$
$$\boxed{5f}-7=\boxed{5f}+2 \quad \text{Combine like terms across = sign.}$$
$$\underline{-5f \qquad -5f} \quad \text{Subtract } 5f \text{ from both sides.}$$
$$-7\overset{?}{=}2 \quad \text{This is a false statement.}$$

This equation has no solution.

25.

$$4t+5=\boxed{3t}+5+\boxed{t} \quad \text{Combine like terms on right side.}$$
$$\boxed{4t}+5=\boxed{4t}+5 \quad \text{Combine like terms across = sign.}$$
$$\underline{-4t \qquad -4t} \quad \text{Subtract } 4t \text{ from both sides.}$$
$$5=5 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

Substitute two random numbers to check.

$$4(-4)+5\overset{?}{=}3(-4)+5+(-4) \quad \text{Check the answer using } -4.$$
$$-16+5\overset{?}{=}-12+5-4$$
$$-11=-11 \quad \text{The answer works.}$$
$$4(11)+5\overset{?}{=}3(11)+5+(11) \quad \text{Check the answer using 11.}$$
$$44+5\overset{?}{=}33+5+11$$
$$49=49 \quad \text{The answer works.}$$

26.

$$\boxed{2z}+8\boxed{-5z}=-3z+8 \quad \text{Combine like terms on left side.}$$
$$\boxed{-3z}+8=\boxed{-3z}+8 \quad \text{Combine like terms across = sign.}$$
$$\underline{-3z \qquad -3z} \quad \text{Subtract } 3z \text{ from both sides.}$$
$$8=8 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

Substitute two random numbers to check.

$$2(-7)+8-5(-7)\overset{?}{=}-3(-7)+8 \quad \text{Check the answer using } -7.$$
$$-14+8+35\overset{?}{=}21+8$$
$$29=29 \quad \text{The answer works.}$$
$$2(0)+8-5(0)\overset{?}{=}-3(0)+8 \quad \text{Check the answer using 0.}$$
$$0+8-0\overset{?}{=}0+8$$
$$8=8 \quad \text{The answer works.}$$

27.

$$\boxed{3.5h} = \boxed{2h} - 12 \quad \text{Combine like terms across = sign.}$$
$$\underline{-2h \quad -2h} \quad \text{Subtract } 2h \text{ from both sides.}$$
$$1.5h = -12 \quad \text{Divide both sides by 1.5.}$$
$$\frac{\cancel{1.5}h}{\cancel{1.5}} = \frac{-12}{1.5}$$
$$h = -8$$

Check the answer as in problems 17-20..

28.

$$\boxed{4.8d} + 20 = \boxed{7.3d} \quad \text{Combine like terms across = sign.}$$
$$\underline{-4.8d \qquad -4.8d} \quad \text{Subtract } 4.8d \text{ from both sides.}$$
$$20 = 2.5d \quad \text{Divide both sides by 2.5.}$$
$$\frac{20}{2.5} = \frac{\cancel{2.5}d}{\cancel{2.5}}$$
$$8 = d$$

Check the answer as in problems 17-20.

29.

$$15\boxed{-x} = 8 \quad \text{Isolate variable.}$$
$$\underline{-15 \quad -15} \quad \text{Subtract 15 from both sides.}$$
$$-x = -7 \quad \text{Multiply both sides by } -1.$$
$$-1 \cdot -x = -7 \cdot -1$$
$$x = 7$$

Check the answer as in problems 17-20.

30.

$$\boxed{8x} + 5\boxed{-9x} = 20 \quad \text{Combine like terms on left side.}$$
$$\boxed{-x} + 5 = 20 \quad \text{Isolate variable.}$$
$$\underline{-5 \quad -5} \quad \text{Subtract 5 from both sides.}$$
$$-x = 15$$
$$-1 \cdot -x = 15 \cdot -1 \quad \text{Multiply both sides by } -1.$$
$$x = -15$$

Check the answer as in problems 17-20.

31.

$$\boxed{3h} + 8\boxed{-4h} = 13 \quad \text{Combine like terms on left side.}$$
$$\boxed{-h} + 8 = 13 \quad \text{Isolate variable.}$$
$$\underline{-8 \quad -8} \quad \text{Subtract 8 from both sides.}$$
$$-h = 5$$
$$-1 \cdot -h = 5 \cdot -1 \quad \text{Multiply both sides by } -1.$$
$$h = -5$$

Check the answer as in problems 17-20.

32.

$$14 = \boxed{5m} - 8\boxed{-6m} \quad \text{Combine like terms on right side.}$$
$$14 = \boxed{-m} - 8 \quad \text{Isolate variable.}$$
$$\underline{+8 \qquad +8} \quad \text{Add 8 to both sides.}$$
$$22 = -m$$
$$-1 \cdot 22 = -m \cdot -1 \quad \text{Multiply both sides by } -1.$$
$$-22 = m$$

Check the answer as in problems 17-20.

33.

$$2(3x+5) = 4x + 22 \quad \text{Simplify on left - distribute.}$$
$$\boxed{6x} + 10 = \boxed{4x} + 22 \quad \text{Combine like terms across = sign.}$$
$$\underline{-4x \qquad -4x} \quad \text{Subtract } 4x \text{ from both sides.}$$
$$2x + 10 = 22$$
$$\underline{-10 \quad -10} \quad \text{Subtract 10 from both sides.}$$
$$2x = 12 \quad \text{Divide both sides by 2.}$$
$$\frac{\cancel{2}x}{\cancel{2}} = \frac{12}{2}$$
$$x = 6$$

Check the answer as in problems 17-20.

34.

$$3(8x-9) = 30x - 99 \quad \text{Simplify on left - distribute.}$$
$$\boxed{24x} - 27 = \boxed{30x} - 99 \quad \text{Combine like terms across = sign.}$$
$$\underline{-30x \qquad -30x} \quad \text{Subtract } 30x \text{ from both sides.}$$
$$-6x - 27 = -99$$
$$\underline{+27 \quad +27} \quad \text{Add 27 to both sides.}$$
$$-6x = -72 \quad \text{Divide both sides by } -6.$$
$$\frac{\cancel{-6}x}{\cancel{-6}} = \frac{-72}{-6}$$
$$x = 12$$

Check the answer as in problems 17-20.

35.

$$5(2c+3) - 8 = 3(4c+2) - 2c \quad \text{Distribute on both sides.}$$
$$10c + \boxed{15}\boxed{-8} = \boxed{12c} + 6\boxed{-2c} \quad \text{Simplify on both sides.}$$
$$\boxed{10c} + 7 = \boxed{10c} + 6 \quad \text{Combine like terms across = sign.}$$
$$\underline{-10c \quad -10c} \quad \text{Subtract } 10c \text{ from both sides.}$$
$$7 \stackrel{?}{=} 6 \quad \text{This is a false statement.}$$

This equation has no solution.

36.

$$2(6w-5)=3(4w-2)-7 \quad \text{Distribute on both sides.}$$

$$12w-10=12w\boxed{-6}\boxed{-7} \quad \text{Simplify on right side.}$$

$$\boxed{12w}-10=\boxed{12w}-13 \quad \text{Combine like terms across = sign.}$$

$$\underline{-12w \qquad -12w} \quad \text{Subtract } 12w \text{ from both sides.}$$

$$-10\overset{?}{=}-13 \quad \text{This is a false statement.}$$

This equation has no solution.

37.

$$\boxed{7d}+20\boxed{-3d}=9d+50 \quad \text{Combine like terms on left side.}$$

$$\boxed{4d}+20=\boxed{9d}+50 \quad \text{Combine like terms across = sign.}$$

$$\underline{-9d \qquad -9d} \quad \text{Subtract } 9d \text{ from both sides.}$$

$$-5d+20=50$$

$$\underline{-20 \quad -20} \quad \text{Subtract 20 from both sides.}$$

$$-5d=30 \quad \text{Divide both sides by } -5.$$

$$\frac{\cancel{-5}d}{\cancel{-5}}=\frac{30}{-5}$$

$$d=-6$$

Check the answer as in problems 17-20.

38.

$$\boxed{12r}-15\boxed{-5r}=3r-51 \quad \text{Combine like terms on left side.}$$

$$-15+\boxed{7r}=\boxed{3r}-51 \quad \text{Combine like terms across = sign.}$$

$$\underline{-3r \quad -3r} \quad \text{Subtract } 3r \text{ from both sides.}$$

$$-15+4r=-51$$

$$\underline{+15 \qquad +15} \quad \text{Add 15 to both sides.}$$

$$4r=-36 \quad \text{Divide both sides by 4.}$$

$$\frac{\cancel{4}r}{\cancel{4}}=\frac{-36}{4}$$

$$r=-9$$

Check the answer as in problems 17-20.

39.

$$\frac{1}{2}x+5=3x-45 \quad \text{Multiply by 2 to remove fraction.}$$

$$(\cancel{2})\frac{1}{\cancel{2}}x+(2)5=(2)3x-45(2)$$

$$\boxed{x}+10=\boxed{6x}-90 \quad \text{Combine like terms across = sign.}$$

$$\underline{-6x \qquad -6x} \quad \text{Subtract } 6x \text{ from both sides.}$$

$$-5x+10=-90$$

$$\underline{-10 \quad -10} \quad \text{Subtract 10 from both sides.}$$

$$-5x=-100 \quad \text{Divide both sides by } -5.$$

$$\frac{\cancel{-5}x}{\cancel{-5}}=\frac{-100}{-5}$$

$$x=20$$

Check the answer as in problems 17-20.

40.

$$\frac{1}{2}z-4=5z-31 \quad \text{Multiply by 2 to remove fraction.}$$

$$(\cancel{2})\frac{1}{\cancel{2}}z-(2)4=(2)5z-31(2)$$

$$\boxed{z}-8=\boxed{10z}-62 \quad \text{Combine like terms across = sign.}$$

$$\underline{-10z \qquad -10z} \quad \text{Subtract } 10z \text{ from both sides.}$$

$$-9z-8=-62$$

$$\underline{+8 \quad +8} \quad \text{Add 8 to both sides.}$$

$$-9z=-54 \quad \text{Divide both sides by } -5.$$

$$\frac{\cancel{-9}x}{\cancel{-9}}=\frac{-54}{-9}$$

$$x=6$$

Check the answer as in problems 17-20.

41.

$$\frac{1}{3}x+20=2x+20 \quad \text{Multiply by 3 to remove fraction.}$$

$$(\cancel{3})\frac{1}{\cancel{3}}x+(3)20=2x(3)+20(3)$$

$$\boxed{x}+60=\boxed{6x}+60 \quad \text{Combine like terms across = sign.}$$

$$\underline{-x \qquad -x} \quad \text{Subtract } x \text{ from both sides.}$$

$$60=5x+60$$

$$\underline{-60 \qquad -60} \quad \text{Subtract 60 from both sides.}$$

$$0=5x \quad \text{Divide both sides by 5.}$$

$$\frac{0}{5}=\frac{\cancel{5}x}{\cancel{5}}$$

$$0=x$$

Check the answer as in problems 17-20.

42.

$$\frac{1}{7}h+8=8 \quad \text{Multiply by 7 to remove fraction.}$$

$$(\cancel{7})\frac{1}{\cancel{7}}h+(7)8=8(7)$$

$$h+56=56 \quad \text{Isolate variable.}$$

$$\underline{-56 \quad -56} \quad \text{Subtract 56 from both sides.}$$

$$h=0$$

Check the answer as in problems 17-20.

43.

$$\begin{array}{ll} \boxed{9y}-2.1=\boxed{5y}+3.5 & \text{Combine like terms across = sign.} \\ \underline{-5y \qquad\quad -5y} & \text{Subtract } 5y \text{ from both sides.} \\ 4y-2.1=3.5 & \\ \underline{\;+2.1\;\; +2.1} & \text{Add 2.1 to both sides.} \\ 4y=5.6 & \text{Divide both sides by 4.} \\ \dfrac{\cancel{4}y}{\cancel{4}}=\dfrac{5.6}{4} & \\ y=1.4 & \end{array}$$

Check the answer as in problems 17-20.

44.

$$\begin{array}{ll} \boxed{15y}+3.6=\boxed{8y}-11.8 & \text{Combine like terms across = sign.} \\ \underline{-8y \qquad\quad -8y} & \text{Subtract } 8y \text{ from both sides.} \\ 7y+3.6=-11.8 & \\ \underline{\;-3.6\quad -3.6} & \text{Subtract 3.6 from both sides.} \\ 7y=-15.4 & \text{Divide both sides by 4.} \\ \dfrac{\cancel{7}y}{\cancel{7}}=\dfrac{-15.4}{7} & \\ y=-2.2 & \end{array}$$

Check the answer as in problems 17-20.

45.

$$\begin{array}{ll} \boxed{35t}+10.2=\boxed{5t}+9.9 & \text{Combine like terms across = sign.} \\ \underline{-5t \qquad\quad -5t} & \text{Subtract } 5t \text{ from both sides.} \\ 30t+10.2=9.9 & \\ \underline{\;-10.2\;\; -10.2} & \text{Subtract 10.2 from both sides.} \\ 30y=-0.3 & \text{Divide both sides by 4.} \\ \dfrac{\cancel{30}y}{\cancel{30}}=\dfrac{-0.3}{30} & \\ y=-0.01 & \end{array}$$

Check the answer as in problems 17-20.

46.

$$\begin{array}{ll} \boxed{3w}-7.9=-4.75\boxed{-4w} & \text{Combine like terms across = sign.} \\ \underline{+4w \qquad\qquad +4w} & \text{Add } 4w \text{ to both sides.} \\ 7w-7.9=-4.75 & \\ \underline{\;+7.9\quad +7.9} & \text{Add 7.9 to both sides.} \\ 7w=3.15 & \text{Divide both sides by 7.} \\ \dfrac{\cancel{7}w}{\cancel{7}}=\dfrac{3.15}{7} & \\ w=0.45 & \end{array}$$

Check the answer as in problems 17-20.

47. Add the measures of the given angles and set them equal to $180°$ then solve for x.

$$\begin{array}{ll} x+2x+5x=180 & \text{Combine like terms.} \\ 8x=180 & \text{Divide both sides by 8.} \\ \dfrac{\cancel{8}x}{\cancel{8}}=\dfrac{180}{8} & \\ x=22.5 & \end{array}$$

Substitute $x=22.5$ into the expressions that represent the. The measures of the 3 angles are $22.5°$, $45°$, and $112.5°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{array}{ll} 22.5°+45°+112.5°\stackrel{?}{=}180° & \text{Check the answer.} \\ 180°=180° & \text{The answer works.} \end{array}$$

48. Add the measures of the given angles and set them equal to $180°$ then solve for y.

$$\begin{array}{ll} y+3y+6y=180 & \text{Combine like terms.} \\ 10y=180 & \text{Divide both sides by 10.} \\ \dfrac{\cancel{10}y}{\cancel{10}}=\dfrac{180}{10} & \\ y=18 & \end{array}$$

Substitute $x=18$ into the expressions that represent the angles. The measures of the 3 angles are $18°$, $54°$, and $108°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{array}{ll} 18°+54°+108°\stackrel{?}{=}180° & \text{Check the answer.} \\ 180°=180° & \text{The answer works.} \end{array}$$

49. Substitute $P=66$, $l=3x+1$, and $w=5x$ into the formula for perimeter and solve for x.

$$\begin{array}{ll} P=2l+2w & \text{Formula for perimeter.} \\ 66=2(3x+1)+2(5x) & \text{Substitute in values.} \\ 66=6x+2+10x & \text{Distribute/mulitply on right side.} \\ 66=\boxed{16x}+2 & \text{Simplify \& isolate variable term.} \\ \underline{-2 \qquad\quad -2} & \text{Subtract 2 from both sides.} \\ 64=16x & \text{Divide both sides by 16.} \\ \dfrac{64}{16}=\dfrac{\cancel{16}x}{\cancel{16}} & \\ 4=x & \end{array}$$

Now substitute $x = 4$ into the expressions for length and width.

$$\begin{aligned} l &= 3(4)+1 & w &= 5(4) && \text{Substitute } x = 4. \\ l &= 12+1 & w &= 20 && \text{Simplify each equation.} \\ l &= 13 \end{aligned}$$

The length and width of the yard measure 13 ft and 20 ft.

To check the solution, substitute these values into the formula for perimeter and set it equal to 66.

$$\begin{aligned} P &= 2l+2w \\ 66 &\stackrel{?}{=} 2(13)+2(20) && \text{Check the answer.} \\ 66 &\stackrel{?}{=} 26+40 \\ 66 &= 66 && \text{The answer works.} \end{aligned}$$

50. Substitute $P = 88$, $l = 4x+2$, and $w = 3x$ into the formula for perimeter and solve for x.

$$\begin{aligned} P &= 2l+2w && \text{Formula for perimeter.} \\ 88 &= 2(4x+2)+2(3x) && \text{Substitute in values.} \\ 88 &= 8x+4+6x && \text{Distribute/mulitply on right side.} \\ 88 &= \boxed{14x}+4 && \text{Simplify \& isolate variable term.} \\ -4 & \quad\ -4 && \text{Subtract 4 from both sides.} \\ 84 &= 14x && \text{Divide both sides by 14.} \\ \frac{84}{14} &= \frac{\cancel{14}x}{\cancel{14}} \\ 6 &= x \end{aligned}$$

Now substitute $x = 6$ into the expressions for length and width.

$$\begin{aligned} l &= 4(6)+2 & w &= 3(6) && \text{Substitute } x = 6. \\ l &= 24+2 & w &= 18 && \text{Simplify each equation.} \\ l &= 26 \end{aligned}$$

The length and width of the yard measure 26 ft and 18 ft.

To check the solution, substitute these values into the formula for perimeter and set it equal to 88.

$$\begin{aligned} P &= 2l+2w \\ 88 &\stackrel{?}{=} 2(26)+2(18) && \text{Check the answer.} \\ 88 &\stackrel{?}{=} 52+36 \\ 88 &= 88 && \text{The answer works.} \end{aligned}$$

51. Substitute $P = 83$, and $s = 3x-2$ into the formula for perimeter and solve for x.

$$\begin{aligned} P &= 4s && \text{Formula for perimeter.} \\ 83 &= 4(3x-2) && \text{Substitute in value for } s. \\ 83 &= \boxed{12x}-8 && \text{Distribute/mulitply on right side.} \\ +8 & \quad\ +8 && \text{Add 8 to both sides.} \\ 91 &= 12x && \text{Divide both sides by 12.} \\ \frac{91}{12} &= \frac{\cancel{12}x}{\cancel{12}} \\ 7\frac{7}{12} &= x \text{ or } x = \frac{91}{12} \end{aligned}$$

Now substitute $x = \frac{91}{12}$ into the expression for the length of each side.

$$\begin{aligned} s &= 3\left(\frac{91}{12}\right)-2 && \text{Substitute } x = \frac{91}{12}. \\ s &= 22\frac{3}{4}-2 && \text{Simplify.} \\ s &= 20\frac{3}{4} \text{ or } 20.75 \end{aligned}$$

To check the solution, substitute this value into the formula for perimeter and set it equal to 83.

$$\begin{aligned} P &= 4s \\ 83 &\stackrel{?}{=} 4(20.75) && \text{Check the answer.} \\ 83 &= 83 && \text{The answer works.} \end{aligned}$$

52. Substitute $P = 60$, and $s = 6x-3$ into the formula for perimeter and solve for x.

$$\begin{aligned} P &= 4s && \text{Formula for perimeter.} \\ 60 &= 4(6x-3) && \text{Substitute in value for } s. \\ 60 &= \boxed{24x}-12 && \text{Distribute/mulitply on right side.} \\ +12 & \quad\ +12 && \text{Add 8 to both sides.} \\ 72 &= 24x && \text{Divide both sides by 12.} \\ \frac{72}{24} &= \frac{\cancel{24}x}{\cancel{24}} \\ 3 &= x \end{aligned}$$

Now substitute $x = 3$ into the expression for the length of each side.

$$\begin{aligned} s &= 6(3)-3 && \text{Substitute } x = 3. \\ s &= 18-3 && \text{Simplify.} \\ s &= 15 \end{aligned}$$

The length of each side of the yard measures 15 ft.

To check the solution, substitute this value into the formula for perimeter and set it equal to 60.

$$\begin{aligned} P &= 4s \\ 60 &\stackrel{?}{=} 4(15) && \text{Check the answer.} \\ 60 &= 60 && \text{The answer works.} \end{aligned}$$

53. Substitute $P = 100$, $l = x - 5$, and $w = 4x$ into the formula for perimeter and solve for x.

$$\begin{aligned} P &= 2l + 2w && \text{Formula for perimeter.} \\ 100 &= 2(x-5) + 2(4x) && \text{Substitute in values.} \\ 100 &= 2x - 10 + 8x && \text{Distribute/mulitply on right side.} \\ 100 &= \boxed{10x} - 10 && \text{Simplify \& isolate variable term.} \\ +10 &\quad\quad +10 && \text{Add 10 to both sides.} \\ 110 &= 10x && \text{Divide both sides by 10.} \\ \frac{110}{10} &= \frac{\cancel{10}x}{\cancel{10}} \\ 11 &= x \end{aligned}$$

Now substitute $x = 11$ into the expressions for length and width.

$$\begin{aligned} l &= (11) - 5 \quad & w &= 4(11) \quad && \text{Substitute } x = 11. \\ l &= 6 & w &= 44 && \text{Simplify each equation.} \end{aligned}$$

The length and width of the lawn measure 6 ft and 44 ft.

To check the solution, substitute these values into the formula for perimeter and set it equal to 100.

$$\begin{aligned} P &= 2l + 2w \\ 100 &\stackrel{?}{=} 2(6) + 2(44) && \text{Check the answer.} \\ 100 &\stackrel{?}{=} 12 + 88 \\ 100 &= 100 && \text{The answer works.} \end{aligned}$$

54. Substitute $P = 58$, $l = x - 7$, and $w = 3x$ into the formula for perimeter and solve for x.

$$\begin{aligned} P &= 2l + 2w && \text{Formula for perimeter.} \\ 58 &= 2(x-7) + 2(3x) && \text{Substitute in values.} \\ 58 &= 2x - 14 + 6x && \text{Distribute/mulitply on right side.} \\ 58 &= \boxed{8x} - 14 && \text{Simplify \& isolate variable term.} \\ +14 &\quad\quad +14 && \text{Add 14 to both sides.} \\ 72 &= 8x && \text{Divide both sides by 10.} \\ \frac{72}{8} &= \frac{\cancel{8}x}{\cancel{8}} \\ 9 &= x \end{aligned}$$

Now substitute $x = 9$ into the expressions for length and width.

$$\begin{aligned} l &= (9) - 7 \quad & w &= 3(9) \quad && \text{Substitute } x = 9. \\ l &= 2 & w &= 27 && \text{Simplify each equation.} \end{aligned}$$

The length and width of the lawn measure 2 ft and 27 ft.

To check the solution, substitute these values into the formula for perimeter and set it equal to 58.

$$\begin{aligned} P &= 2l + 2w \\ 58 &\stackrel{?}{=} 2(2) + 2(27) && \text{Check the answer.} \\ 58 &\stackrel{?}{=} 4 + 54 \\ 58 &= 58 && \text{The answer works.} \end{aligned}$$

55.

$$\begin{aligned} x + 2x + 2x &= 180 && \text{Combine like terms.} \\ 5x &= 180 && \text{Divide both sides by 5.} \\ \frac{\cancel{5}x}{\cancel{5}} &= \frac{180}{5} \\ x &= 36 \end{aligned}$$

Now substitute $x = 36$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $36°$, $72°$, and $72°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 36° + 72° + 72° &\stackrel{?}{=} 180° && \text{Check the answer.} \\ 180° &= 180° && \text{The answer works.} \end{aligned}$$

56.

$$\begin{aligned} x + 2x + 3x &= 180 && \text{Combine like terms.} \\ 6x &= 180 && \text{Divide both sides by 6.} \\ \frac{\cancel{6}x}{\cancel{6}} &= \frac{180}{6} \\ x &= 30 \end{aligned}$$

Now substitute $x = 30$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $30°$, $60°$, and $90°$.

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 30° + 60° + 90° &\stackrel{?}{=} 180° && \text{Check the answer.} \\ 180° &= 180° && \text{The answer works.} \end{aligned}$$

57.

$$3(x-0.5)+1=3x-0.5 \quad \text{Simplify on left - distribute.}$$
$$3x-1.5+1=3x-0.5 \quad \text{Combine like terms on left side.}$$
$$\boxed{3x}-0.5=\boxed{3x}-0.5 \quad \text{Combine like terms across = sign.}$$
$$\underline{-3x \qquad -3x} \quad \text{Subtract } 3x \text{ from both sides.}$$
$$-0.5=-0.5 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -2 and 2, and substitute these into the equation.

$$3([-2]-0.5)+1\overset{?}{=}3(-2)-0.5 \quad \text{Check the answer using } -2.$$
$$3(-2.5)+1\overset{?}{=}-6-0.5$$
$$-7.5+1\overset{?}{=}-6.5$$
$$-6.5=-6.5 \quad \text{The answer works.}$$

$$3([2]-0.5)+1\overset{?}{=}3(2)-0.5 \quad \text{Check the answer using 2.}$$
$$3(1.5)+1\overset{?}{=}6-0.5$$
$$4.5+1\overset{?}{=}5.5$$
$$5.5=5.5 \quad \text{The answer works.}$$

58.

$$2.1(x+2)-3=2.1x+1.2 \quad \text{Simplify on left - distribute.}$$
$$2.1x+4.2-3=2.1x+1.2 \quad \text{Combine like terms on left side.}$$
$$\boxed{2.1x}+1.2=\boxed{2.1x}+1.2 \quad \text{Combine like terms across = sign.}$$
$$\underline{-2.1x \qquad -2.1x} \quad \text{Subtract } 2.1x \text{ from both sides.}$$
$$1.2=1.2 \quad \text{This is a true statement.}$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -9 and 8, and substitute these into the equation.

$$2.1([-9]+2)-3\overset{?}{=}2.1(-9)+1.2 \quad \text{Check the answer using } -9.$$
$$2.1(-7)-3\overset{?}{=}-18.9+1.2$$
$$-14.7-3\overset{?}{=}-17.7$$
$$-17.7=-17.7 \quad \text{The answer works.}$$
$$2.1([8]+2)-3\overset{?}{=}2.1(8)+1.2 \quad \text{Check the answer using 8.}$$
$$2.1(10)-3\overset{?}{=}16.8+1.2$$
$$21-3\overset{?}{=}18$$
$$18=18 \quad \text{The answer works.}$$

59.

$$0.3x+0.3=\boxed{0.5x}+0.1\boxed{-0.2x} \quad \text{Simplify on right side.}$$
$$\boxed{0.3x}+0.3=\boxed{0.3x}+0.1 \quad \text{Combine like terms across = sign.}$$
$$\underline{-0.3x \qquad -0.3x} \quad \text{Subtract } 0.3x \text{ from both sides.}$$
$$0.3\overset{?}{=}0.1 \quad \text{This is a false statement.}$$

This equation has no solution.

60.

$$0.9x-0.2=0.5(3x+1)-0.6x \quad \text{Simplify on right side.}$$
$$0.9x-0.2=1.5x+0.5-0.6x$$
$$\boxed{0.9x}-0.2=\boxed{0.9x}+0.5 \quad \text{Combine like terms across = sign.}$$
$$\underline{-0.9x \qquad -0.9x} \quad \text{Subtract } 0.9x \text{ from both sides.}$$
$$-0.2\overset{?}{=}0.5 \quad \text{This is a false statement.}$$

This equation has no solution.

61.

$$\frac{1}{2}r+5=\frac{7}{5}r+5 \quad \text{Multiply by 10 } (5\cdot 2) \text{ to clear fractions.}$$
$$(10)\frac{1}{2}r+(10)5=(10)\frac{7}{5}r+5(10)$$
$$(\overset{5}{\cancel{10}})\frac{1}{\cancel{2}}r+50=(\overset{2}{\cancel{10}})\frac{7}{\cancel{5}}r+50$$
$$\boxed{5r}+50=\boxed{14r}+50 \quad \text{Combine like terms across = sign.}$$
$$\underline{-14r \qquad -14r} \quad \text{Subtract } 14r \text{ from both sides.}$$
$$-9r+50=50$$
$$\underline{\quad -50 \quad -50} \quad \text{Subtract 50 from both sides.}$$
$$-9r=0 \quad \text{Divide both sides by } -9.$$
$$\frac{\cancel{-9}r}{\cancel{-9}}=\frac{0}{-9}$$
$$r=0$$

$$\frac{1}{2}(0)+5\overset{?}{=}\frac{7}{5}(0)+5 \quad \text{Check the answer.}$$
$$0+5\overset{?}{=}0+5$$
$$5=5 \quad \text{The answer works.}$$

62.

$$\frac{1}{4}w+50=3w+50 \quad \text{Multiply by 4 to clear fraction.}$$
$$(\cancel{4})\frac{1}{\cancel{4}}w+(4)50=(4)3w+50(4)$$
$$\boxed{w}+200=\boxed{12w}+200 \quad \text{Combine like terms across = sign.}$$
$$\underline{-12w \qquad -12w} \quad \text{Subtract } 12w \text{ from both sides.}$$
$$-11w+200=200$$
$$\underline{\quad -200 \quad -200} \quad \text{Subtract 200 from both sides.}$$
$$-11w=0 \quad \text{Divide both sides by } -11.$$

$$\frac{\cancel{-11}w}{\cancel{-11}}=\frac{0}{-11}$$
$$w=0$$

$\frac{1}{4}(0)+50\overset{?}{=}3(0)+50$ Check the answer.
$0+50\overset{?}{=}0+50$
$50=50$ The answer works.

63.

$\frac{3}{5}d-1=\frac{1}{10}(6d-10)$ Multiply by 10 to clear fractions.
$(\cancel{10}^{2})\frac{3}{\cancel{5}}d-(10)1=(\cancel{10})\frac{1}{\cancel{10}}(6d-10)$
$\boxed{6d}-10=\boxed{6d}-10$ Combine like terms across = sign.
$-6d \quad -6d$ Subtract $6d$ from both sides.
$-10=-10$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.
To check this we will randomly choose two real numbers -20 and 10, and substitute these into the equation.

$\frac{3}{5}(-20)-1\overset{?}{=}\frac{1}{10}(6[-20]-10)$ Check the answer using -20.
$-12-1\overset{?}{=}\frac{1}{10}(-120-10)$
$-13\overset{?}{=}\frac{1}{10}(-130)$
$-13=-13$ The answer works.
$\frac{3}{5}(10)-1\overset{?}{=}\frac{1}{10}(6[10]-10)$ Check the answer using 10.
$6-1\overset{?}{=}\frac{1}{10}(60-10)$
$5\overset{?}{=}\frac{1}{10}(50)$
$5=5$ The answer works.

64.

$\frac{2}{3}n+6=\frac{1}{3}(2n+18)$ Multiply by 3 to clear fractions.
$(\cancel{3})\frac{2}{\cancel{3}}n+(3)6=(\cancel{3})\frac{1}{\cancel{3}}(2n+18)$
$\boxed{2n}+18=\boxed{2n}+18$ Combine like terms across = sign.
$-2n \quad -2n$ Subtract $2n$ from both sides.
$18=18$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -12 and 6, and substitute these into the equation.

$\frac{2}{3}(-12)+6\overset{?}{=}\frac{1}{3}(2[-12]+18)$ Check the answer using -12.
$-8+6\overset{?}{=}\frac{1}{3}(-24+18)$
$-2\overset{?}{=}\frac{1}{3}(-6)$
$-2=-2$ The answer works.
$\frac{2}{3}(6)+6\overset{?}{=}\frac{1}{3}(2[6]+18)$ Check the answer using 6.
$4+6\overset{?}{=}\frac{1}{3}(12+18)$
$10\overset{?}{=}\frac{1}{3}(30)$
$10=10$ The answer works.

65.

$\frac{1}{5}g+7=2+\frac{2}{5}g$ Multiply by 5 to clear fractions.
$(\cancel{5})\frac{1}{\cancel{5}}g+(5)7=(5)2+\frac{2}{\cancel{5}}g(\cancel{5})$
$\boxed{g}+35=10+\boxed{2g}$ Combine like terms across = sign.
$-2g \quad -2g$ Subtract $2g$ from both sides.
$-g+35=10$
$-35 \quad -35$ Subtract 35 from both sides.
$-g=-25$ Multiply both sides by -1.
$-1\cdot -g=-25\cdot -1$
$g=25$

$\frac{1}{5}(25)+7\overset{?}{=}2+\frac{2}{5}(25)$ Check the answer.
$5+7\overset{?}{=}2+10$
$12=12$ The answer works.

66.

$\frac{2}{7}t-5=15-\frac{3}{7}t$ Multiply by 7 to clear fractions.
$(\cancel{7})\frac{2}{\cancel{7}}t-(7)5=(7)15-\frac{3}{\cancel{7}}t(\cancel{7})$
$\boxed{2t}-35=105\boxed{-3t}$ Combine like terms across = sign.
$+3t \quad +3t$ Add $3t$ to both sides.
$5t-35=105$
$+35 \quad +35$ Add 35 to both sides.
$5t=140$ Divide both sides by 5.
$$\frac{\cancel{5}t}{\cancel{5}}=\frac{140}{5}$$
$t=28$

$$\frac{2}{7}(28)-5\stackrel{?}{=}15-\frac{3}{7}(28) \quad \text{Check the answer.}$$
$$8-5\stackrel{?}{=}15-12$$
$$3=3 \quad \text{The answer works.}$$

67.

$$\frac{1}{2}x+7=\frac{2}{5}x+9 \quad \text{Multiply by 10 } (5\cdot 2) \text{ to clear fractions.}$$
$$(^{5}\cancel{10})\frac{1}{\cancel{2}}x+(10)7=(^{2}\cancel{10})\frac{2}{\cancel{5}}x+9(10)$$
$$\boxed{5x}+70=\boxed{4x}+90 \quad \text{Combine like terms across = sign.}$$
$$\underline{-4x \qquad -4x} \quad \text{Subtract } 4x \text{ from both sides.}$$
$$x+70=90$$
$$\underline{-70 \quad -70} \quad \text{Subtract 70 from both sides.}$$
$$x=20$$
$$\frac{1}{2}(20)+7\stackrel{?}{=}\frac{2}{5}(20)+9 \quad \text{Check the answer.}$$
$$10+7\stackrel{?}{=}8+9$$
$$17=17 \quad \text{The answer works.}$$

68.

$$\frac{1}{3}v+4=\frac{1}{4}v+\frac{9}{2} \quad \text{Multiply by 12 (LCD) to clear fractions.}$$
$$(^{4}\cancel{12})\frac{1}{\cancel{3}}v+(12)4=(^{3}\cancel{12})\frac{1}{\cancel{4}}v+\frac{9}{\cancel{2}}(^{6}\cancel{12})$$
$$\boxed{4v}+48=\boxed{3v}+54 \quad \text{Combine like terms across = sign.}$$
$$\underline{-3v \qquad -3v} \quad \text{Subtract } 3v \text{ from both sides.}$$
$$v+48=54$$
$$\underline{-48 \quad -48} \quad \text{Subtract 48 from both sides.}$$
$$v=6$$
$$\frac{1}{3}(6)+4\stackrel{?}{=}\frac{1}{4}(6)+\frac{9}{2} \quad \text{Check the answer.}$$
$$2+4\stackrel{?}{=}\frac{3}{2}+\frac{9}{2}$$
$$6\stackrel{?}{=}\frac{12}{2}$$
$$6=6 \quad \text{The answer works.}$$

69.

$$\frac{1}{2}x+5=\frac{1}{2}x+3 \quad \text{Multiply by 2 to clear fractions.}$$
$$(\cancel{2})\frac{1}{\cancel{2}}x+(2)5=(\cancel{2})\frac{1}{\cancel{2}}x+3(2)$$
$$\boxed{x}+10=\boxed{x}+6 \quad \text{Combine like terms across = sign.}$$
$$\underline{-x \qquad -x} \quad \text{Subtract } x \text{ from both sides.}$$
$$10\stackrel{?}{=}6 \quad \text{This is a false statement.}$$

This equation has no solution.

70.

$$\frac{1}{3}(3x+6)=2\left(\frac{1}{2}x+4\right) \quad \text{Simplify on each side - distribute.}$$
$$\boxed{x}+2=\boxed{x}+8 \quad \text{Combine like terms across = sign.}$$
$$\underline{-x \qquad -x} \quad \text{Subtract } x \text{ from both sides.}$$
$$2\stackrel{?}{=}8 \quad \text{This is a false statement.}$$

This equation has no solution.

71.

$$75+x+(x-5)=180 \quad \text{Combine like terms.}$$
$$2x+70=180$$
$$\underline{-70 \quad -70} \quad \text{Subtract 70 from both sides.}$$
$$2x=110$$
$$\frac{\cancel{2}x}{\cancel{2}}=\frac{110}{2} \quad \text{Divide both sides by 2.}$$
$$x=55$$

Now substitute $x=55$ into the expressions that represent the angles. The measures of the 3 angles are $75°,\ 55°,\ \text{and}\ 50°.$

To check the solution, the measures of the angles should add up to 180.

$$75°+55°+50°\stackrel{?}{=}180° \quad \text{Check the answer.}$$
$$180°=180° \quad \text{The answer works.}$$

72.

$$80+(x+10)+(x-20)=180 \quad \text{Combine like terms.}$$
$$2x+70=180$$
$$\underline{-70 \quad -70} \quad \text{Subtract 70 from both sides.}$$
$$2x=110$$
$$\frac{\cancel{2}x}{\cancel{2}}=\frac{110}{2} \quad \text{Divide both sides by 2.}$$
$$x=55$$

Now substitute $x=55$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $80°,\ 65°,\ \text{and}\ 35°.$

To check the solution, the measures of the angles should add up to 180.

$$80° + 65° + 35° \stackrel{?}{=} 180° \quad \text{Check the answer.}$$
$$180° = 180° \quad \text{The answer works.}$$

73.

$$x + (x+5) + (x-14) = 180 \quad \text{Combine like terms.}$$
$$3x - 9 = 180$$
$$\underline{+9 \quad +9} \quad \text{Add 9 to both sides.}$$
$$3x = 189$$
$$\frac{\cancel{3}x}{\cancel{3}} = \frac{189}{3} \quad \text{Divide both sides by 3.}$$
$$x = 63$$

Now substitute $x = 63$ into the expressions that represent the angles. The measures of the 3 angles are $63°$, $68°$, and $49°$.

To check the solution, the measures of the angles should add up to 180.

$$63° + 68° + 49° \stackrel{?}{=} 180° \quad \text{Check the answer.}$$
$$180° = 180° \quad \text{The answer works.}$$

74.

$$2x + (x+30) + (x-10) = 180 \quad \text{Combine like terms.}$$
$$4x + 20 = 180$$
$$\underline{-20 \quad -20} \quad \text{Subtract 20 from both sides.}$$
$$4x = 160$$
$$\frac{\cancel{4}x}{\cancel{4}} = \frac{160}{4} \quad \text{Divide both sides by 4.}$$
$$x = 40$$

Now substitute $x = 40$ into the expressions that represent the angles. The measures of the 3 angles are $80°$, $70°$, and $30°$.

To check the solution, the measures of the angles should add up to 180.

$$80° + 70° + 30° \stackrel{?}{=} 180° \quad \text{Check the answer.}$$
$$180° = 180° \quad \text{The answer works.}$$

75. The sum of the measures of the angles in a quadrilateral must equal $360°$. Add the measures of the given angles and set them equal to $360°$ then solve for x.

$$x + (x-25) + 65 + (x+20) = 360$$
$$3x + 60 = 360 \quad \text{Combine like terms.}$$
$$\underline{-60 \quad -60} \quad \text{Subtract 60 from both sides.}$$
$$3x = 300$$
$$\frac{\cancel{3}x}{\cancel{3}} = \frac{300}{3} \quad \text{Divide both sides by 3.}$$
$$x = 100$$

Now substitute $x = 100$ into the expressions that represent the angles. The measures of the 4 angles are $100°$, $75°$, $65°$, and $120°$.

To check the solution, the measures of the angles should add up to 360.

$$100° + 75° + 65° + 120° \stackrel{?}{=} 360° \quad \text{Check the answer.}$$
$$360° = 360° \quad \text{The answer works.}$$

76.

$$(2x-10) + (2x-5) + (3x+15) + x = 360$$
$$8x = 360 \quad \text{Combine like terms.}$$
$$\frac{\cancel{8}x}{\cancel{8}} = \frac{360}{8} \quad \text{Divide both sides by 8.}$$
$$x = 45$$

Now substitute $x = 45$ into the expressions that represent the angles. The measures of the 4 angles are $80°$, $85°$, $150°$, and $45°$.

To check the solution, the measures of the angles should add up to 360.

$$80° + 85° + 150° + 45° \stackrel{?}{=} 360° \quad \text{Check the answer.}$$
$$360° = 360° \quad \text{The answer works.}$$

77. Add the given expressions for side lengths, set them equal to 342, and solve for p.

$$(p-3) + (p+20) + p + (p+5) = 342$$
$$4p + 22 = 342 \quad \text{Combine like terms on left side.}$$
$$\underline{-22 \quad -22} \quad \text{Subtract 22 from both sides.}$$
$$4p = 320 \quad \text{Divide both sides by 4.}$$
$$\frac{\cancel{4}p}{\cancel{4}} = \frac{320}{4}$$
$$p = 80$$

Now substitute $p = 80$ into the expressions that represent the lengths of each side. The lengths of the sides are 77 ft., 100 ft., 80 ft., and 85 ft.

To check the solution, the sum of the lengths of the sides should equal 342.

$$77 + 100 + 80 + 85 \stackrel{?}{=} 342 \quad \text{Check the answer.}$$
$$342 = 342 \quad \text{The answer works.}$$

78. Add the given expressions for side lengths, set them equal to 335, and solve for m.

$$\begin{aligned}
(m-5)+m+(m+10)&=335 \\
3m+5&=335 && \text{Combine like terms on left side.} \\
-5\quad -5& && \text{Subtract 5 from both sides.} \\
3m&=330 && \text{Divide both sides by 3.} \\
\frac{\cancel{3}m}{\cancel{3}}&=\frac{330}{3} \\
m&=110
\end{aligned}$$

Now substitute $m=110$ into the expressions that represent the lengths of each side. The lengths of the sides are 105 ft., 110 ft., and 120 ft.
To check the solution, the sum of the lengths of the sides should equal 335.

$$\begin{aligned}
105+110+120&\stackrel{?}{=}335 && \text{Check the answer.} \\
335&=335 && \text{The answer works.}
\end{aligned}$$

79. Add the given expressions for side lengths, set them equal to 345, and solve for s.

$$\begin{aligned}
s+2s+(s-5)+(2s-10)&=345 \\
6s-15&=345 && \text{Combine like terms on left side.} \\
+15\quad +15& && \text{Add 15 to both sides.} \\
6s&=360 && \text{Divide both sides by 6.} \\
\frac{\cancel{6}s}{\cancel{6}}&=\frac{360}{6} \\
s&=60
\end{aligned}$$

Now substitute $s=60$ into the expressions that represent the lengths of each side. The lengths of the sides are 60 ft., 120 ft., 55 ft., and 110 ft.
To check the solution, the sum of the lengths of the sides should equal 345.

$$\begin{aligned}
60+120+55+110&\stackrel{?}{=}345 && \text{Check the answer.} \\
345&=345 && \text{The answer works.}
\end{aligned}$$

80. Add the given expressions for side lengths, set them equal to 500, and solve for x.

$$\begin{aligned}
(x+20)+(3x+5)+x+(3x+10)+(x-30)&=500 \\
9x+5&=500 && \text{Combine like terms on left side.} \\
-5\quad -5& && \text{Subtract 5 from both sides.} \\
9x&=495 && \text{Divide both sides by 9.} \\
\frac{\cancel{9}x}{\cancel{9}}&=\frac{495}{9} \\
x&=55
\end{aligned}$$

Now substitute $x=55$ into the expressions that represent the lengths of each side. The lengths of the sides are 75 ft., 170 ft., 55 ft., 175 ft., and 25 ft.
To check the solution, the sum of the lengths of the sides should equal 500.

$$\begin{aligned}
75+170+55+175+25&\stackrel{?}{=}500 && \text{Check the answer.} \\
500&=500 && \text{The answer works.}
\end{aligned}$$

81. Let $s=$ the number of students going on the bike tour.

- $145(s)$ dollars for the bikes
- $2(2s)$ dollars for the water bottles
- $4.50(3s)$ dollars for the food sacks

We write out the following equation equal to Carlotta's budget of $2275.00

$$145s+2(2s)+4.50(3s)=2275$$

Now solve the equation for s.

$$\begin{aligned}
145s+2(2s)+4.50(3s)&=2275 && \text{Multiply on left side.} \\
145s+4s+13.5s&=2275 && \text{Combine like terms on left side.} \\
162.5s&=2275 \\
\frac{\cancel{162.5}s}{\cancel{162.5}}&=\frac{2275}{162.5} && \text{Divide both sides by 162.5.} \\
s&=14
\end{aligned}$$

Carlotta can supply 14 students for the tour.

82. Let $c=$ the number of Alphabet Cars Bill is going to build.
Bill will need to buy the following:

- $4c$ wheels, 4 for each car.
- $2c$ axles, two for each car.
- $5c$ hubcaps, 5 for each car.

Now we multiply each of these expressions by how much they cost and then add those costs together to get the total of $14,700.

- $0.27(4c)$ dollars for the wheels
- $0.78(2c)$ dollars for the axles
- $0.06(5c)$ dollars for the hubcaps

We write out the following equation equal to Bill's budget of $14,700.00

$$0.27(4c)+0.78(2c)+0.06(5c)=14700$$

Now solve the equation for *c*.

$$0.27(4c)+0.78(2c)+0.06(5c)=14700$$
$$1.08c+1.56c+0.3c=14700$$
$$2.94c=14700 \quad \text{Combine like terms on left side.}$$
$$\frac{\cancel{2.94}c}{\cancel{2.94}}=\frac{14700}{2.94} \quad \text{Divide both sides by 2.94.}$$
$$c=5000$$

Bill can build 5000 Alphabet Cars.

83. a. First consider how many of each item is needed for *k* kids.

- $k+8$ pine 2X2, 1foot for each kid plus 8 extra feet.
- $1.5k+10$ pine 1X3, 1.5 feet for each kid plus 10 extra feet.
- $k+12$ sets of nails, 1 set for each kid plus 12 extra sets.

Now we multiply each of these expressions by how much they cost.

- $0.45(k+8)$ dollars for pine 2X2
- $0.55(1.5k+10)$ dollars for pine 1X3
- $0.05(k+12)$ dollars for nails

Let *S* = the total amount in dollars needed for supplies.

$$S=0.45(k+8)+0.55(1.5k+10)+0.05(k+12)$$
$$S=0.45k+3.6+0.825k+5.5+0.05k+0.6 \quad \text{Distribute.}$$
$$S=1.325k+9.7 \quad \text{Combine like terms.}$$

b. Substitute $k=75$ into the equation and solve for *S*.

$$S=1.325(75)+9.7 \quad \text{Substitute } k=75.$$
$$S=99.375+9.7 \quad \text{Multiply then add.}$$
$$S=109.075$$

The cost would be \$109.08 (rounded to the nearest cent).

c. Substitute $S=310$ into the equation and solve for *k*.

$$310=1.325k+9.7 \quad \text{Substitute } S=310.$$
$$\underline{-9.7 \qquad -9.7} \quad \text{Subtract 9.7 from both sides.}$$
$$300.3=1.325k \quad \text{Divide both sides by 1.325.}$$
$$\frac{300.3}{1.325}=\frac{\cancel{1.325}k}{\cancel{1.325}}$$
$$226.64\approx k \quad \text{Rounded to hundredths}$$

The manager can buy supplies for 226 projects.

84. a. First consider how many of each item is needed for *y* yards.

- $12y+15$ 10-ft PVC pipes, 12 for each yard plus 15 extra.
- $9y+6$ sprinkler heads, 9 for each yard plus 6 extra.
- $y+2$ sets of misc. PVC parts, 1 set for each yard plus 2 extra sets.

Now we multiply each of these expressions by how much they cost.

- $1.50(12y+15)$ dollars for 10-ft PVC pipes
- $2.50(9y+6)$ dollars for sprinkler heads
- $15(y+2)$ dollars for misc. PVC parts

Let *S* = the total amount in dollars needed for supplies.

$$S=1.50(12y+15)+2.50(9y+6)+15(y+2)$$
$$S=18y+22.5+22.5y+15+15y+30 \quad \text{Distribute.}$$
$$S=55.5y+67.5 \quad \text{Combine like terms.}$$

b. Substitute $y=12$ into the equation and solve for *S*.

$$S=55.5(12)+67.5 \quad \text{Substitute } t=12.$$
$$S=666+67.5 \quad \text{Multiply then add.}$$
$$S=733.5$$

It will cost \$733.50 for supplies.

c. Substitute $S=6006$ into the equation and solve for *y*.

$$6006=55.5y+67.5 \quad \text{Substitute } S=6006.$$
$$\underline{-67.5 \qquad -67.5} \quad \text{Subtract 67.5 from both sides.}$$
$$5938.5=55.5y \quad \text{Divide both sides by 55.5.}$$
$$\frac{5938.5}{55.5}=\frac{\cancel{55.5}y}{\cancel{55.5}}$$
$$107=y \quad \text{Rounded to hundredths}$$

107 sprinkler systems can be installed.

85. The statement does not have an equal sign, therefore it is an expression.

$$\boxed{5ab}+6a^2-4a+\boxed{12ab}+3 \quad \text{Identify like terms.}$$
$$6a^2-4a+17ab+3 \quad \text{Arrange in conventional form.}$$

86. The statement does not have an equal sign, therefore it is an expression.

$\boxed{10mn^2}+9n+\boxed{\boxed{1}}\boxed{-7mn^2}+\boxed{\boxed{4}}$ Identify like terms.

$3mn^2+9n+5$ Arrange in conventional form.

87. The statement has an equal sign, therefore it is an equation.

$\boxed{0.5x}\boxed{\boxed{-4}}=\boxed{2x}+\boxed{\boxed{7}}$ Identify like terms.

$\underline{-2x \qquad -2x}$ Subtract $2x$ from both sides.

$-1.5x-4=7$

$\underline{\quad +4 \quad +4}$ Add 4 to both sides.

$-1.5x=11$ Divide both sides by -1.5.

$$\frac{\cancel{-1.5}x}{\cancel{-1.5}}=\frac{11}{-1.5}$$

$$x=-7.\overline{3}$$

88. The statement has an equal sign, therefore it is an equation.

$\boxed{-0.25r}+\boxed{\boxed{12}}=\boxed{4.5r}\boxed{\boxed{-15}}$ Identify like terms.

$\underline{-4.5r \qquad -4.5r}$ Subtract $4.5r$ from both sides.

$-4.75r+12=-15$

$\underline{\quad -12 \quad -12}$ Subtract 12 from both sides.

$-4.75r=-27$ Divide both sides by -4.75.

$$\frac{\cancel{-4.75}x}{\cancel{-4.75}}=\frac{-27}{-4.75}$$

$$x\approx 5.68$$

89. The statement has an equal sign, therefore it is an equation.

Multiply each term by 24 to clear fractions.

$$\frac{1}{8}n+12=\frac{3}{24}n-2$$

$$(^3\cancel{24})\frac{1}{\cancel{8}}n+(24)12=(\cancel{24})\frac{3}{\cancel{24}}n-2(24)$$

$\boxed{3n}+\boxed{\boxed{288}}=\boxed{3n}\boxed{\boxed{-48}}$ Identify like terms.

$\underline{-3n \qquad -3n}$ Subtract $3n$ from both sides.

$288\overset{?}{=}-48$ This is a false statement.

This equation has no solution.

90. The statement has an equal sign, therefore it is an equation.

Multiply each term by 16 to clear fractions.

$$\frac{3}{4}d+14=\frac{12}{16}d-20$$

$$(^4\cancel{16})\frac{3}{\cancel{4}}d+(16)14=(\cancel{16})\frac{12}{\cancel{16}}d-20(16)$$

$\boxed{12d}+\boxed{\boxed{224}}=\boxed{12d}\boxed{\boxed{-320}}$ Identify like terms.

$\underline{-12d \qquad -12d}$ Subtract $12d$ from both sides.

$224\overset{?}{=}-320$ This is a false statement.

This equation has no solution.

91. The statement does not have an equal sign, therefore it is an expression.

$\boxed{2x}+\boxed{\boxed{11}}\boxed{-4x}+\boxed{\boxed{8}}$ Identify like terms.

$-2x+19$ Arrange in conventional form.

92. The statement does not have an equal sign, therefore it is an expression. Simplify as follows

$7y^3\boxed{-10y}+3y^2+\boxed{2y}$ Identify like terms.

$7y^3+3y^2-8y$ Arrange in conventional form.

93. The statement has an equal sign, therefore it is an equation.

Multiply each term by 6 to clear fractions.

$$\frac{1}{2}(3x+4)=\frac{1}{3}x+20$$

$$(^3\cancel{6})\frac{1}{\cancel{2}}(3x+4)=(^2\cancel{6})\frac{1}{\cancel{3}}x+20(6)$$

$3(3x+4)=2x+120$ Distribute on left side.

$\boxed{9x}+\boxed{\boxed{12}}=\boxed{2x}+\boxed{\boxed{120}}$ Identify like terms.

$\underline{-2x \qquad -2x}$ Subtract $2x$ from both sides.

$7x+12=120$

$\underline{\quad -12 \quad -12}$ Subtract 12 from both sides.

$7x=108$ Divide both sides by 7.

$$\frac{\cancel{7}x}{\cancel{7}}=\frac{108}{7}$$

$$x=15\frac{3}{7}$$

94. The statement has an equal sign, therefore it is an equation.

Multiply each term by 36 to clear fractions.

$$\frac{1}{4}(5w+2)=11-\frac{5}{18}w$$

$$({}^{9}\cancel{36})\frac{1}{\cancel{4}}(5w+2)=(36)11-\frac{5}{\cancel{18}}w({}^{2}\cancel{36})$$

$9(5w+2)=396-10w$ Distribute on left side.

$\boxed{45w}+\boxed{\boxed{18}}=\boxed{\boxed{396}}\boxed{-10w}$ Identify like terms.

$+10w \qquad\qquad +10w$ Add $10w$ to both sides.

$55w+18=396$

$-18 \quad -18$ Subtract 18 from both sides.

$55w=378$ Divide both sides by 55.

$$\frac{\cancel{55}w}{\cancel{55}}=\frac{378}{55}$$

$$x=6\frac{48}{55}$$

Section 2.4 Solving and Graphing Linear Inequalities on a Number Line

1.

$3x \geq 21$ Divide both sides by 3.

$\frac{\cancel{3}x}{\cancel{3}} \geq \frac{21}{3}$

$x \geq 7$

$3(7) \stackrel{?}{=} 21$ Check the answer.
$21 = 21$ The answer works.

Check a number greater than 7 ($x = 8$) to test the direction of the inequality symbol.

$3(8) \stackrel{?}{\geq} 21$ Check the direction of the inequality.
$24 \geq 21$ The direction of the inequality works.

2.

$5w \geq 300$ Divide both sides by 5.

$\frac{\cancel{5}w}{\cancel{5}} \geq \frac{300}{5}$

$w \geq 60$

$5(60) \stackrel{?}{=} 300$ Check the answer.
$300 = 300$ The answer works.

Check a number greater than 60 ($w = 61$) to test the direction of the inequality symbol.

$5(61) \stackrel{?}{\geq} 300$ Check the direction of the inequality.
$305 \geq 300$ The direction of the inequality works.

3.

$2d < 15$ Divide both sides by 2.

$\frac{\cancel{2}d}{\cancel{2}} < \frac{15}{2}$

$d < 7.5$

$2(7.5) \stackrel{?}{=} 15$ Check the answer.
$15 = 15$ The answer works.

Check a number less than 7.5 ($d = 7$) to test the direction of the inequality symbol.

$2(7) \stackrel{?}{<} 15$ Check the direction of the inequality.
$14 < 15$ The direction of the inequality works.

4.

$8z < 56$ Divide both sides by 8.

$\frac{\cancel{8}z}{\cancel{8}} < \frac{56}{8}$

$z < 7$

$8(7) \stackrel{?}{=} 56$ Check the answer.
$56 = 56$ The answer works.

Check a number less than 7 ($z = 6$) to test the direction of the inequality symbol.

$8(6) \stackrel{?}{<} 56$ Check the direction of the inequality.
$48 < 56$ The direction of the inequality works.

5.

$-4x \geq 48$ Divide both sides by -14.

$\frac{\cancel{-4}x}{\cancel{-4}} \leq \frac{48}{-4}$ Divide by neg., reverse inequality.

$x \leq -12$

$-4(-12) \stackrel{?}{=} 48$ Check the answer.
$48 = 48$ The answer works.

Check a number less than -12 ($x = -13$) to test the direction of the inequality symbol.

$-4(-13) \stackrel{?}{\geq} 48$ Check the direction of the inequality.
$52 \geq 48$ The direction of the inequality works.

6.

$-3y \leq 15$ Divide both sides by -3.

$\frac{\cancel{-3}y}{\cancel{-3}} \geq \frac{15}{-3}$ Divide by neg., reverse inequality.

$y \geq -5$

Check using problems 1-5 as a guide.

7.

$-a < -61$ Divide both sides by -1.

$\frac{-a}{-1} > \frac{-61}{-1}$ Divide by neg., reverse inequality.

$a > 61$

Check using problems 1-5 as a guide.

8.

$-x > -55$ Divide both sides by -1.

$\frac{-x}{-1} < \frac{-55}{-1}$ Divide by neg., reverse inequality.

$x < 55$

Check using problems 1-5 as a guide.

9.

$$\begin{aligned} 2g+5&\le 35 \\ \underline{-5\quad}&\underline{\,-5} \quad \text{Subtract 5 from both sides.} \\ 2g&\le 30 \quad \text{Divide both sides by 2.} \\ \frac{\cancel{2}g}{\cancel{2}}&\le\frac{30}{2} \\ g&\le 15 \end{aligned}$$

Check using problems 1-5 as a guide.

10.

$$\begin{aligned} 3x-8&\ge 4 \\ \underline{+8\quad}&\underline{\,+8} \quad \text{Add 8 to both sides.} \\ 3x&\ge 12 \quad \text{Divide both sides by 3.} \\ \frac{\cancel{3}x}{\cancel{3}}&\ge\frac{12}{3} \\ x&\ge 4 \end{aligned}$$

Check using problems 1-5 as a guide.

11.

$$\begin{aligned} 5m-13&>33 \\ \underline{+13\quad}&\underline{\,+13} \quad \text{Add 13 to both sides.} \\ 5m&>46 \quad \text{Divide both sides by 5.} \\ \frac{\cancel{5}m}{\cancel{5}}&>\frac{46}{5} \\ m>9.2 \text{ or } m&>9\frac{1}{5} \end{aligned}$$

Check using problems 1-5 as a guide.

12.

$$\begin{aligned} 6x+15&<42 \\ \underline{-15\quad}&\underline{\,-15} \quad \text{Subtract 15 from both sides.} \\ 6x&<27 \quad \text{Divide both sides by 6.} \\ \frac{\cancel{6}x}{\cancel{6}}&<\frac{27}{6} \\ x<4.5 \text{ or } x&<4\frac{1}{2} \end{aligned}$$

Check using problems 1-5 as a guide.

13.

$$\begin{aligned} -2x+9&\le 25 \\ \underline{-9\quad}&\underline{\,-9} \quad \text{Subtract 9 from both sides.} \\ -2x&\le 16 \quad \text{Divide both sides by } -2. \\ \frac{\cancel{-2}x}{\cancel{-2}}&\ge\frac{16}{-2} \quad \text{Divide by neg., reverse inequality} \\ x&\ge -8 \end{aligned}$$

Check using problems 1-5 as a guide.

14.

$$\begin{aligned} 4-3y&\ge -13 \\ \underline{-4\quad}&\underline{\,-4} \quad \text{Subtract 4 from both sides.} \\ -3y&\ge -17 \quad \text{Divide both sides by } -3. \\ \frac{\cancel{-3}y}{\cancel{-3}}&\le\frac{-17}{-3} \quad \text{Divide by neg., reverse inequality} \\ x&\le\frac{17}{3} \text{ or } 5\frac{2}{3} \end{aligned}$$

Check using problems 1-5 as a guide.

15.

$$\begin{aligned} 4x+7&>6x+3 \\ \underline{-6x\quad}&\underline{\,-6x} \quad \text{Subtract } 6x \text{ from both sides.} \\ -2x+7&>3 \\ \underline{-7\quad}&\underline{\,-7} \quad \text{Subtract 7 from both sides.} \\ -2x&>-4 \quad \text{Divide both sides by } -2. \\ \frac{\cancel{-2}x}{\cancel{-2}}&<\frac{-4}{-2} \quad \text{Divide by neg., reverse inequality} \\ x&<2 \end{aligned}$$

Check using problems 1-5 as a guide.

16.

$$\begin{aligned} 3t-14&<4t-20 \\ \underline{-4t\quad}&\underline{\,-4t} \quad \text{Subtract } 4t \text{ from both sides.} \\ -t-14&<-20 \\ \underline{+14\quad}&\underline{\,+14} \quad \text{Add 14 to both sides.} \\ -t&<-6 \quad \text{Divide both sides by } -1. \\ \frac{-t}{-1}&>\frac{-6}{-1} \quad \text{Divide by neg., reverse inequality} \\ t&>6 \end{aligned}$$

Check using problems 1-5 as a guide.

17.

$$\begin{aligned} -4x+7&\ge 5x+25 \\ \underline{-5x\quad}&\underline{\,-5x} \quad \text{Subtract } 5x \text{ from both sides.} \\ -9x+7&\ge 25 \\ \underline{-7\quad}&\underline{\,-7} \quad \text{Subtract 7 from both sides.} \\ -9x&\ge 18 \quad \text{Divide both sides by } -9. \\ \frac{\cancel{-9}x}{\cancel{-9}}&\le\frac{18}{-9} \quad \text{Divide by neg., reverse inequality} \\ x&\le -2 \end{aligned}$$

Check using problems 1-5 as a guide.

18.

$2-5y \le y+20$

$\underline{-y \quad -y}$ Subtract y from both sides.

$2-6y \le 20$

$\underline{-2 \qquad -2}$ Subtract 2 from both sides.

$-6y \le 18$ Divide both sides by -6.

$\frac{\cancel{-6}y}{\cancel{-6}} \ge \frac{18}{-6}$ Divide by neg., reverse inequality

$y \ge -3$

Check using problems 1-5 as a guide.

19.

$2(k+5)-3 < k+18$ Distribute on left side.

$2k+10-3 < k+18$

$2k+7 < k+18$

$\underline{-k \qquad -k}$ Subtract k from both sides.

$k+7 < 18$

$\underline{-7 \quad -7}$ Subtract 7 from both sides.

$k < 11$

Check using problems 1-5 as a guide.

20.

$4(z-3)+8 \ge 7z+20$ Distribute on left side.

$4z-12+8 \ge 7z+20$

$4z-4 \ge 7z+20$

$\underline{-7z \qquad -7z}$ Subtract $7z$ from both sides.

$-3z-4 \ge 20$

$\underline{+4 \quad +4}$ Add 4 to both sides.

$-3z \ge 24$ Divide both sides by -3.

$\frac{\cancel{-3}z}{\cancel{-3}} \le \frac{24}{-3}$ Divide by neg., reverse inequality

$z \le -8$

Check using problems 1-5 as a guide.

21.

$7(x-2)+1 > 8x-6$ Distribute on left side.

$7x-14+1 > 8x-6$

$7x-13 > 8x-6$

$\underline{-8x \qquad -8x}$ Subtract $8x$ from both sides.

$-x-13 > -6$

$\underline{+13 \quad +13}$ Add 13 to both sides.

$-x > 7$ Divide both sides by -1.

$\frac{-x}{-1} < \frac{7}{-1}$ Divide by neg., reverse inequality

$x < -7$

Check using problems 1-5 as a guide.

22.

$9(x+2)-3 < 10x+13$ Distribute on left side.

$9x+18-3 < 10x+13$

$9x+15 < 10x+13$

$\underline{-10x \quad -10x}$ Subtract $10x$ from both sides.

$-x+15 < 13$

$\underline{-15 \quad -15}$ Subtract 15 from both sides.

$-x < -2$ Divide both sides by -1.

$\frac{-x}{-1} > \frac{-2}{-1}$ Divide by neg., reverse inequality

$x > 2$

Check using problems 1-5 as a guide.

23. a. Write the inequality as follows:

$11h \ge 275$

b. $11h \ge 275$ Divide both sides by 11.

$\frac{\cancel{11}h}{\cancel{11}} \ge \frac{275}{11}$

$h \ge 25$

Kati needs to work at least 25 hours this week.

c. Rewrite the inequality and solve as follows:

$11h \ge 400$ Divide both sides by 11.

$\frac{\cancel{11}h}{\cancel{11}} \ge \frac{400}{11}$

$h \ge 36.\overline{36}$

Kati must work at least 36.36 hours.

24. a. Write the inequality as follows:

$9.75h < 200$

b.

$9.75h < 200$ Divide both sides by 9.75.

$\frac{\cancel{9.75}h}{\cancel{9.75}} < \frac{200}{9.75}$

$h < 20.51$ Answer rounded to hundredths.

Tyler must work less than 20.51 hours.

c. Rewrite the inequality and solve:

$9.75h \ge 150$ Divide both sides by 9.75.

$\frac{\cancel{9.75}h}{\cancel{9.75}} \ge \frac{150}{9.75}$

$h \ge 15.38$ Answer rounded to hundredths.

Tyler must work at least 15.38 hours a week.

25. **a.** Kevin's monthly cell phone charges are given by the expression $30+0.50m$. The inequality that represents Kevin keeping his monthly cell phone bill to at most $45 is:

$$30+0.5m \le 45$$

b.

$$\begin{array}{ll} 30+0.5m \le 45 & \text{Isolate variable term.} \\ \underline{-30 \qquad -30} & \text{Subtract 30 from both sides.} \\ 0.5m \le 15 & \\ \dfrac{\cancel{0.5}m}{\cancel{0.5}} \le \dfrac{15}{0.5} & \text{Divide both sides by 0.5.} \\ m \le 30 & \end{array}$$

Kevin can use no more than 30 minutes over his allowed 200 minutes.

c.

$$\begin{array}{ll} 30+0.5m \le 40 & \text{Isolate variable term.} \\ \underline{-30 \qquad -30} & \text{Subtract 30 from both sides.} \\ 0.5m \le 10 & \\ \dfrac{\cancel{0.5}m}{\cancel{0.5}} \le \dfrac{10}{0.5} & \text{Divide both sides by 0.5.} \\ m \le 20 & \end{array}$$

He can use no more than 20 minutes over his allowed 200 minutes.

26. **a.** Add the costs in an inequality less than or equal to 95.

$$20+0.6m \le 95$$

b.

$$\begin{array}{ll} 20+0.6m \le 95 & \text{Isolate variable term.} \\ \underline{-20 \qquad -20} & \text{Subtract 20 from both sides.} \\ 0.6m \le 75 & \\ \dfrac{\cancel{0.6}m}{\cancel{0.6}} \le \dfrac{75}{0.6} & \text{Divide both sides by 0.6.} \\ m \le 125 & \end{array}$$

Amy can drive the rental truck up to 125 miles on the day she rents it.

c.

$$\begin{array}{ll} 20+0.6m \le 125 & \text{Isolate variable term.} \\ \underline{-20 \qquad -20} & \text{Subtract 20 from both sides.} \\ 0.6m \le 105 & \\ \dfrac{\cancel{0.6}m}{\cancel{0.6}} \le \dfrac{105}{0.6} & \text{Divide both sides by 0.6.} \\ m \le 175 & \end{array}$$

Amy can drive the rental truck up to 175 miles on the day she rents it.

27. **a.** The inequality that represents Warren keeping his monthly texting bill to at most $18 is:

$$9+0.1t \le 18$$

b.

$$\begin{array}{ll} 9+0.1t \le 18 & \text{Isolate variable term.} \\ \underline{-9 \qquad -9} & \text{Subtract 9 from both sides.} \\ 0.1t \le 9 & \\ \dfrac{\cancel{0.1}t}{\cancel{0.1}} \le \dfrac{9}{0.1} & \text{Divide both sides by 0.1.} \\ t \le 90 & \end{array}$$

To stay within his budget, Warren can send no more than 90 texts over his 200 texts allowed.

c.

$$\begin{array}{ll} 9+0.1t \le 15 & \text{Isolate variable term.} \\ \underline{-9 \qquad -9} & \text{Subtract 9 from both sides.} \\ 0.1t \le 6 & \\ \dfrac{\cancel{0.1}t}{\cancel{0.1}} \le \dfrac{6}{0.1} & \text{Divide both sides by 0.1.} \\ t \le 60 & \end{array}$$

He can send no more than 60 texts over his 200 texts allowed.

28. **a.** The inequality that represents Crystal keeping her monthly cell phone bill to at most $65 is:

$$50+0.4m \le 65$$

b.

$$\begin{array}{ll} 50+0.4m \le 65 & \text{Isolate variable term.} \\ \underline{-50 \qquad -50} & \text{Subtract 50 from both sides.} \\ 0.4m \le 15 & \\ \dfrac{\cancel{0.4}m}{\cancel{0.4}} \le \dfrac{15}{0.4} & \text{Divide both sides by 0.4.} \\ m \le 37.5 & \end{array}$$

Crystal can use no more than 37 minutes (rounded down to the nearest whole minute) over her allowed 300 minutes.

c.

$$\begin{array}{rl} 50+0.4m \le 60 & \text{Isolate variable term.} \\ \underline{-50 \qquad -50} & \text{Subtract 50 from both sides.} \\ 0.4m \le 10 & \\ \frac{\cancel{0.4}m}{\cancel{0.4}} \le \frac{10}{0.4} & \text{Divide both sides by 0.4.} \\ m \le 25 & \end{array}$$

She can use no more than 25 minutes over her allowed 300 minutes.

29. **a.** Add the costs in an inequality less than or equal to 115.

$$75+3m \le 115$$

b.

$$\begin{array}{rl} 75+3m \le 115 & \text{Isolate variable term.} \\ \underline{-75 \qquad -75} & \text{Subtract 75 from both sides.} \\ 3m \le 40 & \\ \frac{\cancel{3}m}{\cancel{3}} \le \frac{40}{3} & \text{Divide both sides by 3.} \\ m \le 13\frac{1}{3} & \end{array}$$

Alicia can have her car towed up to 13 miles, over the initial 10 miles.

30. **a.** Add the costs in an inequality less than or equal to 220.

$$100+40n \le 220$$

b.

$$\begin{array}{rl} 100+40n \le 220 & \text{Isolate variable term.} \\ \underline{-100 \qquad -100} & \text{Subtract 100 from both sides.} \\ 40n \le 120 & \\ \frac{\cancel{40}n}{\cancel{40}} \le \frac{120}{40} & \text{Divide both sides by 40.} \\ n \le 3 & \end{array}$$

Ricardo can have up to a total of 6 rooms cleaned (the initial 3 rooms then 3 more).

31.

$$\begin{array}{rl} 0.02t+2.67 \ge 3 & \text{Isolate variable term.} \\ \underline{\qquad -2.67 \;\; -2.67} & \text{Subtract 2.67 from both sides.} \\ 0.02t \ge 0.33 & \\ \frac{\cancel{0.02}t}{\cancel{0.02}} \ge \frac{0.33}{0.02} & \text{Divide both sides by 0.02.} \\ t \ge 16.5 & \end{array}$$

The population of Arkansas is projected to be 3 million or more after the year 2016.

32.

$$\begin{array}{rl} 0.07t+19.01 \ge 20 & \text{Isolate variable term.} \\ \underline{\qquad -19.01 \;\; -19.01} & \text{Subtract 19.01 from both sides.} \\ 0.07t \ge 0.99 & \\ \frac{\cancel{0.07}t}{\cancel{0.07}} \ge \frac{0.99}{0.07} & \text{Divide both sides by 0.07.} \\ t \ge 14.14 & \text{Rounded to hundredths.} \end{array}$$

The population of New York is projected to be 20 million or more after the year 2014.

33.

$$\begin{array}{rl} 0.35t+16.01 \ge 18 & \text{Isolate variable term.} \\ \underline{\qquad -16.01 \;\; -16.01} & \text{Subtract 16.01 from both sides.} \\ 0.35t \ge 1.99 & \\ \frac{\cancel{0.35}t}{\cancel{0.35}} \ge \frac{1.99}{0.35} & \text{Divide both sides by 0.35.} \\ t \ge 5.69 & \text{Rounded to hundredths.} \end{array}$$

The population of Florida is projected to be 18 million or more after the year 2006.

34.

$$\begin{array}{rl} 2p-400 > 0 & \text{Isolate variable term.} \\ \underline{\quad +400 \;\; +400} & \text{Add 400 to both sides.} \\ 2p > 400 & \\ \frac{\cancel{2}p}{\cancel{2}} > \frac{400}{2} & \text{Divide both sides by 2.} \\ p > 200 & \end{array}$$

Juanita must sell more than 200 pieces of jewelry in order to make a profit.

35. If $4 > x$, then x must be less than 4. This means we can rewrite the inequality as

$$x < 4$$

36. If $5 > y$, then y must be less than 5. This means we can rewrite the inequality as

$$y < 5$$

37. If $-9 < n$, then n must be greater than -9. This means we can rewrite the inequality as

$$n > -9$$

38. If $-16 > m$, then m must be less than -16. This means we can rewrite the inequality as

$$m < -16$$

39. If $0 \ge t$, then t must be less than or equal to 0. This means we can rewrite the inequality as

$$t \le 0$$

40. If $10 \le t$, then t must be greater than or equal to 10. This means we can rewrite the inequality as

$$t \ge 10$$

41. If $6 > 2x$, then $2x$ must be less than 6. This means we can rewrite the inequality as

$$2x < 6$$

To solve, divide both sides by 2.

$$\frac{\cancel{2}x}{\cancel{2}} < \frac{6}{2}$$
$$x < 3$$

42. If $4 < -8x$, then $-8x$ must be greater than 4. This means we can rewrite the inequality as

$$-8x > 4$$

To solve, divide both sides by -8.

$$\frac{\cancel{-8}x}{\cancel{-8}} < \frac{4}{-8}$$
$$x < -\frac{1}{2}$$

43. If $5 \le 2x+1$, then $2x+1$ must be greater than or equal to 5. This means we can rewrite the inequality as

$$2x+1 \ge 5$$

To solve, isolate the variable as follows:

$$\begin{array}{rl} 2x+1 \ge 5 & \text{Isolate variable term.} \\ \underline{-1\quad -1} & \text{Subtract 1 from both sides.} \\ 2x \ge 4 & \\ \dfrac{\cancel{2}x}{\cancel{2}} \ge \dfrac{4}{2} & \text{Divide both sides by 2.} \\ x \ge 2 & \end{array}$$

44. If $-3 \ge 3x+6$, then $3x+6$ must be less than or equal to -3. This means we can rewrite the inequality as

$$3x+6 \le -3$$

To solve, isolate the variable as follows:

$$\begin{array}{rl} 3x+6 \le -3 & \text{Isolate variable term.} \\ \underline{-6\quad -6} & \text{Subtract 6 from both sides.} \\ 3x \le -9 & \\ \dfrac{\cancel{3}x}{\cancel{3}} \le \dfrac{-9}{3} & \text{Divide both sides by 3.} \\ x \le -3 & \end{array}$$

45.

$$\begin{array}{rl} 4x > 20 & \text{Divide both sides by 4.} \\ \dfrac{\cancel{4}x}{\cancel{4}} > \dfrac{20}{4} & \\ x > 5 & \end{array}$$

$$\begin{array}{rl} 4(5) \stackrel{?}{=} 20 & \text{Check the answer.} \\ 20 = 20 & \text{The answer works.} \end{array}$$

Check a number greater than 5 ($x = 6$) to test the direction of the inequality symbol.

$$\begin{array}{rl} 4(6) \stackrel{?}{>} 20 & \text{Check the direction of the inequality.} \\ 24 > 20 & \text{The direction of the inequality works.} \end{array}$$

Using interval notation, the answer is written as $(5, \infty)$.

Using a number line:

46.

$$\begin{array}{rl} 2x > 16 & \text{Divide both sides by 2.} \\ \dfrac{\cancel{2}x}{\cancel{2}} > \dfrac{16}{2} & \\ x > 8 & \end{array}$$

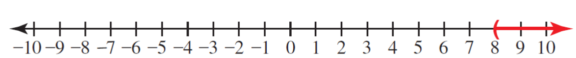
$$\begin{array}{rl} 2(8) \stackrel{?}{=} 16 & \text{Check the answer.} \\ 16 = 16 & \text{The answer works.} \end{array}$$

Check a number greater than 8 ($x = 9$) to test the direction of the inequality symbol.

$$\begin{array}{rl} 2(9) \stackrel{?}{>} 16 & \text{Check the direction of the inequality.} \\ 18 > 16 & \text{The direction of the inequality works.} \end{array}$$

Using interval notation, the answer is written as $(8, \infty)$.

Using a number line:



47. $\dfrac{m}{3} < -2$ Multiply both sides by 3.

$$\cancel{3} \cdot \frac{m}{\cancel{3}} < -2 \cdot 3$$

$$m < -6$$

$\dfrac{(-6)}{3} \stackrel{?}{=} -2$ Check the answer.

$-2 = -2$ The answer works.

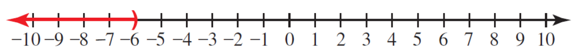
Check a number less than -6 ($m = -9$) to test the direction of the inequality symbol.

$\dfrac{(-9)}{3} \stackrel{?}{<} -2$ Check the direction of the inequality.

$-3 < -2$ The direction of the inequality works.

Using interval notation, the answer is written as $(-\infty, -6)$.

Using a number line:



48.

$\dfrac{h}{4} < 1.5$ Multiply both sides by 4.

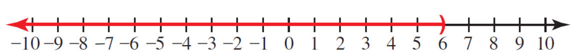
$$\cancel{4} \cdot \frac{h}{\cancel{4}} < 1.5 \cdot 4$$

$$h < 6$$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(-\infty, 6)$.

Using a number line:



49.

$-3x \geq 12$ Divide both sides by -3.

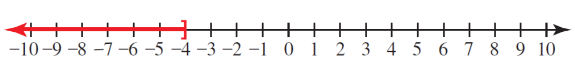
$\dfrac{\cancel{-3}x}{\cancel{-3}} \leq \dfrac{12}{-3}$ Divide by neg., reverse inequality.

$$x \leq -4$$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(-\infty, -4]$.

Using a number line:



50.

$-6x \geq -30$ Divide both sides by -6.

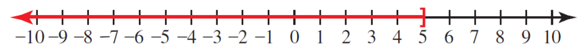
$\dfrac{\cancel{-6}x}{\cancel{-6}} \leq \dfrac{-30}{-6}$ Divide by neg., reverse inequality.

$$x \leq 5$$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(-\infty, 5]$.

Using a number line:



51.

$-\dfrac{2}{5}x < -\dfrac{1}{10}$ Multiply both sides by $-\dfrac{5}{2}$.

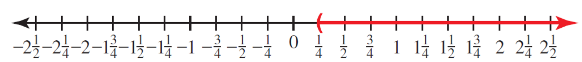
$-\dfrac{\cancel{5}}{\cancel{2}} \cdot -\dfrac{\cancel{2}}{\cancel{5}} x > -\dfrac{1}{\cancel{10}_2} \cdot -\dfrac{\cancel{5}}{2}$ Multiply by neg., reverse inequality.

$$x > \frac{1}{4}$$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $\left(\dfrac{1}{4}, \infty\right)$.

Using a number line:



52.

$-\dfrac{5y}{7} > \dfrac{3}{5}$ Multiply both sides by $-\dfrac{7}{5}$.

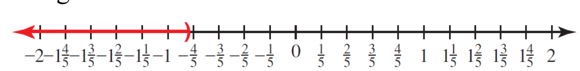
$-\dfrac{\cancel{7}}{\cancel{5}} \cdot -\dfrac{\cancel{5}y}{\cancel{7}} < \dfrac{3}{5} \cdot -\dfrac{7}{5}$ Multiply by neg., reverse inequality.

$$y < -\frac{21}{25}$$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $\left(-\infty, -\dfrac{21}{25}\right)$.

Using a number line:



53.

$\frac{-a}{3} \le -4$ Multiply both sides by -3.

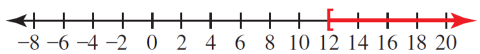
$-\cancel{3} \cdot \frac{-a}{\cancel{3}} \ge -4 \cdot -3$ Multiply by neg., reverse inequality.

$a \ge 12$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $[12, \infty)$.

Using a number line:



54.

$\frac{-b}{5} \ge -11$ Multiply both sides by -5.

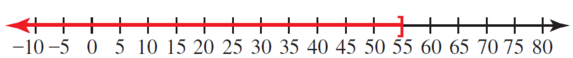
$-\cancel{5} \cdot \frac{-b}{\cancel{5}} \le -11 \cdot -5$ Multiply by neg., reverse inequality.

$b \le 55$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(-\infty, 55]$.

Using a number line:



55.

$2(k+5) \le k+13$ Distribute on left side.

$2k+10 \le k+13$

$\underline{-k \qquad -k}$ Subtract k from both sides.

$k+10 \le 13$

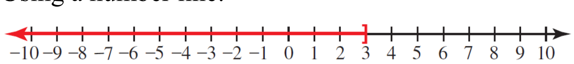
$\underline{-10 \ -10}$ Subtract 10 from both sides.

$k \le 3$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(-\infty, 3]$.

Using a number line:



56.

$-(p+4)+5 \le 3p+9$ Distribute on left side.

$-p-4+5 \le 3p+9$ Simplify on left side.

$-p+1 \le 3p+9$

$\underline{-3p \quad -3p}$ Subtract $3p$ from both sides.

$-4p+1 \le 9$

$\underline{-1 \ -1}$ Subtract 1 from both sides.

$-4p \le 8$

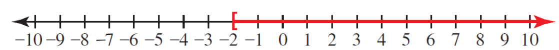
$\frac{\cancel{-4}p}{\cancel{-4}} \ge \frac{8}{-4}$ Divide by neg., reverse inequality.

$p \ge -2$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $[-2, \infty)$.

Using a number line:



57.

$2.5z+8 \ge 3.5z-4$

$\underline{-3.5z \quad -3.5z}$ Subtract $3.5z$ from both sides.

$-z+8 \ge -4$

$\underline{-8 \ -8}$ Subtract 8 from both sides.

$-z \ge -12$ Divide both sides by -1.

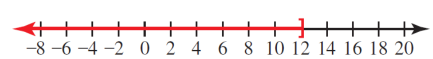
$\frac{-z}{-1} \le \frac{-12}{-1}$ Divide by neg., reverse inequality.

$z \le 12$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(-\infty, 12]$.

Using a number line:



58.

$-0.5x+11 \ge -x-4$

$\underline{+x \qquad +x}$ Add x to both sides.

$0.5x+11 \ge -4$

$\underline{-11 \ -11}$ Subtract 11 from both sides.

$0.5x \ge -15$ Divide both sides by 0.5.

$\frac{0.5x}{0.5} \ge \frac{-15}{0.5}$

$x \ge -30$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $[-30,\infty)$.

Using a number line:

59.

$$\begin{array}{ll} 2c+7\le 6c+17 & \\ \underline{-6c \quad -6c} & \text{Subtract } 6c \text{ from both sides.} \\ -4c+7\le 17 & \\ \underline{-7 \quad -7} & \text{Subtract 7 from both sides.} \\ -4c\le 10 & \text{Divide both sides by } -4. \\ \dfrac{\cancel{-4}c}{\cancel{-4}}\ge\dfrac{10}{-4} & \text{Divide by neg., reverse inequality} \\ c\ge -2.5 & \end{array}$$

Check using problems 45-47 as a guide.
Using interval notation, the answer is written as $[-2.5,\infty)$.

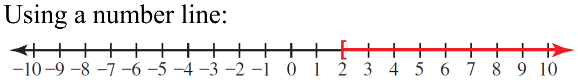
Using a number line:

60.

$$\begin{array}{ll} -5z-16\le 9z-44 & \\ \underline{-9z \quad -9z} & \text{Subtract } 9z \text{ from both sides.} \\ -14z-16\le -44 & \\ \underline{+16 \quad +16} & \text{Add 16 to both sides.} \\ -14z\le -28 & \text{Divide both sides by } -14. \\ \dfrac{\cancel{-14}z}{\cancel{-14}}\ge\dfrac{-28}{-14} & \text{Divide by neg., reverse inequality} \\ z\ge 2 & \end{array}$$

Check using problems 45-47 as a guide.
Using interval notation, the answer is written as $[2,\infty)$.

Using a number line:

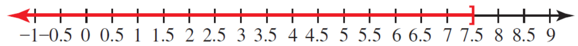


61.

$$\begin{array}{ll} 5w-12\ge 2(5w-10)-30 & \text{Distribute on right side.} \\ 5w-12\ge 10w-20-30 & \text{Simplify on right side} \\ 5w-12\ge 10w-50 & \\ \underline{-10w \quad -10w} & \text{Subtract } 10w \text{ from both sides.} \\ -5w-12\ge -50 & \\ \underline{+12 \quad +12} & \text{Add 12 to both sides.} \\ -5w\ge -38 & \text{Divide both sides by } -14. \\ \dfrac{\cancel{-5}w}{\cancel{-5}}\le\dfrac{-38}{-5} & \text{Divide by neg., reverse inequality} \\ w\le 7.6 & \end{array}$$

Check using problems 45-47 as a guide.
Using interval notation, the answer is written as $(-\infty,7.6]$.

Using a number line:



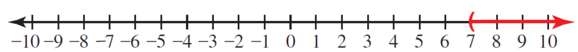
62.

$$\begin{array}{ll} 4(3g+8)<5(4g-10)+26 & \text{Distribute on both sides.} \\ 12g+32<20g-50+26 & \text{Simplify on right side} \\ 12g+32<20g-24 & \\ \underline{-20g \quad -20g} & \text{Subtract } 20g \text{ from both sides.} \\ -8g+32<-24 & \\ \underline{-32 \quad -32} & \text{Subtract 32 from both sides.} \\ -8g<-56 & \text{Divide both sides by } -8. \\ \dfrac{\cancel{-8}g}{\cancel{-8}}>\dfrac{-56}{-8} & \text{Divide by neg., reverse inequality} \\ g>7 & \end{array}$$

Check using problems 45-47 as a guide.

Using interval notation, the answer is written as $(7,\infty)$.

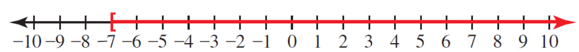
Using a number line:



63.

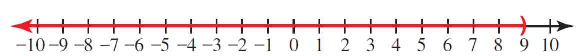
This is equivalent to the inequality $x\ge -1$.

64.



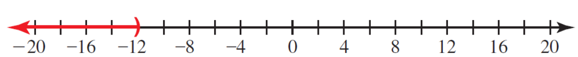
This is equivalent to the inequality $x\ge -7$.

65.



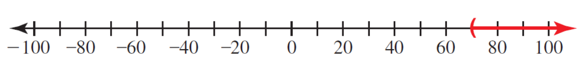
This is equivalent to the inequality $x<9$.

66.



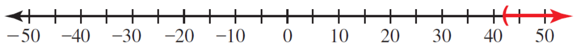
This is equivalent to the inequality $x<-12$.

67.



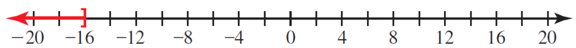
This is equivalent to the inequality $x>69$.

68.



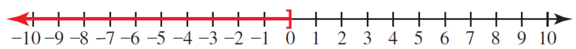
This is equivalent to the inequality $x > 42$.

69.



This is equivalent to the inequality $x \le -16$.

70.



This is equivalent to the inequality $x \le 0$.

71. Let $s =$ the number of students enrolled in the beginning algebra class.

$16 \le s \le 38$

72. Let $p =$ the number of passengers that can be on the Boeing 717-200.

$0 \le p \le 106$

73. Let $s =$ the number of students that can ride on school bus #12.

$0 \le s \le 71$

74. Let $p =$ the number of people the camp can accommodate.

$0 \le p \le 177$

75. Let $p =$ the number of people the camp can accommodate.

$200 \le p \le 450$

76. Let $c =$ the amount in dollars this accountant charges to prepare tax returns.

$150 \le c \le 500$

77. Let $h =$ the height requirements in inches for children to ride on some attractions at LEGOLAND with an adult.

$42 \le h \le 52$

78. Let $n =$ the course number.

$100 \le n < 300$

79. Let $r =$ the average adult's resting heart rate in beats per minute.

$66 \le r \le 100$

80. Let $r =$ the average newborn baby's resting heart rate in beats per minute.

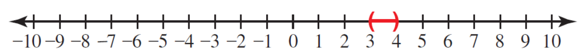
$100 \le r \le 160$

81.

$$6 < 2x < 8 \qquad \text{Isolate } x \text{ by dividing all sides by 2.}$$
$$\frac{6}{2} < \frac{2x}{2} < \frac{8}{2}$$
$$3 < x < 4$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(3,4)$.

Using a number line:

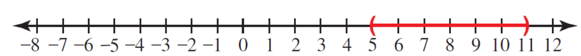


82.

$$25 < 5x < 55 \qquad \text{Isolate } x \text{ by dividing all sides by 5.}$$
$$\frac{25}{5} < \frac{5x}{5} < \frac{55}{5}$$
$$5 < x < 11$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(5,11)$.

Using a number line:

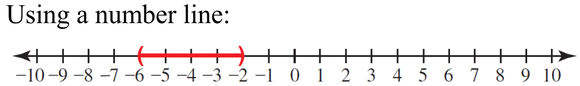


83.

$$-7 < y-1 < -3 \qquad \text{Isolate } y.$$
$$\underline{+1 \quad +1 \quad +1} \qquad \text{Add 1 to all sides.}$$
$$-6 < y < -2$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(-6,-2)$.

Using a number line:



84.

$$\begin{array}{ll} -4 < b+5 < 6 & \text{Isolate } b. \\ \underline{-5 \quad -5 \quad -5} & \text{Subtract 5 from all sides.} \\ -9 < b < 1 & \end{array}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(-9,1)$.

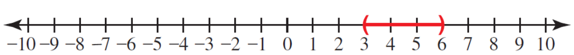
Using a number line:

85.

$$\begin{array}{ll} 12 < 3x+3 < 21 & \text{Isolate } x. \\ \underline{-3 \quad -3 \quad -3} & \text{Subtract 3 from all sides.} \\ 9 < 3x < 18 & \text{Divide all sides by 3.} \\ \frac{9}{3} < \frac{3x}{3} < \frac{18}{3} & \\ 3 < x < 6 & \end{array}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(3,6)$.

Using a number line:

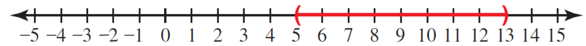


86.

$$\begin{array}{ll} 20 < 2x+10 < 36 & \text{Isolate } x. \\ \underline{-10 \quad -10 \quad -10} & \text{Subtract 10 from all sides.} \\ 10 < 2x < 26 & \text{Divide all sides by 2.} \\ \frac{10}{2} < \frac{2x}{2} < \frac{26}{2} & \\ 5 < x < 13 & \end{array}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(5,13)$.

Using a number line:

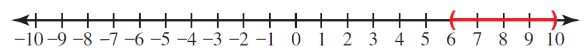


87.

$$\begin{array}{ll} 3 < \frac{k}{2} < 5 & \text{Isolate } k \text{ by multiplying all sides by 2.} \\ (2)3 < (2)\frac{k}{2} < (2)5 & \\ 6 < k < 10 & \end{array}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(6,10)$.

Using a number line:

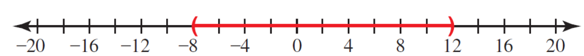


88.

$$\begin{array}{ll} -2 < \frac{n}{4} < 3 & \text{Isolate } n \text{ by multiplying all sides by 4.} \\ -2(4) < (4)\frac{n}{4} < (4)3 & \\ -8 < n < 12 & \end{array}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(-8,12)$.

Using a number line:

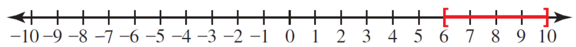


89.

$$\begin{array}{ll} 40 \le 6x+4 \le 64 & \text{Isolate } x. \\ \underline{-4 \quad -4 \quad -4} & \text{Subtract 4 from all sides.} \\ 36 \le 6x \le 60 & \text{Divide all sides by 6.} \\ \frac{36}{6} \le \frac{6x}{6} \le \frac{60}{6} & \\ 6 \le x \le 10 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[6,10]$.

Using a number line:

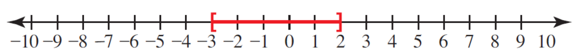


90.

$$\begin{array}{ll} -25 \le 8x-1 \le 15 & \text{Isolate } x. \\ \underline{+1 \quad\quad +1 \;\; +1} & \text{Add 1 to all sides.} \\ -24 \le 8x \le 16 & \text{Divide all sides by 8.} \\ \frac{-24}{8} \le \frac{8x}{8} \le \frac{16}{8} & \\ -3 \le x \le 2 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-3,2]$.

Using a number line:

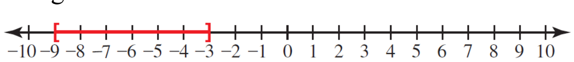


91.

$$\begin{array}{ll} -1.5 \le \frac{m}{6} \le -0.5 & \text{Isolate } m. \\ -1.5(6) \le (6)\frac{m}{6} \le -0.5(6) & \text{Multiply all sides by 6.} \\ -9 \le m \le -3 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-9,-3]$.

Using a number line:

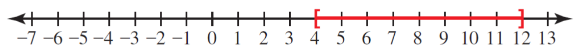


92.

$$\begin{array}{ll} 3 \le \frac{w}{4}+2 \le 5 & \text{Isolate } w. \\ \underline{-2 \quad\quad -2 \;\; -2} & \text{Subtract 2 from all sides.} \\ 1 \le \frac{w}{4} \le 3 & \text{Multiply all sides by 4.} \\ (4)1 \le (4)\frac{w}{4} \le (4)3 & \\ 4 \le w \le 12 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[4,12]$.

Using a number line:

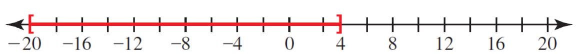


93.

$$\begin{array}{ll} -12 \le \frac{1}{2}x-2 \le 0 & \text{Isolate } x. \\ \underline{+2 \quad\quad +2 \;\; +2} & \text{Add 2 to all sides.} \\ -10 \le \frac{1}{2}x \le 2 & \text{Multiply all sides by 2.} \\ -10(2) \le (2)\frac{1}{2}x \le (2)2 & \\ -20 \le x \le 4 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-20,4]$.

Using a number line:

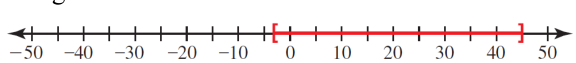


94.

$$\begin{array}{ll} 0 \le \frac{1}{3}x+1 \le 16 & \text{Isolate } x. \\ \underline{-1 \quad\quad -1 \;\; -1} & \text{Subtract 1 from all sides.} \\ -1 \le \frac{1}{3}x \le 15 & \text{Multiply all sides by 3.} \\ -1(3) \le (3)\frac{1}{3}x \le (3)15 & \\ -3 \le x \le 45 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-3,45]$.

Using a number line:

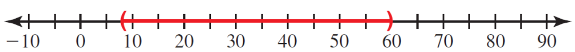


95.

$$4 < \frac{x}{2} < 30 \qquad \text{Isolate } x \text{ by multiplying all sides by 2.}$$
$$(2)4 < (2)\frac{x}{2} < (2)30$$
$$8 < x < 60$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(8,60)$.

Using a number line:

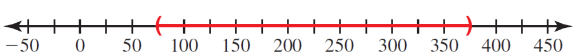


96.

$$5 < \frac{x}{15} < 25 \qquad \text{Isolate } x \text{ by multiplying all sides by 15.}$$
$$(15)5 < (15)\frac{x}{15} < (15)25$$
$$75 < x < 375$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $(75,375)$.

Using a number line:

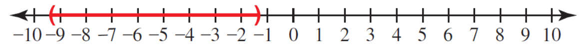


97.

$$-7 < \frac{3x}{4} < -1 \qquad \text{Isolate } x.$$
$$\left(\frac{4}{3}\right)(-7) < \left(\frac{4}{3}\right)\frac{3x}{4} < \left(\frac{4}{3}\right)(-1) \quad \text{Multiply by } \frac{4}{3}$$
$$-\frac{28}{3} < x < -\frac{4}{3}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $\left(-\frac{28}{3},-\frac{4}{3}\right)$.

Using a number line:

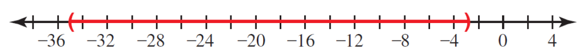


98.

$$-25 < \frac{5x}{7} < -2 \qquad \text{Isolate } x.$$
$$\left(\frac{7}{5}\right)(-25) < \left(\frac{7}{5}\right)\frac{5x}{7} < \left(\frac{7}{5}\right)(-2) \quad \text{Multiply by } \frac{7}{5}$$
$$-35 < x < -\frac{14}{5}$$

Since both sides do not have "equal to" as part of the inequality, the solution written in interval notation will have parentheses on both sides. Always write intervals from lowest to highest numbers, so we get the interval $\left(-35,-\frac{14}{5}\right)$.

Using a number line:

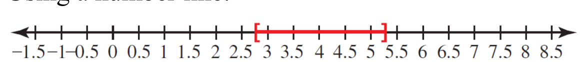


99.

$$\begin{array}{ll} 3.5 \le 2x-2 \le 8.5 & \text{Isolate } x. \\ \underline{+2 \qquad +2 \ +2} & \text{Add 2 to all sides.} \\ 5.5 \le 2x \le 10.5 & \text{Divide all sides by 2.} \\ \frac{5.5}{2} \le \frac{2x}{2} \le \frac{10.5}{2} & \\ 2.75 \le x \le 5.25 & \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[2.75, 5.25]$.

Using a number line:

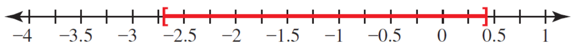


100.

$$\begin{array}{ll} -12.3 \le 6x+4 \le 6.6 & \text{Isolate } x. \\ \underline{-4 \qquad -4 \ -4} & \text{Subtract 4 from all sides.} \\ -16.3 \le 6x \le 2.6 & \text{Divide all sides by 2.} \\ \frac{-16.3}{6} \le \frac{6x}{6} \le \frac{2.6}{6} & \\ -2.72 \le x \le 0.43 & \text{Answers rounded to hundredths.} \end{array}$$

Since both sides have "equal to" as part of the inequality, the solution written in interval notation will have brackets on both sides. Always write intervals from lowest to highest numbers, so we get the interval $[-2.72, 0.43]$.

Using a number line:

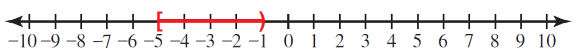


101.

$$\begin{array}{ll} -9 \le 3v+6 < 3 & \text{Isolate } x. \\ \underline{-6 \quad\; -6 \;\; -6} & \text{Subtract 6 from all sides.} \\ -15 \le 3v < -3 & \text{Divide all sides by 3.} \\ \dfrac{-15}{3} \le \dfrac{3v}{3} < \dfrac{-3}{3} & \\ -5 \le v < -1 & \end{array}$$

In interval notation, the solution set will have a bracket on the left side, since it is less than or equal to, and a parenthesis on the right side, since it is less than. This gives us the interval $[-5, -1)$.

Using a number line:

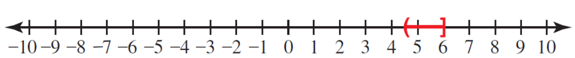


102.

$$\begin{array}{ll} 5 < 2x - 4 \le 8 & \text{Isolate } x. \\ \underline{+4 \quad\; +4 \;\; +4} & \text{Add 4 to all sides.} \\ 9 < 2x \le 12 & \text{Divide all sides by 2.} \\ \dfrac{9}{2} < \dfrac{2x}{2} \le \dfrac{12}{2} & \\ 4.5 < x \le 6 & \end{array}$$

In interval notation, the solution set will have a parenthesis on the left side, since it is less than, and a bracket on the right side, since it is less than or equal to. This gives us the interval $(4.5, 6]$.

Using a number line:



103.

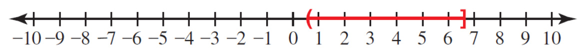
$$\begin{array}{ll} -7 < \dfrac{5a}{3} - 8 \le 3 & \text{Isolate } a. \\ \underline{+8 \qquad +8 \;\; +8} & \text{Add 8 to all sides.} \\ 1 < \dfrac{5a}{3} \le 11 & \text{Multiply all sides by } \dfrac{3}{5}. \end{array}$$

$$\left(\frac{3}{5}\right)1 < \left(\frac{3}{5}\right)\frac{5a}{3} \le \left(\frac{3}{5}\right)11$$

$$\frac{3}{5} < a \le \frac{33}{5}$$

In interval notation, the solution set will have a parenthesis on the left side, since it is less than, and a bracket on the right side, since it is less than or equal to. This gives us the interval $\left(\frac{3}{5}, \frac{33}{5}\right]$.

Using a number line:

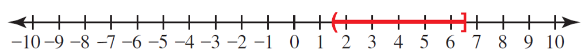


104.

$$\begin{array}{ll} -3 < 4x - 9 \le 17 & \text{Isolate } x. \\ \underline{+9 \qquad +9 \;\; +9} & \text{Add 9 to all sides.} \\ 6 < 4x \le 26 & \text{Divide all sides by 4.} \\ \dfrac{6}{4} < \dfrac{4x}{4} \le \dfrac{26}{4} & \\ 1.5 < x \le 6.5 & \end{array}$$

In interval notation, the solution set will have a parenthesis on the left side, since it is less than, and a bracket on the right side, since it is less than or equal to. This gives us the interval $(1.5, 6.5]$.

Using a number line:



105. The statement has an inequality symbol, therefore it is an inequality.

$$\begin{array}{ll} 2x + 7 > 41 & \text{Isolate variable term.} \\ \underline{\quad -7 \;\; -7} & \text{Subtract 7 from both sides.} \\ 2x > 34 & \\ \dfrac{\cancel{2}x}{\cancel{2}} > \dfrac{34}{2} & \text{Divide both sides by 2.} \\ x > 17 & \end{array}$$

Using interval notation, the answer is written as $(17, \infty)$. Use a parenthesis next to the 17 because the inequality is not also "equal to" 17. Always use a parenthesis next to the infinity symbol.

106. The statement has an inequality symbol, therefore it is an inequality.

$$\begin{array}{ll} 6c-10<32 & \text{Isolate variable term.} \\ \underline{\ +10\ \ +10} & \text{Add 10 to both sides.} \\ 6c<42 & \\ \frac{\cancel{6}c}{\cancel{6}}<\frac{42}{6} & \text{Divide both sides by 6.} \\ c<7 & \end{array}$$

Using interval notation, the answer is written as $(-\infty,7)$. Use a parenthesis next to the 7 because the inequality is not also "equal to" 7. Always use a parenthesis next to the infinity symbol.

107. The statement does not have an equal sign or an inequality symbol, therefore it is an expression.

$$\begin{array}{ll} \boxed{4x}+7\boxed{-12x} & \text{Combine like terms.} \\ -8x+7 & \end{array}$$

108. The statement does not have an equal sign or an inequality symbol, therefore it is an expression.

$$\begin{array}{ll} \boxed{2m^2}+3-4m\boxed{-7m^2} & \text{Combine like terms.} \\ -5m^2-4m+3 & \text{Write in conventional form.} \end{array}$$

109. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} 5h+12=3h-16 & \text{Isolate variable term.} \\ \underline{\ -3h\ \ -3h} & \text{Subtract } 3h \text{ from both sides.} \\ 2h+12=-16 & \\ \underline{\ -12\ \ -12} & \text{Subtract 12 from both sides.} \\ 2h=-28 & \\ \frac{\cancel{2}h}{\cancel{2}}=\frac{-28}{2} & \text{Divide both sides by 2.} \\ h=-14 & \end{array}$$

110. The statement has an equal sign, therefore it is an equation.

$$\begin{array}{ll} 2(4n-7)=-5n+19 & \text{Distribute on left side.} \\ 8n-14=-5n+19 & \text{Isolate variable term.} \\ \underline{+5n\qquad +5n} & \text{Add } 5n \text{ to both sides.} \\ 13n-14=19 & \\ \underline{\ +14\ \ +14} & \text{Add 14 to both sides.} \\ 13n=33 & \\ \frac{\cancel{13}n}{\cancel{13}}=\frac{33}{13} & \text{Divide both sides by 13.} \\ n=\frac{33}{13} & \end{array}$$

111. The statement has an inequality symbol, therefore it is an inequality.

$$\begin{array}{ll} 3a+4\ge 7a-20 & \text{Isolate variable term.} \\ \underline{-7a\quad -7a} & \text{Subtract } 7a \text{ from both sides.} \\ -4a+4\ge -20 & \\ \underline{\ -4\ \ -4} & \text{Subtract 4 from both sides.} \\ -4a\ge -24 & \text{Divide both sides by } -4. \\ \frac{\cancel{-4}a}{\cancel{-4}}\le\frac{-24}{-4} & \text{Divide by neg. reverse inequality.} \\ a\le 6 & \end{array}$$

Using interval notation, the answer is written as $(-\infty,6]$. Use a bracket next to the 6 because the inequality is also "equal to" 6. Always use a parenthesis next to the infinity symbol.

112. The statement has an inequality symbol, therefore it is an inequality.

$$\begin{array}{ll} -5t-14\le 3t+2 & \text{Isolate variable term.} \\ \underline{-3t\quad -3t} & \text{Subtract } 3t \text{ from both sides.} \\ -8t-14\le 2 & \\ \underline{\ +14\ \ +14} & \text{Add 14 to both sides.} \\ -8t\le 16 & \text{Divide both sides by } -8. \\ \frac{\cancel{-8}t}{\cancel{-8}}\ge\frac{16}{-8} & \text{Divide by neg. reverse inequality.} \\ t\ge -2 & \end{array}$$

Using interval notation, the answer is written as $[-2,\infty)$.

113. The statement has an equal sign, therefore it is an equation. Multiply each term by 3 first to clear the denominators.

$$\begin{array}{ll} \frac{2}{3}x+\frac{4}{3}=\frac{1}{3}x+7 & \text{Multiply by 3.} \\ (\cancel{3})\frac{2}{\cancel{3}}x+(\cancel{3})\frac{4}{\cancel{3}}=(\cancel{3})\frac{1}{\cancel{3}}x+7(3) & \\ 2x+4=x+21 & \text{Isolate variable term.} \\ \underline{-x\quad -x} & \text{Subtract } x \text{ from both sides.} \\ x+4=21 & \\ \underline{\ -4\ \ -4} & \text{Subtract 4 from both sides.} \\ x=17 & \end{array}$$

114. The statement has an equal sign, therefore it is an equation. Multiply each term by 7 first to clear the denominators.

$$(\cancel{7})\frac{4}{\cancel{7}}d-(\cancel{7})\frac{2}{\cancel{7}}=(7)2d+\frac{3}{\cancel{7}}(\cancel{7})$$

$4d-2=14d+3$ Isolate variable term.

$-14d \quad -14d$ Subtract $14d$ from both sides.

$-10d-2=3$

$+2 \quad +2$ Add 2 to both sides.

$-10d=5$

$\frac{-10d}{-10}=\frac{5}{-10}$ Divide both sides by -10.

$d=-\frac{1}{2}$

115. The statement has an inequality symbol, therefore it is an inequality.

$-20<4a+2<12$ Isolate a.

$-2 \quad -2 \quad -2$ Subtract 2 from all sides.

$-22<4a<10$ Divide all sides by 4.

$\frac{-22}{4}<\frac{4a}{4}<\frac{10}{4}$

$-5.5<a<2.5$

The answer in interval notation is $(-5.5, 2.5)$.

116. The statement has an inequality symbol, therefore it is an inequality. Multiply each term by 4 first to clear the denominator.

$8\le\frac{y}{4}+10<16$ Multiply by 4.

$(4)8\le(4)\frac{y}{4}+(4)10<16(4)$

$32\le y+40<64$ Isolate y.

$-40 \quad -40 \quad -40$ Subtract 40 from all sides.

$-8\le y<24$

The answer in interval notation is $[-8, 24)$.

117. The statement does not have an equal sign or an inequality symbol, therefore it is an expression.

$\boxed{\frac{2}{3}b}+\boxed{\boxed{5}}+\boxed{\frac{4}{9}b}\boxed{\boxed{-2}}$ Combine like terms.

$\frac{6}{9}b+\frac{4}{9}b+3$ Rewrite fractions with LCD = 9.

$\frac{10}{9}b+3$ Write in conventional form.

118. The statement does not have an equal sign or an inequality symbol, therefore it is an expression.

$\boxed{\frac{3}{5}x}\boxed{\boxed{-8}}+\boxed{\frac{3}{10}x}+\boxed{\boxed{\frac{1}{2}}}$ Combine like terms.

$\frac{6}{10}x+\frac{3}{10}x-8+\frac{1}{2}$ Rewrite x-term fractions with LCD = 10.

$\frac{9}{10}x-\frac{16}{2}+\frac{1}{2}$ Rewrite constant-term fractions with LCD = 2.

$\frac{9}{10}x-\frac{15}{2}$ or $\frac{9}{10}x-7\frac{1}{2}$

119. The statement has an inequality symbol, therefore it is an inequality.

$4<-\frac{g}{2}\le7$ Isolate g.

$(-2)4>(-2)-\frac{g}{2}\ge7(-2)$ Multiply all sides by -2.

$-8>g\ge-14$ Multiply by neg., reverse inequalities.

$-14\le g<-8$ Reorder compound inequality from smallest to greatest.

The answer, in interval notation, is $[-14, -8)$.

120. The statement has an inequality symbol, therefore it is an inequality.

$-8\le\frac{x}{3}\le4$ Isolate x.

$(3)-8\le(3)\frac{x}{3}\le4(3)$ Multiply all sides by 3.

$-24\le x\le12$

The answer in interval notation is $[-24, 12]$.

Chapter 2 Review

1. **a.** To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} D = 75t & \text{Original equation.} \\ 262.5 \overset{?}{=} 75(3.5) & \text{Substitute values for } D \text{ and } t. \\ 262.5 = 262.5 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $t = 3.5$ and $D = 262.5$ is a solution to the equation $D = 75t$.

b. These values represent that 262.5 miles is the distance traveled when driving for 3.5 hours.

2. **a.** To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} F = 11.5L & \text{Original equation.} \\ 6900 \overset{?}{=} 11.5(600) & \text{Substitute values for } F \text{ and } L. \\ 6900 = 6900 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $L = 600$ and $F = 6900$ is a solution to the equation $F = 11.5L$.

b. These values represent that a loan of $600,000.00 would have an origination fee of $6,900.00.

3. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} -2x + 4y = -8 & \text{Original equation.} \\ -2(-2) + 4(3) \overset{?}{=} -8 & \text{Substitute } x = -2 \text{ and } y = 3. \\ 4 + 12 \overset{?}{=} -8 & \text{Simplify left side.} \\ 16 \overset{?}{=} -8 & \text{This statement is not true.} \\ 16 \neq -8 & \end{array}$$

Because the final results are not equal, $x = -2$ and $y = 3$ is not a solution to the equation $-2x + 4y = -8$.

4. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$$\begin{array}{ll} y = -3x + 5 & \text{Original equation.} \\ (14) \overset{?}{=} -3(-3) + 5 & \text{Substitute } x = -3 \text{ and } y = 14. \\ 14 \overset{?}{=} 9 + 5 & \text{Simplify both sides.} \\ 14 = 14 & \text{This statement is true.} \end{array}$$

Because the final statement is true, $x = -3$ and $y = 14$ is a solution to the equation $y = -3x + 5$.

5. Using the equation $P = R - C$ substitute $R = 49000$ for the revenue, $C = 26000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P = R - C & \text{Given equation.} \\ P = (49000) - (26000) & \text{Substitute value of variables.} \\ P = 23000 & \text{Simplify on right side.} \end{array}$$

The solution is $P = 23000$ which represents that the company has monthly profit of $23,000.

6. Using the equation $P = R - C$ substitute $R = 225000$ for the revenue, $C = 186000$ for costs, then solve for P to find the company's profit.

$$\begin{array}{ll} P = R - C & \text{Given equation.} \\ P = (225000) - (186000) & \text{Substitute value of variables.} \\ P = 39000 & \text{Simplify on right side.} \end{array}$$

The solution is $P = 39000$ which represents that the company has monthly profit of $39,000.

7.

$$\begin{array}{ll} x - 3 = -9 & \\ \underline{\quad +3 \quad +3} & \text{Add 3 to both sides.} \\ x = -6 & \end{array}$$

$$\begin{array}{ll} (-6) - 3 \overset{?}{=} -9 & \text{Check the answer.} \\ -9 = -9 & \text{The answer works.} \end{array}$$

8.

$$\begin{array}{ll} p - 16 = -9 & \\ \underline{\quad +16 \quad +16} & \text{Add 16 to both sides.} \\ p = 7 & \end{array}$$

$$\begin{array}{ll} (7) - 16 \overset{?}{=} -9 & \text{Check the answer.} \\ -9 = -9 & \text{The answer works.} \end{array}$$

9.

$$\begin{aligned} -8 &= a+9 \\ \underline{-9} &\quad \underline{-9} \\ -17 &= a \end{aligned}$$ Subtract 9 from both sides.

$-8 \stackrel{?}{=} (-17)+9$ Check the answer.
$-8=-8$ The answer works.

10.

$$\begin{aligned} -16 &= b+7 \\ -7 &\quad -7 \\ \hline -23 &= b \end{aligned}$$ Subtract 7 from both sides.

$-16 \stackrel{?}{=} (-23)+7$ Check the answer.
$-16=-16$ The answer works.

11.

$$\begin{aligned} k-\frac{1}{2} &= \frac{3}{2} \\ +\frac{1}{2} &\quad +\frac{1}{2} \\ \hline k &= \frac{4}{2} \\ k &= 2 \end{aligned}$$ Add $\frac{1}{2}$ to both sides.

$(2)-\frac{1}{2} \stackrel{?}{=} \frac{3}{2}$ Check the answer.
$\frac{4}{2}-\frac{1}{2} \stackrel{?}{=} \frac{3}{2}$
$\frac{3}{2}=\frac{3}{2}$ The answer works.

12.

$$\begin{aligned} \frac{-2}{5}+x &= \frac{4}{5} \\ +\frac{2}{5} &\quad +\frac{2}{5} \\ \hline x &= \frac{6}{5} \end{aligned}$$ Add $\frac{2}{5}$ to both sides.

$\frac{-2}{5}+\left(\frac{6}{5}\right) \stackrel{?}{=} \frac{4}{5}$ Check the answer.
$\frac{4}{5}=\frac{4}{5}$ The answer works.

13.

$$\begin{aligned} y-9.8 &= 4.6 \\ +9.8 &\quad +9.8 \\ \hline y &= 14.4 \end{aligned}$$ Add 9.8 to both sides.

$(14.4)-9.8 \stackrel{?}{=} 4.6$ Check the answer.
$4.6=4.6$ The answer works.

14.

$$\begin{aligned} 0.02+h &= 1.04 \\ \underline{-0.02} &\quad \underline{-0.02} \\ h &= 1.02 \end{aligned}$$ Subtract 0.02 from both sides.

$0.02+(1.02) \stackrel{?}{=} 1.04$ Check the answer.
$1.04=1.04$ The answer works.

15. To solve for q means to isolate q on one side of the equal sign.

$2p+\boxed{q}=9$ Identify the variable term to isolate.
$-2p \quad -2p$ Subtract $2p$ from both sides.
$q=-2p+9$

16. To solve for x means to isolate x on one side of the equal sign.

$\boxed{x}-y=2$ Identify the variable term to isolate.
$+y \quad +y$ Add y to both sides.
$x=y+2$

17. To solve for y means to isolate y on one side of the equal sign.

$8x\boxed{-24y}=48$ Identify the variable term to isolate.
$-8x \quad -8x$ Subtract $8x$ from both sides.
$-24y=-8x+48$

$\frac{-24y}{-24}=\frac{-8x+48}{-24}$ Divided both sides by -24.
$y=\frac{-8x}{-24}+\frac{48}{-24}$
$y=\frac{1}{3}x-2$

18. To solve for p means to isolate p on one side of the equal sign.

$\boxed{3p}-5q=-30$ Identify the variable term to isolate.
$+5q \quad +5q$ Add $5q$ to both sides.
$3p=5q-30$
$\frac{3p}{3}=\frac{5q-30}{3}$ Divided both sides by 3.
$p=\frac{5q}{3}-\frac{30}{3}$
$p=\frac{5}{3}q-10$

19.

$$\begin{aligned} 7y &= 84 \\ \frac{7y}{7} &= \frac{84}{7} && \text{Divide both sides by 7.} \\ y &= 12 \end{aligned}$$

$$\begin{aligned} 7(12) &\stackrel{?}{=} 84 && \text{Check the answer.} \\ 84 &= 84 && \text{The answer works.} \end{aligned}$$

20.

$$\begin{aligned} 4x &= -64 \\ \frac{4x}{4} &= \frac{-64}{4} && \text{Divide both sides by 4.} \\ x &= -16 \end{aligned}$$

$$\begin{aligned} 4(-16) &\stackrel{?}{=} -64 && \text{Check the answer.} \\ -64 &= -64 && \text{The answer works.} \end{aligned}$$

21.

$$\begin{aligned} -a &= 7 \\ -1 \cdot -a &= 7 \cdot -1 && \text{Multiply both sides by } -1. \\ a &= -7 \end{aligned}$$

$$\begin{aligned} -(-7) &\stackrel{?}{=} 7 && \text{Check the answer.} \\ 7 &= 7 && \text{The answer works.} \end{aligned}$$

22.

$$\begin{aligned} -8 &= -x \\ -1 \cdot -8 &= -x \cdot -1 && \text{Multiply both sides by } -1. \\ 8 &= x \end{aligned}$$

$$\begin{aligned} -8 &\stackrel{?}{=} -(8) && \text{Check the answer.} \\ -8 &= -8 && \text{The answer works.} \end{aligned}$$

23.

$$\begin{aligned} -2b &= -22 \\ \frac{-2b}{-2} &= \frac{-22}{-2} && \text{Divide both sides by } -2. \\ b &= 11 \end{aligned}$$

Check the answer as in problems 19-22.

24.

$$\begin{aligned} -5y &= 35 \\ \frac{-5y}{-5} &= \frac{35}{-5} && \text{Divide both sides by } -5. \\ y &= -7 \end{aligned}$$

Check the answer as in problems 19-22.

25.

$$\begin{aligned} \frac{2}{3}x &= -16 \\ \frac{3}{2} \cdot \frac{2}{3}x &= -16 \cdot \frac{3}{2} && \text{Multiply both sides by } \frac{3}{2}. \\ x &= -24 \end{aligned}$$

Check the answer as in problems 19-22.

26.

$$\begin{aligned} \frac{-3}{4}n &= -9 \\ -\frac{4}{3} \cdot \frac{-3}{4}n &= -9 \cdot -\frac{4}{3} && \text{Multiply both sides by } -\frac{4}{3}. \\ n &= 12 \end{aligned}$$

Check the answer as in problems 19-22.

27.

$$\begin{aligned} 6.2t &= -8.4 \\ \frac{6.2t}{6.2} &= \frac{-8.4}{6.2} && \text{Divide both sides by 6.2.} \\ t &\approx -1.35 && \text{Answer rounded to hundredths.} \end{aligned}$$

Check the answer as in problems 19-22.

28.

$$\begin{aligned} -0.5k &= -16.5 \\ \frac{-0.5k}{-0.5} &= \frac{-16.5}{-0.5} && \text{Divide both sides by } -0.5. \\ k &= 33 \end{aligned}$$

Check the answer as in problems 19-22.

29. a. To find the number of airplanes that are needed to transport 520 people, substitute $P = 520$ into the equation $J = \frac{P}{126}$ and solve for *J*.

$$\begin{aligned} J &= \frac{P}{126} && \text{Substitute } P = 520. \\ J &= \frac{520}{126} \\ J &\approx 4.13 && \text{Answer rounded to hundredths.} \end{aligned}$$

Since you cannot have 4.13 airplanes, we round the final answer up to the nearest whole number. To transport 520 people, 5 airplanes would be needed.

b. To find the number of people that the carrier can transport at a time with 15 planes, substitute $J = 15$ into the equation $J = \frac{P}{126}$ and solve for *P*.

$$J = \frac{P}{126} \quad \text{Substitute } J = 15.$$
$$15 = \frac{P}{126}$$
$$126 \cdot 15 = \frac{P}{126} \cdot 126 \quad \text{Multiply both sides by 126.}$$
$$1890 = P$$

If the airline carrier has 15 planes, they can transport 1890 people at a time.

30. a. To fine Devora's monthly salary if she works 140 hours, substitute $h = 140$ into the equation $S = 14h$ and solve for *S*.

$$S = 14h \quad \text{Substitute } h = 140.$$
$$S = 14(140)$$
$$S = 1960$$

Devora's monthly salary will be \$1960 if she works 140 hours.

b. To find the number of hours Devora needs to work a month to make \$2100 a month, substitute $S = 2100$ into the equation $S = 14h$ and solve for *h*.

$$S = 14h \quad \text{Substitute } S = 2100.$$
$$2100 = 14h$$
$$\frac{2100}{14} = \frac{14h}{14} \quad \text{Divide both sides by 14}$$
$$150 = h$$

Devora has to work 150 hours a month to make \$2100 a month.

c. To find the number of hours Devora needs to work a month to earn \$1330 a month, substitute $S = 1330$ into the equation $S = 14h$ and solve for *h*.

$$S = 14h \quad \text{Substitute } S = 1330.$$
$$1330 = 14h$$
$$\frac{1330}{14} = \frac{14h}{14} \quad \text{Divide both sides by 14}$$
$$95 = h$$

Devora has to work 95 hours a month to earn \$1330 a month.

31.

$$\begin{array}{r} 6x - 9 = -63 \\ \underline{+9 \quad +9} \\ 6x = -54 \end{array} \quad \text{Add 9 to both sides.}$$
$$\frac{6x}{6} = \frac{-54}{6} \quad \text{Divide both sides by 6.}$$
$$x = -9$$
$$6(-9) - 9 \stackrel{?}{=} -63 \quad \text{Check the answer.}$$
$$-54 - 9 \stackrel{?}{=} -63$$
$$-63 = -63 \quad \text{The answer works.}$$

32.

$$\begin{array}{r} 5y - 17 = 33 \\ \underline{+17 \quad +17} \\ 5y = 50 \end{array} \quad \text{Add 17 to both sides.}$$
$$\frac{5y}{5} = \frac{50}{5} \quad \text{Divide both sides by 5.}$$
$$y = 10$$
$$5(10) - 17 \stackrel{?}{=} 33 \quad \text{Check the answer.}$$
$$50 - 17 \stackrel{?}{=} 33$$
$$33 = 33 \quad \text{The answer works.}$$

33.

$$\begin{array}{r} -2a + 9 = -5 \\ \underline{-9 \quad -9} \\ -2a = -14 \end{array} \quad \text{Subtract 9 from both sides.}$$
$$\frac{-2a}{-2} = \frac{-14}{-2} \quad \text{Divide both sides by } -2.$$
$$a = 7$$

Check the answer as in problems 31-32.

34.

$$\begin{array}{r} -8k - 19 = 5 \\ \underline{+19 \quad +19} \\ -8k = 24 \end{array} \quad \text{Add 19 to both sides.}$$
$$\frac{-8k}{-8} = \frac{24}{-8} \quad \text{Divide both sides by } -8.$$
$$k = -3$$

Check the answer as in problems 31-32.

35.

$$\begin{array}{r} \frac{x}{2} - 1 = -11 \\ \underline{+1 \quad +1} \end{array} \quad \text{Add 1 to both sides.}$$
$$\frac{x}{2} = -10$$
$$2 \cdot \frac{x}{2} = -10 \cdot 2 \quad \text{Multiply both sides by 2.}$$
$$x = -20$$

Check the answer as in problems 31-32.

36.

$$\begin{aligned} \frac{-x}{3}+2&=-4 \\ -2\quad -2& \qquad \text{Subtract 2 from both sides.} \\ \frac{-x}{3}&=-6 \\ -3\cdot\frac{-x}{3}&=-6\cdot -3 \qquad \text{Multiply both sides by } -3. \\ x&=18 \end{aligned}$$

Check the answer as in problems 31-32.

37.

$$\begin{aligned} -8.6-1.2x&=10.6 \\ +8.6 \qquad\quad &+8.6 \qquad \text{Add 8.6 to both sides.} \\ -1.2x&=19.2 \\ \frac{-1.2x}{-1.2}&=\frac{19.2}{-1.2} \qquad \text{Divide both sides by } -1.2. \\ x&=-16 \end{aligned}$$

Check the answer as in problems 31-32.

38.

$$\begin{aligned} 0.25y-1&=-7 \\ +1\quad &+1 \qquad \text{Add 1 to both sides.} \\ 0.25y&=-6 \\ \frac{0.25y}{0.25}&=\frac{-6}{0.25} \qquad \text{Divide both sides by 0.25.} \\ y&=-24 \end{aligned}$$

Check the answer as in problems 31-32.

39. Let $x =$ "a number." The sentence translates as follows

$$9x=76$$

Solve:

$$\frac{9x}{9}=\frac{76}{9} \qquad \text{Divide both sides by 9.}$$

$$x=8\frac{4}{9}$$

$$9\left(8\frac{4}{9}\right)\stackrel{?}{=}76 \qquad \text{Check the answer.}$$

$$9\left(\frac{76}{9}\right)\stackrel{?}{=}76$$

$$76=76 \qquad \text{The answer works.}$$

40. Let $x =$ "a number." The sentence translates as follows

$$12=-2x$$

Solve:

$$\frac{12}{-2}=\frac{-2x}{-2} \qquad \text{Divide both sides by } -2.$$

$$-6=x$$

$$12\stackrel{?}{=}-2(-6) \qquad \text{Check the answer.}$$

$$12=12 \qquad \text{The answer works.}$$

41. Let $x =$ "a number." The sentence translates as follows

$$2x+16=-44$$

Solve:

$$\begin{aligned} 2x+16&=-44 \\ -16\quad &-16 \qquad \text{Subtract 16 from both sides.} \\ 2x&=-60 \\ \frac{2x}{2}&=\frac{-60}{2} \qquad \text{Divide both sides by 2.} \\ x&=-30 \end{aligned}$$

Check the answer as in problems 39-40.

42. Let $x =$ "a number." The sentence translates as follows

$$\frac{1}{2}x+4=-18$$

Solve:

$$\begin{aligned} \frac{1}{2}x+4&=-18 \\ -4\quad &-4 \qquad \text{Subtract 4 from both sides.} \\ \frac{1}{2}x&=-22 \\ 2\cdot\frac{1}{2}x&=-22\cdot 2 \qquad \text{Multiply both sides by 2.} \\ x&=-44 \end{aligned}$$

Check the answer as in problems 39-40.

43. Let $x =$ "a number." The sentence translates as follows

$$\frac{x}{4} = 0.25$$

Solve:

$$4 \cdot \frac{x}{4} = 0.25 \cdot 4 \quad \text{Multiply both sides by 4.}$$

$$x = 1$$

Check the answer as in problems 39-40.

44. Let $x =$ "a number." The sentence translates as follows

$$-\frac{x}{3} = 0.75$$

Solve:

$$-3 \cdot -\frac{x}{3} = 0.75 \cdot -3 \quad \text{Multiply both sides by } -3.$$

$$x = -2.25$$

Check the answer as in problems 39-40.

45. Let $x =$ "a number." The sentence translates as follows

$$8 - 3x = 17$$

Solve:

$$8 - 3x = 17$$

$$\underline{-8 \qquad -8} \quad \text{Subtract 8 from both sides.}$$

$$-3x = 9$$

$$\frac{-3x}{-3} = \frac{9}{-3} \quad \text{Divide both sides by } -3.$$

$$x = -3$$

Check the answer as in problems 39-40.

46. Let $x =$ "a number." The sentence translates as follows $2x - 9 = 7$.

Solve:

$$2x - 9 = 7$$

$$\underline{+9 \quad +9} \quad \text{Add 9 to both sides.}$$

$$2x = 16$$

$$\frac{2x}{2} = \frac{16}{2} \quad \text{Divide both sides by 2.}$$

$$x = 8$$

Check the answer as in problems 39-40.

47.

$$D = c\boxed{m}a \quad \text{Identify the variable to isolate.}$$

$$\frac{D}{ca} = \frac{\cancel{c}m\cancel{a}}{\cancel{c}\cancel{a}} \quad \text{Divide both sides by } ca.$$

$$\frac{D}{ca} = m$$

48.

$$V = lw\boxed{h} \quad \text{Identify the variable to isolate.}$$

$$\frac{V}{lw} = \frac{\cancel{l}\cancel{w}h}{\cancel{l}\cancel{w}} \quad \text{Divide both sides by } lw.$$

$$\frac{V}{lw} = h$$

49.

$$C = \pi \cdot \boxed{d} \quad \text{Identify the variable to isolate.}$$

$$\frac{C}{\pi} = \frac{\cancel{\pi}d}{\cancel{\pi}} \quad \text{Divide both sides by } \pi.$$

$$\frac{C}{\pi} = d$$

50.

$$A = \frac{1}{2}\boxed{b} \cdot h \quad \text{Identify the variable to isolate.}$$

$$(2)A = \frac{1}{\cancel{2}} b \cdot h(\cancel{2}) \quad \text{Multiply both sides by 2.}$$

$$\frac{2A}{h} = \frac{b \cdot \cancel{h}}{\cancel{h}} \quad \text{Divide both sides by } h.$$

$$\frac{2A}{h} = b$$

51.

$$9x - 3\boxed{y} = -12 \quad \text{Identify the variable to isolate.}$$

$$\underline{-9x \qquad -9x} \quad \text{Subtract } 9x \text{ from both sides.}$$

$$-3y = -9x - 12 \quad \text{Divide both sides by } -3.$$

$$\frac{-3y}{-3} = \frac{-9x - 12}{-3}$$

$$y = \frac{-9x}{-3} - \frac{12}{-3}$$

$$y = 3x + 4$$

52.

$$-8x + 4\boxed{y} = -24 \quad \text{Identify the variable to isolate.}$$

$$\underline{+8x \qquad +8x} \quad \text{Add } 8x \text{ to both sides.}$$

$$4y = 8x - 24 \quad \text{Divide both sides by } -3.$$

$$\frac{4y}{4} = \frac{8x - 24}{4}$$

$$y = \frac{8x}{4} - \frac{24}{4}$$

$$y = 2x - 6$$

53. Let $x =$ "a number." The sentence translates as follows

$$2x+1=3x-4$$

Solve:

$$\begin{array}{ll} 2x+1=3x-4 & \\ \underline{-3x \quad\; -3x} & \text{Subtract } 3x \text{ from both sides.} \\ -x+1=-4 & \\ \underline{\quad -1 \quad -1} & \text{Subtract 1 from both sides.} \\ -x=-5 & \\ -1\cdot -x=-5\cdot -1 & \text{Multiply both sides by } -1. \\ x=5 & \end{array}$$

$$\begin{array}{ll} 2(5)+1\stackrel{?}{=}3(5)-4 & \text{Check the answer.} \\ 10+1\stackrel{?}{=}15-4 & \\ 11=11 & \text{The answer works.} \end{array}$$

54. Let $x =$ "a number." The sentence translates as follows

$$\frac{1}{2}x+10=x-4$$

Solve:

$$\begin{array}{ll} (2)\frac{1}{2}x+(2)10=(2)x-4(2) & \text{Multiply each term by 2.} \\ x+20=2x-8 & \\ \underline{-2x \quad\; -2x} & \text{Subtract } 2x \text{ from both sides.} \\ -x+20=-8 & \\ \underline{\quad -20 \quad -20} & \text{Subtract 20 from both sides.} \\ -x=-28 & \\ -1\cdot -x=-28\cdot -1 & \text{Multiply both sides by } -1. \\ x=28 & \end{array}$$

$$\begin{array}{ll} \frac{1}{2}(28)+10\stackrel{?}{=}(28)-4 & \text{Check the answer.} \\ 14+10\stackrel{?}{=}28-4 & \\ 24=24 & \text{The answer works.} \end{array}$$

55.

$$\begin{array}{ll} 4x-8=-3x+20 & \\ \underline{+3x \quad\; +3x} & \text{Add } 3x \text{ to both sides.} \\ 7x-8=20 & \\ \underline{\quad +8 \quad +8} & \text{Add 8 to both sides.} \\ 7x=28 & \\ \frac{7x}{7}=\frac{28}{7} & \text{Divide both sides by 7.} \\ x=4 & \end{array}$$

$$\begin{array}{ll} 4(4)-8\stackrel{?}{=}-3(4)+20 & \text{Check the answer.} \\ 16-8\stackrel{?}{=}-12+20 & \\ 8=8 & \text{The answer works.} \end{array}$$

56.

$$\begin{array}{ll} 9y+12=7y+6 & \\ \underline{-7y \quad\; -7y} & \text{Subtract } 7y \text{ from both sides.} \\ 2y+12=6 & \\ \underline{\quad -12 \quad -12} & \text{Subtract 12 from both sides.} \\ 2y=-6 & \\ \frac{2y}{2}=\frac{-6}{2} & \text{Divide both sides by 2.} \\ y=-3 & \end{array}$$

$$\begin{array}{ll} 9(-3)+12\stackrel{?}{=}7(-3)+6 & \text{Check the answer.} \\ -27+12\stackrel{?}{=}-21+6 & \\ -15=-15 & \text{The answer works.} \end{array}$$

57.

$$\begin{array}{ll} 5(a+5)=12a-13 & \text{Distribute on left side.} \\ 5a+25=12a-13 & \\ \underline{-12a \quad\; -12a} & \text{Subtract } 12a \text{ from both sides.} \\ -7a+25=-13 & \\ \underline{\quad -25 \quad -25} & \text{Subtract 25 from both sides.} \\ -7a=-38 & \\ \frac{-7a}{-7}=\frac{-38}{-7} & \text{Divide both sides by } -7. \\ a=\frac{38}{7} \text{ or } a=5\frac{3}{7} & \end{array}$$

$5\left(\left[\frac{38}{7}\right]+5\right)=12\left(\frac{38}{7}\right)-13$ Check the answer.

$5\left(\left[\frac{38}{7}\right]+\frac{35}{7}\right)=12\left(\frac{38}{7}\right)-\frac{91}{7}$

$5\left(\frac{73}{7}\right)\overset{?}{=}\frac{456}{7}-\frac{91}{7}$

$\frac{365}{7}=\frac{365}{7}$ The answer works.

58.

$11+7x+7=5x-2$ Simplify on left side.

$7x+18=5x-2$

$\underline{-5x \qquad -5x}$ Subtract $5x$ from both sides.

$2x+18=-2$

$\underline{\quad -18 \quad -18}$ Subtract 18 from both sides.

$2x=-20$

$\frac{2x}{2}=\frac{-20}{2}$ Divide both sides by 2.

$x=-10$

$11+7(-10)+7\overset{?}{=}5(-10)-2$ Check the answer.

$18-70\overset{?}{=}-50-2$

$-52=-52$ The answer works.

59.

$4k+1=-5k+3(3k-1)$ Distribute on right side.

$4k+1=-5k+9k-3$ Simplify on right side.

$4k+1=4k-3$

$\underline{-4k \qquad -4k}$ Subtract $4k$ from both sides.

$1\overset{?}{=}-3$ This is a false statement.

This equation has no solution.

60.

$9h-7(h+1)=2h+9$ Distribute on left side.

$9h-7h-7=2h+9$ Simplify on left side.

$2h-7=2h+9$

$\underline{-2h \qquad -2h}$ Subtract $2h$ from both sides.

$-7\overset{?}{=}9$ This is a false statement.

This equation has no solution.

61.

$-5x+3=13-5(x+2)$ Distribute on right side.

$-5x+3=13-5x-10$ Simplify on right side.

$-5x+3=-5x+3$

$\underline{+5x \qquad +5x}$ Add $5x$ to both sides.

$3=3$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -3 and 1, and substitute these into the equation.

$-5(-3)+3\overset{?}{=}13-5([-3]+2)$ Check the answer using -3.

$15+3\overset{?}{=}13-5(-1)$

$18=18$ The answer works.

$-5(0)+3\overset{?}{=}13-5([0]+2)$ Check the answer using 0.

$0+3\overset{?}{=}13-5(2)$

$3=3$ The answer works.

62.

$7y-10+2(-3y+2)=y-6$ Distribute-left side.

$7y-10-6y+4=y-6$ Simplify on left side.

$y-6=y-6$

$\underline{+y \qquad +y}$ Add y to both sides.

$-6=-6$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -1 and 5, and substitute these into the equation.

Check the answer using -1.

$7(-1)-10+2(-3[-1]+2)\overset{?}{=}(-1)-6$

$-7-10+2(3+2)\overset{?}{=}-7$

$-17+2(5)\overset{?}{=}-7$

$-7=-7$ The answer works.

Check the answer using 5.

$7(5)-10+2(-3[5]+2)\overset{?}{=}(5)-6$

$35-10+2(-15+2)\overset{?}{=}-1$

$25+2(-13)\overset{?}{=}-1$

$-1=-1$ The answer works.

63. The sum of the measures of the angles in a triangle must equal $180°$. Add the measures of the given angles and set them equal to $180°$ then solve for *x*.

$$
\begin{aligned}
x+(x+6)+(x-12)&=180 && \text{Combine like terms.}\\
3x-6&=180\\
+6\quad +6 & && \text{Add 6 to both sides.}\\
3x&=186\\
\frac{3x}{3}&=\frac{186}{3} && \text{Divide both sides by 3.}\\
x&=62
\end{aligned}
$$

Now substitute $x=62$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $62°,\ 68°,\ \text{and}\ 50°$.

To check the solution, the measures of the angles should add up to 180.

$$
\begin{aligned}
62°+68°+50°&\overset{?}{=}180° && \text{Check the answer.}\\
180°&=180° && \text{The answer works.}
\end{aligned}
$$

64. The sum of the measures of the angles in a triangle must equal $180°$. Add the measures of the given angles and set them equal to $180°$ then solve for *x*.

$$
\begin{aligned}
3x+(x+20)+(x-10)&=180 && \text{Combine like terms.}\\
5x+10&=180\\
-10\quad -10 & && \text{Subtract 10 from both sides.}\\
5x&=170\\
\frac{5x}{5}&=\frac{170}{5} && \text{Divide both sides by 5.}\\
x&=34
\end{aligned}
$$

Now substitute $x=34$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $102°,\ 54°,\ \text{and}\ 24°$.

To check the solution, the measures of the angles should add up to 180.

$$
\begin{aligned}
102°+54°+24°&\overset{?}{=}180° && \text{Check the answer.}\\
180°&=180° && \text{The answer works.}
\end{aligned}
$$

65.

$$
\begin{aligned}
4x+1&>49\\
-1\quad -1 & && \text{Subtract 1 from both sides.}\\
4x&>48 && \text{Divide both sides by 4.}\\
\frac{4x}{4}&>\frac{48}{4}\\
x&>12
\end{aligned}
$$

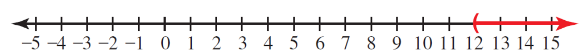
$$
\begin{aligned}
4(12)+1&\overset{?}{=}49 && \text{Check the answer.}\\
48+1&\overset{?}{=}49\\
49&=49 && \text{The answer works.}
\end{aligned}
$$

Check a number greater than 12 ($x=13$) to test the direction of the inequality symbol.

$$
\begin{aligned}
4(13)+1&\overset{?}{>}49 && \text{Check the direction of the inequality.}\\
52+1&\overset{?}{>}49\\
53&>49 && \text{The direction of the inequality works.}
\end{aligned}
$$

Using interval notation, the answer is written as $(12,\infty)$. Use a parenthesis next to the 12 because *x* is not also "equal to" 12. Always use a parenthesis next to the infinity symbol.

Using a number line:



66.

$$
\begin{aligned}
3x-2&\le 19\\
+2\quad +2 & && \text{Add 2 to both sides.}\\
3x&\le 21 && \text{Divide both sides by 3.}\\
\frac{3x}{3}&\le\frac{21}{3}\\
x&\le 7
\end{aligned}
$$

$$
\begin{aligned}
3(7)-2&\overset{?}{=}19 && \text{Check the answer.}\\
21-2&\overset{?}{=}19\\
19&=19 && \text{The answer works.}
\end{aligned}
$$

Check a number less than 7 ($x=6$) to test the direction of the inequality symbol.

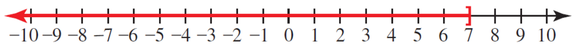
$$
\begin{aligned}
3(6)-2&\overset{?}{\le}19 && \text{Check the direction of the inequality.}\\
18-2&\overset{?}{\le}19\\
16&\le 19 && \text{The direction of the inequality works.}
\end{aligned}
$$

Using interval notation, the answer is written as $(-\infty,7]$.

Use a bracket next to the 7 because *x* is also "equal to" 7.

This means that 7 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:



67.

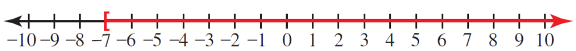
$$\begin{aligned} -x &\le 7 && \text{Multiply both sides by } -1. \\ -1\cdot -x &\ge 7\cdot -1 && \text{Multiply by neg., reverse inequality.} \\ x &\ge -7 \end{aligned}$$

Check the answer as in problems 65-66.

Using interval notation, the answer is written as $[-7,\infty)$.

Use a bracket next to the -7 because x is also "equal to" -7. This means that -7 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:



68.

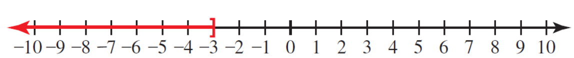
$$\begin{aligned} -y &\ge 3 && \text{Multiply both sides by } -1. \\ -1\cdot -y &\le 3\cdot -1 && \text{Multiply by neg., reverse inequality.} \\ y &\le -3 \end{aligned}$$

$$\begin{aligned} -(-3) &\overset{?}{=} 3 && \text{Check the answer.} \\ 3 &= 3 && \text{The answer works.} \end{aligned}$$

Check the answer as in problems 65-66.

Using interval notation, the answer is written as $(-\infty,-3]$. Use a bracket next to the -3 because y is also "equal to" -3. This means that -3 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:



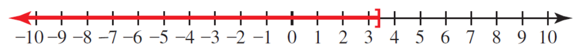
69.

$$\begin{aligned} -5y+1 &\ge -16 \\ \underline{-1 \quad -1} & && \text{Subtract 1 from both sides.} \\ -5y &\ge -17 && \text{Divide both sides by } -5. \\ \frac{-5y}{-5} &\le \frac{-17}{-5} && \text{Divide by neg., reverse inequality.} \\ y &\le \frac{17}{5} \end{aligned}$$

Check the answer as in problems 65-66.

Using interval notation, the answer is written as $\left(-\infty,\frac{17}{5}\right]$. Use a bracket next to the $\frac{17}{5}$ because y is also "equal to" $\frac{17}{5}$. This means that $\frac{17}{5}$ is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:

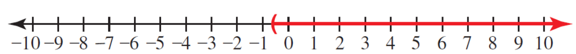


70.

$$\begin{aligned} -6x-7 &< -3 \\ \underline{+7 \quad +7} & && \text{Add 7 to both sides.} \\ -6x &< 4 && \text{Divide both sides by } -6. \\ \frac{-6x}{-6} &> \frac{4}{-6} && \text{Divide by neg., reverse inequality.} \\ x &> -\frac{2}{3} \end{aligned}$$

Using interval notation, the answer is written as $\left(-\frac{2}{3},\infty\right)$. Use a parenthesis next to the $-\frac{2}{3}$ because x is not also "equal to" $-\frac{2}{3}$. Always use a parenthesis next to the infinity symbol.

Using a number line:



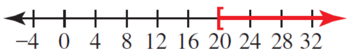
71.

$$\begin{aligned} \frac{-1}{4}y+3 &\le -2 \\ \underline{-3 \quad -3} & && \text{Subtract 3 from both sides.} \\ \frac{-1}{4}y &\le -5 && \text{Multiply both sides by } -4. \\ -4\cdot\frac{-1}{4}y &\ge -5\cdot -4 && \text{Multiply by neg., reverse inequality.} \\ y &\ge 20 \end{aligned}$$

Check the answer as in problems 65-66.

Using interval notation, the answer is written as $[20,\infty)$. Use a bracket next to the 20 because y is also "equal to" 20. This means that 20 is part of the solution set. Always use a parenthesis next to the infinity symbol.

Using a number line:



72.

$$4-\frac{2}{5}t>-8$$

$$\underline{-4 \qquad -4} \quad \text{Subtract 4 from both sides.}$$

$$-\frac{2}{5}t>-12 \quad \text{Multiply both sides by } -\frac{5}{2}.$$

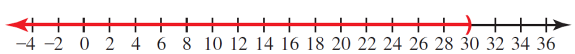
$$-\frac{5}{2}\cdot-\frac{2}{5}t<-12\cdot-\frac{5}{2} \quad \text{Multiply by neg., reverse inequality.}$$

$$t<30$$

Check the answer as in problems 65-66.

Using interval notation, the answer is written as $(-\infty,30)$. Use a parenthesis next to the 30 because t is not also "equal to" 30. Always use a parenthesis next to the infinity symbol.

Using a number line:



73.

$$-3x-3<-2x+9$$

$$\underline{+2x \qquad +2x} \quad \text{Add } 2x \text{ to both sides.}$$

$$-x-3<9$$

$$\underline{\qquad +3 \ +3} \quad \text{Add 3 to both sides.}$$

$$-x<12 \quad \text{Multiply both sides by } -1.$$

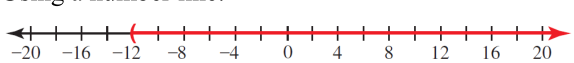
$$-1\cdot-x>12\cdot-1 \quad \text{Multiply by neg., reverse inequality.}$$

$$x>-12$$

Check the answer as in problems 65-66.

Using interval notation, the answer is written as $(-12,\infty)$. Use a parenthesis next to the -12 because x is not also "equal to" -12. Always use a parenthesis next to the infinity symbol.

Using a number line:



74.

$$-8y-1>-3y+9$$

$$\underline{+3y \qquad +3y} \quad \text{Add } 3y \text{ to both sides.}$$

$$-5y-1>9$$

$$\underline{\quad +1 \ +1} \quad \text{Add 1 to both sides.}$$

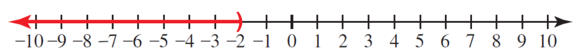
$$-5y>10 \quad \text{Divide both sides by } -5.$$

$$\frac{-5y}{-5}<\frac{10}{-5} \quad \text{Divide by neg., reverse inequality.}$$

$$y<-2$$

Using interval notation, the answer is written as $(-\infty,-2)$.

Using a number line:



75.

$$-3<2x+3<11 \quad \text{Isolate } x.$$

$$\underline{-3 \qquad -3 \ -3} \quad \text{Subtract 3 from all sides.}$$

$$-6<2x<8 \quad \text{Divide all sides by 2.}$$

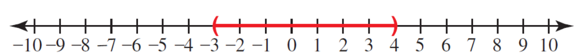
$$\frac{-6}{2}<\frac{2x}{2}<\frac{8}{2}$$

$$-3<x<4$$

Check the answer as in problems 65-66.

The solution in interval notation is $(-3,4)$.

Using a number line:



76.

$$-1<5x-6<24 \quad \text{Isolate } x.$$

$$\underline{+6 \qquad +6 \ +6} \quad \text{Add 6 to all sides.}$$

$$5<5x<30 \quad \text{Divide all sides by 5.}$$

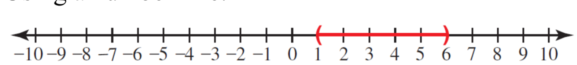
$$\frac{5}{5}<\frac{5x}{5}<\frac{30}{5}$$

$$1<x<6$$

Check the answer as in problems 65-66.

The solution in interval notation is $(1,6)$.

Using a number line:



77.

$$-2<\frac{x}{3}<9 \qquad \text{Isolate } x.$$

$$(3)-2<(3)\frac{x}{3}<9(3) \qquad \text{Multiply each side by 3.}$$

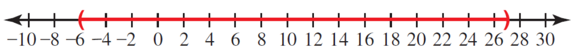
$$-6<x<27$$

$$-2\overset{?}{<}\frac{(3)}{3}\overset{?}{<}9 \qquad \text{Check direction using a number between } -6 \text{ and } 27.$$

$$-2<1<9 \qquad \text{The direction of the inequality symbols works.}$$

The solution in interval notation is $(-6,27)$.

Using a number line:



78.

$$-8<\frac{y}{2}+11<-5 \qquad \text{Isolate } x.$$

$$\underline{-11 \quad -11 \; -11} \qquad \text{Subtract 11 from all sides.}$$

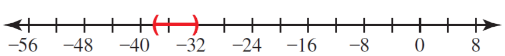
$$-19<\frac{y}{2}<-16$$

$$(2)-19<(2)\frac{y}{2}<-16(2) \qquad \text{Multiply each side by 2.}$$

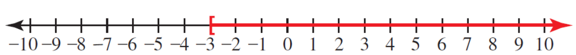
$$-38<y<-32$$

The solution in interval notation is $(-38,-32)$.

Using a number line:



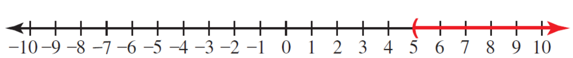
79. The graph of the interval $[-3,\infty)$ is below:



The values that are shown start at -3, include -3, and all numbers greater than -3.

This is equivalent to the inequality $x \geq -3$.

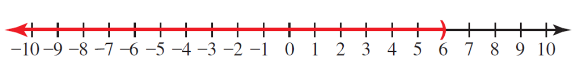
80. The graph of the interval $(5,\infty)$ is below:



The values shown start at 5, do not include 5, and include all numbers greater than 5.

This is equivalent to the inequality $x > 5$.

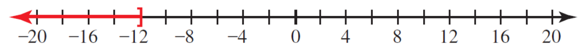
81. The graph of the interval $(-\infty,6)$ is below:



The values that are shown start at 6, do not include 6, and include all numbers less than 6.

This is equivalent to the inequality $x < 6$.

82. The graph of the interval $(-\infty,-12]$ is below:



The values that are shown start at -12, include -12, and all numbers less than -12.

This is equivalent to the inequality $x \leq -12$.

83. If $-6 > x$, then x must be less than -6. This means we can rewrite the inequality as $x < -6$

84. If $0 \leq y$, then y must be greater than or equal to 0. This means we can rewrite the inequality as $y \geq 0$

85.

$$80n-2400>0 \qquad \text{Isolate variable term.}$$

$$\underline{\quad +2400 \;\; +2400} \qquad \text{Add 2400 to both sides.}$$

$$80n>2400$$

$$\frac{\cancel{80}n}{\cancel{80}}>\frac{2400}{80} \qquad \text{Divide both sides by 80.}$$

$$n>30$$

Kiano must sell more than 30 stained-glass windows in order to make a profit.

86.

$$32.49d+21.65 \leq 119.12 \qquad \text{Isolate variable term.}$$

$$\underline{\quad -21.65 \;\; -21.65} \qquad \text{Subtract 21.65 from both sides.}$$

$$32.49d \leq 97.47$$

$$\frac{\cancel{32.49}d}{\cancel{32.49}} \leq \frac{97.47}{32.49} \qquad \text{Divide both sides by 32.49.}$$

$$d \leq 3$$

Jessie can rent a car for 3 days or less.

87. a. The inequality that represents Karyn keeping her monthly texting bill to at most \$10 is:

$7.5+0.1t \leq 10$

b.

$$7.5+0.1t \leq 10 \qquad \text{Isolate variable term.}$$

$$\underline{-7.5 \qquad -7.5} \qquad \text{Subtract 7.5 from both sides.}$$

$$0.1t \leq 2.5$$

$$\frac{\cancel{0.1}t}{\cancel{0.1}} \leq \frac{2.5}{0.1} \qquad \text{Divide both sides by 0.1.}$$

$$t \leq 25$$

Karyn can send no more than 25 texts over her 200 texts allowed.

88. **a.** Add the costs in an inequality less than or equal to 65.

$$50+1.5m \le 65$$

b. $50+1.5m \le 65$ Isolate variable term.

$$\begin{array}{r} 50+1.5m \le 65 \\ \underline{-50 \qquad -50} \\ 1.5m \le 15 \end{array}$$ Subtract 50 from both sides.

$$\frac{\cancel{1.5}m}{\cancel{1.5}} \le \frac{15}{1.5}$$ Divide both sides by 1.5.

$$m \le 10$$

Trey can have the TV delivered and stay within his budget for the delivery charge if he lives 10 miles or less from the store.

Chapter 2 Test

1. To check if the given value of the variable is a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$5b+8=2$ Original equation.

$5(-2)+8\overset{?}{=}2$ Substitute $b=-2$.

$-10+8\overset{?}{=}2$ Simplify both sides.

$-2\overset{?}{=}2$ This statement is not true.

$-2\neq 2$

Because the final results are not equal, $b=-2$ is not a solution to the equation $5b+8=2$.

2. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$D=70t$ Original equation.

$294\overset{?}{=}70(4.2)$ Substitute values for D and t.

$294=294$ This statement is true.

Because the final statement is true, $t=4.2$ and $D=294$ is a solution to the equation $D=70t$.

3.

$-5+\boxed{x}=-17$ Identify the variable term.

$+5 \quad\quad +5$ Add 5 to both sides.

$x=-12$

$-5+(-12)\overset{?}{=}-17$ Check the answer.

$-17=-17$ The answer works.

4. To solve for c means to isolate c on one side of the equal sign.

$P=a+b+\boxed{c}$ Identify the variable term to isolate.

$-a-b \quad -a-b$ Subtract a and b from both sides.

$P-a-b=c$ or $c=P-a-b$

5. Using the equation $P=R-C$ substitute $R=250000$ for the revenue, $C=88000$ for costs, then solve for P to find the company's profit.

$P=R-C$ Given equation.

$P=(250000)-(88000)$ Substitute value of variables.

$P=162000$ Simplify on right side.

The solution is $P=162000$ which represents that the company has monthly profit of \$162,000.

6.

$-5w=450$ Variable term is isolated.

$\frac{-5w}{-5}=\frac{450}{-5}$ Divide both sides by -5.

$w=-90$

$-5(-90)\overset{?}{=}450$ Check the answer.

$450=450$ The answer works.

7.

$\boxed{-4p}+25=-119$ Identify variable term to isolate.

$-25 \quad -25$ Subtract 25 from both sides.

$-4p=-144$

$\frac{-4p}{-4}=\frac{-14}{-4}$ Divide both sides by -4.

$p=36$

$-4(36)+25\overset{?}{=}-119$ Check the answer.

$-144+25\overset{?}{=}-119$

$-119=-119$ The answer works.

8.

$\boxed{\frac{x}{3}}+7=-5$ Identify variable term to isolate.

$-7 \quad -7$ Subtract 7 from both sides.

$\frac{x}{3}=-12$

$3\cdot\frac{x}{3}=-12\cdot 3$ Multiply both sides by 3.

$x=-36$

$\frac{(-36)}{3}+7\overset{?}{=}-5$ Check the answer.

$-12+7\overset{?}{=}-5$

$-5=-5$ The answer works.

9.

$4(x+4)-5=4x+11$ Distribute-left side.

$4x+16-5=4x+11$ Simplify on left side.

$4x+11=4x+11$

$-4x \quad -4x$ Subtract $4x$ from both sides.

$11=11$ This is a true statement.

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -6 and 10, and substitute these into the equation.

Check the answer using -6.

$$4([-6]+4)-5\overset{?}{=}4(-6)+11$$
$$4(-2)-5\overset{?}{=}-24+11$$
$$-8-5\overset{?}{=}-13$$
$$-13=-13 \quad \text{The answer works.}$$

Check the answer using 10.

$$4([10]+4)-5\overset{?}{=}4(10)+11$$
$$4(14)-5\overset{?}{=}40+11$$
$$56-5\overset{?}{=}51$$
$$51=51 \quad \text{The answer works.}$$

10.

$$3x+20=20+3(x-5) \quad \text{Distribute on right side.}$$
$$3x+20=20+3x-15 \quad \text{Simplify on right side.}$$
$$3x+20=3x+5$$
$$\underline{-3x \qquad -3x} \quad \text{Subtract } 3x \text{ from both sides.}$$
$$20\overset{?}{=}5 \quad \text{This is a false statement.}$$

This equation has no solution.

11. Recall that the perimeter of a rectangle can be calculated using the formula $P=2l+2w$ where *P* is the perimeter of the rectangle with length, *l*, and width, *w*. We are given the perimeter and width of the rectangular lot, so substitute $P=330$ and $w=40$. After substituting in these values, solve the equation for *l*.

$$330=2l+2(40) \quad \text{Substitute in known values.}$$
$$330=\boxed{2l}+80 \quad \text{Simplify \& isolate variable term.}$$
$$\underline{-80 \qquad -80} \quad \text{Subtract 80 from both sides.}$$
$$250=2l \quad \text{Divide both sides by 2.}$$
$$\frac{250}{2}=\frac{2l}{2}$$
$$125=l$$

$$330\overset{?}{=}2(125)+80 \quad \text{Check the answer.}$$
$$330\overset{?}{=}250+80$$
$$330=330 \quad \text{The answer works.}$$

The length of the building lot is 125 feet.

12. To solve for *x* means to isolate *x* on one side of the equal sign.

$$y=m\boxed{x}+b \quad \text{Identify the variable to isolate.}$$
$$\underline{-b \qquad -b} \quad \text{Subtract } b \text{ from both sides.}$$
$$y-b=mx \quad \text{Divide both sides by } m.$$
$$\frac{y-b}{m}=\frac{\cancel{m}x}{\cancel{m}}$$
$$\frac{y-b}{m}=x$$

13. Let $x=$ "a number." The sentence translates as follows

$$4x+7=-17$$

Solve:

$$4x+7=-17$$
$$\underline{-7 \quad -7} \quad \text{Subtract 7 from both sides.}$$
$$4x=-24$$
$$\frac{4x}{4}=\frac{-24}{4} \quad \text{Divide both sides by 4.}$$
$$x=-6$$

$$4(-6)+7\overset{?}{=}-17 \quad \text{Check the answer.}$$
$$-24+7\overset{?}{=}-17$$
$$-17=-17 \quad \text{The answer works.}$$

14.

$$10x-15=7x-9$$
$$\underline{-7x \qquad -7x} \quad \text{Subtract } 7x \text{ from both sides.}$$
$$3x-15=-9$$
$$\underline{+15 \quad +15} \quad \text{Add 15 to both sides.}$$
$$3x=6$$
$$\frac{3x}{3}=\frac{6}{3} \quad \text{Divide both sides by 3.}$$
$$x=2$$

$$10(2)-15\overset{?}{=}7(2)-9 \quad \text{Check the answer.}$$
$$20-15\overset{?}{=}14-9$$
$$5=5 \quad \text{The answer works.}$$

15.

$$
\begin{aligned}
4x+3 &= 4(x-1)+7 && \text{Distribute-right side.}\\
4x+3 &= 4x-4+7 && \text{Simplify on right side.}\\
4x+3 &= 4x+3 &&\\
\underline{-4x \quad} & \underline{\ -4x} && \text{Subtract } 4x \text{ from both sides.}\\
3 &= 3 && \text{This is a true statement.}
\end{aligned}
$$

The equation is an identity therefore the solution is all real numbers or $\mathbb{R}$.

To check this we will randomly choose two real numbers -2 and 7, and substitute these into the equation.

Check the answer using -2.

$$
\begin{aligned}
4(-2)+3 &\overset{?}{=} 4([-2]-1)+7\\
-8+3 &\overset{?}{=} 4(-3)+7\\
-5 &\overset{?}{=} -12+7\\
-5 &= -5 && \text{The answer works.}
\end{aligned}
$$

Check the answer using 7.

$$
\begin{aligned}
4(7)+3 &\overset{?}{=} 4([7]-1)+7\\
28+3 &\overset{?}{=} 4(6)+7\\
31 &\overset{?}{=} 24+7\\
31 &= 31 && \text{The answer works.}
\end{aligned}
$$

16. The sum of the measures of the angles in a triangle must equal $180°$. Add the measures of the given angles and set them equal to $180°$ then solve for *x*.

$$
\begin{aligned}
x+11x+6x &= 180 && \text{Combine like terms.}\\
18x &= 180 &&\\
\frac{18x}{18} &= \frac{180}{18} && \text{Divide both sides by 18.}\\
x &= 10
\end{aligned}
$$

Now substitute $x = 10$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $10°,\ 110°,$ and $60°$.

To check the solution, the measures of the angles should add up to 180.

$$
\begin{aligned}
10°+110°+60° &\overset{?}{=} 180° && \text{Check the answer.}\\
180° &= 180° && \text{The answer works.}
\end{aligned}
$$

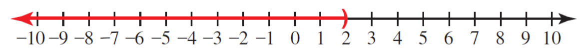
17. If $-16 \le x$, then *x* must be greater than or equal to -16. This means we can rewrite the inequality as

$x \ge -16$

18.

$$
\begin{aligned}
2x+1 &> 4x-3 &&\\
\underline{-4x \quad} & \underline{\ -4x} && \text{Subtract } 4x \text{ from both sides.}\\
-2x+1 &> -3 &&\\
\underline{\ -1 \quad} & \underline{\ -1} && \text{Subtract 1 from both sides.}\\
-2x &> -4 && \text{Divide both sides by } -2.\\
\frac{-2x}{-2} &< \frac{-4}{-2} && \text{Multiply by neg., reverse inequality.}\\
x &< 2
\end{aligned}
$$

Graphing the solution on a number line:



19.

$$
\begin{aligned}
5 \le 2x-7 &\le 15 && \text{Isolate } x.\\
\underline{+7 \qquad +7} & \underline{\ \ +7} && \text{Add 7 to all sides.}\\
12 \le 2x &\le 22 && \text{Divide all sides by 2.}\\
\frac{12}{2} \le \frac{2x}{2} &\le \frac{22}{2}\\
6 \le x &\le 11
\end{aligned}
$$

20. a. Aiden's hourly wage, \$10.25, times the number of hours *h* he works in a week must be greater than \$287 in order to meet his expenses. Write the inequality as follows:

$10.25h > 287$

b.

$$
\begin{aligned}
10.25h &> 287 && \text{Divide both sides by 10.25.}\\
\frac{10.25h}{10.25} &> \frac{287}{10.25}\\
h &> 28
\end{aligned}
$$

Aiden needs to work more than 28 hours a week to meet his expenses.

Cumulative Review for Chapters 1 and 2

1. The base is $\frac{9}{4}$ and we multiply $\frac{9}{4}$ by itself 6 times. So the exponent is 6. The exponential form is $\left(\frac{9}{4}\right)^6$.

$$\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}\cdot\frac{9}{4}=\left(\frac{9}{4}\right)^6$$

2. The base is -4, and the exponent of 3 tells us we are multiplying -4 by itself 3 times. The expanded form is $(-4)\cdot(-4)\cdot(-4)$.

$$(-4)^3=(-4)\cdot(-4)\cdot(-4)$$

3. The base is -1 and we multiply -1 by itself 5 times.

$$-1\cdot-1\cdot-1\cdot-1\cdot-1=-1$$

4. The exponent on 10 is 8. Move the decimal point 8 places to the right.

$$3.045\times10^8=3.045\cdot100{,}000{,}000=304{,}500{,}000$$

Therefore, 3.045×10^8 has the standard form 304,500,000.

5. Evaluating the expression using the order of operations would be as follows:

$$\begin{aligned}
&\boxed{\frac{84}{10-6}\cdot3}\boxed{-2^2}\boxed{-(-5)}+\boxed{20\div4\cdot(-3)} && \text{Outline the terms.}\\
&=\frac{84}{10-6}\cdot3-2^2-(-5)+20\div4\cdot(-3) && \text{Simplify fraction first.}\\
&=\frac{84}{4}\cdot3-2^2-(-5)+20\div4\cdot(-3)\\
&=21\cdot3-2^2-(-5)+20\div4\cdot(-3) && \text{Evaluate exponent.}\\
&=21\cdot3-4-(-5)+20\div4\cdot(-3) && \text{Simplify within each term.}\\
&=63-4-(-5)+5\cdot(-3) && \text{Multiply in 1st term, divide in last.}\\
&=63-4+5-15 && \text{Multiply in last term.}\\
&=49 && \text{Add/subtract from left to right.}
\end{aligned}$$

6. Evaluating the expression using the order of operations would be as follows:

$$\begin{aligned}
&\boxed{18\div(-2)}+\boxed{|6-7\cdot(-2)|}+\boxed{(-3)^2} && \text{Outline the terms.}\\
&=18\div(-2)+|6+14|+(-3)^2 && \text{Evaluate absolute value.}\\
&=18\div(-2)+|20|+(-3)^2\\
&=18\div(-2)+20+9 && \text{Evaluate exponent.}\\
&=-9+20+9 && \text{Divide.}\\
&=20 && \text{Add/subtract from left to right.}
\end{aligned}$$

7. $(-16)+(3-7)=(3-7)+(-16)$

This is an example of the commutative property of addition, because the order of the terms has been changed.

8. In this problem, there are 2 quantities that can change. One quantity is the amount of money (revenue) the soccer club makes, and the second is the number of candy bars sold. Let R = the amount of revenue in dollars the soccer club makes and c = the number of candy bars sold.

9. Let x = a number. "Less than" translates as subtraction, but it is done in reverse order. So this translates as something minus 7. "8 times a number" means to multiply a number by 8 so this translates as $8x$ and the sentence translates as $8x-7$.

10. Convert 95 feet to meters. First, form the unity fraction. We want to convert to the units of meters, so meters will go in the numerator. We want to convert from the units of feet, so feet will go in the denominator. There are 3.28 ft in 1 m, so the unity fraction is $\frac{1\text{ m}}{3.28\text{ ft}}$. Multiply 95 ft by this unity fraction and simplify the expression as follows.

$$\begin{aligned}
&95\text{ ft}\cdot\frac{1\text{ m}}{3.28\text{ ft}}\\
&=\frac{95\ \cancel{\text{ft}}}{1}\cdot\frac{1\text{ m}}{3.28\ \cancel{\text{ft}}}\\
&=\frac{95\text{ m}}{3.28}\approx28.96\text{ m}
\end{aligned}$$

Therefore, 95 feet is equal to approximately 28.96 m.

11. Evaluate $\frac{-x}{3}+7x$ for $x=-6$.

$$\begin{aligned}
&\frac{-x}{3}+7x && \text{Substitute in } x=-6.\\
&=\frac{-(-6)}{3}+7(-6) && \text{Simplify.}\\
&=\frac{6}{3}-42\\
&=2-42\\
&=-40
\end{aligned}$$

12.

Number of Biscuits for Scout	Number of Biscuits for Shadow
0	50 - 0 = 50
5	50 - 5 = 45
10	50 - 10 = 40
15	50 - 15 = 35
n	50 - *n*

To find number of dog biscuits Lisa will give to Shadow, subtract the number of biscuits given to Scout from 50 biscuits. The general variable expression is $50-n$.

13. Identify like terms first. Then combine like terms and arrange in conventional form.

$$\boxed{\boxed{7xy}}\boxed{-3x^2}+\boxed{6x}\boxed{-9x^2}+\boxed{\boxed{8xy}}\boxed{-x}$$
$$=-12x^2+5x+15xy$$

14. Evaluate parentheses first. Then identify like terms, combine like terms, and arrange in conventional form.

$6x-(3x-5)+8$ Evaluate parentheses.
$=\boxed{6x}\boxed{-3x}+\boxed{5}+\boxed{8}$ Identify like terms.
$=3x+13$ Combine like terms.

15. Evaluate parentheses first. Then identify like terms, combine like terms, and arrange in conventional form.

$(3b-c)-(-b+7c)$ Evaluate parentheses.
$=3b-c+b-7c$ Identify like terms.
$=4b-8c$ Combine like terms.

16. To determine the coordinates of the points we need to find the values of the *x*- and *y*-coordinates. Beginning in the top right quadrant with the point on the *x*-axis, then following counterclockwise for the other points, the first point is located 4 units to the right of the *y*-axis, so the *x*-coordinate is $x=4$. The point is located on the *x*-axis, so the *y*-coordinate is $y=0$.

The coordinates of this point are $(4,0)$.

The next point is located 1 unit to the right of the *y*-axis, so the *x*-coordinate is $x=1$. The point is located 2 units above the *x*-axis, so the *y*-coordinate is $y=2$.

The coordinates of this point are $(1,2)$.

The next point is located 3 units to the left of the *y*-axis, so the *x*-coordinate is $x=-3$. The point is located 4 units above the *x*-axis, so the *y*-coordinate is $y=4$.

The coordinates of this point are $(-3,4)$.

The next point is located 3 units to the left of the *y*-axis, so the *x*-coordinate is $x=-3$. The point is located 5 units below the *x*-axis, so the *y*-coordinate is $y=-5$.

The coordinates of this point are $(-3,-5)$.

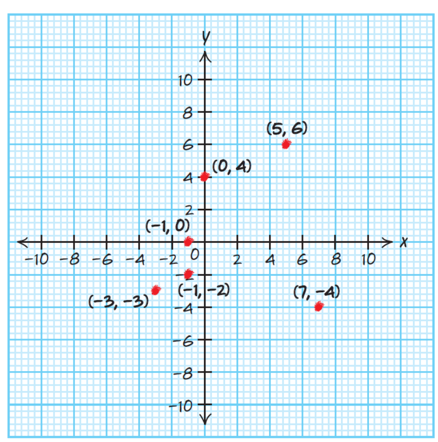
The next point is located on the *y*-axis, so the *x*-coordinate is $x=0$. The point is located 3 units below the *x*-axis, so the *y*-coordinate is $y=-3$.

The coordinates of this point are $(0,-3)$.

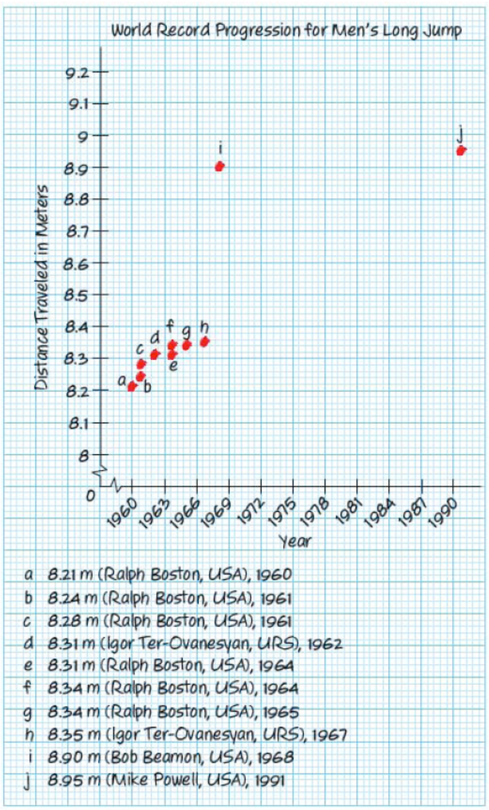
The next point is located 6 units to the right of the *y*-axis, so the *x*-coordinate is $x=6$. The point is located 2 units below the *x*-axis, so the *y*-coordinate is $y=-2$.

The coordinates of this point are $(6,-2)$.

17. The input values range from -3 to 7. It is reasonable to scale the horizontal axis by 2's. The output values range from -3 to 6 so it will be reasonable to scale the *y*-axis by 2's. The points are plotted on the graph below.



18. A reasonable vertical axis for this data would range between 0 and 9.2 with a scale of 0.1 and a break from 0 to 8. The horizontal axis will start at 0 and end at 1990 with a scale of 3 and a break from 0 to 1960. For a scatterplot, instead of using a bar to represent the height, use a large dot. This scatterplot should have a title and would be as follows:



19. To check if the given values of the variables are a solution to the equation, evaluate each side of the equation and see if the two sides are equal.

$4x-7y=-6$ Original equation.

$4(-1.5)-7(0)\stackrel{?}{=}-6$ Substitute $x=-1.5$ and $y=0$.

$-6-0\stackrel{?}{=}-6$ Simplify both sides.

$-6=-6$ This statement is true.

Because the final statement is true, $x=-1.5$ and $y=0$ are a solution to the equation $4x-7y=-6$.

20.

$-2+\boxed{y}=-7$ Identify the variable term.

$+2 \quad +2$ Add 2 to both sides.

$y=-5$

21.

$\boxed{x}-\frac{1}{3}=\frac{5}{6}$ Identify the variable term.

$+\frac{1}{3} \quad +\frac{1}{3}$ Add $\frac{1}{3}$ to both sides.

$x=\frac{5}{6}+\frac{2}{6}$ Find LCD = 6.

$x=\frac{7}{6}$ or $x=1\frac{1}{6}$

22.

$-0.051+\boxed{n}=4.006$ Identify the variable term.

$+0.051 \quad +0.051$ Add 0.051 to both sides.

$n=4.057$

23. We are solving for y so we want to isolate the variable y on one side of the equation.

$3x\boxed{-5y}=-30$ Identify variable term to isolate.

$-3x \quad -3x$ Subtract $3x$ from both sides.

$-5\boxed{y}=-3x-30$ Identify variable to isolate

$\frac{-5y}{-5}=\frac{-3x-30}{-5}$ Divide both sides by -5.

$y=\frac{-3x}{-5}-\frac{30}{-5}$ Simplify on right side.

$y=\frac{3}{5}x+6$

24.

$-7x=-21$

$\frac{-7x}{-7}=\frac{-21}{-7}$ Divide both sides by -7.

$x=3$

25.

$\frac{2}{3}n=-8$

$\frac{3}{2}\cdot\frac{2}{3}n=-8\cdot\frac{3}{2}$ Multiply both sides by $\frac{3}{2}$.

$n=-12$

26.

$$\begin{aligned} -5z &= 7.95 \\ \frac{-5z}{-5} &= \frac{7.95}{-5} \quad \text{Divide both sides by } -5. \\ z &= -1.59 \end{aligned}$$

27. **a.** Substitute $h=120$ into the equation $S=12h$ and solve for S.

$$\begin{aligned} S &= 12h && \text{Given equation.} \\ S &= 12(120) && \text{Substitute } h=120. \\ S &= 1440 && \text{Multiply \& solve for } S. \end{aligned}$$

If Corinthia works 120 hours, her salary will be \$1440.

b. Substitute $S=1680$ into the equation $S=12h$ and solve for h.

$$\begin{aligned} S &= 12h && \text{Given equation.} \\ 1680 &= 12h && \text{Substitute } S=1680 \text{ \& solve for } h. \\ \frac{1680}{12} &= \frac{12h}{12} && \text{Divide both sides by 12.} \\ 140 &= h \end{aligned}$$

Corinthia needs to work 140 hours in a month to make \$1680 a month.

c. Substitute $S=1200$ into the equation $S=12h$ and solve for h.

$$\begin{aligned} S &= 12h && \text{Given equation.} \\ 1200 &= 12h && \text{Substitute } S=1200 \text{ \& solve for } h. \\ \frac{1200}{12} &= \frac{12h}{12} && \text{Divide both sides by 12.} \\ 100 &= h \end{aligned}$$

Corinthia needs to work 100 hours in a month if she only wants to earn \$1200 a month.

28.

$$\begin{aligned} 8y-11 &= 21 \\ +11 \quad &\ \ +11 && \text{Add 11 to both sides.} \\ 8y &= 32 \\ \frac{8y}{8} &= \frac{32}{8} && \text{Divide both sides by 8.} \\ y &= 4 \end{aligned}$$

29.

$$\begin{aligned} \frac{x}{5}-4 &= -9 \\ +4 \quad &\ \ +4 && \text{Add 4 to both sides.} \\ \frac{x}{5} &= -5 \\ 5\cdot\frac{x}{5} &= -5\cdot 5 && \text{Multiply both sides by 5.} \\ x &= -25 \end{aligned}$$

30.

$$\begin{aligned} -1.2+3.7x &= 15.45 \\ +1.2 \qquad &\ \ +1.2 && \text{Add 1.2 to both sides.} \\ 3.7x &= 16.65 \\ \frac{3.7x}{3.7} &= \frac{16.65}{3.7} && \text{Divide both sides by 3.7.} \\ x &= 4.5 \end{aligned}$$

31. Let x = a number. The sentence translates as follows:

$$\begin{aligned} 2x+20 &= 6 \\ -20 \ &\ -20 && \text{Subtract 20 from both sides.} \\ 2x &= -14 \\ \frac{2x}{2} &= \frac{-14}{2} && \text{Divide both sides by 8.} \\ x &= -7 \end{aligned}$$

32. Isolate the variable m.0

$$\begin{aligned} P &= rg\boxed{m} && \text{Identify variable to isolate.} \\ \frac{P}{rg} &= \frac{\cancel{r}\cancel{g}m}{\cancel{r}\cancel{g}} && \text{Divide both sides by } lh. \\ \frac{P}{rg} &= m \end{aligned}$$

33. Isolate the variable y.

$$\begin{aligned} 6x\boxed{-3y} &= -30 && \text{Identify variable term to isolate.} \\ -6x \qquad &\ -6x && \text{Subtract } 6x \text{ from both sides.} \\ -3\boxed{y} &= -6x-30 && \text{Identify variable to isolate} \\ \frac{-3y}{-3} &= \frac{-6x-30}{-3} && \text{Divide both sides by } -3. \\ y &= \frac{-6x}{-3}-\frac{30}{-3} && \text{Simplify on right side.} \\ y &= 2x+10 \end{aligned}$$

34. Let x = a number. The sentence translates as follows:

$$\begin{aligned} 2x+8&=4x-18 \\ -4x\quad &\quad -4x && \text{Subtract } 4x \text{ from both sides.} \\ -2x+8&=-18 \\ -8\quad &\quad -8 && \text{Subtract 8 from both sides.} \\ -2x&=-26 \\ \frac{-2x}{-2}&=\frac{-26}{-2} && \text{Divide both sides by } -2. \\ x&=13 \end{aligned}$$

35.

$$\begin{aligned} 8y+4&=12y+20 \\ -12y\quad &\quad -12y && \text{Subtract } 12y \text{ from both sides.} \\ -4y+4&=20 \\ -4\ &\ -4 && \text{Subtract 4 from both sides.} \\ -4y&=16 \\ \frac{-4y}{-4}&=\frac{16}{-4} && \text{Divide both sides by } -4. \\ y&=-4 \end{aligned}$$

36.

$$\begin{aligned} 7n+8&=-3n+2(4n-12) && \text{Distribute on right side.} \\ 7n+8&=-3n+8n-24 && \text{Simplify on right side.} \\ 7n+8&=5n-24 \\ -5n\quad &\quad -5n && \text{Subtract } 5n \text{ from both sides.} \\ 2n+8&=-24 \\ -8\quad &\quad -8 && \text{Subtract 8 from both sides.} \\ 2n&=-32 \\ \frac{2n}{2}&=\frac{-32}{2} && \text{Divide both sides by 2.} \\ n&=-16 \end{aligned}$$

37.

$$\begin{aligned} 5w-6+3(-4w+9)&=w+5 && \text{Distribute on left side.} \\ 5w-6-12w+27&=w+5 && \text{Simplify on left side.} \\ -7w+21&=w+5 \\ -w\quad &\quad -w && \text{Subtract } w \text{ from both sides.} \\ -8w+21&=5 \\ -21\ &\ -21 && \text{Subtract 21 from both sides.} \\ -8w&=-16 \\ \frac{-8w}{-8}&=\frac{-16}{-8} && \text{Divide both sides by } -8. \\ w&=2 \end{aligned}$$

38.

$$\begin{aligned} x+(x+18)+(x-3)&=180 && \text{Combine like terms.} \\ 3x+15&=180 \\ -15\ &\ -15 && \text{Subtract 15 from both sides.} \\ \frac{3x}{3}&=\frac{165}{3} && \text{Divide both sides by 3.} \\ x&=55 \end{aligned}$$

Now substitute $x=55$ into the expressions that represent the angles to find the measure of each angle. The measures of the 3 angles are $55°,\ 73°,\ \text{and}\ 52°.$

To check the solution, the measures of the angles should add up to 180.

$$\begin{aligned} 55°+73°+52°&\overset{?}{=}180° && \text{Check the answer.} \\ 180°&=180° && \text{The answer works.} \end{aligned}$$

39.

$$\begin{aligned} 6x+1&>49 \\ -1\ &\ -1 && \text{Subtract 1 from both sides.} \\ 6x&>48 && \text{Divide both sides by 6.} \\ \frac{6x}{6}&>\frac{48}{6} \\ x&>8 \end{aligned}$$

40.

$$\begin{aligned} \frac{-1}{7}r+5&\le 9 \\ -5\ &\ -5 && \text{Subtract 5 from both sides.} \\ \frac{-1}{7}r&\le 4 && \text{Multiply both sides by } -7. \\ -7\cdot\frac{-1}{7}r&\ge 4\cdot -7 && \text{Multiply by neg., reverse inequality.} \\ r&\ge -28 \end{aligned}$$

41.

$$\begin{aligned} 14<3x&+5<26 && \text{Isolate } x. \\ -5\quad &-5\ \ -5 && \text{Subtract 5 from all sides.} \\ 9<3x&<21 && \text{Divide all sides by 3.} \\ \frac{9}{3}<\frac{3x}{3}&<\frac{21}{3} \\ 3<x&<7 \end{aligned}$$

42.

$$\begin{aligned} 10-\frac{3}{8}t &> -4 \\ \underline{-10 \qquad\quad -10} & \quad \text{Subtract 10 from both sides.} \\ -\frac{3}{8}t &> -14 \quad \text{Multiply both sides by } -\frac{8}{3}. \\ -\frac{8}{3}\cdot -\frac{3}{8}t &< -14\cdot -\frac{8}{3} \quad \text{Multiply by neg., reverse inequality.} \\ t < \frac{112}{3} &\text{ or } t < 37\frac{1}{3} \end{aligned}$$

43. The English class can have between 15 students and 25 students enrolled. The maximum enrollment is 25, so we include 25 in the interval. The class must have at least 15 students, so we include 15 in the interval. Let $s =$ the number of students enrolled in the class.

$$15 \le s \le 25$$

44. The upper-division courses are numbered between 200 and 400. The problem states that 200 is included in the interval, but 400 is not included. Let $n =$ the course number.

$$200 \le n < 400$$