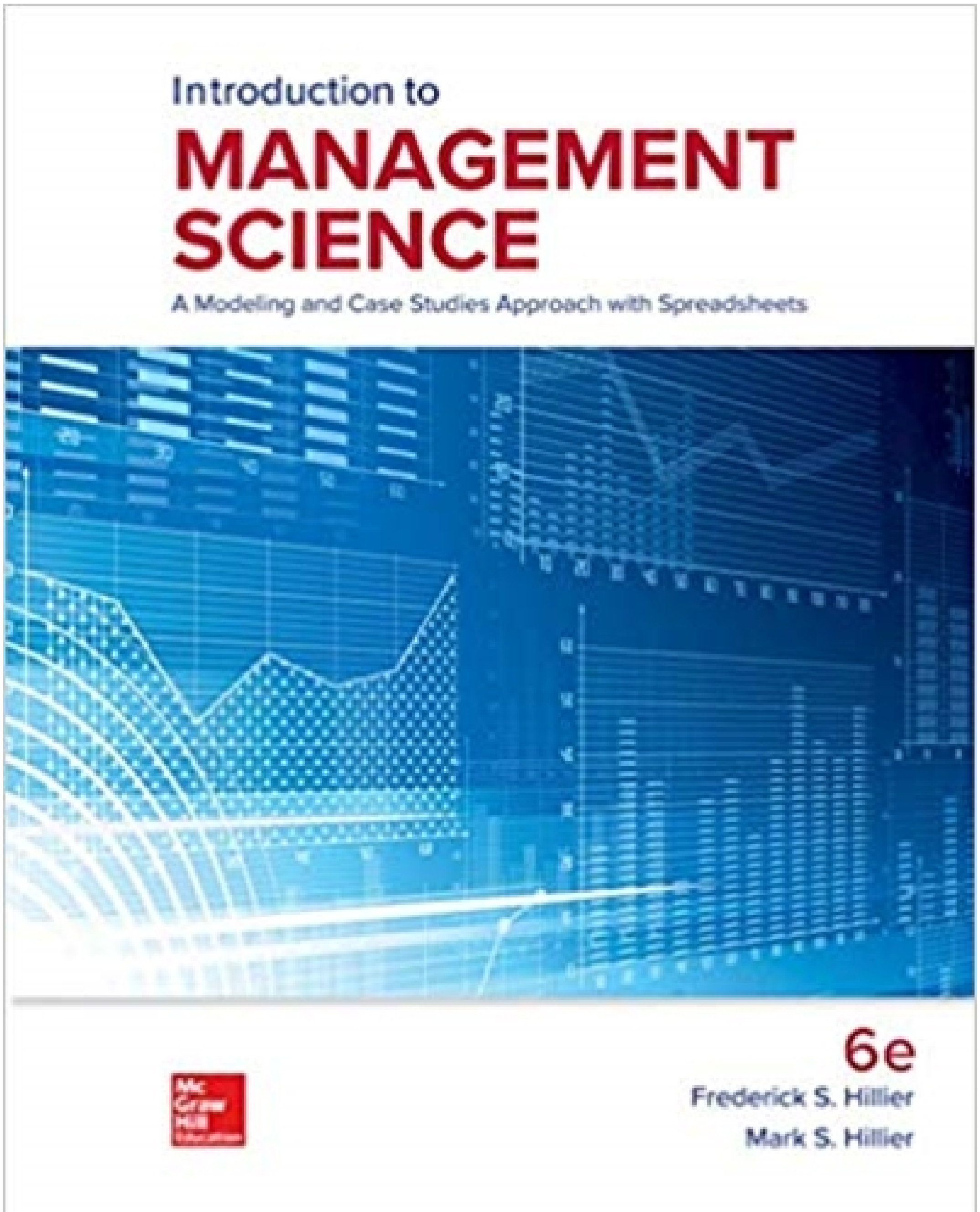
Test Bank for Introduction to Management Science 6th Edition by Hillier



Test Bank

***Intro to Management Science: Modeling and Case Studies, 6e* (Hillier)**
Chapter 2 Linear Programming: Basic Concepts

1) Linear programming problems may have multiple goals or objectives specified.

2) Linear programming allows a manager to find the best mix of activities to pursue and at what levels.

3) Linear programming problems always involve either maximizing or minimizing an objective function.

4) All linear programming models have an objective function and at least two constraints.

5) Constraints limit the alternatives available to a decision maker.

6) When formulating a linear programming problem on a spreadsheet, the data cells will show the optimal solution.

7) When formulating a linear programming problem on a spreadsheet, objective cells will show the levels of activities for the decisions being made.

8) When formulating a linear programming problem on a spreadsheet, the Excel equation for each output cell can typically be expressed as a SUMPRODUCT function.

9) One of the great strengths of spreadsheets is their flexibility for dealing with a wide variety of problems.

10) Linear programming problems can be formulated both algebraically and on spreadsheets.

11) The parameters of a model are the numbers in the data cells of a spreadsheet.

12) An example of a decision variable in a linear programming problem is profit maximization.

13) A feasible solution is one that satisfies all the constraints of a linear programming problem simultaneously.

14) An infeasible solution violates all of the constraints of the problem.

15) The best feasible solution is called the optimal solution.

16) Since all linear programming models must contain nonnegativity constraints, Solver will automatically include them and it is not necessary to add them to a formulation.

17) The line forming the boundary of what is permitted by a constraint is referred to as a parameter.

18) The origin satisfies any constraint with a ≥ sign and a positive right-hand side.

19) The feasible region only contains points that satisfy all constraints.

20) A circle would be an example of a feasible region for a linear programming problem.

21) The equation $5x + 7y = 10$ is linear.

22) The equation $3xy = 9$ is linear.

23) The graphical method can handle problems that involve any number of decision variables.

24) An objective function represents a family of parallel lines.

25) When solving linear programming problems graphically, there are an infinite number of possible objective function lines.

26) For a graph where the horizontal axis represents the variable x and the vertical axis represents the variable y, the slope of a line is the change in y when x is increased by 1.

27) The value of the objective function decreases as the objective function line is moved away from the origin.

28) A feasible point on the optimal objective function line is an optimal solution.

29) A linear programming problem can have multiple optimal solutions.

30) All constraints in a linear programming problem are either $\leq$ or $\geq$ inequalities.

31) Linear programming models can have either $\leq$ or $\geq$ inequality constraints but not both in the same problem.

32) A maximization problem can generally be characterized by having all $\geq$ constraints.

33) If a single optimal solution exists while using the graphical method to solve a linear programming problem, it will exist at a corner point.

34) When solving a maximization problem graphically, it is generally the goal to move the objective function line out, away from the origin, as far as possible.

35) When solving a minimization problem graphically, it is generally the goal to move the objective function line out, away from the origin, as far as possible.

36) A manager should know the following things about linear programming.
A) What it is.
B) When it should be used.
C) When it should not be used.
D) How to interpret the results of a study.
E) All of the answer choices are correct.

37) Which of the following is not a component of a linear programming model?
A) constraints
B) decision variables
C) parameters
D) an objective
E) a spreadsheet

38) In linear programming, solutions that satisfy all of the constraints simultaneously are referred to as:
A) optimal.
B) feasible.
C) nonnegative.
D) targeted.
E) All of the answer choices are correct.

39) When formulating a linear programming problem on a spreadsheet, which of the following is true?
A) Parameters are called data cells.
B) Decision variables are called changing cells.
C) Nonnegativity constraints must be included.
D) The objective function is called the objective cell.
E) All of the answer choices are correct.

40)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where are the data cells located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

41)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where are the changing cells located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

42)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where is the objective cell located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

43)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where are the output cells located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

44) Which of the following could not be a constraint for a linear programming problem?
A) $1A + 2B \leq 3$
B) $1A + 2B \geq 3$
C) $1A + 2B = 3$
D) $1A + 2B$
E) $1A + 2B + 3C \leq 3$

45) For the products A, B, C, and D, which of the following could be a linear programming objective function?
A) $P = 1A + 2B + 3C + 4D$
B) $P = 1A + 2BC + 3D$
C) $P = 1A + 2AB + 3ABC + 4ABCD$
D) $P = 1A + 2B/C + 3D$
E) All of the answer choices are correct.

46) After the data is collected the next step to formulating a linear programming model is to:
A) identify the decision variables.
B) identify the objective function.
C) identify the constraints.
D) specify the parameters of the problem.
E) None of the answer choices are correct.

47) When using the graphical method, the region that satisfies all of the constraints of a linear programming problem is called the:
A) optimum solution space.
B) region of optimality.
C) profit maximization space.
D) feasible region.
E) region of nonnegativity.

48) Solving linear programming problems graphically
A) is possible with any number of decision variables.
B) provides geometric intuition about what linear programming is trying to achieve.
C) will always result in an optimal solution.
D) All of the answers choices are correct.
E) None of the answers choices are correct.

49) Which objective function has the same slope as this one: $4x + 2y = 20$.
A) $2x + 4y = 20$
B) $2x - 4y = 20$
C) $4x - 2y = 20$
D) $8x + 8y = 20$
E) $4x + 2y = 10$

50) Given the following 2 constraints, which solution is a feasible solution for a maximization problem?

(1) $14x_1 + 6x_2 \leq 42$
(2) $x_1 - x_2 \leq 3$
A) $(x_1, x_2) = (1, 5)$
B) $(x_1, x_2) = (5, 1)$
C) $(x_1, x_2) = (4, 4)$
D) $(x_1, x_2) = (2, 1)$
E) $(x_1, x_2) = (2, 6)$

51) Which of the following constitutes a simultaneous solution to the following 2 equations?

(1) $3x_1 + 4x_2 = 10$
(2) $5x_1 + 4x_2 = 14$
A) $(x_1, x_2) = (2, 0.5)$
B) $(x_1, x_2) = (4, 0.5)$
C) $(x_1, x_2) = (2, 1)$
D) $x_1 = x_2$
E) $x_2 = 2x_1$

52) Which of the following constitutes a simultaneous solution to the following 2 equations?

(1) $3x_1 + 2x_2 = 6$
(2) $6x_1 + 3x_2 = 12$
A) $(x_1, x_2) = (1, 1.5)$
B) $(x_1, x_2) = (0.5, 2)$
C) $(x_1, x_2) = (0, 3)$
D) $(x_1, x_2) = (2, 0)$
E) $(x_1, x_2) = (0, 0)$

53) What is the optimal solution for the following problem?
Maximize $P = 3x + 15y$
subject to $2x + 4y \leq 12$
$5x + 2y \leq 10$
and $x \geq 0$, $y \geq 0$.
A) $(x, y) = (2, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (1, 5)$
E) None of the answer choices are correct.

54) Given the following 2 constraints, which solution is a feasible solution for a minimization problem?

(1) $14x_1 + 6x_2 \geq 42$
(2) $x_1 + 3x_2 \geq 6$
A) $(x_1, x_2) = (0.5, 5)$.
B) $(x_1, x_2) = (0, 4)$.
C) $(x_1, x_2) = (2, 5)$.
D) $(x_1, x_2) = (1, 2)$.
E) $(x_1, x_2) = (2, 1)$.

55) Use the graphical method for linear programming to find the optimal solution for the following problem.

Minimize $C = 3x + 15y$
subject to $2x + 4y \geq 12$
$5x + 2y \geq 10$
and $x \geq 0$, $y \geq 0$.
A) $(x, y) = (0, 0)$.
B) $(x, y) = (0, 3)$.
C) $(x, y) = (0, 5)$.
D) $(x, y) = (1, 2.5)$.
E) $(x, y) = (6, 0)$.

56) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the objective function?
A) $P = A + 2B$.
B) $P = 12A + 8B$.
C) $P = 2A + B$.
D) $P = 8A + 12B$.
E) $P = 4A + 8B$.

57) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the constraint for Colombian beans?
A) $A + 2B \leq 4{,}800$.
B) $12A + 8B \leq 4{,}800$.
C) $2A + B \leq 4{,}800$.
D) $8A + 12B \leq 4{,}800$.
E) $4A + 8B \leq 4{,}800$.

58) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the constraint for Dominican beans?
A) $12A + 8B \leq 4{,}800$.
B) $8A + 12B \leq 4{,}800$.
C) $4A + 8B \leq 3{,}200$.
D) $8A + 4B \leq 3{,}200$.
E) $4A + 8B \leq 4{,}800$.

59) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

Which of the following is not a feasible solution?
A) (A, B) = (0, 0).
B) (A, B) = (0, 400).
C) (A, B) = (200, 300).
D) (A, B) = (400, 0).
E) (A, B) = (400, 400).

60) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the weekly profit when producing the optimal amounts?
A) $0.
B) $400.
C) $700.
D) $800.
E) $900.

61) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

What is the objective function?
A) $P = 2L + 3D$.
B) $P = 2L + 4D$.
C) $P = 3L + 2D$.
D) $P = 4L + 2D$.
E) $P = 5L + 3D$.

62) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

What is the time constraint?
A) $2L + 3D \leq 480$.
B) $2L + 4D \leq 480$.
C) $3L + 2D \leq 480$.
D) $4L + 2D \leq 480$.
E) $5L + 3D \leq 480$.

63) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

Which of the following is not a feasible solution?
A) $(L, D) = (0, 0)$.
B) $(L, D) = (0, 120)$.
C) $(L, D) = (90, 75)$.
D) $(L, D) = (135, 0)$.
E) $(L, D) = (135, 120)$.

64) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $0.
B) $240.
C) $420.
D) $405.
E) $505.

65) The production planner for a private label soft drink maker is planning the production of two soft drinks: root beer (R) and sassafras soda (S). There are at most 12 hours per day of production time and 1,500 gallons per day of carbonated water available. A case of root beer requires 2 minutes of time and 5 gallons of water to produce, while a case of sassafras soda requires 3 minutes of time and 5 gallons of water. Profits for the root beer are $6.00 per case, and profits for the sassafras soda are $4.00 per case. The firm's goal is to maximize profits.

What is the objective function?
A) $P = 4R + 6S$
B) $P = 2R + 3S$
C) $P = 6R + 4S$
D) $P = 3R +2S$
E) $P = 5R + 5S$

66) What is the time constraint?
A) $2R + 3S \leq 720$.
B) $2R + 5S \leq 720$.
C) $3R + 2S \leq 720$.
D) $3R + 5S \leq 720$.
E) $5R + 5S \leq 720$.

67) The production planner for a private label soft drink maker is planning the production of two soft drinks: root beer (R) and sassafras soda (S). There are at most 12 hours per day of production time and 1,500 gallons per day of carbonated water available. A case of root beer requires 2 minutes of time and 5 gallons of water to produce, while a case of sassafras soda requires 3 minutes of time and 5 gallons of water. Profits for the root beer are $6.00 per case, and profits for the sassafras soda are $4.00 per case. The firm's goal is to maximize profits.

Which of the following is not a feasible solution?
A) $(R, S) = (0, 0)$
B) $(R, S) = (0, 240)$
C) $(R, S) = (180, 120)$
D) $(R, S) = (300, 0)$
E) $(R, S) = (180, 240)$

68) The production planner for a private label soft drink maker is planning the production of two soft drinks: root beer (R) and sassafras soda (S). There are at most 12 hours per day of production time and 1,500 gallons per day of carbonated water available. A case of root beer requires 2 minutes of time and 5 gallons of water to produce, while a case of sassafras soda requires 3 minutes of time and 5 gallons of water. Profits for the root beer are $6.00 per case, and profits for the sassafras soda are $4.00 per case. The firm's goal is to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $960
B) $1,560
C) $1,800
D) $1,900
E) $2,520

69) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

What is the objective function?
A) $P = 4A + 1B$
B) $P = 0.25A + 1B$
C) $P = 1A + 4B$
D) $P = 1A + 1B$
E) $P = 0.25A + 0.5B$

70) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

What is the time constraint?
A) $1A + 1B \leq 800$
B) $0.25A + 0.5B \leq 800$
C) $0.5A + 0.25B \leq 800$
D) $1A + 0.5B \leq 800$
E) $0.25A + 1B \leq 800$

71) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

Which of the following is not a feasible solution?
A) $(A, B) = (0, 0)$
B) $(A, B) = (0, 1000)$
C) $(A, B) = (1800, 700)$
D) $(A, B) = (2500, 0)$
E) $(A, B) = (100, 1600)$

72) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

What is the weekly profit when producing the optimal amounts?
A) $10,000
B) $4,600
C) $2,500
D) $5,200
E) $6,400

73) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

What is the objective function?
A) $P = 0.3B + 0.2C$.
B) $P = 0.6B + 0.3C$.
C) $P = 0.2B + 0.3C$.
D) $P = 0.2B + 0.4C$.
E) $P = 0.1B + 0.1C$.

74) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

What is the sugar constraint?
A) $6B + 3C \le 4{,}800$
B) $1B + 1C \le 4{,}800$
C) $2B + 4C \le 4{,}800$
D) $4B + 2C \le 4{,}800$
E) $2B + 3C \le 4{,}800$

75) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

Which of the following is not a feasible solution?
A) (*B*, *C*) = (0, 0)
B) (*B*, *C*) = (0, 1100)
C) (*B*, *C*) = (800, 600)
D) (*B*, *C*) = (1100, 0)
E) (*B*, *C*) = (0, 1400)

76) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $580
B) $340
C) $220
D) $380
E) $420

77) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

What is the objective function?
A) $P = 0.5D + 0.4C$
B) $P = 0.2D + 0.3C$
C) $P = 0.4D + 0.5C$
D) $P = 0.1D + 0.2C$
E) $P = 0.6D + 0.8C$

78) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

What is the sugar constraint?
A) $2D + 3C \leq 4,800$
B) $6D + 8C \leq 4,800$
C) $1D + 2C \leq 4,800$
D) $3D + 2C \leq 4,800$
E) $4D + 5C \leq 4,800$

79) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

Which of the following is not a feasible solution?
A) $(D, C) = (0, 0)$
B) $(D, C) = (0, 1000)$
C) $(D, C) = (800, 600)$
D) $(D, C) = (1600, 0)$
E) $(D, C) = (0, 1,200)$

80) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $800
B) $500
C) $640
D) $620
E) $600

81) The operations manager of a mail order house purchases double (D) and twin (T) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

What is the objective function?
A) $P = 150D + 300T$
B) $P = 500D + 300T$
C) $P = 300D + 500T$
D) $P = 300D + 150T$
E) $P = 100D + 90T$

82) The operations manager of a mail order house purchases double (D) and twin (T) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

What is the storage space constraint?
A) $90D + 100T \leq 18{,}000$
B) $100D + 90T \geq 18{,}000$
C) $300D + 90T \leq 18{,}000$
D) $500D + 100T \leq 18{,}000$
E) $100D + 90T \leq 18{,}000$

83) The operations manager of a mail order house purchases double (D) and twin (T) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

Which of the following is not a feasible solution?
A) $(D, T) = (0, 0)$
B) $(D, T) = (0, 250)$
C) $(D, T) = (150, 0)$
D) $(D, T) = (90, 100)$
E) $(D, T) = (0, 200)$

84) The operations manager of a mail order house purchases double (*D*) and twin (*T*) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

What is the weekly profit when ordering the optimal amounts?
A) $0
B) $30,000
C) $42,000
D) $45,000
E) $54,000

85) Which of the following constitutes a simultaneous solution to the following 2 equations?

(1) $4x_1 + 2x_2 = 7$
(2) $4x_1 - 3x_2 = 2$
A) $(x_1, x_2) = (1, 1.25)$
B) $(x_1, x_2) = (1.25, 1)$
C) $(x_1, x_2) = (0, 3)$
D) $(x_1, x_2) = (1.25, 0)$
E) $(x_1, x_2) = (0, 0)$

86) Use the graphical method for linear programming to find the optimal solution for the following problem.

Maximize $P = 4x + 5y$
subject to $2x + 4y \leq 12$
$5x + 2y \leq 10$
and $x \geq 0, y \geq 0$.
A) $(x, y) = (2, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (1, 5)$
E) None of the answer choices are correct.

87) Using Excel's Solver add-in, find the optimal solution for the following problem?

Maximize $P = 3x + 8y$
subject to $2x + 4y \leq 20$
$6x + 3y \leq 18$
and $x \geq 0, y \geq 0.$
A) $(x, y) = (2, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (0, 5)$
E) None of the answer choices are correct.

88) Using Excel's Solver add-in, find the optimal solution for the following problem?

Maximize $P = 8x + 3y$
subject to $2x + 4y \leq 20$
$6x + 3y \leq 18$
and $x \geq 0, y \geq 0.$
A) $(x, y) = (3, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (0, 5)$
E) None of the answer choices are correct.

89) Use the graphical method for linear programming to find the optimal solution for the following problem.

Minimize $C = 6x + 10y$
subject to $2x + 4y \geq 12$
$5x + 2y \geq 10$
and $x \geq 0, y \geq 0.$
A) $(x, y) = (0, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 5)$
D) $(x, y) = (1, 2.5)$
E) $(x, y) = (6, 0)$

90) Use the graphical method for linear programming to find the optimal solution for the following problem.

Minimize $C = 12x + 4y$
subject to $2x + 4y \geq 12$
$5x + 2y \geq 10$
and $x \geq 0, y \geq 0.$
A) $(x, y) = (0, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 5)$
D) $(x, y) = (1, 2.5)$
E) $(x, y) = (6, 0)$

***Intro to Management Science: Modeling and Case Studies, 6e* (Hillier)**
Chapter 2 Linear Programming: Basic Concepts

1) Linear programming problems may have multiple goals or objectives specified.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

2) Linear programming allows a manager to find the best mix of activities to pursue and at what levels.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

3) Linear programming problems always involve either maximizing or minimizing an objective function.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

4) All linear programming models have an objective function and at least two constraints.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

5) Constraints limit the alternatives available to a decision maker.

Answer: TRUE
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

6) When formulating a linear programming problem on a spreadsheet, the data cells will show the optimal solution.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

7) When formulating a linear programming problem on a spreadsheet, objective cells will show the levels of activities for the decisions being made.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

8) When formulating a linear programming problem on a spreadsheet, the Excel equation for each output cell can typically be expressed as a SUMPRODUCT function.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

9) One of the great strengths of spreadsheets is their flexibility for dealing with a wide variety of problems.

Answer: TRUE
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Understand
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

10) Linear programming problems can be formulated both algebraically and on spreadsheets.

Answer: TRUE
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

11) The parameters of a model are the numbers in the data cells of a spreadsheet.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Name and identify the purpose of the four kinds of cells used in linear programming spreadsheet models.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

12) An example of a decision variable in a linear programming problem is profit maximization.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Name and identify the purpose of the four kinds of cells used in linear programming spreadsheet models.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

13) A feasible solution is one that satisfies all the constraints of a linear programming problem simultaneously.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

14) An infeasible solution violates all of the constraints of the problem.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

15) The best feasible solution is called the optimal solution.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Explain what linear programming is.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

16) Since all linear programming models must contain nonnegativity constraints, Solver will automatically include them and it is not necessary to add them to a formulation.

Answer: FALSE
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

17) The line forming the boundary of what is permitted by a constraint is referred to as a parameter.

Answer: FALSE
Difficulty: 1 Easy
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

18) The origin satisfies any constraint with a ≥ sign and a positive right-hand side.

Answer: FALSE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

19) The feasible region only contains points that satisfy all constraints.

Answer: TRUE
Difficulty: 1 Easy
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

20) A circle would be an example of a feasible region for a linear programming problem.

Answer: FALSE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

21) The equation $5x + 7y = 10$ is linear.

Answer: TRUE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Present the algebraic form of a linear programming model from its formulation on a spreadsheet.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

22) The equation $3xy = 9$ is linear.

Answer: FALSE
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Present the algebraic form of a linear programming model from its formulation on a spreadsheet.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

23) The graphical method can handle problems that involve any number of decision variables.

Answer: FALSE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

24) An objective function represents a family of parallel lines.

Answer: TRUE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

25) When solving linear programming problems graphically, there are an infinite number of possible objective function lines.

Answer: TRUE
Difficulty: 1 Easy
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

26) For a graph where the horizontal axis represents the variable *x* and the vertical axis represents the variable *y*, the slope of a line is the change in *y* when *x* is increased by 1.

Answer: TRUE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

27) The value of the objective function decreases as the objective function line is moved away from the origin.

Answer: FALSE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Understand
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

28) A feasible point on the optimal objective function line is an optimal solution.

Answer: TRUE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

29) A linear programming problem can have multiple optimal solutions.

Answer: TRUE
Difficulty: 1 Easy
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

30) All constraints in a linear programming problem are either $\leq$ or $\geq$ inequalities.

Answer: FALSE
Difficulty: 1 Easy
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

31) Linear programming models can have either $\leq$ or $\geq$ inequality constraints but not both in the same problem.

Answer: FALSE
Difficulty: 1 Easy
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

32) A maximization problem can generally be characterized by having all $\geq$ constraints.

Answer: FALSE
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

33) If a single optimal solution exists while using the graphical method to solve a linear programming problem, it will exist at a corner point.

Answer: TRUE
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

34) When solving a maximization problem graphically, it is generally the goal to move the objective function line out, away from the origin, as far as possible.

Answer: TRUE
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

35) When solving a minimization problem graphically, it is generally the goal to move the objective function line out, away from the origin, as far as possible.

Answer: FALSE
Explanation: Multiple-Choice Questions
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

36) A manager should know the following things about linear programming.
A) What it is.
B) When it should be used.
C) When it should not be used.
D) How to interpret the results of a study.
E) All of the answer choices are correct.

Answer: E
Difficulty: 1 Easy
Topic: Formulating the Wyndor problem on a spreadsheet
Learning Objective: Identify the three key questions to be addressed in formulating any spreadsheet model.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

37) Which of the following is not a component of a linear programming model?
A) constraints
B) decision variables
C) parameters
D) an objective
E) a spreadsheet

Answer: E
Difficulty: 1 Easy
Topic: Formulating the Wyndor problem on a spreadsheet
Learning Objective: Name and identify the purpose of the four kinds of cells used in linear programming spreadsheet models.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

38) In linear programming, solutions that satisfy all of the constraints simultaneously are referred to as:
A) optimal.
B) feasible.
C) nonnegative.
D) targeted.
E) All of the answer choices are correct.

Answer: B
Difficulty: 1 Easy
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

39) When formulating a linear programming problem on a spreadsheet, which of the following is true?
A) Parameters are called data cells.
B) Decision variables are called changing cells.
C) Nonnegativity constraints must be included.
D) The objective function is called the objective cell.
E) All of the answer choices are correct.

Answer: E
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

40)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where are the data cells located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

Answer: B
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

41)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where are the changing cells located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

Answer: C
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

42)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where is the objective cell located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

Answer: D
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

43)

	A	B	C	D	E	F
1		Activity 1	Activity 2			
2	Unit Cost	$15	$20			
3						
4	Benefit	Contribution per Unit		Totals		Needed
5	A	1	2	10	>=	10
6	B	2	3	16	>=	6
7	C	1	1	6	>=	6
8						
9		Activity 1	Activity 2			Total Cost
10	Solution	2	4			$110

Where are the output cells located?
A) B2:C2
B) B2:C2, B5:C7, and F5:F7
C) B10:C10
D) F10
E) None of the answer choices are correct.

Answer: E
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

44) Which of the following could not be a constraint for a linear programming problem?
A) $1A + 2B \leq 3$
B) $1A + 2B \geq 3$
C) $1A + 2B = 3$
D) $1A + 2B$
E) $1A + 2B + 3C \leq 3$

Answer: D
Explanation: A constraint requires both a left-hand side (level of activities) and right-hand side (feasible value).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Name and identify the purpose of the four kinds of cells used in linear programming spreadsheet models.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

45) For the products A, B, C, and D, which of the following could be a linear programming objective function?
A) $P = 1A + 2B + 3C + 4D$
B) $P = 1A + 2BC + 3D$
C) $P = 1A + 2AB + 3ABC + 4ABCD$
D) $P = 1A + 2B/C + 3D$
E) All of the answer choices are correct.

Answer: A
Explanation: A linear objective function can only include products of a changing cell and a data cell. Only option "a" can be represented with a SUMPRODUCT function in Excel.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Name and identify the purpose of the four kinds of cells used in linear programming spreadsheet models.
Bloom's: Apply
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

46) After the data is collected the next step to formulating a linear programming model is to:
A) identify the decision variables.
B) identify the objective function.
C) identify the constraints.
D) specify the parameters of the problem.
E) None of the answer choices are correct.

Answer: A
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

47) When using the graphical method, the region that satisfies all of the constraints of a linear programming problem is called the:
A) optimum solution space.
B) region of optimality.
C) profit maximization space.
D) feasible region.
E) region of nonnegativity.

Answer: D
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

48) Solving linear programming problems graphically
A) is possible with any number of decision variables.
B) provides geometric intuition about what linear programming is trying to achieve.
C) will always result in an optimal solution.
D) All of the answers choices are correct.
E) None of the answers choices are correct.

Answer: B
Difficulty: 2 Medium
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Understand
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

49) Which objective function has the same slope as this one: $4x + 2y = 20$.
A) $2x + 4y = 20$
B) $2x - 4y = 20$
C) $4x - 2y = 20$
D) $8x + 8y = 20$
E) $4x + 2y = 10$

Answer: E
Explanation: To determine the slope of the objective function, solve for the variable "y." $y = -2x + 10$ indicates a slope of -2. Only option "e" has the same slope.
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

50) Given the following 2 constraints, which solution is a feasible solution for a maximization problem?

(1) $14x_1 + 6x_2 \leq 42$
(2) $x_1 - x_2 \leq 3$
A) $(x_1, x_2) = (1, 5)$
B) $(x_1, x_2) = (5, 1)$
C) $(x_1, x_2) = (4, 4)$
D) $(x_1, x_2) = (2, 1)$
E) $(x_1, x_2) = (2, 6)$

Answer: D
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "d" values of x_1 and x_2 leaves both constraints satisfied.

(1) $14x_1 + 6x_2 \leq 42 \Rightarrow 14(2) + 6(1) = 34 \leq 42$
(2) $x_1x_2 \leq 3 \Rightarrow 1(2) - 1(1) = 3 \leq 3$
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Evaluate
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

51) Which of the following constitutes a simultaneous solution to the following 2 equations?

(1) $3x_1 + 4x_2 = 10$
(2) $5x_1 + 4x_2 = 14$
A) $(x_1, x_2) = (2, 0.5)$
B) $(x_1, x_2) = (4, 0.5)$
C) $(x_1, x_2) = (2, 1)$
D) $x_1 = x_2$
E) $x_2 = 2x_1$

Answer: C
Explanation: Using subtraction to eliminate one variable (x_2) allows solving for the other (x_1). Then substitution of the value for x_1 into an original equation allows us to solve for x_2.

$3x_1 + 4x_2 = 10$
$-(5x_1 + 4x_2 = 14)$
$-2x_1 + 0x_2 = -4 \Rightarrow x_1 = 2$
Since $x = 2$, $3x_1 + 4x_2 = 10 \Rightarrow 4x_2 = 4 \Rightarrow x_2 = 1$
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

52) Which of the following constitutes a simultaneous solution to the following 2 equations?

(1) $3x_1 + 2x_2 = 6$
(2) $6x_1 + 3x_2 = 12$
A) $(x_1, x_2) = (1, 1.5)$
B) $(x_1, x_2) = (0.5, 2)$
C) $(x_1, x_2) = (0, 3)$
D) $(x_1, x_2) = (2, 0)$
E) $(x_1, x_2) = (0, 0)$

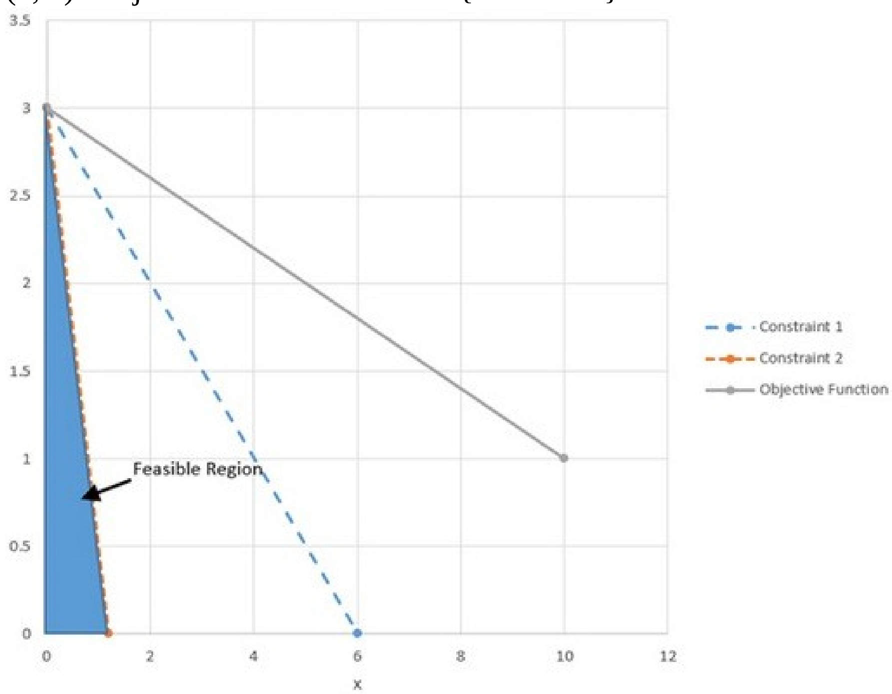
Answer: D
Explanation: Using subtraction to eliminate one variable (x_1) allows solving for the other (x_2). Then substitution of the value for x_2 into an original equation allows us to solve for x_1.

$2(3x_1 + 2x_2 = 6)$ {this equation is multiplied by 2 to allow elimination of x_1)
$\underline{-(6x_1 + 3x_2 = 12)}$
$0x_1 - 2x_2 = 0 \Rightarrow x_2 = 0$
Since $x_2 = 0$, $3x_1 + 2x_2 = 6 \Rightarrow 3x_1 = 6 \Rightarrow x_1 = 2$
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

53) What is the optimal solution for the following problem?
Maximize $P = 3x + 15y$
subject to $2x + 4y \leq 12$
$5x + 2y \leq 10$
and $x \geq 0, y \geq 0$.
A) $(x, y) = (2, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (1, 5)$
E) None of the answer choices are correct.

Answer: B
Explanation: Graph the two constraints to define the feasible region. Next, find the objective function value that just touches the edge of the feasible region (here, at point (0, 3) the objective function is maximized with a value of 45.

Alternatively, evaluate the extreme points of the feasible region:
(0, 0) - objective function value 0
(1.2, 0) - objective function value 3.6
(0, 3) - objective function value 45 {maximum}



Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

54) Given the following 2 constraints, which solution is a feasible solution for a minimization problem?

(1) $14x_1 + 6x_2 \geq 42$
(2) $x_1 + 3x_2 \geq 6$
A) $(x_1, x_2) = (0.5, 5)$.
B) $(x_1, x_2) = (0, 4)$.
C) $(x_1, x_2) = (2, 5)$.
D) $(x_1, x_2) = (1, 2)$.
E) $(x_1, x_2) = (2, 1)$.

Answer: C
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "c" values of x_1 and x_2 leaves both constraints satisfied.

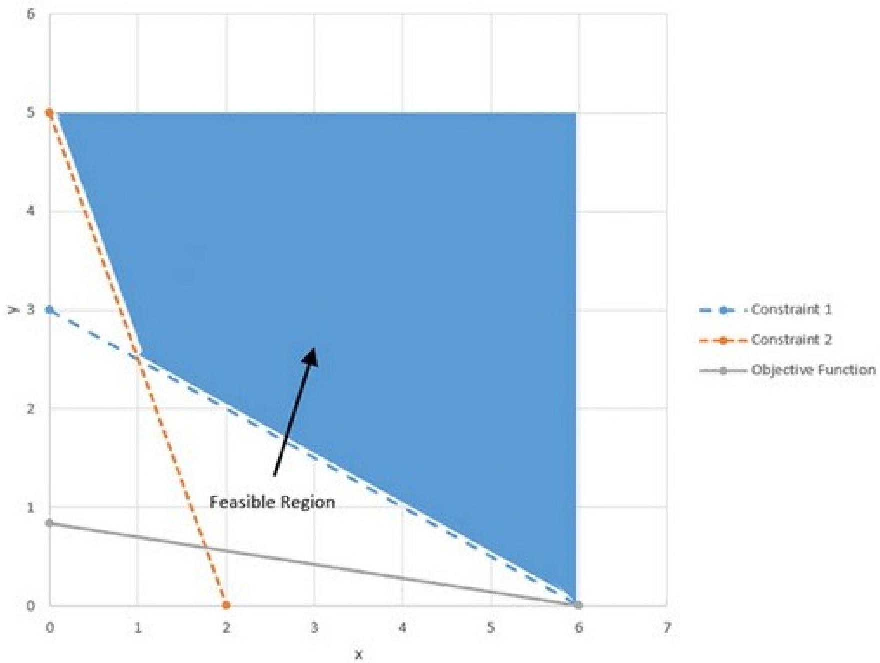
(1) $14x_1 + 6x_2 \geq 42 \Rightarrow 14(2) + 6(5) = 48 \geq 42$
(2) $x_1 + 3x_2 \geq 6 \Rightarrow 1(2) + 3(5) = 17 \geq 6$
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Evaluate
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

55) Use the graphical method for linear programming to find the optimal solution for the following problem.

Minimize $C = 3x + 15y$
subject to $2x + 4y \geq 12$
$5x + 2y \geq 10$
and $x \geq 0$, $y \geq 0$.
A) $(x, y) = (0, 0)$.
B) $(x, y) = (0, 3)$.
C) $(x, y) = (0, 5)$.
D) $(x, y) = (1, 2.5)$.
E) $(x, y) = (6, 0)$.

Answer: E
Explanation: Graph the two constraints to define the feasible region. Next, find the objective function value that just touches the edge of the feasible region (here, at point (6, 0) the objective function is minimized with a value of 18.

Alternatively, evaluate the extreme points of the feasible region:
(6, 0) - objective function value 18 {minimum}
(0, 5) - objective function value 75
(1, 2.5) - objective function value 40.5



Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Evaluate
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

56) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the objective function?
A) $P = A + 2B$.
B) $P = 12A + 8B$.
C) $P = 2A + B$.
D) $P = 8A + 12B$.
E) $P = 4A + 8B$.

Answer: C
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of A ($2.00 per pound) and B ($1.00 per pound).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

57) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the constraint for Colombian beans?
A) $A + 2B \leq 4{,}800$.
B) $12A + 8B \leq 4{,}800$.
C) $2A + B \leq 4{,}800$.
D) $8A + 12B \leq 4{,}800$.
E) $4A + 8B \leq 4{,}800$.

Answer: B
Explanation: Since each pound of A uses 12 ounces of Colombian beans and each pound of B uses 8 ounces of Colombian beans, it is convenient to convert the supply of Columbian beans to ounces (300 pounds = 4,800 ounces). Then the constraint should reflect that the usages (12 ounces per pound of A, 8 ounces per pound of B) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

58) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the constraint for Dominican beans?
A) $12A + 8B \leq 4{,}800$.
B) $8A + 12B \leq 4{,}800$.
C) $4A + 8B \leq 3{,}200$.
D) $8A + 4B \leq 3{,}200$.
E) $4A + 8B \leq 4{,}800$.

Answer: C
Explanation: Since each pound of A uses 12 ounces of Dominican beans and each pound of B uses 8 ounces of Dominican beans, it is convenient to convert the supply of Dominican beans to ounces (200 pounds = 3,200 ounces). Then the constraint should reflect that the usages (4 ounces per pound of A, 8 ounces per pound of B) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

59) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

Which of the following is not a feasible solution?
A) $(A, B) = (0, 0)$.
B) $(A, B) = (0, 400)$.
C) $(A, B) = (200, 300)$.
D) $(A, B) = (400, 0)$.
E) $(A, B) = (400, 400)$.

Answer: E
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "e" values of *A* and *B* violates both constraints.

(1) $12A + 8B \leq 4{,}800 \Rightarrow 12(400) + 8(400) = 8{,}000 \geq 4{,}800$
(2) $4A + 8B \leq 3{,}200 \Rightarrow 4(400) + 8(400) = 4{,}800 \geq 3{,}200$
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

60) The production planner for Fine Coffees, Inc. produces two coffee blends: American (*A*) and British (*B*). He can only get 300 pounds of Colombian beans per week and 200 pounds of Dominican beans per week. Each pound of American blend coffee requires 12 ounces of Colombian beans and 4 ounces of Dominican beans, while a pound of British blend coffee uses 8 ounces of each type of bean. Profits for the American blend are $2.00 per pound, and profits for the British blend are $1.00 per pound. The goal of Fine Coffees, Inc. is to maximize profits.

What is the weekly profit when producing the optimal amounts?
A) $0.
B) $400.
C) $700.
D) $800.
E) $900.

Answer: D
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is A = 400, B = 0, with weekly profits of $800.

Maximize $P = 2A + B$
subject to $12A + 4B \leq 4{,}800$
$4A + 8B \leq 3{,}600$
and $A \geq 0, B \geq 0.$
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Analyze
AACSB: Technology
Accessibility: Keyboard Navigation

61) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

What is the objective function?
A) $P = 2L + 3D$.
B) $P = 2L + 4D$.
C) $P = 3L + 2D$.
D) $P = 4L + 2D$.
E) $P = 5L + 3D$.

Answer: C
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of L ($3.00 per keg) and D ($2.00 per keg).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

62) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

What is the time constraint?
A) $2L + 3D \leq 480$.
B) $2L + 4D \leq 480$.
C) $3L + 2D \leq 480$.
D) $4L + 2D \leq 480$.
E) $5L + 3D \leq 480$.

Answer: B
Explanation: Since each keg of L requires 2 minutes and each keg of D uses 4 minutes, it is convenient to convert the available time to minutes (8 hours = 480 minutes). Then the constraint should reflect that the usages (2 minutes for A, 4 minutes for D) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

63) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

Which of the following is not a feasible solution?
A) $(L, D) = (0, 0)$.
B) $(L, D) = (0, 120)$.
C) $(L, D) = (90, 75)$.
D) $(L, D) = (135, 0)$.
E) $(L, D) = (135, 120)$.

Answer: E
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "e" values of *L* and *D* violates both constraints.

(1) $2L + 4D \leq 480 \Rightarrow 2(135) + 4(120) = 750 \geq 480$
(2) $5L + 3D \leq 675 \Rightarrow 5(135) + 3(120) = 1{,}035 \geq 675$
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

64) The operations manager for the Blue Moon Brewing Co. produces two beers: Lite (*L*) and Dark (*D*). He can only get 675 gallons of malt extract per day for brewing and his brewing hours are limited to 8 hours per day. To produce a keg of Lite beer requires 2 minutes of time and 5 gallons of malt extract. Each keg of Dark beer needs 4 minutes of time and 3 gallons of malt extract. Profits for Lite beer are $3.00 per keg and profits for Dark beer are $2.00 per keg. The brewery's goal is to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $0.
B) $240.
C) $420.
D) $405.
E) $505.

Answer: C
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is L = 90, D = 75, with weekly profits of $420.

Maximize $P = 3L + 2D$
subject to $2L + 3D \leq 480$
$5L + 2D \leq 675$
and $L \geq 0, D \geq 0.$
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Analyze
AACSB: Technology
Accessibility: Keyboard Navigation

65) The production planner for a private label soft drink maker is planning the production of two soft drinks: root beer (*R*) and sassafras soda (*S*). There are at most 12 hours per day of production time and 1,500 gallons per day of carbonated water available. A case of root beer requires 2 minutes of time and 5 gallons of water to produce, while a case of sassafras soda requires 3 minutes of time and 5 gallons of water. Profits for the root beer are $6.00 per case, and profits for the sassafras soda are $4.00 per case. The firm's goal is to maximize profits.

What is the objective function?
A) $P = 4R + 6S$
B) $P = 2R + 3S$
C) $P = 6R + 4S$
D) $P = 3R + 2S$
E) $P = 5R + 5S$

Answer: C
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of R ($6.00 per case) and S ($4.00 per case).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

66) What is the time constraint?
A) $2R + 3S \leq 720$.
B) $2R + 5S \leq 720$.
C) $3R + 2S \leq 720$.
D) $3R + 5S \leq 720$.
E) $5R + 5S \leq 720$.

Answer: A
Explanation: Since each case of R requires 2 minutes and each case of S uses 3 minutes, it is convenient to convert the available time to minutes (12 hours = 720 minutes). Then the constraint should reflect that the usages (2 minutes for R, 3 minutes for S) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

67) The production planner for a private label soft drink maker is planning the production of two soft drinks: root beer (R) and sassafras soda (S). There are at most 12 hours per day of production time and 1,500 gallons per day of carbonated water available. A case of root beer requires 2 minutes of time and 5 gallons of water to produce, while a case of sassafras soda requires 3 minutes of time and 5 gallons of water. Profits for the root beer are $6.00 per case, and profits for the sassafras soda are $4.00 per case. The firm's goal is to maximize profits.

Which of the following is not a feasible solution?
A) (R, S) = (0, 0)
B) (R, S) = (0, 240)
C) (R, S) = (180, 120)
D) (R, S) = (300, 0)
E) (R, S) = (180, 240)

Answer: E
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "e" values of R and S violates both constraints.

(1) $2R + 3S \leq 720 \Rightarrow 2(180) + 3(240) = 1{,}080 \geq 720$
(2) $5R + 5S \leq 1{,}500 \Rightarrow 5(180) + 5(240) = 2{,}100 \geq 1{,}500$
Difficulty: 1 Easy
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Present the algebraic form of a linear programming model from its formulation on a spreadsheet.
Bloom's: Remember
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

68) The production planner for a private label soft drink maker is planning the production of two soft drinks: root beer (*R*) and sassafras soda (*S*). There are at most 12 hours per day of production time and 1,500 gallons per day of carbonated water available. A case of root beer requires 2 minutes of time and 5 gallons of water to produce, while a case of sassafras soda requires 3 minutes of time and 5 gallons of water. Profits for the root beer are $6.00 per case, and profits for the sassafras soda are $4.00 per case. The firm's goal is to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $960
B) $1,560
C) $1,800
D) $1,900
E) $2,520

Answer: C
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is R = 300, S = 0, with weekly profits of $1,800.

Maximize $P = 6R + 4S$
subject to $6R + 4S \leq 720$
$5R + 5S \leq 1{,}500$
and $R \geq 0, S \geq 0.$
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

69) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

What is the objective function?
A) $P = 4A + 1B$
B) $P = 0.25A + 1B$
C) $P = 1A + 4B$
D) $P = 1A + 1B$
E) $P = 0.25A + 0.5B$

Answer: C
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of A ($1.00 per unit) and B ($4.00 per unit).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

70) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

What is the time constraint?
A) $1A + 1B \leq 800$
B) $0.25A + 0.5B \leq 800$
C) $0.5A + 0.25B \leq 800$
D) $1A + 0.5B \leq 800$
E) $0.25A + 1B \leq 800$

Answer: B
Explanation: Since each A requires 15 minutes and each B uses 30 minutes, it is convenient to convert the required time to hours. Then the constraint should reflect that the usages (0.25 hour for A, 0.5 hour for B) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

71) An electronics firm produces two models of pocket calculators: the A-100 (*A*) and the B-200 (*B*). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

Which of the following is not a feasible solution?
A) $(A, B) = (0, 0)$
B) $(A, B) = (0, 1000)$
C) $(A, B) = (1800, 700)$
D) $(A, B) = (2500, 0)$
E) $(A, B) = (100, 1600)$

Answer: E
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "e" values of *A* and *B* violates at least one constraint.

(1) $0.25A + 0.5B \leq 800 \Rightarrow 2(100) + 3(1{,}600) = 5{,}000 \geq 800$ {constraint violated}
(2) $A + B \leq 2{,}500 \Rightarrow 100 + 1{,}600 = 1{,}700 \leq 2500$
(3) $\text{A} \leq 4{,}000 \Rightarrow 100 \geq 4{,}000$
(4) $\text{B} \leq 1{,}000 \Rightarrow 1{,}600 \geq 1{,}000$ {constraint violated}
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

72) An electronics firm produces two models of pocket calculators: the A-100 (A) and the B-200 (B). Each model uses one circuit board, of which there are only 2,500 available for this week's production. In addition, the company has allocated a maximum of 800 hours of assembly time this week for producing these calculators. Each A-100 requires 15 minutes to produce while each B-200 requires 30 minutes to produce. The firm forecasts that it could sell a maximum of 4,000 of the A-100s this week and a maximum of 1,000 B-200s. Profits for the A-100 are $1.00 each and profits for the B-200 are $4.00 each. The firm's goal is to maximize profits.

What is the weekly profit when producing the optimal amounts?
A) $10,000
B) $4,600
C) $2,500
D) $5,200
E) $6,400

Answer: D
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is A = 1,200, B = 1,000, with weekly profits of $5,200.

Maximize $P = 1A + 4B$
subject to $0.25A + 0.5B \leq 800$
$A + B \leq 2{,}500$
$A \leq 4{,}000$
$B \leq 1{,}000$
and $A \geq 0, B \geq 0.$
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

73) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

What is the objective function?
A) $P = 0.3B + 0.2C$.
B) $P = 0.6B + 0.3C$.
C) $P = 0.2B + 0.3C$.
D) $P = 0.2B + 0.4C$.
E) $P = 0.1B + 0.1C$.

Answer: C
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of B ($0.20 per unit) and C ($0.30 per unit).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

74) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

What is the sugar constraint?
A) $6B + 3C \leq 4{,}800$
B) $1B + 1C \leq 4{,}800$
C) $2B + 4C \leq 4{,}800$
D) $4B + 2C \leq 4{,}800$
E) $2B + 3C \leq 4{,}800$

Answer: C
Explanation: Since each B requires 2 tablespoons of sugar and each C requires 4 tablespoons of sugar, the constraint should reflect that the usages (2 tablespoons for each B, 4 tablespoons for each C) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

75) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

Which of the following is not a feasible solution?
A) $(B, C) = (0, 0)$
B) $(B, C) = (0, 1100)$
C) $(B, C) = (800, 600)$
D) $(B, C) = (1100, 0)$
E) $(B, C) = (0, 1400)$

Answer: E
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "e" values of *A* and *B* violates at least one constraint.

(1) $2B + 4C \leq 4{,}800 \Rightarrow 2(0) + 4(1{,}400) = 5{,}600 \geq 4{,}800$ {constraint violated}
(2) $6B + 3C \leq 6{,}600 \Rightarrow 6(0) + 3(1{,}400) = 4{,}200 \leq 6{,}600$
(3) $\mathrm{B} + \mathrm{C} \leq 1{,}400 \Rightarrow 1{,}400 = 1{,}400$
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

76) A local bagel shop produces bagels (*B*) and croissants (*C*). Each bagel requires 6 ounces of flour, 1 gram of yeast, and 2 tablespoons of sugar. A croissant requires 3 ounces of flour, 1 gram of yeast, and 4 tablespoons of sugar. The company has 6,600 ounces of flour, 1,400 grams of yeast, and 4,800 tablespoons of sugar available for today's baking. Bagel profits are 20 cents each and croissant profits are 30 cents each. The shop wishes to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $580
B) $340
C) $220
D) $380
E) $420

Answer: D
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is B = 1,200, C = 1,000, with weekly profits of $5,200.

Maximize $P = 0.2B + 0.3C$
subject to $2B + 4C \leq 4{,}800$
$6B + 3C \leq 6{,}600$
$B + C \leq 1{,}400$
and $B \geq 0$, $C \geq 0$.
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

77) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

What is the objective function?
A) $P = 0.5D + 0.4C$
B) $P = 0.2D + 0.3C$
C) $P = 0.4D + 0.5C$
D) $P = 0.1D + 0.2C$
E) $P = 0.6D + 0.8C$

Answer: C
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of D($0.40 per box) and C ($0.50 per box).
Difficulty: 2 Medium
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

78) The owner of Crackers, Inc. produces both Deluxe (D) and Classic (C) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

What is the sugar constraint?
A) $2D + 3C \leq 4{,}800$
B) $6D + 8C \leq 4{,}800$
C) $1D + 2C \leq 4{,}800$
D) $3D + 2C \leq 4{,}800$
E) $4D + 5C \leq 4{,}800$

Answer: A
Explanation: Since each D requires 2 ounces of sugar and each C requires 3 ounces of sugar, the constraint should reflect that the usages (2 ounces for each D, 3 ounces for each C) must be less than the supply.
Difficulty: 2 Medium
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

79) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

Which of the following is not a feasible solution?
A) $(D, C) = (0, 0)$
B) $(D, C) = (0, 1000)$
C) $(D, C) = (800, 600)$
D) $(D, C) = (1600, 0)$
E) $(D, C) = (0, 1{,}200)$

Answer: E
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "e" values of *D* and *C* violates at least one constraint.

(1) $2D + 3C \leq 4{,}800 \Rightarrow 2(0) + 3(1{,}200) = 3{,}600 \leq 4{,}800$
(2) $6D + 8C \leq 9{,}600 \Rightarrow 6(0) + 8(1{,}200) = 9{,}600 = 9{,}600$
(3) $D + 2C \leq 2{,}000 \Rightarrow 1(0) + 2(1{,}200) = 2{,}400 \geq 1{,}400$ {constraint violated}
Difficulty: 2 Medium
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

80) The owner of Crackers, Inc. produces both Deluxe (*D*) and Classic (*C*) crackers. She only has 4,800 ounces of sugar, 9,600 ounces of flour, and 2,000 ounces of salt for her next production run. A box of Deluxe crackers requires 2 ounces of sugar, 6 ounces of flour, and 1 ounce of salt to produce. A box of Classic crackers requires 3 ounces of sugar, 8 ounces of flour, and 2 ounces of salt to produce. Profits are 40 cents for a box of Deluxe crackers and 50 cents for a box of Classic crackers. Cracker's, Inc. would like to maximize profits.

What is the daily profit when producing the optimal amounts?
A) $800
B) $500
C) $640
D) $620
E) $600

Answer: C
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is D = 1,600, C = 0, with weekly profits of $640.

Maximize $P = 0.4D + 0.5C$
subject to $2D + 3C \leq 4{,}800$
$6D + 8C \leq 9{,}600$
$D + 2C \leq 2{,}000$
and $D \geq 0, C \geq 0.$
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

81) The operations manager of a mail order house purchases double (D) and twin (T) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

What is the objective function?
A) $P = 150D + 300T$
B) $P = 500D + 300T$
C) $P = 300D + 500T$
D) $P = 300D + 150T$
E) $P = 100D + 90T$

Answer: D
Explanation: Since the objective is to maximize profits, the objective function should reflect the profitability of D($300 per bed) and T ($150 per bed).
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

82) The operations manager of a mail order house purchases double (D) and twin (T) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

What is the storage space constraint?
A) $90D + 100T \leq 18{,}000$
B) $100D + 90T \geq 18{,}000$
C) $300D + 90T \leq 18{,}000$
D) $500D + 100T \leq 18{,}000$
E) $100D + 90T \leq 18{,}000$

Answer: E
Explanation: Since each D requires 100 cubic feet and each T requires 90 cubic feet, the constraint should reflect that the usages (100 cubic feet for each D, 90 cubic feet for each C) must be less than the supply.
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

83) The operations manager of a mail order house purchases double (*D*) and twin (*T*) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

Which of the following is not a feasible solution?
A) (*D*, *T*) = (0, 0)
B) (*D*, *T*) = (0, 250)
C) (*D*, *T*) = (150, 0)
D) (*D*, *T*) = (90, 100)
E) (*D*, *T*) = (0, 200)

Answer: B
Explanation: To determine feasibility, substitute the variable values into the constraints. Substituting option "b" values of *D* and *T* violates at least one constraint.

(1) $100D + 90T \leq 18{,}000 \Rightarrow 100(0) + 90(250) = 22{,}500 \geq 18{,}000$ {constraint violated}
(2) $500D + 300C \leq 75{,}000 \Rightarrow 500(0) + 300(250) = 75{,}000 = 75{,}000$
Difficulty: 2 Medium
Topic: The Mathematical Model in the Spreadsheet
Learning Objective: Formulate a basic linear programming model in a spreadsheet from a description of the problem.
Bloom's: Apply
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

84) The operations manager of a mail order house purchases double (*D*) and twin (*T*) beds for resale. Each double bed costs $500 and requires 100 cubic feet of storage space. Each twin bed costs $300 and requires 90 cubic feet of storage space. The manager has $75,000 to invest in beds this week, and her warehouse has 18,000 cubic feet available for storage. Profit for each double bed is $300 and for each twin bed is $150. The manager's goal is to maximize profits.

What is the weekly profit when ordering the optimal amounts?
A) $0
B) $30,000
C) $42,000
D) $45,000
E) $54,000

Answer: D
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown below is D = 150, T = 0, with weekly profits of $45,000.

Maximize P = 300D + 150T
subject to $100D + 90T \leq 18{,}000$
$300D + 150T \leq 75{,}000$
and $D \geq 0, T \geq 0$.
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

85) Which of the following constitutes a simultaneous solution to the following 2 equations?

(1) $4x_1 + 2x_2 = 7$
(2) $4x_1 - 3x_2 = 2$
A) $(x_1, x_2) = (1, 1.25)$
B) $(x_1, x_2) = (1.25, 1)$
C) $(x_1, x_2) = (0, 3)$
D) $(x_1, x_2) = (1.25, 0)$
E) $(x_1, x_2) = (0, 0)$

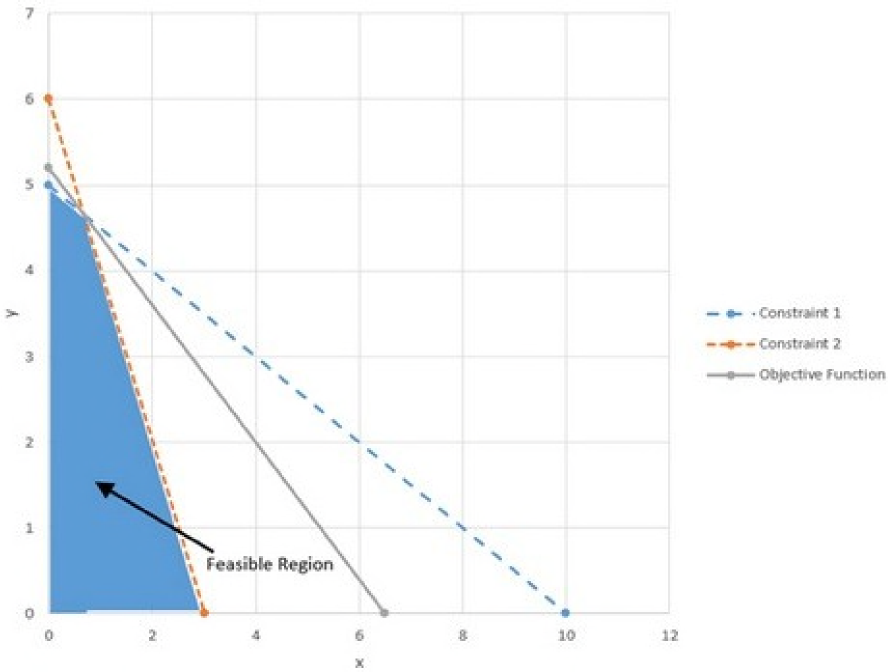
Answer: B
Explanation: Using subtraction to eliminate one variable (x_1) allows solving for the other (x_2). Then substitution of the value for x_2 into an original equation allows us to solve for x_1.

$4x_1 + 2x_2 = 7$
$\underline{-(4x_1 - 3x_2 = 2)}$
$0x_1 + 5x_2 = 5 \Rightarrow x_2 = 1$
Since $x_2 = 1$, $4x_1 + 2x_2 = 7 \Rightarrow 4x_1 = 5 \Rightarrow x_1 = 1.25$
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Knowledge Application
Accessibility: Keyboard Navigation

86) Use the graphical method for linear programming to find the optimal solution for the following problem.

Maximize $P = 4x + 5y$
subject to $2x + 4y \leq 12$
$5x + 2y \leq 10$
and $x \geq 0, y \geq 0.$
A) $(x, y) = (2, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (1, 5)$
E) None of the answer choices are correct.

Answer: B
Explanation: Graph the two constraints to define the feasible region. Next, find the objective function value that just touches the edge of the feasible region (here, at point (2/3, 4 2/3) the objective function is maximized with a value of 26.
Alternatively, evaluate the extreme points of the feasible region:
(0, 0) - objective function value 0
(3, 0) - objective function value 12
(0, 5) - objective function value 25
(2/3, 4 2/3) - objective function value 26 {maximum}



Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Analyze
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

87) Using Excel's Solver add-in, find the optimal solution for the following problem?

Maximize $P = 3x + 8y$
subject to $2x + 4y \leq 20$
$6x + 3y \leq 18$
and $x \geq 0, y \geq 0$.
A) $(x, y) = (2, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (0, 5)$
E) None of the answer choices are correct.

Answer: D
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown above is x = 0, y = 5, with an objective function value of 40.
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

88) Using Excel's Solver add-in, find the optimal solution for the following problem?

Maximize $P = 8x + 3y$
subject to $2x + 4y \leq 20$
$6x + 3y \leq 18$
and $x \geq 0, y \geq 0$.
A) $(x, y) = (3, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 0)$
D) $(x, y) = (0, 5)$
E) None of the answer choices are correct.

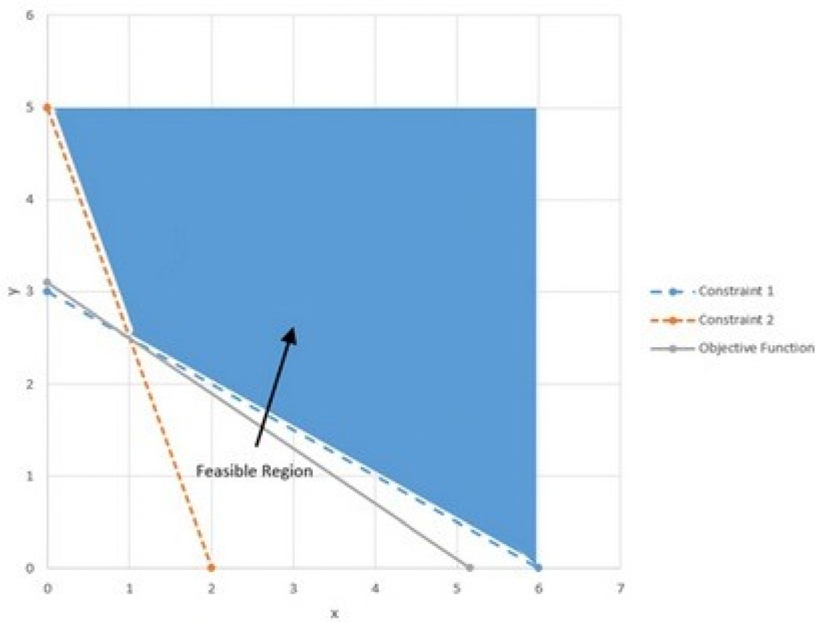
Answer: A
Explanation: Using Excel's Solver add-in, the optimal solution of the linear program shown above is x = 3, y = 0, with an objective function value of 24.
Difficulty: 3 Hard
Topic: Using excel's solver to solve linear programming problems
Learning Objective: Use Excel to solve a linear programming spreadsheet model.
Bloom's: Evaluate
AACSB: Technology
Accessibility: Keyboard Navigation

89) Use the graphical method for linear programming to find the optimal solution for the following problem.

Minimize $C = 6x + 10y$
subject to $2x + 4y \geq 12$
$5x + 2y \geq 10$
and $x \geq 0, y \geq 0$.
A) $(x, y) = (0, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 5)$
D) $(x, y) = (1, 2.5)$
E) $(x, y) = (6, 0)$

Answer: D
Explanation: Graph the two constraints to define the feasible region. Next, find the objective function value that just touches the edge of the feasible region (here, at point (1, 2.5) the objective function is minimized with a value of 31.

Alternatively, evaluate the extreme points of the feasible region:
(6, 0) - objective function value 36
(0, 5) - objective function value 50
(1, 2.5) - objective function value 31 {minimum}



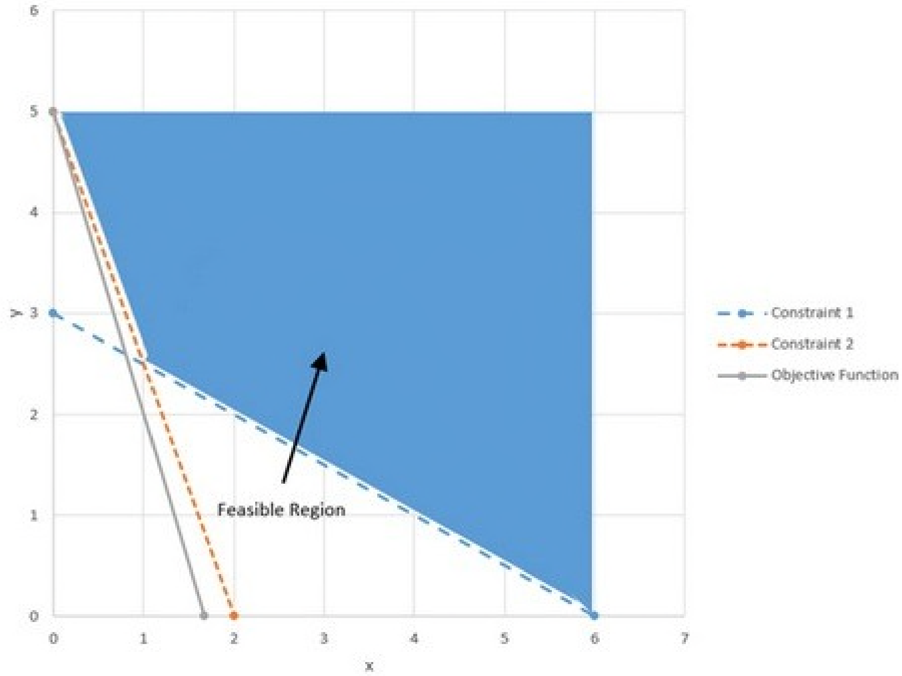
Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Evaluate
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation

90) Use the graphical method for linear programming to find the optimal solution for the following problem.

Minimize $C = 12x + 4y$
subject to $2x + 4y \geq 12$
$5x + 2y \geq 10$
and $x \geq 0, y \geq 0$.
A) $(x, y) = (0, 0)$
B) $(x, y) = (0, 3)$
C) $(x, y) = (0, 5)$
D) $(x, y) = (1, 2.5)$
E) $(x, y) = (6, 0)$

Answer: C
Explanation: Graph the two constraints to define the feasible region. Next, find the objective function value that just touches the edge of the feasible region (here, at point (0, 5) the objective function is minimized with a value of 20).

Alternatively, evaluate the extreme points of the feasible region:
(6, 0) - objective function value 72
(0, 5) - objective function value 20 {minimum}
(1, 2.5) - objective function value 22



Difficulty: 3 Hard
Topic: The graphical method for solving two-variable problems
Learning Objective: Apply the graphical method to solve a two-variable linear programming problem.
Bloom's: Evaluate
AACSB: Analytical Thinking
Accessibility: Keyboard Navigation