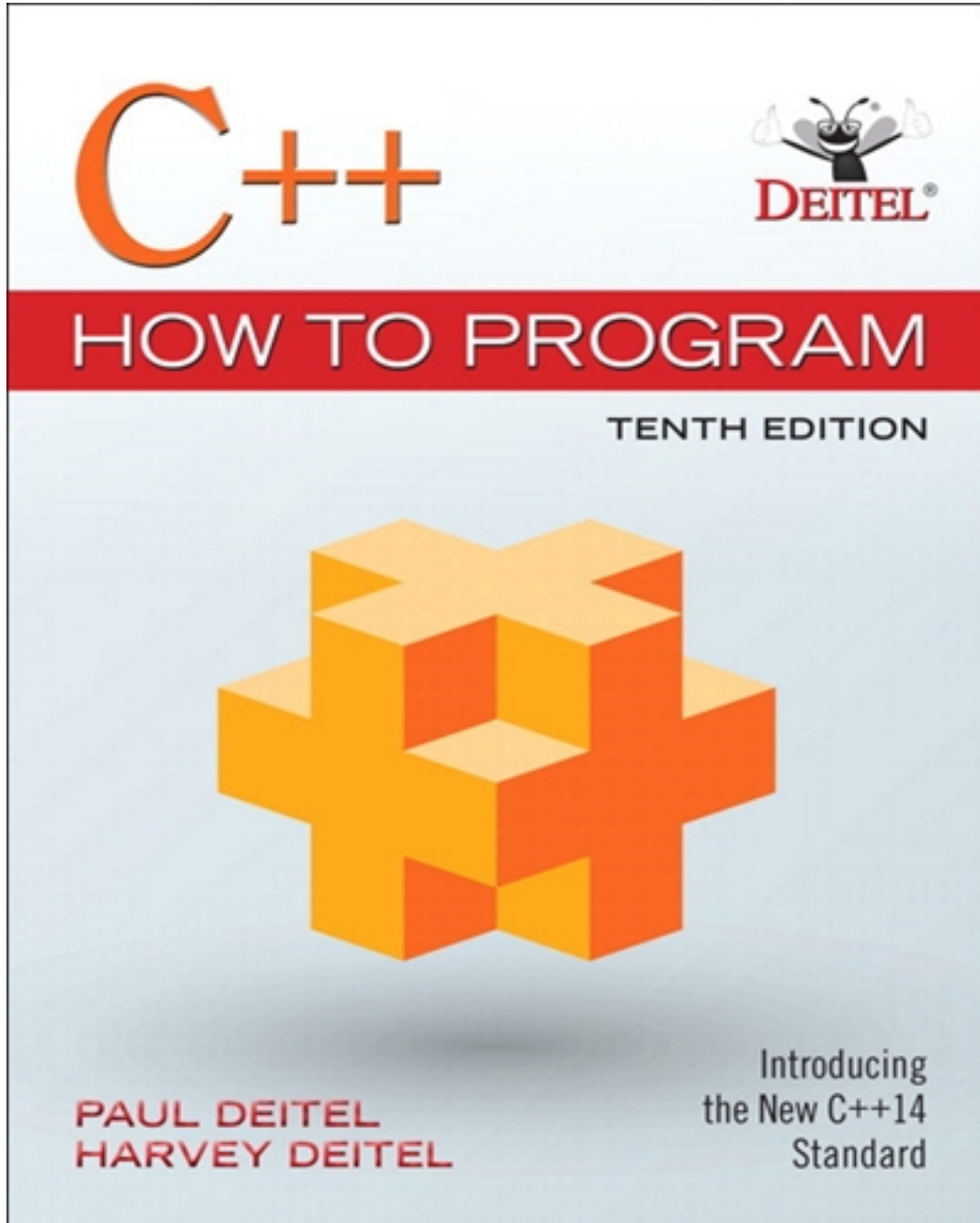


# Solutions for C++ How to Program 10th Edition by Deitel

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# Solutions

# Introduction to C++ Programming, Input/Output and Operators

# 2

## Objectives

In this chapter you'll:

- Write basic computer programs in C++.
- Write input and output statements.
- Use fundamental types.
- Learn computer memory concepts.
- Use arithmetic operators.
- Understand the precedence of arithmetic operators.
- Write decision-making statements.



## Self-Review Exercises

**2.1** Fill in the blanks in each of the following.

- a) Every C++ program begins execution at the function \_\_\_\_\_.

ANS: `main`.

- b) A(n) \_\_\_\_\_ begins the body of every function and a(n) \_\_\_\_\_ ends the body.

ANS: left brace (`{`), right brace (`}`).

- c) Most C++ statements end with a(n) \_\_\_\_\_.

ANS: semicolon.

- d) The escape sequence `\n` represents the \_\_\_\_\_ character, which causes the cursor to position to the beginning of the next line on the screen.

ANS: newline.

- e) The \_\_\_\_\_ statement is used to make decisions.

ANS: `if`.

**2.2** State whether each of the following is *true* or *false*. If *false*, explain why. Assume the statement using `std::cout`; is used.

- a) Comments cause the computer to print the text after the `//` on the screen when the program is executed.

ANS: *False*. Comments do not cause any action to be performed when the program is executed. They're used to document programs and improve their readability.

- b) The escape sequence `\n`, when output with `cout` and the stream insertion operator, causes the cursor to position to the beginning of the next line on the screen.

ANS: *True*.

- c) All variables must be declared before they're used.

ANS: *True*.

- d) All variables must be given a type when they're declared.

ANS: *True*.

- e) C++ considers the variables `number` and `NumBEr` to be identical.

ANS: *False*. C++ is case sensitive, so these variables are different.

- f) Declarations can appear almost anywhere in the body of a C++ function.

ANS: *True*.

- g) The remainder operator (`%`) can be used only with integer operands.

ANS: *True*.

- h) The arithmetic operators `*`, `/`, `%`, `+` and `-` all have the same level of precedence.

ANS: *False*. The operators `*`, `/` and `%` have the same precedence, and the operators `+` and `-` have a lower precedence.

- i) A C++ program that prints three lines of output must contain three statements using `cout` and the stream insertion operator.

ANS: *False*. One statement with `cout` and multiple `\n` escape sequences can print several lines.

**2.3** Write a single C++ statement to accomplish each of the following (assume that neither using declarations nor a using directive have been used):

- a) Declare the variables `c`, `thisIsAVariable`, `q76354` and `number` to be of type `int` (in one statement) and initialize each to 0.

ANS: `int c{0}, thisIsAVariable{0}, q76354{0}, number{0};`

- b) Prompt the user to enter an integer. End your prompting message with a colon (`:`) followed by a space and leave the cursor positioned after the space.

ANS: `std::cout << "Enter an integer: ";`

- c) Read an integer from the user at the keyboard and store it in integer variable `age`.

ANS: `std::cin >> age;`

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- d) If the variable number is not equal to 7, print "The variable number is not equal to 7".

```
ANS: if (number != 7) {  
    std::cout << "The variable number is not equal to 7\n";  
}
```

- e) Print the message "This is a C++ program" on one line.

```
ANS: std::cout << "This is a C++ program\n";
```

- f) Print the message "This is a C++ program" on two lines. End the first line with C++.

```
ANS: std::cout << "This is a C++\nprogram\n";
```

- g) Print the message "This is a C++ program" with each word on a separate line.

```
ANS: std::cout << "This\nis\na\nC++\nprogram\n";
```

- h) Print the message "This is a C++ program". Separate each word from the next by a tab.

```
ANS: std::cout << "This\tis\ta\tC++\tprogram\n";
```

#### 2.4 Write a statement (or comment) to accomplish each of the following (assume that using declarations have been used for cin, cout and endl):

- a) Document that a program calculates the product of three integers.

```
ANS: // Calculate the product of three integers
```

- b) Declare the variables x, y, z and result to be of type int (in separate statements) and initialize each to 0.

```
ANS: int x{0};  
    int y{0};  
    int z{0};  
    int result{0};
```

- c) Prompt the user to enter three integers.

```
ANS: cout << "Enter three integers: ";
```

- d) Read three integers from the keyboard and store them in the variables x, y and z.

```
ANS: cin >> x >> y >> z;
```

- e) Compute the product of the three integers contained in variables x, y and z, and assign the result to the variable result.

```
ANS: result = x * y * z;
```

- f) Print "The product is " followed by the value of the variable result.

```
ANS: cout << "The product is " << result << endl;
```

- g) Return a value from main indicating that the program terminated successfully.

```
ANS: return 0;
```

**2.5** Using the statements you wrote in Exercise 2.4, write a complete program that calculates and displays the product of three integers. Add comments to the code where appropriate. [Note: You'll need to write the necessary using declarations or directive.]

ANS: (See program below.)

---

```

1 // Calculate the product of three integers
2 #include <iostream> // enables program to perform input and output
3 using namespace std; // program uses names from the std namespace
4
5 // function main begins program execution
6 int main() {
7     int x{0}; // first integer to multiply
8     int y{0}; // second integer to multiply
9     int z{0}; // third integer to multiply
10    int result{0}; // the product of the three integers
11
12    cout << "Enter three integers: "; // prompt user for data
13    cin >> x >> y >> z; // read three integers from user
14    result = x * y * z; // multiply the three integers; store result
15    cout << "The product is " << result << endl; // print result; end line
16 } // end function main

```

---

**2.6** Identify and correct the errors in each of the following statements (assume that the statement using `std::cout`; is used):

a) `if (c < 7); {`  
`cout << "c is less than 7\n";`  
`}`

ANS: *Error:* Semicolon after the right parenthesis of the condition in the `if` statement.  
*Correction:* Remove the semicolon after the right parenthesis. [Note: The result of this error is that the output statement executes whether or not the condition in the `if` statement is true.] The semicolon after the right parenthesis is an empty statement that does nothing. We'll say more about the empty statement in Chapter 4.

b) `if (c == 7) {`  
`cout << "c is equal to or greater than 7\n";`  
`}`

ANS: *Error:* The incorrect relational operator `==`.  
*Correction:* Change `==` to `>=`, and you may want to change "equal to or greater than" to "greater than or equal to" as well.

## Exercises

*NOTE: Solutions to the programming exercises are located in the **ch02solutions** folder.*

**2.7** Discuss the meaning of each of the following objects:

a) `std::cin`

ANS: This object refers to the standard input device that is normally connected to the keyboard.

b) `std::cout`

ANS: This object refers to the standard output device that is normally connected to the screen.

**2.8** Fill in the blanks in each of the following:

## 5 Chapter 2 Introduction to C++ Programming, Input/Output and Operators

a) \_\_\_\_\_ are used to document a program and improve its readability.

ANS: Comments

b) The object used to print information on the screen is \_\_\_\_\_.

ANS: `std::cout`

c) A C++ statement that makes a decision is \_\_\_\_\_.

ANS: `if`

d) Most calculations are normally performed by \_\_\_\_\_ statements.

ANS: assignment

e) The \_\_\_\_\_ object inputs values from the keyboard.

ANS: `std::cin`

**2.9** Write a single C++ statement or line that accomplishes each of the following:

a) Print the message "Enter two numbers".

ANS: `cout << "Enter two numbers";`

b) Assign the product of variables `b` and `c` to variable `a`.

ANS: `a = b * c;`

c) State that a program performs a payroll calculation (i.e., use text that helps to document a program).

ANS: `// Payroll calculation program`

d) Input three integer values from the keyboard into integer variables `a`, `b` and `c`.

ANS: `cin >> a >> b >> c;`

**2.10** State which of the following are *true* and which are *false*. If *false*, explain your answers.

a) All operators are evaluated from left to right.

ANS: False. Some operators are evaluated from left to right, while other operators are evaluated right to left.

b) The following are all valid variable names: `_under_bar_`, `m928134`, `t5`, `j7`, `her_sales`, `his_account_total`, `a`, `b`, `c`, `z`, `z2`.

ANS: True.

c) The statement `cout << "a = 5;";` is a typical example of an assignment statement.

ANS: False. The statement is an output statement. The text `a = 5;` is output to the screen.

d) A valid arithmetic expression with no parentheses is evaluated from left to right.

ANS: False. Arithmetic operators can appear in any order in an expression, so the expression is `a = b + c * d;` actually evaluates from right to left because of the rules of operator precedence.

e) The following are all invalid variable names: `3g`, `87`, `67h2`, `h22`, `2h`.

ANS: False. `h22` is a valid variable name. The others are invalid because they each begin with a digit.

**2.11** Fill in the blanks in each of the following:

a) What arithmetic operations are on the same level of precedence as multiplication? \_\_\_\_\_.

ANS: division and modulus.

b) When parentheses are nested, which set of parentheses is evaluated first in an arithmetic expression? \_\_\_\_\_.

ANS: innermost.

c) A location in the computer's memory that may contain different values at various times throughout the execution of a program is called a(n) \_\_\_\_\_.

ANS: variable.

**2.12** What, if anything, prints when each of the following statements is performed? If nothing prints, then answer "nothing." Assume `x = 2` and `y = 3`.

a) `cout << x;`

b) `cout << x + x;`

ANS: 4

c) `cout << "x=";`

ANS: x=

d) `cout << "x = " << x;`

ANS: x = 2

e) `cout << x + y << " = " << y + x;`

ANS: 5 = 5

f) `z = x + y;`

ANS: nothing.

g) `cin >> x >> y;`

ANS: nothing.

h) `// cout << "x + y = " << x + y;`

ANS: nothing (because it is a comment).

i) `cout << "\n";`

ANS: A newline is output which positions the cursor at the beginning of the next line on the screen.

**2.13** Which of the following statements contain variables whose values are replaced?

a) `cin >> b >> c >> d >> e >> f;`

b) `p = i + j + k + 7;`

c) `cout << "variables whose values are replaced";`

d) `cout << "a = 5";`

ANS: (a) and (b)

**2.14** Given the algebraic equation  $y = ax^3 + 7$ , which of the following, if any, are correct C++ statements for this equation?

a) `y = a * x * x * x + 7;`

b) `y = a * x * x * (x + 7);`

c) `y = (a * x) * x * (x + 7);`

d) `y = (a * x) * x * x + 7;`

e) `y = a * (x * x * x) + 7;`

f) `y = a * x * (x * x + 7);`

ANS: (a), (d), (e)

**2.15** (*Order of Evaluation*) State the order of evaluation of the operators in each of the following C++ statements and show the value of x after each statement is performed.

a) `x = 7 + 3 * 6 / 2 - 1;`

ANS: \*, /, +, -, =, 15

b) `x = 2 % 2 + 2 * 2 - 2 / 2;`

ANS: %, \*, /, +, -, =, 3

c) `x = (3 * 9 * (3 + (9 * 3 / (3))));`

ANS: innermost parentheses around 3, \*, /, +, \*, \*, 324

**2.22** What does the following code print?

```
cout << "\n**\n***\n****\n*****" << endl;
```

ANS: \*

\*\*

\*\*\*

\*\*\*\*

\*\*\*\*\*

# Introduction to C++ Programming, Input/Output and Operators

## 2

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ANS: `main`.

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ANS: left brace (`{`), right brace (`}`).

- c) Most C++ statements end with a(n) \_\_\_\_\_.

ANS: semicolon.

- d) The escape sequence `\n` represents the \_\_\_\_\_ character, which causes the cursor to position to the beginning of the next line on the screen.

ANS: `newline`.

- e) The \_\_\_\_\_ statement is used to make decisions.

ANS: `if`.

**2.2** State whether each of the following is *true* or *false*. If *false*, explain why. Assume the statement using `std::cout`; is used.

- a) Comments cause the computer to print the text after the `//` on the screen when the program is executed.

ANS: *False*. Comments do not cause any action to be performed when the program is executed. They're used to document programs and improve their readability.

- b) The escape sequence `\n`, when output with `cout` and the stream insertion operator, causes the cursor to position to the beginning of the next line on the screen.

ANS: *True*.

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ANS: *True*.

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- b) Prompt the user to enter an integer. End your prompting message with a colon (`:`) followed by a space and leave the cursor positioned after the space.

ANS: `std::cout << "Enter an integer: ";`

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ANS: `std::cin >> age;`

### 3 Chapter 2 Introduction to C++ Programming, Input/Output and Operators

- d) If the variable number is not equal to 7, print "The variable number is not equal to 7".

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ANS: if (number != 7) {  
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ANS: cin >> x >> y >> z;
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```
ANS: result = x * y * z;
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ANS: (See program below.)

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## 5 Chapter 2 Introduction to C++ Programming, Input/Output and Operators

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ANS: Comments

b) The object used to print information on the screen is \_\_\_\_\_.

ANS: `std::cout`

c) A C++ statement that makes a decision is \_\_\_\_\_.

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e) The \_\_\_\_\_ object inputs values from the keyboard.

ANS: `std::cin`

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b) Assign the product of variables `b` and `c` to variable `a`.

ANS: `a = b * c;`

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ANS: `// Payroll calculation program`

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b) `cout << x + x;`

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c) `cout << "x=";`

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ANS: x = 2

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b) `y = a * x * x * (x + 7);`

c) `y = (a * x) * x * (x + 7);`

d) `y = (a * x) * x * x + 7;`

e) `y = a * (x * x * x) + 7;`

f) `y = a * x * (x * x + 7);`

ANS: (a), (d), (e)

**2.15** (*Order of Evaluation*) State the order of evaluation of the operators in each of the following C++ statements and show the value of x after each statement is performed.

a) `x = 7 + 3 * 6 / 2 - 1;`

ANS: \*, /, +, -, =, 15

b) `x = 2 % 2 + 2 * 2 - 2 / 2;`

ANS: %, \*, /, +, -, =, 3

c) `x = (3 * 9 * (3 + (9 * 3 / (3))));`

ANS: innermost parentheses around 3, \*, /, +, \*, \*, 324

**2.22** What does the following code print?

```
cout << "\n**\n***\n****\n*****" << endl;
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ANS: \*

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