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Introduction to Java Applications; Input/Output and Operators

What's in a name? That which we call a rose By any other name would smell as sweet.

—William Shakespeare

The chief merit of language is clearness.

—Galen

One person can make a difference and every person should try.

—John F. Kennedy

# **Objectives**

In this chapter you'll:

- Write simple Java applications.
- Use input and output statements.
- Learn about Java's primitive types.
- Understand basic memory concepts.
- Use arithmetic operators.
- Learn the precedence of arithmetic operators.
- Write decision-making statements.
- Use relational and equality operators.









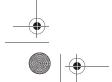




## Self-Review Exercises

## **Self-Review Exercises**

2.1	Fill in the blanks in each of the following statements:  a) A(n) begins the body of every method, and a(n) ends the body of
	every method.  ANS: left brace ({}), right brace (}).
	b) You can use the statement to make decisions.  ANS: if.
	c) begins an end-of-line comment. ANS: //.
	d), and are called white space.  ANS: Space characters, newlines and tabs.
	e) are reserved for use by Java. ANS: Keywords.
	f) Java applications begin execution at method  ANS: main.
	g) Methods, and display information in a command window.
	ANS: System.out.print, System.out.println and System.out.printf.
2.2	State whether each of the following is <i>true</i> or <i>false</i> . If <i>false</i> , explain why.  a) Comments cause the computer to print the text after the // on the screen when the program executes.
	<ul><li>ANS: False. Comments do not cause any action to be performed when the program executes. They're used to document programs and improve their readability.</li><li>b) All variables must be given a type when they're declared.</li><li>ANS: True.</li></ul>
	c) Java considers the variables number and NuMbEr to be identical.  ANS: False. Java is case sensitive, so these variables are distinct. d) The remainder operator (%) can be used only with integer operands.  ANS: False. The remainder operator can also be used with noninteger operands in Java. e) The arithmetic operators *, /, %, + and - all have the same level of precedence.  ANS: False. The operators *, / and % are higher precedence than operators + and
2.3	Write statements to accomplish each of the following tasks:  a) Declare variables c, thisIsAVariable, q76354 and number to be of type int.  ANS: int c, thisIsAVariable, q76354, number;
	<pre>or int c; int thisIsAVariable; int q76354; int number;</pre>
	b) Prompt the user to enter an integer.
	<ul><li>ANS: System.out.print("Enter an integer: ");</li><li>c) Input an integer and assign the result to int variable value. Assume Scanner variable input can be used to read a value from the keyboard.</li></ul>
	ANS: value = input.nextInt(); d) Print "This is a Java program" on one line in the command window. Use method System.out.println.
	ANS: System.out.println("This is a Java program");















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e) Print "This is a Java program" on two lines in the command window. The first line should end with Java. Use method System.out.printf and two %s format specifiers.

ANS: System.out.printf("%s%n%s%n", "This is a Java", "program");

 $f) \quad \text{If the variable number is not equal to 7, display "The variable number is not equal to 7".} \\$ 

ANS: if (number != 7)
 System.out.println("The variable number is not equal to 7");

System. out. printering the variable number is not eque

**2.4** Identify and correct the errors in each of the following statements:

ANS: Error: Semicolon after the right parenthesis of the condition (c < 7) in the if.

Correction: Remove the semicolon after the right parenthesis. [*Note:* As a result, the output statement will execute regardless of whether the condition in the if is true.]

b) if (c => 7)

System.out.println("c is equal to or greater than 7");

ANS: Error: The relational operator => is incorrect. Correction: Change => to >=.

**2.5** Write declarations, statements or comments that accomplish each of the following tasks:

a) State that a program will calculate the product of three integers.

ANS: // Calculate the product of three integers

b) Create a Scanner called input that reads values from the standard input.

ANS: Scanner input = new Scanner(System.in);

c) Declare the variables x, y, z and result to be of type int.

```
ANS: int x, y, z, result;
    or
    int x;
    int y;
    int z;
    int result;
```

d) Prompt the user to enter the first integer.

ANS: System.out.print("Enter first integer: ");

e) Read the first integer from the user and store it in the variable x.

```
ANS: x = input.nextInt();
```

f) Prompt the user to enter the second integer.

ANS: System.out.print("Enter second integer: ");

g) Read the second integer from the user and store it in the variable y.

ANS: y = input.nextInt();

h) Prompt the user to enter the third integer.

ANS: System.out.print("Enter third integer: ");

i) Read the third integer from the user and store it in the variable z.

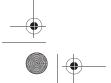
ANS: z = input.nextInt();

j) 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;
```

k) Use System.out.printf to display the message "Product is" followed by the value of the variable result.

ANS: System.out.printf("Product is %d%n", result);













#### Exercises

**2.6** Using the statements you wrote in Exercise 2.5, write a complete program that calculates and prints the product of three integers.

ANS:

```
// Ex. 2.6: Product.java
     // Calculate the product of three integers.
 3
     import java.util.Scanner; // program uses Scanner
     public class Product
 6
        public static void main(String[] args)
 8
 9
           // create Scanner to obtain input from command window
10
           Scanner input = new Scanner(System.in);
П
12
           int x; // first number input by user
           int y; // second number input by user
13
14
           int z; // third number input by user
15
           int result; // product of numbers
16
           System.out.print("Enter first integer: "); // prompt for input
17
18
           x = input.nextInt(); // read first integer
19
20
           System.out.print("Enter second integer: "); // prompt for input
21
           y = input.nextInt(); // read second integer
22
23
           System.out.print("Enter third integer: "); // prompt for input
24
           z = input.nextInt(); // read third integer
25
26
           result = x * y * z; // calculate product of numbers
27
28
           System.out.printf("Product is %d%n", result);
29
        } // end method main
    } // end class Product
30
Enter first integer: 10
Enter second integer: 20
Enter third integer: 30
Product is 6000
```

## **Exercises**

NOTE: Solutions to the programming exercises are located in the ch02solutions folder. Each exercise has its own folder named ex02\_## where ## is a two-digit number representing the exercise number. For example, exercise 2.14's solution is located in the folder ex02\_14.

**2.7** Fill in the blanks in each of the following statements:

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

ANS: Comments.

b) A decision can be made in a Java program with a(n) \_\_\_\_\_

ANS: if statement.

c) Calculations are normally performed by \_\_\_\_\_\_ statements.

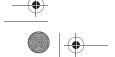
ANS: assignment statements.

d) The arithmetic operators with the same precedence as multiplication are \_\_\_\_\_ and















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ANS: division (/), remainder (%)

e) When parentheses in an arithmetic expression are nested, the \_\_\_\_\_\_ set of parentheses is evaluated first.

ANS: innermost.

f) 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

- **2.8** Write Java statements that accomplish each of the following tasks:
  - a) Display the message "Enter an integer: ", leaving the cursor on the same line.

ANS: System.out.print( "Enter an integer: " );

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

ANS: a = b \* c;

c) Use a comment to state that a program performs a sample payroll calculation.

ANS: // This program performs a simple payroll calculation.

- **2.9** State whether each of the following is *true* or *false*. If *false*, explain why.
  - a) Java operators are evaluated from left to right.

ANS: False. Some operators (e.g., assignment, =) evaluate from 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 and z2.

ANS: True.

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

ANS: False. The expression is evaluated according to operator precedence.

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

ANS: False. Identifier h22 is a valid variable name.

- **2.10** Assuming that x = 2 and y = 3, what does each of the following statements display?
  - a) System.out.printf("x = %d%n", x);

ANS: x = 2

b) System.out.printf("Value of %d + %d is %d%n", x, x, (x + x));

ANS: Value of 2 + 2 is 4

c) System.out.printf("x =");

ANS: x =

d) System.out.printf(" $d = d^n$ , (x + y), (y + x));

ANS: 5 = 5

- **2.11** Which of the following Java statements contain variables whose values are modified?
  - a) p = i + j + k + 7;
  - b) System.out.println("variables whose values are modified");
  - c) System.out.println("a = 5");
  - d) value = input.nextInt();

**ANS:** (a), (d).

- **2.12** Given that  $y = ax^3 + 7$ , which of the following are correct Java 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)
- **2.13** State the order of evaluation of the operators in each of the following Java statements, and show the value of x after each statement is performed:

















#### Exercises

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

ANS: *, /, +, -; Value of x is 15.

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

ANS: %, *, /, +, -; Value of x is 3.

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

ANS: x = ( 3 * 9 * ( 3 + ( 9 * 3 / ( 3 ) ) ) );

4 5 3 1 2

Value of x is 324.
```

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

```
{\bf System.out.printf("*%n**%n****%n******n");}\\
```

ANS:

```
*
    **
    ***
    ***
    ****
```

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

```
System.out.println("*");
System.out.println("***");
System.out.println("****");
System.out.println("***");
System.out.println("**");
```

ANS:

```
*
**
**
**
**
**
**
**
**
```

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

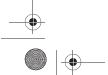
```
System.out.print("*");
System.out.print("***");
System.out.print("****");
System.out.print("****");
System.out.println("***");
```

ANS:

```
******
```

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

```
System.out.print("*");
System.out.println("***");
```















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```
System.out.println("****");
System.out.print("****");
System.out.println("**");
ANS:
```

```
****
****
*****
```

2.23 What does the following code print?

```
System.out.printf("%s%n%s%n%s%n", "*", "****", "*****");
ANS:
```

```
***
```











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