# Chapter 2 — Self-Review Exercises (Complete Answers)

## 2.1

a) A(n) '{' begins the body of every method, and a(n) '}' ends the body of every method.

b) You can use the 'if' statement to make decisions.

c) '//' begins an end-of-line comment.

d) 'space', 'tab' and 'newline' are called white space.

e) 'keywords' are reserved for use by Java.

f) Java applications begin execution at method 'main'.

g) Methods 'println', 'print' and 'printf' display information in a command window.

## 2.2

a) False — comments are ignored by the compiler and not printed at runtime.

b) True — all variables must be declared with a type in Java.

c) False — Java is case-sensitive; 'number' and 'NuMbEr' are different variables.

d) False — the remainder operator (%) may be used with integer and floating-point operands in Java.

e) False — \*, / and % have the same precedence; + and - have lower precedence.

## 2.3

a) int c, thisIsAVariable, q76354, number;

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

c) int value = input.nextInt(); // assuming Scanner input is available

d) System.out.println("This is a Java program");

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

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

## 2.4

a) Error: stray semicolon. Correct: if (c < 7) System.out.println("c is less than 7");

b) Error: wrong operator. Correct: if (c >= 7) System.out.println("c is equal to or greater than 7");

## 2.5

a) // This program calculates the product of three integers.

b) Scanner input = new Scanner(System.in);

c) int x, y, z, result;

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

e) x = input.nextInt();

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

g) y = input.nextInt();

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

i) z = input.nextInt();

j) result = x \* y \* z;

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

2.6 Complete program (example):

public class ProductOfThree {  
 public static void main(String[] args) {  
 java.util.Scanner input = new java.util.Scanner(System.in);  
 System.out.print("Enter the first integer: ");  
 int x = input.nextInt();  
 System.out.print("Enter the second integer: ");  
 int y = input.nextInt();  
 System.out.print("Enter the third integer: ");  
 int z = input.nextInt();  
 int result = x \* y \* z;  
 System.out.printf("Product is %d%n", result);  
 }  
}

## 2.7

a) Comments are used to document a program and improve readability.

b) A decision can be made with an 'if' statement.

c) Calculations are normally performed by assignment statements (expressions in assignments).

d) The operators with the same precedence as multiplication are '/' and '%'.

e) The innermost set of parentheses is evaluated first.

f) A location that may contain different values is called a 'variable'.

## 2.8

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

b) a = b \* c;

c) // This program performs a sample payroll calculation.

## 2.9

a) False — Java operator evaluation uses operator precedence rules, not simply left-to-right.

b) True — the listed names are valid Java identifiers (Java allows '\_' and '$').

c) False — operator precedence determines evaluation order, not strictly left-to-right.

d) False — among those names, h22 is actually valid (starts with a letter); so not all listed are invalid.

## 2.10

a) Prints: x = 2

b) Prints: Value of 2 + 2 is 4

c) Prints: x = (no newline)

d) Prints: 5 = 5

## 2.11

a) Yes — 'p = i + j + k + 7;' modifies p.

b) No — prints a literal string; does not modify variables.

c) No — prints a literal string.

d) Yes — 'value = input.nextInt();' modifies variable value.

## 2.12

Correct statements: a) y = a \* x \* x \* x + 7;

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

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

Incorrect statements: b) and c) and f) are incorrect representations.

## 2.13

a) Order: \*, / then +, - (left to right among same precedence). Value: x = 15.

b) Order: %, \*, / then +, - . Value: x = 3.

c) Innermost parentheses, then multiplication. Value: x = 324.

## 2.14

a) System.out.println("1 2 3 4");

b) System.out.print("1 "); System.out.print("2 "); System.out.print("3 "); System.out.println("4");

c) System.out.printf("%d %d %d %d%n", 1, 2, 3, 4);

## Exercise 2.15 — Arithmetic operations on two integers

import java.util.Scanner;  
public class Exercise2\_15 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter first integer: ");  
 int a = input.nextInt();  
 System.out.print("Enter second integer: ");  
 int b = input.nextInt();  
 System.out.printf("Sum = %d%n", a + b);  
 System.out.printf("Product = %d%n", a \* b);  
 System.out.printf("Difference = %d%n", a - b);  
 if (b != 0) {  
 System.out.printf("Quotient = %d%n", a / b);  
 } else {  
 System.out.println("Quotient = undefined (division by zero)");  
 }  
 input.close();  
 }  
}

## Exercise 2.16 — Comparing two integers

import java.util.Scanner;  
public class Exercise2\_16 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter first integer: ");  
 int x = input.nextInt();  
 System.out.print("Enter second integer: ");  
 int y = input.nextInt();  
 if (x > y) System.out.println(x + " is larger");  
 else if (y > x) System.out.println(y + " is larger");  
 else System.out.println("These numbers are equal");  
 input.close();  
 }  
}

## Exercise 2.17 — Arithmetic, average, largest and smallest of three integers

import java.util.Scanner;  
public class Exercise2\_17 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter first integer: ");  
 int a = input.nextInt();  
 System.out.print("Enter second integer: ");  
 int b = input.nextInt();  
 System.out.print("Enter third integer: ");  
 int c = input.nextInt();  
 int sum = a + b + c;  
 int average = sum / 3; // integer average as requested  
 int product = a \* b \* c;  
 int smallest = Math.min(a, Math.min(b, c));  
 int largest = Math.max(a, Math.max(b, c));  
 System.out.printf("Sum = %d%nAverage (integer) = %d%nProduct = %d%nSmallest = %d%nLargest = %d%n",  
 sum, average, product, smallest, largest);  
 input.close();  
 }  
}

## Exercise 2.18 — Printing shapes (box, oval, arrow, diamond)

public class Exercise2\_18 {  
 public static void main(String[] args) {  
 System.out.println("Box:");  
 System.out.println("\*\*\*\*\*\*\*");  
 System.out.println("\* \*");  
 System.out.println("\* \*");  
 System.out.println("\* \*");  
 System.out.println("\*\*\*\*\*\*\*\n");  
 System.out.println("Oval:");  
 System.out.println(" \*\*\* ");  
 System.out.println(" \* \* ");  
 System.out.println("\* \*");  
 System.out.println(" \* \* ");  
 System.out.println(" \*\*\* \n");  
 System.out.println("Arrow:");  
 System.out.println(" \* ");  
 System.out.println(" \*\*\* ");  
 System.out.println(" \*\*\*\*\* ");  
 System.out.println("\*\*\*\*\*\*\*");  
 System.out.println(" \*\*\* ");  
 System.out.println(" \*\*\* \n");  
 System.out.println("Diamond:");  
 System.out.println(" \* ");  
 System.out.println(" \* \* ");  
 System.out.println(" \* \* ");  
 System.out.println("\* \*");  
 System.out.println(" \* \* ");  
 System.out.println(" \* \* ");  
 System.out.println(" \* ");  
 }  
}

## Exercise 2.19 — Display asterisk pattern

public class Exercise2\_19 {  
 public static void main(String[] args) {  
 System.out.printf("\*%n\*\*%n\*\*\*%n\*\*\*\*%n\*\*\*\*\*%n");  
 }  
}

## Exercise 2.2 — Print another asterisk pattern

public class Exercise2\_20 {  
 public static void main(String[] args) {  
 System.out.println("\*");  
 System.out.println("\*\*\*");  
 System.out.println("\*\*\*\*\*");  
 System.out.println("\*\*\*\*");  
 System.out.println("\*\*");  
 }  
}

## Exercise 2.21 — Print pattern using print and println

public class Exercise2\_21 {  
 public static void main(String[] args) {  
 System.out.print("\*");  
 System.out.print("\*\*\*");  
 System.out.print("\*\*\*\*\*");  
 System.out.print("\*\*\*\*");  
 System.out.println("\*\*");  
 }  
}

## Exercise 2.22 — Pattern mixing print and println

public class Exercise2\_22 {  
 public static void main(String[] args) {  
 System.out.print("\*");  
 System.out.println("\*\*\*");  
 System.out.println("\*\*\*\*\*");  
 System.out.print("\*\*\*\*");  
 System.out.println("\*\*");  
 }  
}

## Exercise 2.23 — Pattern using printf

public class Exercise2\_23 {  
 public static void main(String[] args) {  
 System.out.printf("%s%n%s%n%s%n", "\*", "\*\*\*", "\*\*\*\*\*");  
 }  
}

## Exercise 2.24 — Find largest and smallest among five integers

import java.util.Scanner;  
public class Exercise2\_24 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 int largest = Integer.MIN\_VALUE;  
 int smallest = Integer.MAX\_VALUE;  
 System.out.println("Enter five integers:");  
 for (int i = 0; i < 5; i++) {  
 int n = input.nextInt();  
 if (n > largest) largest = n;  
 if (n < smallest) smallest = n;  
 }  
 System.out.printf("Largest = %d%nSmallest = %d%n", largest, smallest);  
 input.close();  
 }  
}

## Exercise 2.25 — Check if integer is even or odd

import java.util.Scanner;  
public class Exercise2\_25 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter an integer: ");  
 int n = input.nextInt();  
 if (n % 2 == 0) System.out.println(n + " is even");  
 else System.out.println(n + " is odd");  
 input.close();  
 }  
}

## Exercise 2.26 — Check if first integer is a multiple of second

import java.util.Scanner;  
public class Exercise2\_26 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter first integer: ");  
 int a = input.nextInt();  
 System.out.print("Enter second integer: ");  
 int b = input.nextInt();  
 if (b != 0 && a % b == 0) System.out.println(a + " is a multiple of " + b);  
 else if (b == 0) System.out.println("Division by zero: second integer is 0");  
 else System.out.println(a + " is not a multiple of " + b);  
 input.close();  
 }  
}

## Exercise 2.27 — Display 8x8 checkerboard pattern

public class Exercise2\_27 {  
 public static void main(String[] args) {  
 System.out.println("\* \* \* \* \* \* \* \*");  
 System.out.println(" \* \* \* \* \* \* \* ");  
 System.out.println("\* \* \* \* \* \* \* \*");  
 System.out.println(" \* \* \* \* \* \* \* ");  
 System.out.println("\* \* \* \* \* \* \* \*");  
 System.out.println(" \* \* \* \* \* \* \* ");  
 }  
}

## Exercise 2.28 — Compute diameter, circumference, area of a circle

import java.util.Scanner;  
public class Exercise2\_28 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter the radius (integer): ");  
 int r = input.nextInt();  
 System.out.printf("Diameter = %d%n", 2 \* r);  
 System.out.printf("Circumference = %f%n", 2 \* 3.14159 \* r);  
 System.out.printf("Area = %f%n", 3.14159 \* r \* r);  
 input.close();  
 }  
}

## Exercise 2.29 — Show integer equivalents of characters

public class Exercise2\_29 {  
 public static void main(String[] args) {  
 char[] chars = {'A','B','C','a','b','c','0','1','2','$','\*','+','/',' '};  
 for (char ch : chars) {  
 System.out.printf("The character %c has the value %d%n", ch, (int) ch);  
 }  
 }  
}

## Exercise 2.3 — Separate digits in a five-digit number

import java.util.Scanner;  
public class Exercise2\_30 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter a five-digit integer: ");  
 int number = input.nextInt();  
 int d1 = (number / 10000) % 10;  
 int d2 = (number / 1000) % 10;  
 int d3 = (number / 100) % 10;  
 int d4 = (number / 10) % 10;  
 int d5 = number % 10;  
 System.out.printf("%d %d %d %d %d%n", d1, d2, d3, d4, d5);  
 input.close();  
 }  
}

## Exercise 2.31 — Display table of squares and cubes

public class Exercise2\_31 {  
 public static void main(String[] args) {  
 System.out.println("n n^2 n^3");  
 for (int n = 0; n <= 10; n++) {  
 System.out.printf("%d %d %d%n", n, n\*n, n\*n\*n);  
 }  
 }  
}

## Exercise 2.32 — Count positives, negatives, zeros

import java.util.Scanner;  
public class Exercise2\_32 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 int positives = 0, negatives = 0, zeros = 0;  
 System.out.println("Enter five numbers:");  
 for (int i = 0; i < 5; i++) {  
 int n = input.nextInt();  
 if (n > 0) positives++;  
 else if (n < 0) negatives++;  
 else zeros++;  
 }  
 System.out.printf("Positives: %d%nNegatives: %d%nZeros: %d%n", positives, negatives, zeros);  
 input.close();  
 }  
}

## Exercise 2.33 — Body Mass Index (BMI) calculator

import java.util.Scanner;  
public class Exercise2\_33 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter weight in pounds: ");  
 double pounds = input.nextDouble();  
 System.out.print("Enter height in inches: ");  
 double inches = input.nextDouble();  
 double bmi = (pounds \* 703) / (inches \* inches);  
 System.out.printf("BMI = %.2f%n", bmi);  
 System.out.println("BMI Categories:\nUnderweight = <18.5\nNormal = 18.5–24.9\nOverweight = 25–29.9\nObesity = 30 or greater");  
 input.close();  
 }  
}

## Exercise 2.34 — World population growth projection

import java.util.Scanner;  
public class Exercise2\_34 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Enter current world population (integer): ");  
 long pop = input.nextLong();  
 System.out.print("Enter annual growth rate (percent, e.g., 1.2): ");  
 double rate = input.nextDouble() / 100.0;  
 long p1 = Math.round(pop \* (1 + rate));  
 long p2 = Math.round(pop \* Math.pow(1 + rate, 2));  
 long p3 = Math.round(pop \* Math.pow(1 + rate, 3));  
 long p4 = Math.round(pop \* Math.pow(1 + rate, 4));  
 long p5 = Math.round(pop \* Math.pow(1 + rate, 5));  
 System.out.printf("After 1 year: %d%nAfter 2 years: %d%nAfter 3 years: %d%nAfter 4 years: %d%nAfter 5 years: %d%n",  
 p1,p2,p3,p4,p5);  
 input.close();  
 }  
}

## Exercise 2.35 — Car-pool savings calculator

import java.util.Scanner;  
public class Exercise2\_35 {  
 public static void main(String[] args) {  
 Scanner input = new Scanner(System.in);  
 System.out.print("Total miles driven per day: ");  
 double miles = input.nextDouble();  
 System.out.print("Cost per gallon of gasoline: ");  
 double costPerGallon = input.nextDouble();  
 System.out.print("Average miles per gallon: ");  
 double mpg = input.nextDouble();  
 System.out.print("Parking fees per day: ");  
 double parking = input.nextDouble();  
 System.out.print("Tolls per day: ");  
 double tolls = input.nextDouble();  
 double fuelCost = (miles / mpg) \* costPerGallon;  
 double total = fuelCost + parking + tolls;  
 System.out.printf("Fuel cost per day = %.2f%nTotal cost per day = %.2f%n", fuelCost, total);  
 input.close();  
 }  
}