**Chapter 4**

**Exercise 1**

Find the error in each of the following code segments, and explain how to correct it:

1. i = 1;

while (i <= 10);

++i;

}

**ANSWER:**

EXPLANATION:

The variable i is not declared, which will cause a compilation error unless it was declared elsewhere in the program

There is an unmatched closing brace } at the end, which is unnecessary and will cause a syntax error.

The semicolon ; at the end of the while statement creates an empty loop body

CORRECT CODE:

**int i = 1;**

**while (i <= 10) {**

**++i;**

**}**

1. for (k = 0.1; k != 1.0; k += 0.1)

System.out.println(k);

**ANSWER:**

Floating-point numbers like 0.1 are not precise, so k may never exactly reach 1.0. and k is not declared.

**CORRECT CODE:**

**for (double k = 0.1; k <= 1.0; k += 0.1) {**

**System.out.println(k);**

**}**

1. switch (n) {

case 1:

System.out.println("The number is 1");

case 2:

System.out.println("The number is 2");

break;

default:

System.out.println("The number is not 1 or 2");

break;

}

**ANSWER:**

**EXPLANATION**

Without the break statement in case 1, the program will "fall through" and execute case 2 as well, even if n == 1.

formatting improves readability eventhough its not an error

**CORECTED CODE:**

**switch (n) {**

**case 1:**

**System.out.println("The number is 1");**

**break;**

**case 2:**

**System.out.println("The number is 2");**

**break;**

**default:**

**System.out.println("The number is not 1 or 2");**

**break;**

**}**

1. The following code should print the values 1 to 10:

n = 1;

while (n < 10)

System.out.println(n++);

**ANSWER:**

This code prints numbers **1 to 9**, not 1 to 10, because the condition n < 10 stops the loop before it prints 10.

**CORECTED CODE:**

**int n = 1;**

**while (n <= 10) { // Change condition to n <= 10**

**System.out.println(n++);**

**}**

By Changing the condition from n < 10 to n <= 10 so the loop includes 10.

**Exercise 2**

4.5 Describe the four basic elements of counter-controlled repetition.

**ANSWER:**

Counter-controlled repetition, often called a "definite loop," involves repeating a set of instructions a specific number of times.

**Control Variable (or Loop Counter)**:This variable is used to keep track of the number of repetitions. It’s initialized at the beginning of the loop./’

**Initial Value**:The starting value of the control variable. For example, int i = 1; initializes the loop counter i to 1.

**Condition (or Loop Continuation Test)**:A logical test that determines whether the loop should continue. For example, i <= 10 ensures the loop runs while i is less than or equal to 10.

**Increment/Decrement (or Update)**:The control variable is updated (usually increased or decreased) at the end of each iteration. For example, i++ increments i by 1 after each repetition.

Together, these elements enable counter-controlled repetition by controlling how many times the loop executes.

4.6 Compare and contrast the while and for repetition statements.

**ANSWERS:**

**While Loop:**Ideal for situations where the number of repetitions isn't known in advance. IT Runs as long as a specified condition remains true

**For Loop:**Suitable for situations where the number of iterations is controlled by a counter.Includes initialization, condition, and update in a single line

**Key Difference:** While loops focus on conditions; for loops focus on counting iterations.

4.7 Discuss a situation in which it would be more appropriate to use a do…while statement than a while statement. Explain why.

We can Use a **do...while** when the code needs to run at least once before checking the condition. For example, getting user input: you want to ask for input first and then check if it's valid. This ensures the code executes at least once before validating. That's why **do...while** is better in such cases.

4.8 Compare and contrast the break and continue statements.

**Break Statement:**Immediately exits the current loop or switch statement.Stops execution of the loop completely.

**Continue Statement:**Skips the rest of the current loop iteration and moves to the next iteration.

It Does not exit the loop; the loop continues running.

**Key Difference:** Break ends the loop, while continue skips to the next cycle of the loop.

4.9 Find and correct the error(s) in each of the following segments of code:

a) For (i = 100, i >= 1, i++) System.out.println(i);

b) The following code should print whether integer value is odd or even:

switch (value % 2) {

case 0:

System.out.println("Even integer");

case 1:

System.out.println("Odd integer");

}

c) The following code should output the odd integers from 19 to 1:

for (i = 19; i >= 1; i += 2)

System.out.println(i);

d) The following code should output the even integers from 2 to 100:

counter = 2;

do {

System.out.println(counter);

counter += 2;

} While (counter < 100);

4.10 What does the following program do?

// Exercise 4.10: Printing.java

public class Printing {

public static void main(String[] args) {

for (int i = 1; i <= 10; i++) {

for (int j = 1; j <= 5; j++)

System.out.print('@');

System.out.println();

}

}

}

4.11 (Find the Smallest Value) Write an application that finds the smallest of several integers. Assume that the first value read specifies the number of values to input from the user.

4.12 (Calculating the Product of Odd Integers)

Write an application that calculates the product of the odd integers from 1 to 15.

4.13 (Factorials) Factorials are used frequently in probability problems. The factorial of a positive integer n (written n! and pronounced “n factorial”) is equal to the product of the positive integers from 1 to n. Write an application that calculates the factorials of 1 through 20. Use type long. Display the results in tabular format. What difficulty might prevent you from calculating the factorial of 100?

4.14 (Modified Compound-Interest Program) Modify the compound-interest application to repeat its steps for interest rates of 5%, 6%, 7%, 8%, 9% and 10%. Use a for loop to vary the interest rate.

**Making a Difference**

**4.30 (Global Warming Facts Quiz)**

The controversial issue of global warming has been widely publicized by the film “An Inconvenient Truth,” featuring former Vice President Al Gore. Mr. Gore and a U.N. network of scientists, the Intergovernmental Panel on Climate Change, shared the 2007 Nobel Peace Prize in recognition of “their efforts to build up and disseminate greater knowledge about man-made climate change.” Research both sides of the global warming issue online (you might want to search for phrases like “global warming skeptics”). Create a five-question multiplechoice quiz on global warming, each question having four possible answers (numbered 1–4). Be objective and try to fairly represent both sides of the issue. Next, write an application that administers the quiz, calculates the number of correct answers (zero through five) and returns a message to the user. If the user correctly answers five questions, print “Excellent”; if four, print “Very good”; if three or fewer, print “Time to brush up on your knowledge of global warming,” and include a list of some of the websites where you found your facts.

**4.31 (Tax Plan Alternatives; The “FairTax”)**

There are many proposals to make taxation fairer. Check out the FairTax initiative in the United States at www.fairtax.org. Research how the proposed FairTax works. One suggestion is to eliminate income taxes and most other taxes in favor of a 23% consumption tax on all products and services that you buy. Some FairTax opponents question the 23% figure and say that because of the way the tax is calculated, it would be more accurate to say the rate is 30%—check this carefully. Write a program that prompts the user to enter expenses in various expense categories they have (e.g., housing, food, clothing, transportation, education, health care, vacations), then prints the estimated FairTax that person would pay.

**4.32 (Facebook User Base Growth)**

According to CNNMoney.com, Facebook hit one billion users in October 2012. Using the compound-growth technique you learned in Fig. 4.6 and assuming its user base grows at a rate of 4% per month, how many months will it take for Facebook to grow its user base to 1.5 billion users? How many months will it take for Facebook to grow its user base to two billion users?