**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;

}

Ans: The error in the code is that the ++i statement is not inside the while loop. This means that the loop will run indefinitely because the condition i <= 10 will always be true. To fix the error, the ++i statement should be moved inside the while loop:

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

System.out.println(k);

Ans: The error in the code is that the condition k != 1.0 may never be true due to floating-point precision issues. This is because floating-point numbers are not always represented exactly in binary, so adding 0.1 repeatedly may not result in a value that is exactly equal to 1.0. To fix the error, we can use a loop counter that increments by 1 and then divide it by 10 to get the desired value of 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;

}

Ans: The break statement after the case 2 is unnecessary. This is because break statements are used to exit a switch block immediately, and the next case or default block will not be executed.

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

n = 1;

while (n < 10)

System.out.println(n++);

Ans: The code will print the numbers 1 to 9.The while loop will continue to execute as long as the value of n is less than 10. Inside the loop, the current value of n is printed, and then n is incremented by 1. This means that the loop will stop when n reaches 10.

**Exercise 2**

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

Ans:

 **Initialization:** This is where you set the starting value for the loop counter. For example, you might set a variable called count to 0.

 **Test:** This is the condition that determines whether the loop should continue. It's usually a comparison between the loop counter and a target value. For example, you might test if count is less than or equal to 10.

 **Increment/Decrement:** This is where you change the value of the loop counter. You can either increase it by a certain amount (increment) or decrease it (decrement). For example, you might increment count by 1 each time through the loop.

 **Body:** This is the code that is executed each time the loop runs. It's the part of the loop that does the work

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4.6 Compare and contrast the while and for repetition statements.

Ans: **while loop:**

The loop continues as long as a certain condition is true.

You can use it to repeat code an indefinite number of times, as long as the condition is met.

For loop:

It's used when you know exactly how many times you want to repeat the code.

It often requires less code to write than a while loop for the same task.

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

Ans: A good example of when to use a do-while loop is when you want to make sure a block of code runs at least once, regardless of the initial condition.

4.8 Compare and contrast the break and continue statements.

Ans: the break statement immediately exits the entire loop.regardless of the current iteration.

The continue statement skips the rest of the current iteration and moves to the next iteration.

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);

Ans: **Comma (,) instead of semicolon (;)**: The comma separates expressions in a for loop, but the condition needs to be a single boolean expression.

i >= 1 won't cause the loop to terminate as intended because i starts at 100.

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");

}

Ans: no default case which is used to handle numbers not even or odd

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

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

System.out.println(i);

Ans: the code will print even numbers because I is incremented by 2 in each iteration

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);

Ans:

This code correctly outputs even numbers from 2 to 100 using a do-while loop. The loop ensures at least one iteration (printing 2) even if counter starts as an odd number.

4.10 What does the following program do?

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();

}

}

}

Ans:

This program uses nested loops to print 10 rows, each containing 5 '@' symbols. The outer loop (i) iterates 10 times, and the inner loop (j) iterates 5 times within each outer loop iteration. It creates a rectangular pattern of 10 lines of 5 '@' symbols each.

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?