Chapter 4

Exercise 1

A) Error**:** The error is that the while loop has a semicolon (;) after the condition, making it an empty loop. This means the code inside the loop will not execute.

Correction**:** Remove the semicolon after the while condition and enclose the increment ++i within the loop's curly braces {}. See correction below :

int i = 1;

while (i <= 10) {

++i;

}

(B) Error: The issue is that k is a float or double, and due to floating-point precision errors, k may never exactly equal 1.0. So k != 1.0 can be problematic.

Correction: Using a double type for k ensures that the loop works, and checking k < 1.0 ensures the loop stops before it goes beyond 1.0.

Correct code:

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

System.out.println(k);

(C) Error: The issue is that there is a missing break statement after the first case 1. Without it, the program will fall through to case 2 even if n is 1.

Correction: Add a break statement .

Correct 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;

}

(D) Error: The issue here is that it will print values from 1 to 9, but it should print 1 to 10. The condition n < 10 will stop before 10.

Correction**:** Change the loop condition to n <= 10 or increment n before printing.

Correct code:

n = 1;

while (n <= 10) {

System.out.println(n++);

}

Exercise 2

4.5

The four basic elements of counter-controlled repetition (loops) are:

1. **Initialization:** Setting the loop control variable to its starting value (e.g., i = 0).
2. **Condition Test:** Evaluating a boolean expression that determines whether the loop should continue (e.g., i < 10).
3. **Loop Body:** The block of code that is executed repeatedly as long as the condition is true.
4. **Increment/Decrement:** Modifying the loop control variable (usually by incrementing or decrementing it) after each iteration (e.g., i++).

4.6

Similarities:

* + Both are used for repetitive execution of a block of code based on a condition.
  + Both can be used to achieve the same results, although one might be more concise or clear in certain situations.

Differences:

Structure:

* + - for loops typically combine initialization, condition testing, and increment/decrement into a single line.
    - while loops separate the initialization and increment/decrement from the condition test.

Use Cases:

* + - for loops are generally preferred when the number of iterations is known or can be easily determined.
    - while loops are better suited when the number of iterations is unknown or dependent on a condition that might change during execution.

4.7

A do...while loop is more appropriate when you need to execute the loop body at least once, regardless of the initial condition. This is because the condition is checked *after* the loop body is executed.

**Example:** Reading user input until a valid value is entered.

Java

int input;

do {

System.out.print("Enter a positive number: ");

input = scanner.nextInt();

} while (input <= 0); // Loop continues if input is not positive

In this case, you want to ask the user for input at least once, even if their first attempt is invalid.

4.8

Similarities**:**

* + Both are used to alter the normal flow of control within loops.

Differences:

* + **break:** Terminates the loop immediately, and execution continues with the statement following the loop.
  + **continue:** Skips the remaining statements in the current iteration of the loop and proceeds to the next iteration.

4.9

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

**Error:** The increment i++ will cause i to increase, not decrease. This will lead to an infinite loop.

**Correction:** Change i++ to i-- to decrement i.

for (int i = 100; i >= 1; i--) {

System.out.println(i);

}

**(b)**

**Error:** The case 0 statement is missing a break statement. Without it, execution will "fall through" to case 1 even if value is even.

**Correction:** Add a break statement after case 0.

Correct code:

switch (value % 2) {

case 0:

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

break;

case 1:

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

break;

}

**(c)**

* **Error:** The loop will print all odd numbers, but it will increment i by 2, which is correct for getting odd numbers, but it will not start at 19 and go *down* to 1.
* **Correction:** Change i += 2 to i -= 2.

Correct code:

for (int i = 19; i >= 1; i -= 2) {

System.out.println(i);

}

**(d)**

* **Error:** The loop condition counter < 100 will cause the loop to stop when counter is 100, but the last value printed will be 98.
* **Correction:** Change the loop condition to counter <= 100.

Java

int counter = 2;

do {

System.out.println(counter);

counter += 2;

} while (counter <= 100);

4.10

The program will print 10 lines, each containing 5 @ symbols. So, the output will be:

@@@@@

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4.11 - 4.14 (Applications and Exercises)

4.30 – 4.32

*4.30 (Global Warming Facts Quiz)*

**1. Research and Create the Quiz:**

Here's a sample five-question multiple-choice quiz on global warming, designed to be objective and represent both sides of the issue.

1. Which gas is considered the primary driver of the current global warming trend?
   1. Oxygen
   2. Nitrogen
   3. Carbon Dioxide
   4. Argon
2. Some scientists argue that natural factors, such as solar activity, have a greater impact on global temperatures than human activity. True or False?
   1. True
   2. False
3. The Intergovernmental Panel on Climate Change (IPCC) has concluded that warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are1unprecedented over decades to millennia.2What is the level of certainty they assign to human influence on the climate?

[1. www.nipaers.com](https://www.nipaers.com/ebook/9789389130713)

[www.nipaers.com](http://www.nipaers.com)

[2. books.google.com](http://books.google.com/books?id=UvxF7pem0GgC)

[books.google.com](http://books.google.com/books?id=UvxF7pem0GgC)

* 1. Low confidence
  2. Medium confidence
  3. High confidence
  4. Virtually certain

1. Critics of climate change action often argue that proposed solutions will have a negative impact on which of the following?
   1. Economic growth
   2. Public health
   3. Biodiversity
   4. Ocean acidity
2. Which of the following is a potential consequence of rising sea levels due to global warming?
   1. Increased agricultural productivity
   2. Displacement of coastal populations
   3. Expansion of polar ice caps
   4. Decreased frequency of extreme weather events

**Answer Key:**

* + 1. 3. Carbon Dioxide
    2. 1. True (This is a point of debate)
    3. 4. Virtually certain
    4. 1. Economic growth
    5. 2. Displacement of coastal population

*4.31 Tax Plan Alternatives; The “FairTax”*

**Objective:**

Create a program that calculates the estimated FairTax for a user based on their expenses in various categories.

**Program Outline:**

* Prompt the user to enter expenses in categories such as housing, food, clothing, etc.
* Calculate the FairTax based on a rate of 23%.
* Print the total FairTax the user would pay.

Code is in Notepad++

*4.32 (Facebook User Base Growth)*

**Problem:**

* Facebook had 1 billion users in October 2012.
* Assume a monthly growth rate of 4%.
* Calculate how many months it takes to reach 1.5 billion and 2 billion users.

**Solution:**

We'll use the compound growth formula:

* **Future Value (FV) = Present Value (PV) \* (1 + r)^n**

Where: \* FV = Future Value (target user base) \* PV = Present Value (initial user base) \* r = Growth rate per period (monthly in this case) \* n = Number of periods (months)

We need to solve for 'n' (number of months).

**1. Growth to 1.5 Billion Users:**

* FV = 1.5 billion
* PV = 1 billion
* r = 4% = 0.04

1.5 = 1 \* (1.04)^n 1.5 = (1.04)^n

To solve for 'n', we can use logarithms:

log(1.5) = log(1.04^n) log(1.5) = n \* log(1.04) n = log(1.5) / log(1.04)

Using a calculator: n ≈ 10.338 months

Since we're dealing with months, we'll round *up* to the nearest whole month.

**It will take approximately 11 months for Facebook to reach 1.5 billion users.**

**2. Growth to 2 Billion Users:**

* FV = 2 billion
* PV = 1 billion
* r = 4% = 0.04

2 = 1 \* (1.04)^n 2 = (1.04)^n

Using logarithms:

log(2) = log(1.04^n) log(2) = n \* log(1.04) n = log(2) / log(1.04)

Using a calculator: n ≈ 17.673 months

Again, we'll round *up* to the nearest whole month.

**It will take approximately 18 months for Facebook to reach 2 billion users.**

Code is in notepad++