SELECTION part 2

Teaching Team of Programming Fundamentals

2023

Learning Outcome

- Students must be able to understand the definition and the use of nested selection (nested IF) syntax
- Students have to understand the basic structure of nested selection syntax
- Students must be able to solve logical problems by creating a Java program that utilizes nested selection (nested IF) syntax

Nested Selection (Nested IF)

- Nested Selection (NESTED IF) is a specific form of selection to perform a multilevel condition selection
- Nested IF means an IF statement within another IF statement. It allows us to test multiple criteria and increases the number of possible outcomes
- Inside an IF statement (or IF-ELSE or IF-ELSE IF-ELSE), it is possible to have another IF or IF-ELSE or IF-ELSE IF-ELSE statement

Basic Structure of Nested IF

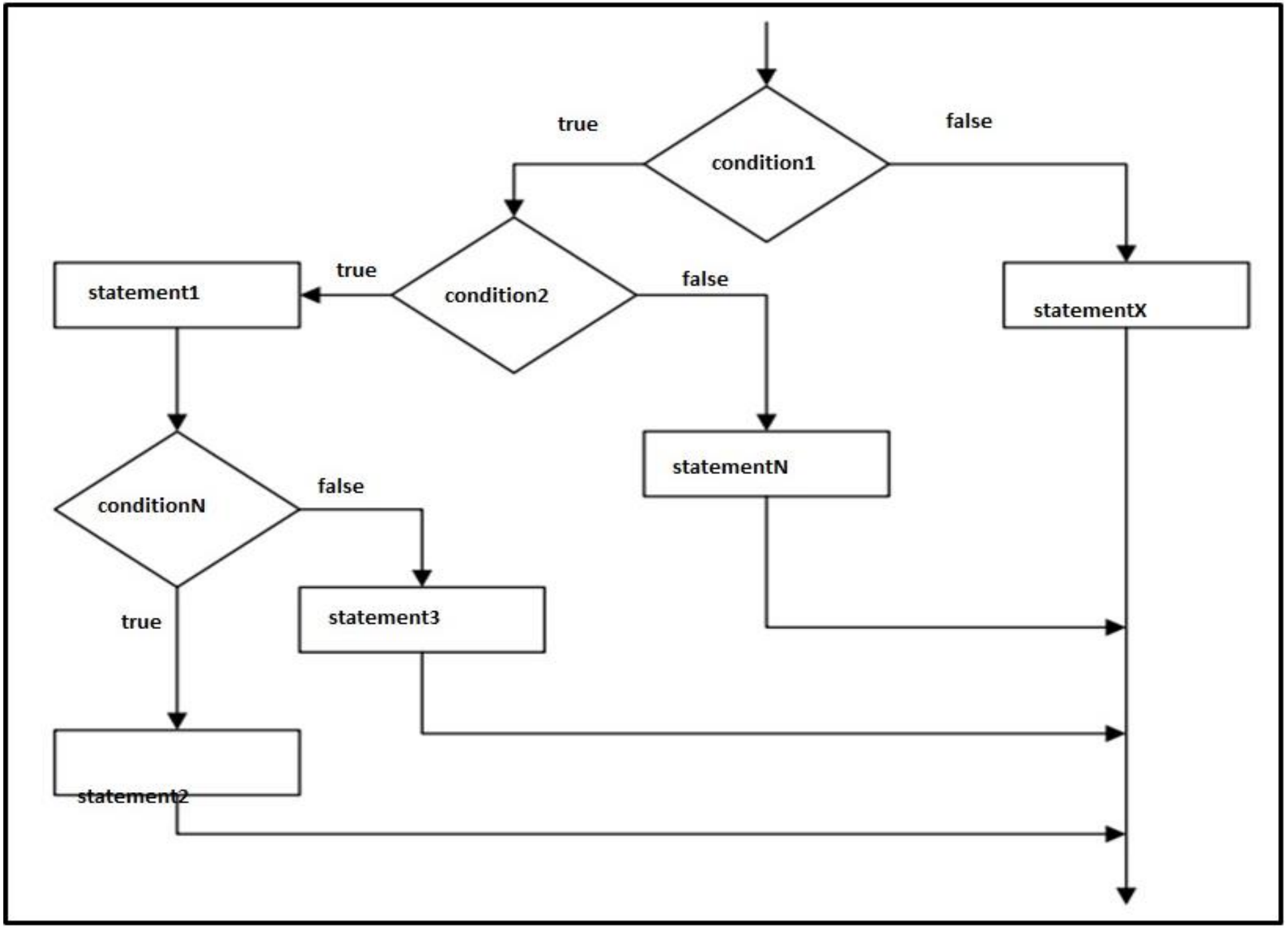
```
if (condition1){
        if (condition2){
                statement1;
                …
                …
                if (conditionN){
                                statement2;
                } else {
                        statement3;
                }
        } else {
                statementN;
        }
} else {
        statementX;
}
```

Nested IF

- **Condition1** will be **firstly evaluated**. If it is **false**, then the compiler will go to **outermost else** block
- If **condition1** is **true**, then it will continue to evaluate **condition2**.
- If **condition2** is **true**, then **statement1** will be executed. If **condition2** is **false**, then it will go to else block to execute **statementN**.
- After executing **statement1**, it will continue to evaluate **conditionN**. If **conditionN** is **true**, then **statement2** will be executed, otherwise **statement3** will run.

```
if (condition1){
        if (condition2){
                statement1;
                …
                …
                if (conditionN){
                                statement2;
                } else {
                        statement3;
                }
        } else {
                statementN;
        }
} else {
        statementX;
}
```

Flowchart of Nested IF



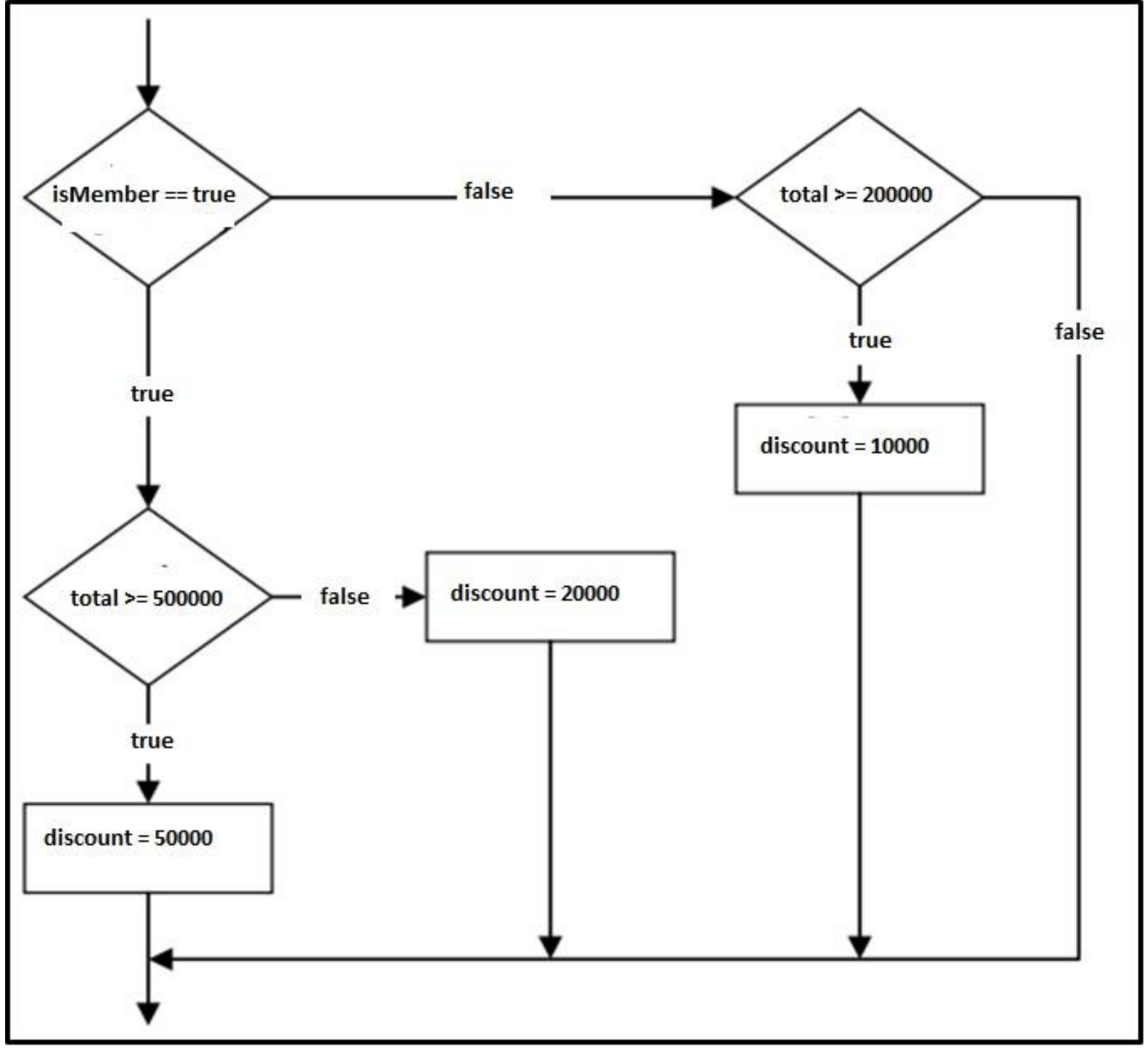
Example

In a Point of Sales application, there is a rule as follows:

If the customer is a member?

- TRUE:
  - **Is the total amount bigger than Rp 500.000?**
    - TRUE: The customer will get discount Rp 50.000
    - FALSE: The customer will get discount Rp 25.000
- FALSE:
  - **Is the total amount bigger than Rp 200.000?**
    - TRUE: The customer will get discount Rp 10.000
    - FALSE: The customer will not get any discount

Example Flowchart:



Example: Source code

```java
public class Kasir {
    Run | Debug
    public static void main(String[] args) {
        int total, discount, purchase;
        boolean isMember;
        Scanner input = new Scanner(System.in);

        System.out.print(s:"Is member? (true/false) = ");
        isMember = input.nextBoolean();
        System.out.print(s:"Total = ");
        total = input.nextInt();

        if(isMember)
            if(total > 500000)
                discount = 50000;
            else
                discount = 25000;
        else
            if(total > 200000)
                discount = 10000;
            else
                discount = 0;

        purchase = total - discount;
        System.out.println("Total = "+total);
        System.out.println("Discount = "+discount);
        System.out.println(x:"----------------------");
        System.out.println("Purchase = "+purchase);
    }
}
```

Logical Expression

- There are 3 logical operators which are frequently used to construct condition statement:
  - && : AND
  - || : OR
  - ! : NOT
- **Logical operators** are generally used for combining two or more relational statements that represent two or more conditions.
- In logical operator, the condition statement will be evaluated from left to the right

Logical Expression

- When evaluating (e1 **&&** e2), if **e1** returns **FALSE**, then **e2 will not** be evaluated. Thus, the value of the entire expression (e1 && e2) will be considered false.
- However, if **e1** results **TRUE**, then **e2 will** then be evaluated to determine the value of the entire expression.
- Example:

```
If(speed == 0 && machineOn == true)
    System.out.println("Turn of the machine!");
```

Logical Expression

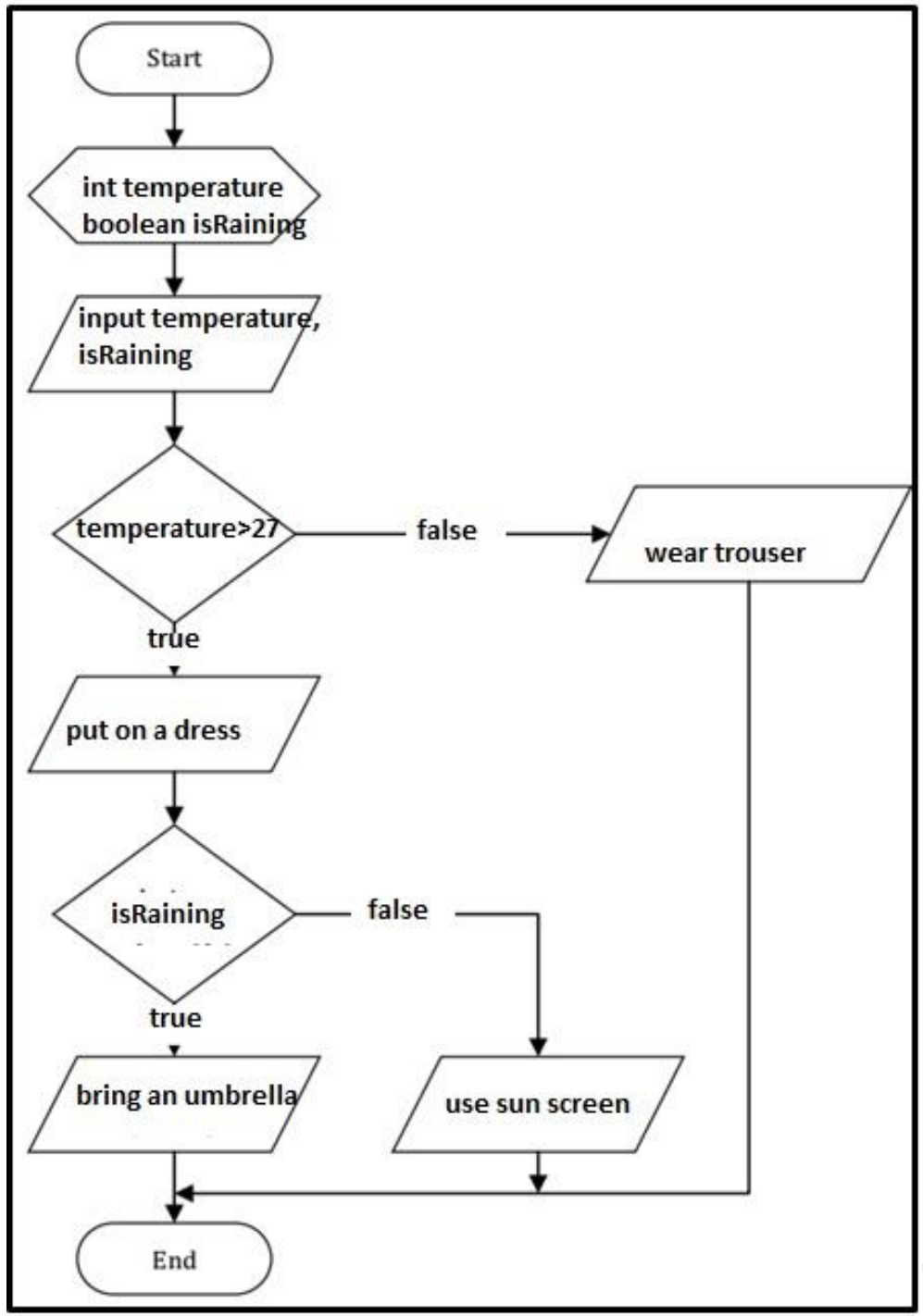
- When evaluating (e1 **||** e2), if **e1** returns **TRUE**, then **e2 will not** be evaluated. Thus, the value of the entire expression (e1 || e2) will be considered **true**
- However, if **e1** returns **FALSE**, then **e2 will** then be evaluated to determine the value of the entire expression
- Example:

```
If(speed == 0 || machineOn == true)
    System.out.println("Turn off the machine");
```

Case Studies

- A system was created to determine the clothing and equipment that users should carry according to weather conditions. If the temperature is more than 27C, the user is advised to put on a **dress**, then check whether it is currently raining, if it is raining then the user is advised to bring an **umbrella**, whereas if it is not raining then the user is advised to use **sunscreen**. However, if the temperature is less than or equal to 27C, then users are advised to wear **long trousers**
- Make a flowchart for the system!

Flowchart Studi Kasus:



Self Learning

Question 1

Design an algorithm using a flowchart to determine the maximum number from the 3 numbers input(without using logical operators)

input :

num1 = 28
num2 = 54
num3 = 15

output :

max number = 54

Question 2

In every Wednesday, a bookshop gives discount to all customers depend on the book category, as the following rules:

- A 10% discount will be given to customers who buy **dictionary**, then an additional 2% discount will be given if the customers buy more than 2 books.
- A 7% discount will be given to customers who buy **novel**, then an additional 2% discount will be given if they buy more than 3 novels, but if there are only 3 or less than 3 novels they buy, thenadditional 1% discount will be given
- The customers who buy other categories, then they will get 5% discount if they buy more than 3 books

Make a flowchart (using logical operators) to determine the total amount that must be paid by customer. The input are the **book category** and **number** of books bought, while the output is the discount amount

Assignment Team Based Project

1. Identify according to each project, what features require the nested selection concept.
2. Determine the form of selection used, as well as each required condition, with or without logical operators
3. Create an algorithm in the form of a flowchart according to the needs you have identified based on tasks No. 1 and 2