JOBSHEET 2

Case Study

1. Objective

- Students are able to model problems in Sequence case studies

- Students are able to model problems in the Selection case study

- Students are able to model problems in a Repetitive case study

2. Theory Review

Algorithms are sequences of logical steps in completing task. In the algorithm, which will carry out our thought flow is a computer. The command can be given in the form of a collection of instructions called a program. The program is written in a language called a programming language. A program is arranged systematically, meaning that the sequence of steps arranged must be clear by having a certain pattern. In addition, a program must be logical, make sense, be read and accepted by reason and can be judged right and wrong.

In addition, an algorithm must follow criteria:

1) Input

   There are zero or more input values that come from outside the program.

2) Output

   The minimum output consists of one result.

3) Definiteness

   Any instructions given should be clear and unambiguous.

4) Finiteness

   If a set of algorithm instructions is traced, the algorithm stage will end after a limited number of steps.

5) Effectivenes

   Each instruction should be basic enough that it is easy to carry out as needed

Algorithms are judged from the correct results as needed, produce good outputs, as well as good efficiency (time and memory) algorithms. The Basic Structure of the Algorithm consists of:

1) Sequential Stucture

Used for programs that have sequential statements

2) Selection Structure

Used for programs that use selection conditions

3) Looping Structure

Used for programs that have statements that will be executed repeatedly.

The steps to create the algorithm summarized as follows:

1. Understand the problem
2. Specify initial conditions → Input data
3. Specify the final condition → Data output
4. Other data (if any)

   Other supporting data needed in the problem solving process
5. Determine the steps to solve the problem starting from the initial conditions, until the final condition can be reached. Creating steps may involve:

   - Sequence
   - Selection
   - Loop

3. Practice

3.1 Experiment 1: Complete Case Study On Sequence

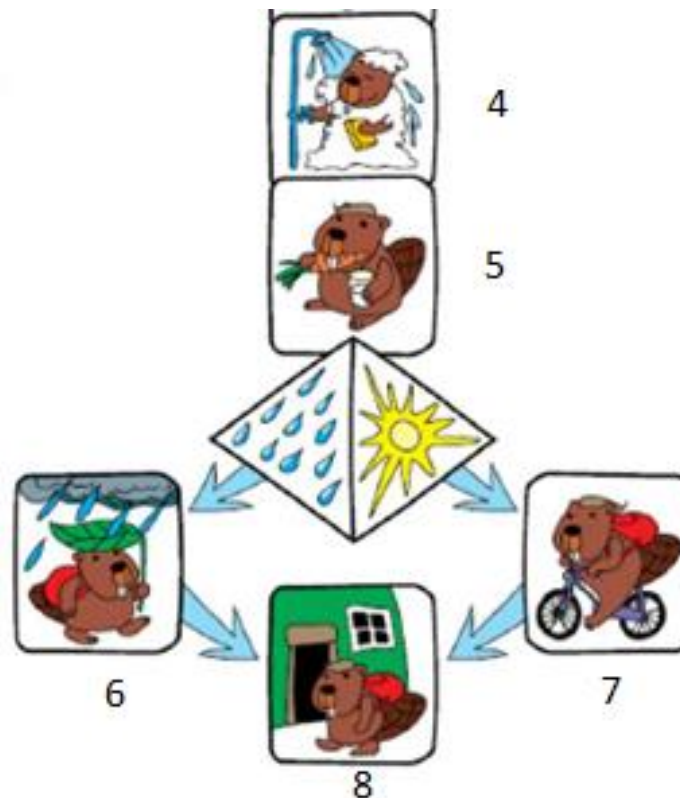1. Every morning Gabrielle routines in sequence according to Figure 1 below.

Figure 1. Case Study of Gabrielle's Morning Activities

However, there are 2 routines that are not in the right order. What is the correct order?

<u>Answer</u>

The correct sequence is 1-2-4-3-5-6 / 7-8. Explanation correct order as follows:

- Gabrielle woke up
- Then exercising
- After finishing exercising, continue with bathing
- After bathing, Gabrielle combs his hair
- Then, followed by a breakfast of carrots in the morning
- If it is raining, Gabrielle will use a leaf umbrella and walk to school. If it's sunny, biking is the preferred way to go to school
- The last stage, when he arrived in front of the school, Gabrielle rushed into the school building

2. A frog is exercising by jumping around the pool. The frog jumps from the lily pad to another lily pad in the order shown in figure 2 below.
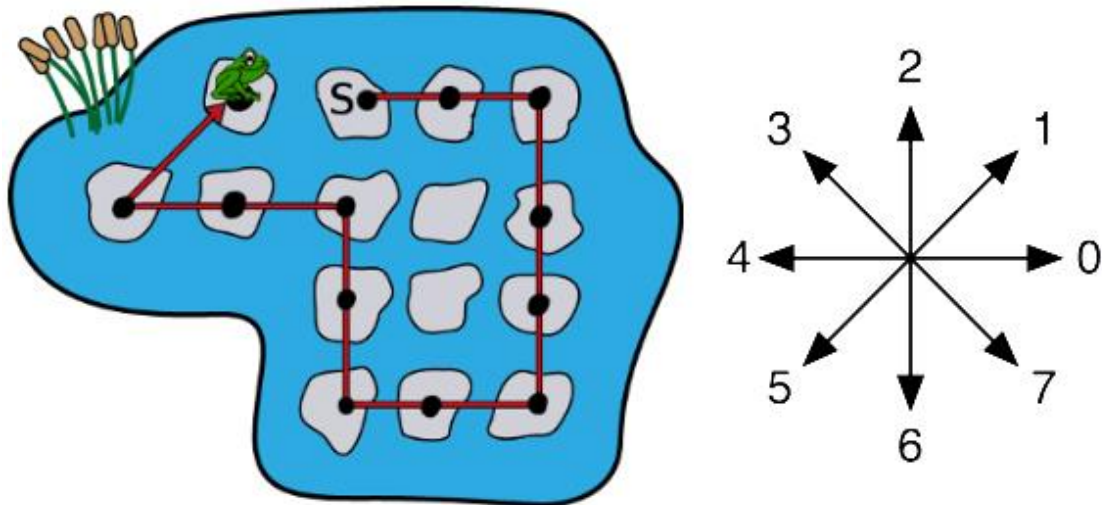

Figure 2 Case Study of the Frog Sports Route

The frog starts its sport from the lily pad labeled S and ends at the lily pad as shown in the picture (the frog shown has finished jumping). Every black dot in the picture marks the lily pad where the frog landed. The direction of the arrow in the picture above shows the direction Label the frog is jumping. Write a sequence that can describe the frog jump path?

Answer

The sequence that matches the frog sport route is S-0-0-6-6-6-4-4-2-2-4-4-1. Explain the correct sequence as follows:

- From the start the frog jumps in the 0 direction

- Then jump again in the 0 direction

- Then the frog turns to the lily pad in the 6 direction

- ....

- ....

3. Solve the problem below with logical steps in accordance with the review of the theory previously explained.

"Mr. Ahmad has a square piece of land. If the periphery of Mr Ahmad's land is 64 m, How long and wide the area of Mr. Ahmad's land? "

Answer

Input   : Periphery of Mr Ahmad's land

Output   : Land Area

Other Data   : -

Process   :

- Enter the circumference of the land

- Calculate the length of sides from Mr. Ahmad's land, Side = Perimeter: 4

- Calculate area = side x side

- Pak Ahmad's land area as an output

Question

1. Mention sequentially what you do after college like experiment 1 question-1!

2. Rewrite and complete the algorithm in Experiment 1 No. 2!

3. Calculate mathematically the results of experiment 1 problem 3! What is the result?

4. If there is additional information as follows

    "Mr. Ahmad wants to plant a circular rose in the middle of his land. Pak Ahmad wants to maximize his land so that as much as possible there are only a few vacant lands. What is the area of Mr. Ahmad's land planted with Mawar flowers? "

    Rewrite the steps for making the correct algorithm!

5. After additional data about question 4, what is the area of Mr. Ahmad's land that is not planted with roses?

3.2 Experiment 2: Complete a Case Study About Selection

In the following illustration in Figure 3, the beaver wants to swim across the entire river. But beavers are only allowed once through each river. How the path that must be traversed beaver? Use the algorithm to solve the beaver's problems!
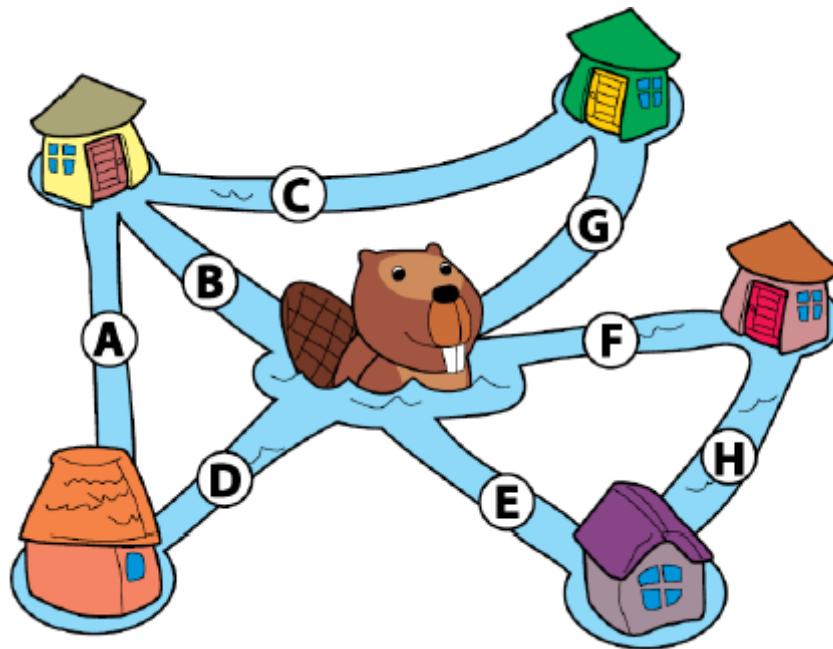
Figure 3. Case Study of the River Path to Be Crossed by Beaver

Answer

Input   : River, River connectivity information

(For example, A is adjacent to B and D)

Output   : Path of the entire river

Other Data   : -

Process   :

- Beaver is in the middle of several river meetings. He can swim from the river B / D / E / F / G

- If starting from **B** then the track that can be traversed by choosing river A or C. If it crosses river A, then:
  - River A continues to river D
  - From D has the option to E / F / G river. If you choose F or G then it is possibility that one river must be crossed more than once. Then the river E was chosen
  - From E, proceed to the connected and have same direction river, river H
  - From the river **H** continued to the river that is connected and have same direction, there are **F-G-C**
  - So the path Beaver goes through is B-C-G-F-H-E-D-A (output)

        If it crosses river C, then ......

- If it starts from D then the track that can be traversed...

- If starting from E then the track that can be traversed ...

- If starting from F then the track that can be traversed ...

- If starting from G then the track that can be traversed...

Question!

    1. Rewrite and complete the algorithm in experiment 2!

    2. Write the algorithm of the regulation SP1, SP2, and SP3 at JTI Polinema as you know!

3.3 Experiment 3: Complete a Case Study of Repetition

1. There are case studies of repetition as follows:

    Ani is having a birthday today. Ani's mother wants to share a little fortune for Ani's classmates. Since dawn, Ani has prepared 50 pairs of whole wheat bread, one bottle of peanut butter and one bottle of strawberry jam to make sandwiches. Because Ani's mother doesn't know for sure which Ani's friend likes peanut butter or prefers strawberry jam. So Ani plans to prepare 23 sandwiches with peanut butter and the rest is sandwiches with strawberry jam.

Figure 4. Example Sandwich with 2 types of jam

Explain the algorithm for preparing the bread?

<u>Answer</u>

Input   : Number of white breads, a bottle of peanut butter, a bottle of strawberry jam

Output   : Sandwich

Other Data   : -

Process   :

- Prepare ingredients for making sandwiches

- Take a knife

- Apply peanut butter with a knife on the surface of white bread with the needed amount of peanut butter

- Apply strawberry jam with a knife on the surface of white bread with the desired amount of peanut butter (Number of white bread - number of sandwiches with peanut butter)

- Sandwiches ready to be served (output)

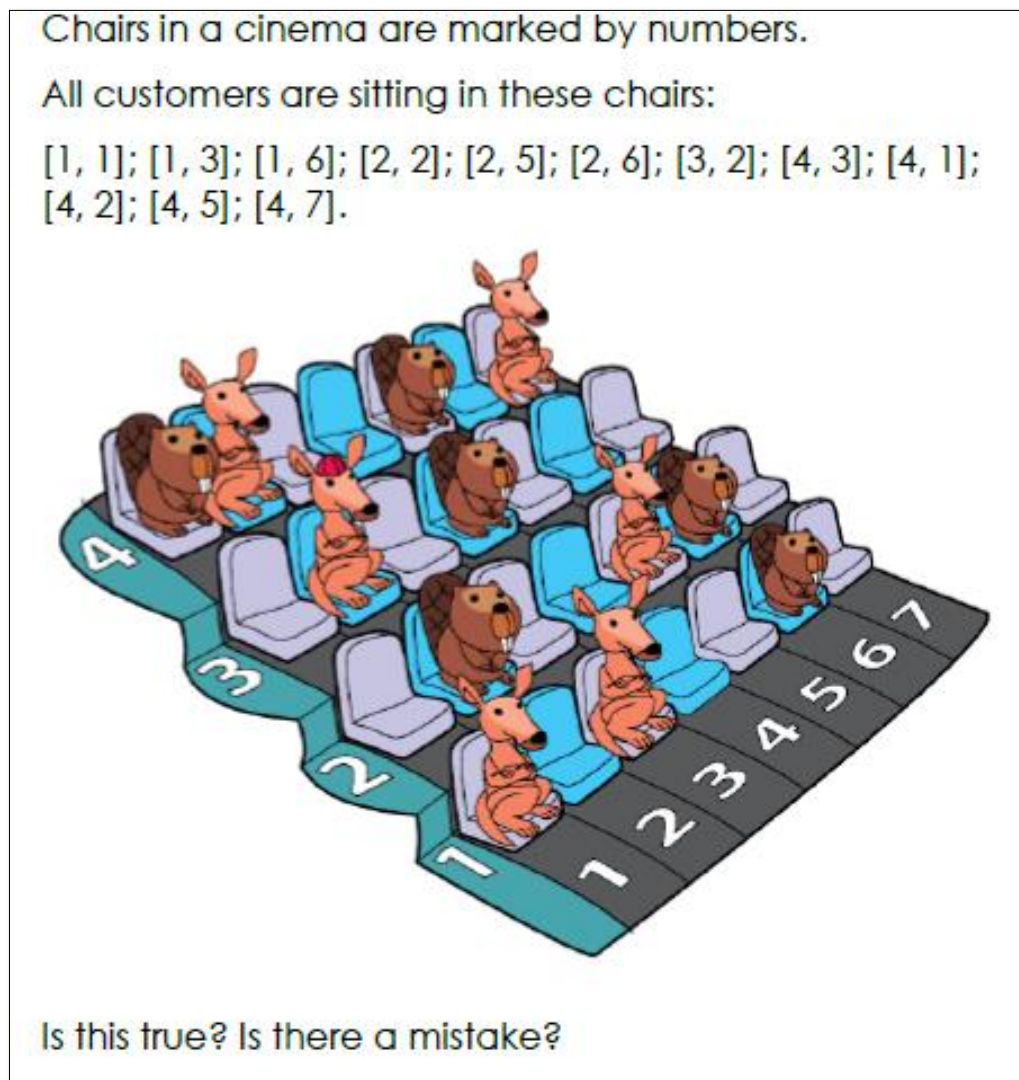2. There is a case study according to Figure 5 below:

Figure 5. Customer seating position in the cinema

Explain about the algorithm to solve the problem?

Answer

Input   : Customer sitting position (row, column), number of rows, number of columns

Output   : Seated position of all customers

Other Data   : -

Process   :

- Check repeatedly starting from the first row for columns 1 to 7

- Save the customer's sitting position information on the 1st row

- Check repeatedly starting from the second row for columns 1 to 7

- Save the customer's sitting position information in the 2nd row

- Check repeatedly starting from the third row for columns 1 to 7

- Save the customer's sitting position information on the 3rd row

- Check repeatedly starting from the fourth row for columns 1 to 7

- Save the customer's sitting position information on the 4th row

- Release the seat position information of all customers that have been detected (Output)

Question!

1. Mention the position that was detected wrongly in experiment 3 questions 2!

2. Mention 5 activities that use the concept of repetition/looping that you have encountered!

4. Assignment

1. Lina Otter has 6 stamps, as shown below:

Figure 6. Lina's stamps

Using these stamps, Lina wanted to make a painting like in Figure 7.

Figure 7. The painting that Lina wanted

What sequence of stamps should Lina use to get a painting like the one above? Create the algorithm!

2. Before answering the questions in the following questions, make the algorithm first! The townspeople of Beaver City love to ride the colorful bikes. The city government has registered all bicycle parts that can be ridden. They have also published a series of rules for assembling bicycles. Figure 8 shows how bicycle parts can be combined to make a bicycle. Bike building always starts with the wheel and then follows which arrows to follow to build the bike.
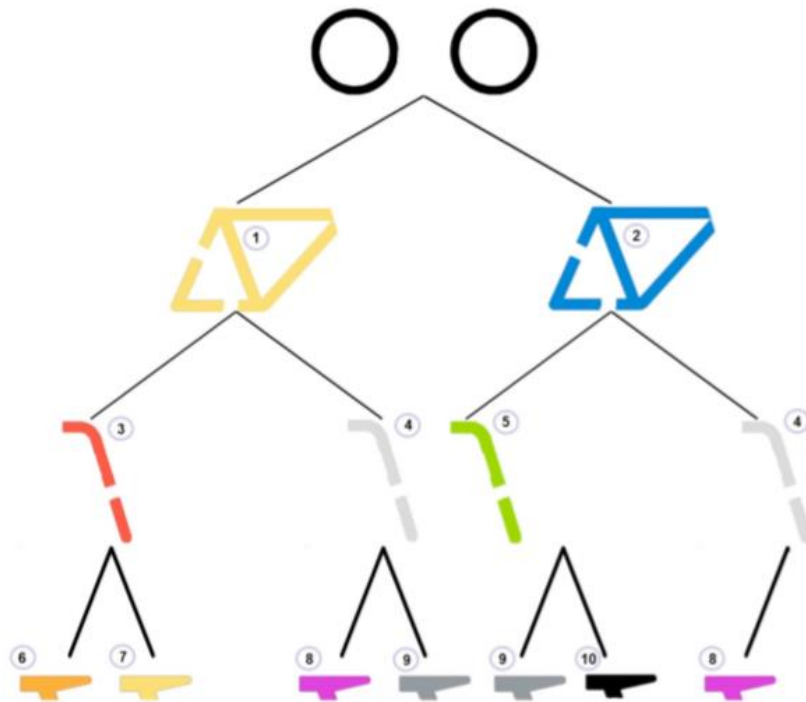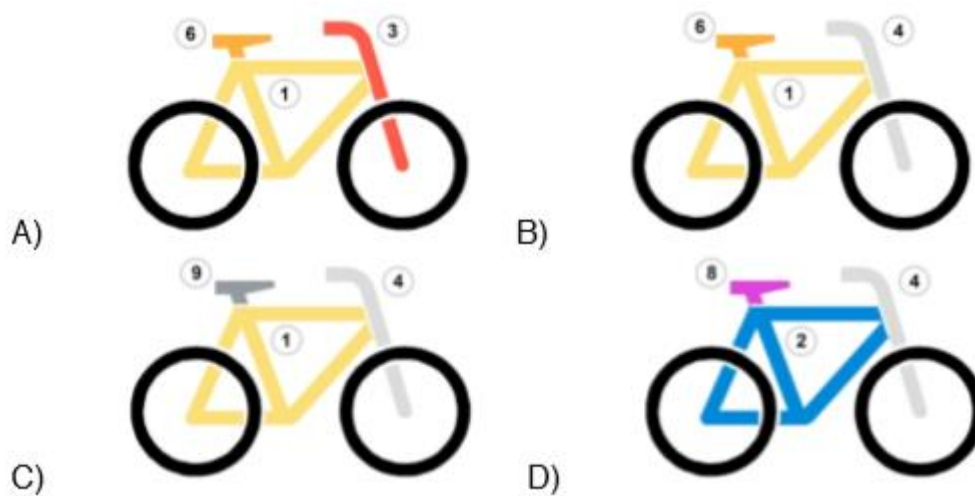
Figure 8. Bicycle Color Rule

In accordance with the above rules, which of the following bikes is unsuitable?

A)

B)

C)

D)

3. Do interviews with students in the same class (choose 10-15 students) as you! Record information about nickname, blood group, date of birth, month of birth, hometown, and hobby. Present the information in a network like the following example (free to use any networking media):
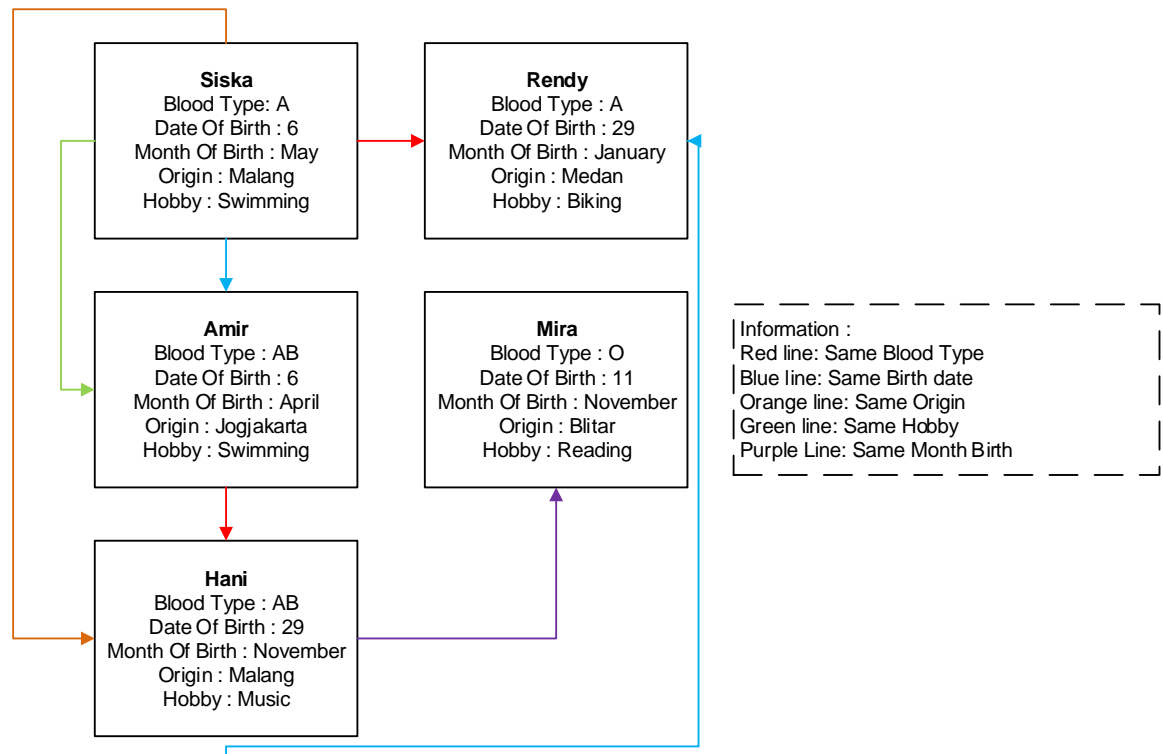
(The image above was created using Microsoft Office Visio)

Then answer the following questions:

1) Who has the same blood type as you?

2) Who were born in the same month as you?

3) Who was born on the same date as you?

4) Who are from the same area as you?

5) Who has the same hobby as you?

4. A laundry service "Smile Laundry" has a fee rule like this one

-   The fare for every 1 kg of clothing is Rp. 4,500.

-   If the customer washes clothes more than 10 kg, the customer will get a 5% discount

Today, Laundry only has 4 customers, namely Ani, Budi, Bina, and Cita. Ani brought 4kg of clothes, Budi brought 15kg of clothes, Bina brought 2kg, and finally Cita brought 11kg. What did Smile Laundry think that day? Create the Algorithm!