Case Study

Basic Programming Teaching Team 2022

Objectives

After studying this material, students should be able to:

1. Identify inputs, processes, and outputs from case study problems (sequence, selection, looping)

Review

Algorithm Structure

1. **Sequential structure:**
   Used for programs that have sequential statements
2. **Selection structure:**
   Used for programs that use selection conditions
3. **Loop structure:**
   Used for programs that have statements that will be executed repeatedly.

Algorithm Criteria

- Input

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

- Output

  The minimum output consists of one result.

- Definiteness

  Any instructions given should be clear and unambiguous.

- Finiteness

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

- Effectivenes

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

Week 2

CASE STUDY

How to Make an Algorithm

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

Case Study Example: Sequential (1)

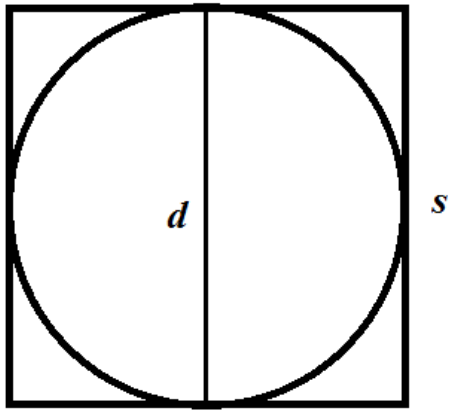
The Bobi beavers have set up the breakfast table as shown in the picture. There are tablecloths, knives, plates, napkins, cups and saucers. Create an algorithm that Bobi uses to set the table!

Example Answer

- **Input**: tablecloth, knife, plate, napkin, saucer-cup
- **Process**:
  - Attach the tablecloth
  - Put down the cups and saucers
  - Put down the napkin
  - Put the plate down
  - On the plate, put the knife
- **Output**: The breakfast table has been set up
- **Other data**: -

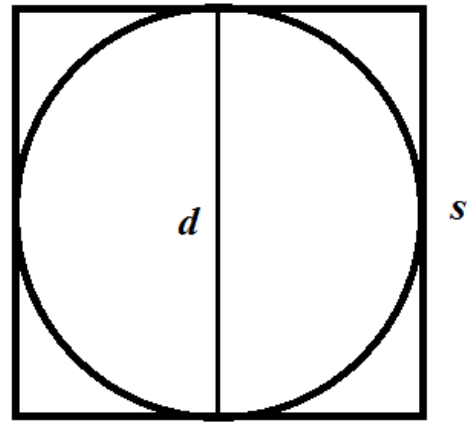
Case Study Example: Sequential (2)

Mr. Ahmad owns a square land with sides of 100 meters. Inside Mr. Ahmad's land, there is a flower garden in the shape of a circle. Create an algorithm to calculate Mr. Ahmad's land area that is not planted with flowers!



Example Answer

- **Input**: land with a side of 100 meters
- **Output**: the area of land not planted with flowers
- **Process**:
  - Total land area (square)
    = side x side = 10,000 meters
  - Flower planted area (circle)
    = pi * r * r = 3.14 * 50 * 50 = 7850 meters
  - Area not planted with flowers
    = area squared - area of circle = 10,000 - 7850 = 2,150 meters
- **Other data**: -



Case Study Example: Selection

During the final exam, there is a rule that if a student has a score below 70 then the student takes a retest. Andi turns out to get a score of 90. Does Andi have to take the retest? Create the algorithm!

Example Answer

- **Input**: student's score
- **Process**:
  - Enter student's score
  - If the student's score is < 70, then the student must retake the test
  - If the student's score >= 70, then the student does not need to retest
  - Retest / no
- **Output**: retest / not
- **Other Data**: -

Case Study Example: Looping (1)

- **Problem**: ironing 5 pieces of clothing
- **Input**: clothes, electricity
- **Process**:
  - Prepare a base for ironing
  - Plug the iron cable into the power socket
  - When the iron is hot, start ironing
  - If the clothes have been ironed, then fold the clothes
  - Repeat the ironing steps until there are no clothes left
  - Fold the base and unplug the iron from the power socket
- **Output**: ironed clothes
- **Other data**: iron, ironing board

Discussion 1

- Mr. Ade has a paper in the shape of an equilateral triangle with a perimeter of 270 cm. Create an algorithm to determine the length of one side of the triangle!

Discussion 2

Ani has a series of numbers = 8, 7, 5, 10, 18, 4, 2.

For each number in the series, Ani wants to know whether the number is odd or even. Create the algorithm!

Assignment

Assignment 1

- Mr. Ade has a paper in the shape of an equilateral triangle with a perimeter of 270 cm. Create an algorithm to determine the length of one side of the triangle!

Assignment 2

Mr. Andi owns 5 agricultural land, each land is rectangular. What is the total area of Mr. Andi's land if each land has a different length and width. Create the algorithm!

- **Land 1:** Length: 100 meters, width: 50 meters
- **Land 2:** Length: 20 meters, width: 50 meters
- **Land 3:** Length: 50 meters, width: 60 meters
- **Land 4:** Length: 60 meters, width: 20 meters
- **Land 5:** Length: 30 meters, width: 20 meters

Assignment 3

- The beaver has a washing machine with two separate machines for washing and drying. Both machines have an operating cycle of half an hour, so each beaver needs 60 minutes to wash.
- Two beavers arrived in haste. They need to wash and dry their clothes as quickly as possible. How many minutes does it take to wash and dry clothes for two beavers? Create the algorithm