Basic Programming

Basic Programming Teaching Team 2022

Introduction

Course Description

Description of Basic Programming Courses

Basic Programming provides **knowledge and understanding** of the basic concepts of algorithms and basic programming so that in this course students **have a basis for solving logic problems** using flowcharts and pseudocode.

Course Objectives

At the end of this course, students are able to:

1. Mastering the concept of algorithms and can model them in the form of flowcharts and pseudocode.
2. Understand the basic concepts of programming to translate an algorithm model into a programming language.
3. Understand the concept of selection and looping algorithms and the use of arrays and functions / procedures.

Subject

1. Basic Programming (Algorithm Concept)
2. Case Study
3. Data Types, Variables, Constants, Values, Expressions, Input-Output
4. Selection
5. Looping
6. Array
7. Functions / Procedures

Introduction – Course Contract…(1)

Weeks	Materials
Week – 1	Basic programming
Week – 2	Case study
Week – 3	Data type, Variable, Input – Output, Sequence
Week – 4	**Quiz 1**
Week – 5	Selection 1
Week – 6	Selection 2
Week – 7	Looping 1
Week – 8	**Midterm Exam**
Week – 9	Looping 2
Week – 10	Array 1
Week – 11	Array 2
Week – 12	**Quiz - 2**

Introduction – Course Contract…(2)

Pertemuan	Materi
Week – 13	Function 1
Week – 14	Function 2
Week – 15	Review Materials (Week 1 - 14)
Week – 17	**Final Exam**

Assessment

- **Quiz: 20 %**
- **Assignment: 20 %**
- **Midterm Exam: 30%**
- **Final Exam: 30%**

Week 1

BASIC PROGRAMMING

Objectives

After studying this material, students should be able to:

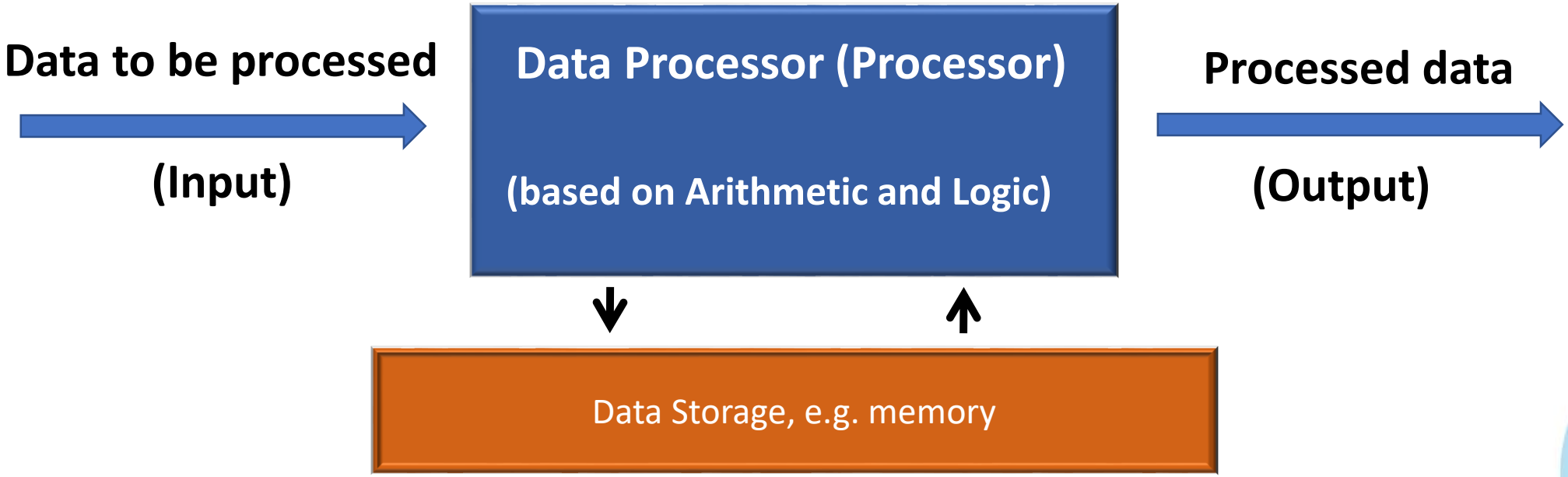
1. Understand the meaning and importance of algorithms
2. Understand the basic concepts of algorithms
3. Analyze simple problems

Introduction - What Is a Computer?

COMPUTER → **TO – COMPUTE + ER**

computing/processing numbers

processing data

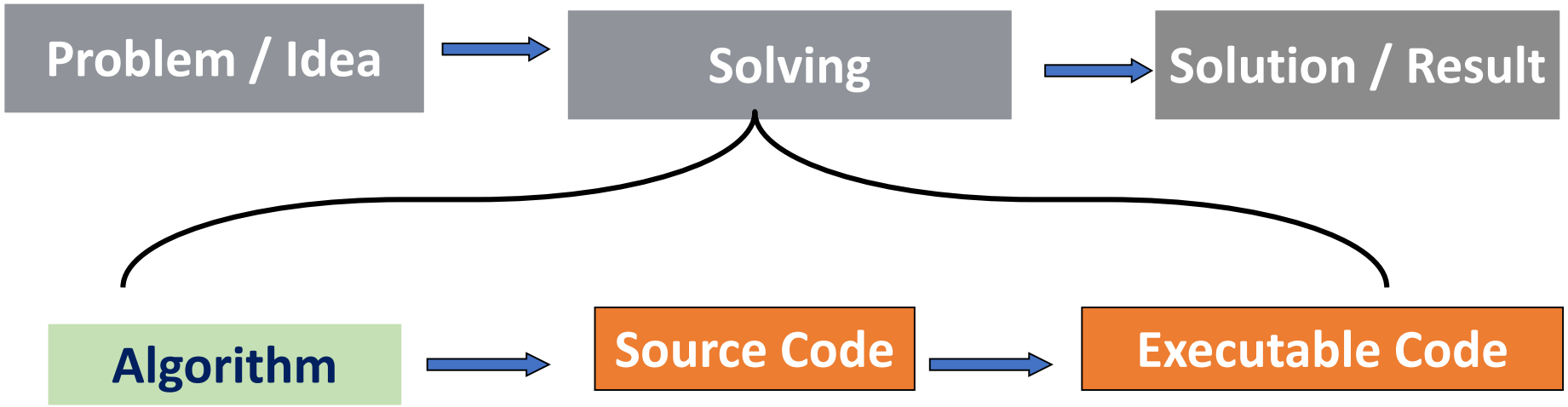


Algorithm…(1)

- Data processing requires algorithms
- Algorithm: a sequence of logical steps to solve problems arranged in a **systematic** and **logical** manner
- **Systematic**: the order of the steps arranged must be clear, have a certain pattern
- **Logical**: reasonable, readable, and acceptable to reason
- Can be judged right or wrong

Algorithm…(2)

- **Computer programming**
  - Algorithms are implemented in computer programs
  - A set of instructions or steps executed by a computer to solve a problem



Algorithm Assessment

- The results must be correct, as desired
- How good is the result of the algorithm
- Algorithm efficiency → time and memory

From **the same problem**, it is possible from one person to another will get a **different algorithm**. Everything is considered true, as long as the results obtained are as expected. However, among the different algorithms, we can choose which one is **more efficient**

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

Example

- **Problem:** cooking rice using a rice cooker
- **Process**:
  1. Prepare rice, water, rice cooker, and electricity.
  2. Wash the rice
  3. Put rice in the rice cooker, add water.
  4. Plug the rice cooker cable into an electric socket.
  5. Select cooking mode for cooking rice.
  6. Cooked rice
- **Structure**: **Sequential**

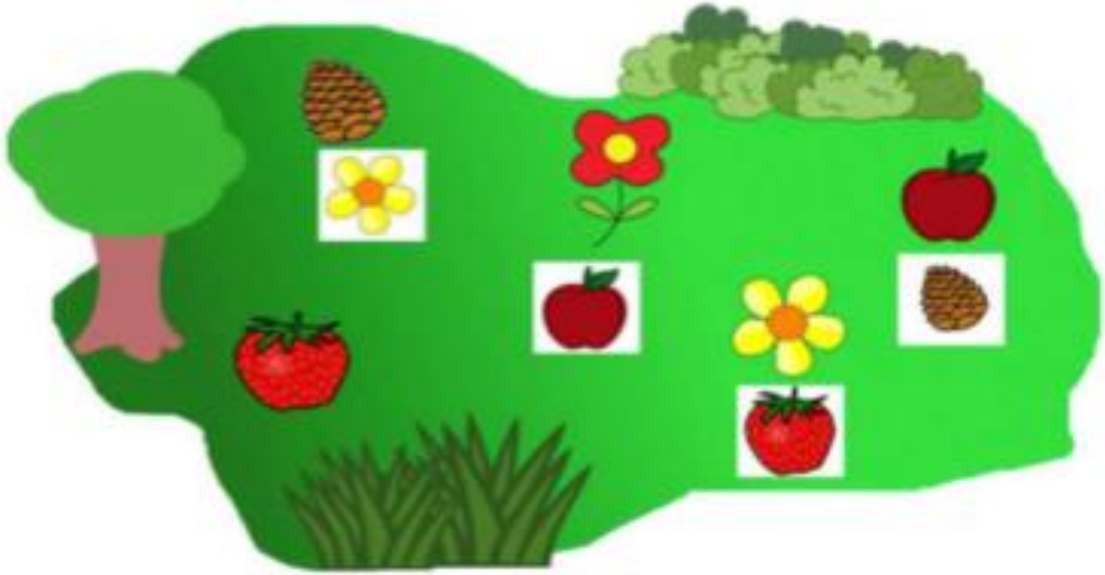
Computational Thinking

What is Computational Thinking?

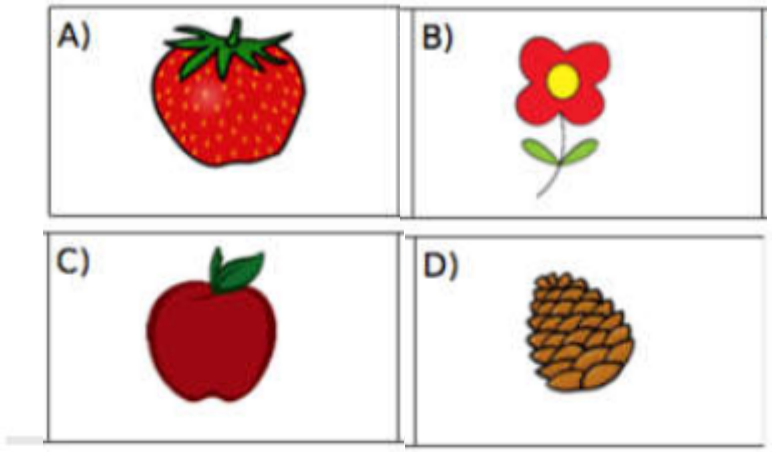
- Computational Thinking (CT) is a way of thinking to solve problems, design systems, understand human behavior.
- CT is the basic concept of informatics.
- CT means thinking to create and use several levels of abstraction, from understanding problems to proposing solutions for effective and efficient solutions.

Example 1

- The Beaver family is preparing a Food Festival, they want to bake cookies. Kati is going to make the cake. She pays great attention to the order of making the cake by putting the ingredients in the right order.
- As she walked in the garden, she saw that there was a piece of paper on each ingredient in the cake that had to be used. **The picture on the paper describes the cake ingredients that must be added in the next sequence.** There is only one cake ingredient that has no paper. The garden is illustrated as shown below.



Which cake ingredients should be entered first?

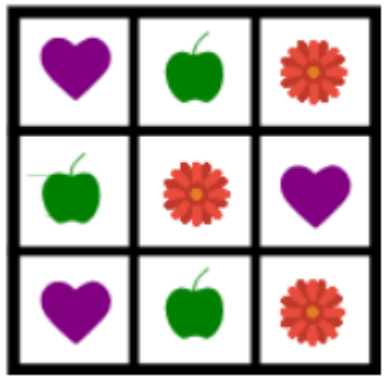


Example 2

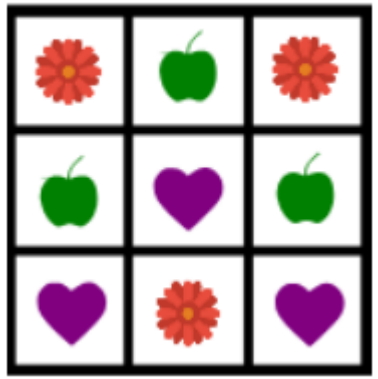
Beni has to fill in 9 boxes in the field with 3 kinds of stickers. Each sticker contains one image. The condition is that on each row or column, there cannot be stickers with the same image.

Which sticker arrangement is correct?

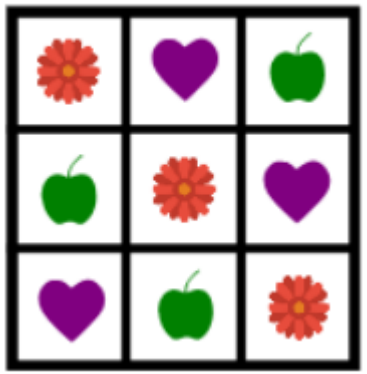
A)



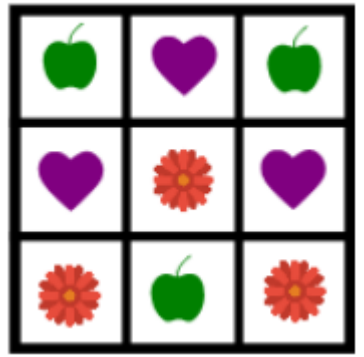
B)



C)

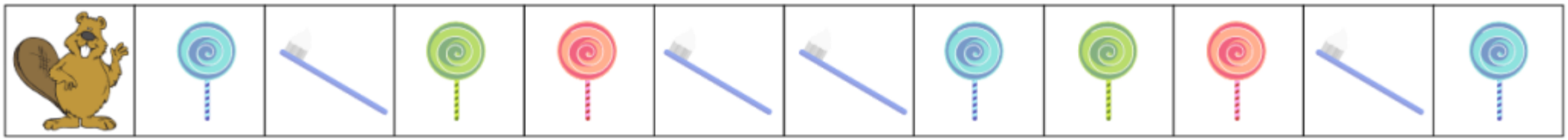


D)



Example 3

Bebras found an alley consisting of a row of boxes, each containing a lollipop or a toothbrush. He must walk along the alley to the end of the right and must not go back or turn around to the end of the left. Bebras can brush his teeth if he find a toothbrush. After eating two lollipops, he had to brush his teeth before he could eat again. In each box, he can only eat lollipop, or brush his teeth, or just walk. He can't take a lollipop or a toothbrush to the next step.



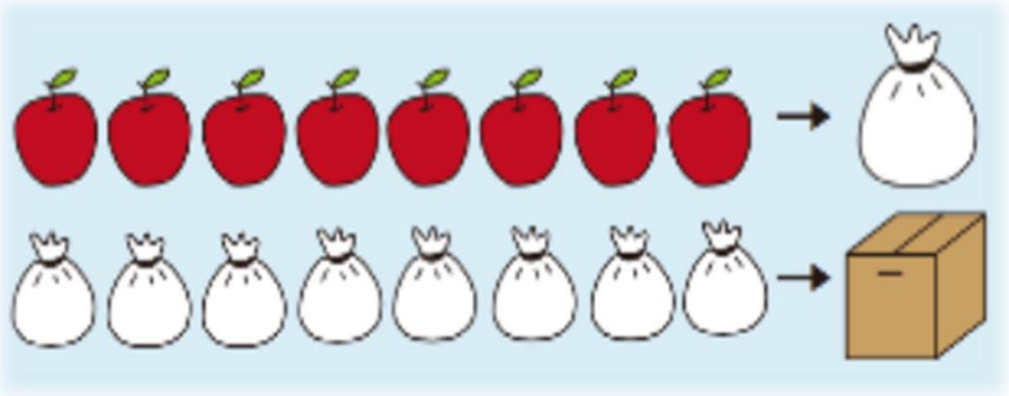
How many lollipops can he eat and keep his teeth healthy?

A. 3 **B. 5** **C. 6** **D. 7**

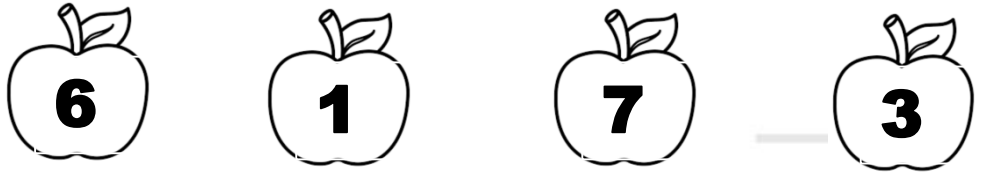
Example 4

The Bebras family owns an apple orchard. After harvest, they want to pack the best they can to sell. They pack according to the following rules:

1. Apples are put in the bag. Each bag is filled with 8 apples. If there are less than 8 apples left, the apples are left unpackaged.
2. Bags will be put into cardboard boxes, each box contains 8 bags. If there are less than 8 bags left, the remaining bags are not put into the cardboard box.

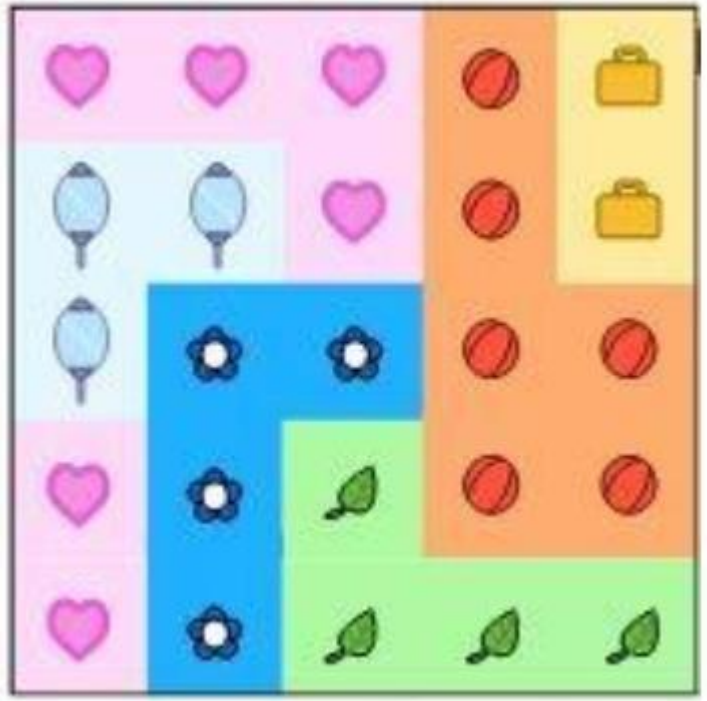


Today, they harvest 275 apples. How many apples are left in the bag?



Example 5 - Sequential

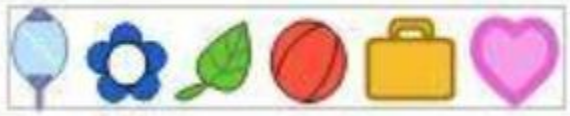
Robin the beaver wants to stick paper on the walls of his 5x5 room, using squares of paper in different sizes and colors. The papers are always pasted without going beyond the borders of the walls and without cutting them. He piled one paper on top of another. The results are shown in the following picture.



If the result looks like the picture, what order Robin pasted the paper?

A) 

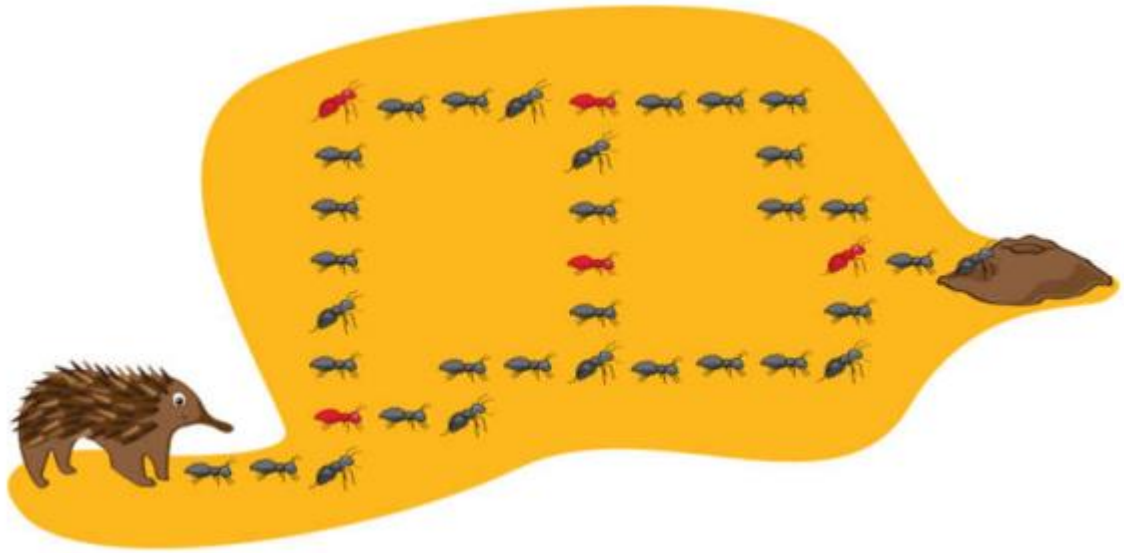
C) 

B) 

D) 

Example 6 - Selection

A hedgehog named Etna (in the lower left corner) wants to go to the ant hill. In order to go there, he had to collect red ants. Help Etna determine the path by telling the direction: Right (to go right), Left (to go left), Up (to go up), Down (to go down).

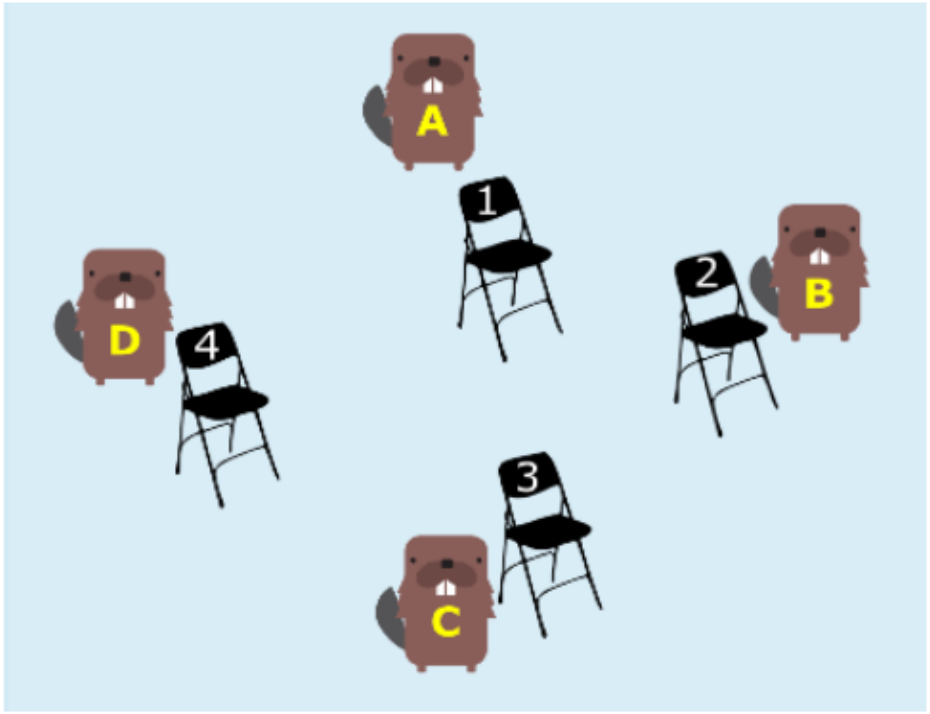


Which order should be given to Etna?

A. Right, Up, Right, Up, Right, Up, Right, Down, Right, Down, Right
B. Right, Up, Right, Down, Right, Up, Right
C. Right, Up, Right, Up, Left, Down, Right
D. Right, Up, Right, Down, Right, Down, Right

Example 7 - Looping

- A group of 4 beavers play "chair-music" which is a game of changing chairs while the music is played.
- When the music starts, each beaver must move to the chair in a clockwise direction. One seat can be occupied by more than one beaver.
- At each round, the beaver (A) will move three seats. The beaver (C) will move two seats, while others (B, D) will only move one seat. All beavers move clockwise.

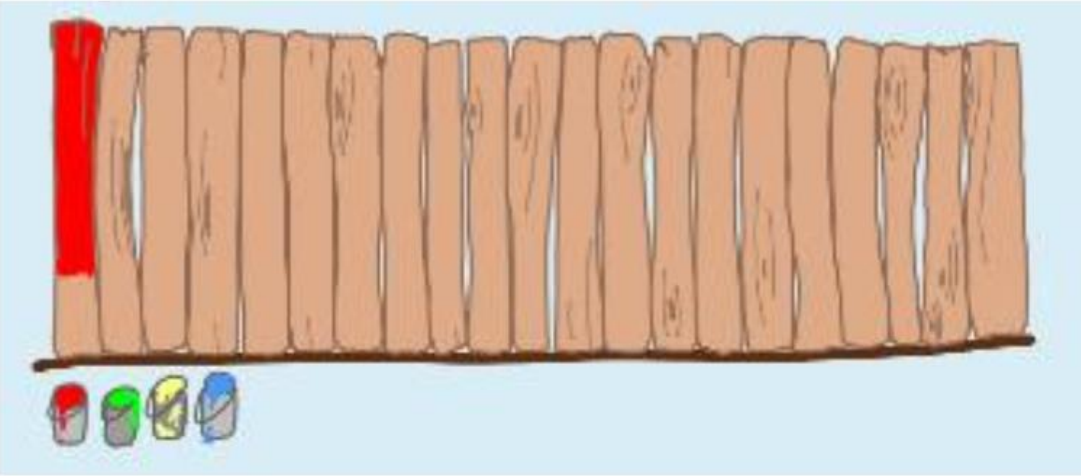


If the initial position of each otter is as shown in the picture, which seat is empty in the 3rd round?

A. 1 B. 2 C. 3 D. 4

Example 8 - Looping

A painting robot initially has 4 paint cans, each containing red (R), green (G), yellow (Y), and blue (B) paint. It will paint the Bebras fence made of rows of boards and color each board using only one color. Then it will color the next board with the next color in the order red, green, yellow, blue (R-G-Y-B). If the robot has colored the last color (B), it will return to the first color (R). If one of the paint cans runs out, the robot will throw the paint can, and continue to color with the remaining paint cans, and so on, so that all paint cans are empty or paint is left in one can, because two consecutive boards cannot be the same color.



How many boards can the Robot paint until it stops?

At first, the robot is equipped with 4 cans of the following colors:

1. Red, enough to paint 5 boards
2. Green, enough for 3 boards
3. Yellow, enough for 7 boards
4. Blue, enough for 2 boards

A. 8

C. 15

B. 17

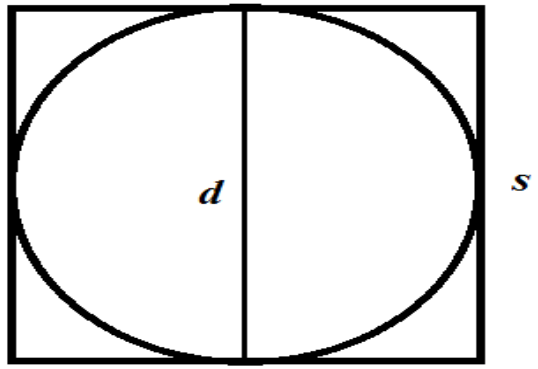
D. 5

Is there any question?

Assignment

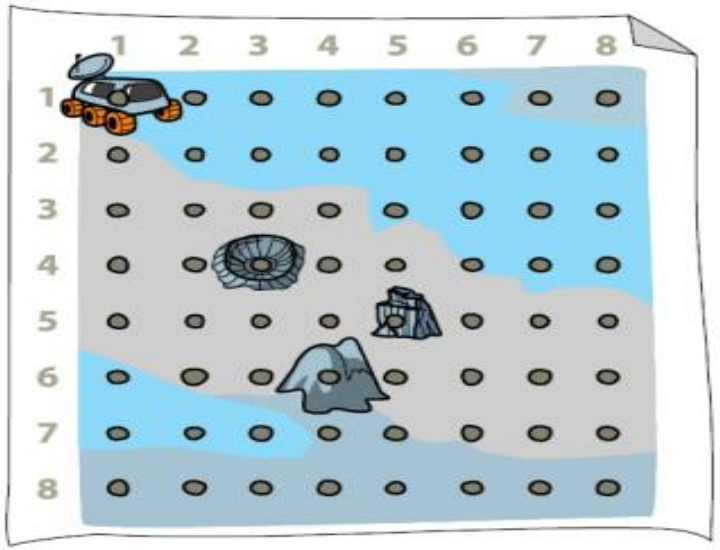
Assignment 1

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!



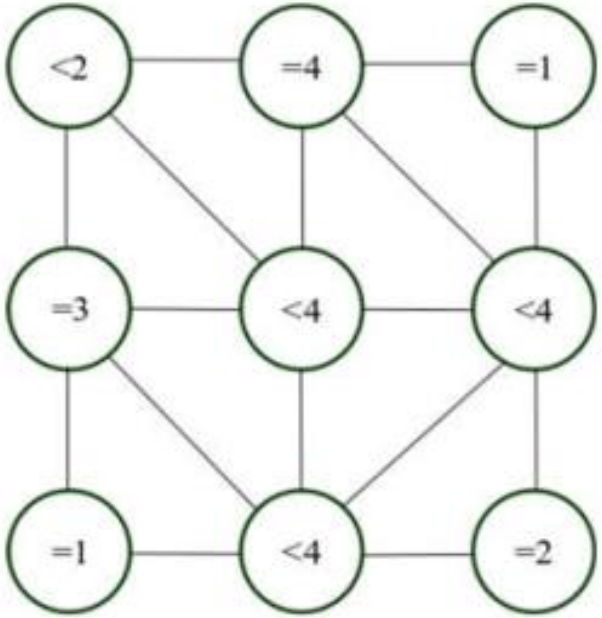
Assignment 2

A lunar rover controlled by an otter moves from one direction to another using the map below. The path traversed is from (1,1) to (8,8). The first number is the row and the second is the column. Create an algorithm to determine where the object mountain is!



Assignment 3

Your task is to color the circles in the following image. The circles are connected with neighboring circles (which are connected directly using lines). There are 9 circles and 16 relationships between two circles. The numbers written in the circle indicate the number of neighbors that must be colored. For example, a circle with the words "= 3", means that 3 out of 4 of its neighbors must be colored. A circle with the words "<4" means the neighbor circle that must be colored less than 4. Create an algorithm to calculate how many circles you should color!



Assignment 4

Employee net salaries at PT. Sentausa is obtained from the total base salary and allowances, then deducted by taxes. The basic salary for employees of PT. Sentausa is Rp. 2,000,000, -. The allowance is calculated as 20% of the basic salary. Meanwhile, tax is 15% of basic salary plus allowances. Create an algorithm to calculate the net salary of employees at PT. Sentausa!