

Lab4 – Create a Process Flowchart

Objectives

Part 1: Recognize Symbols Used in a Flowchart and List Logical Process to Solve a Problem

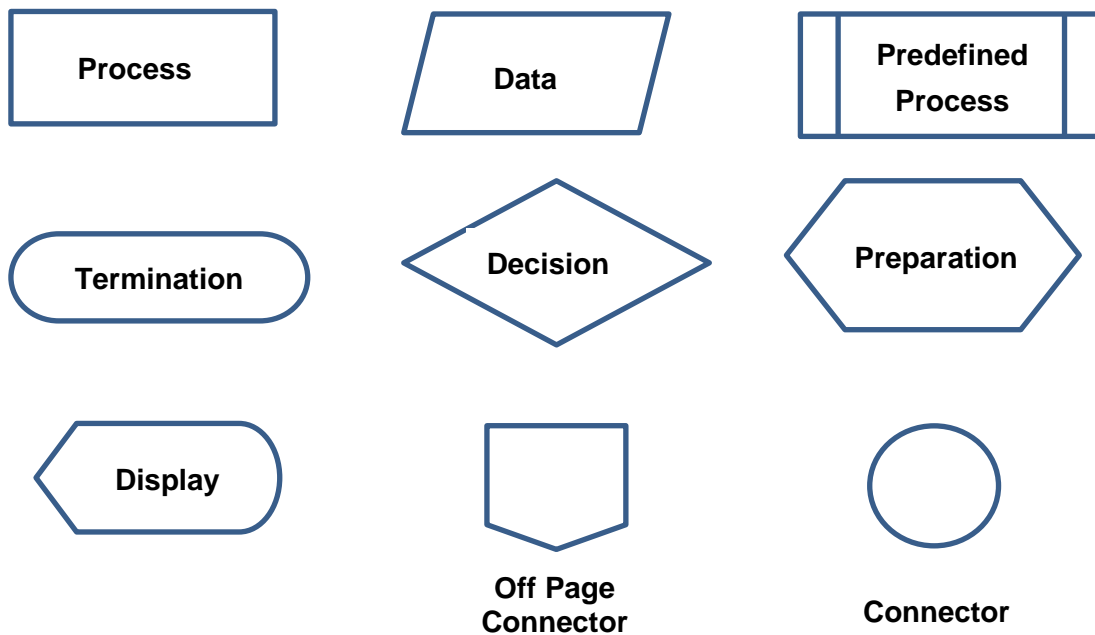
Part 2: Draw the Flowchart to Illustrate the Problem Solving Process

Background

Flowcharts are diagrams used to represent processes or workflows. Using different shapes, boxes, and connecting arrows, a flowchart represents the solution flow to a given problem. Flowcharts are commonly used to represent programs, algorithms, or any ordered process in various disciplines. Flowcharts are typically created prior to starting a process or writing an application in order to verify and catch potential logic flows toward the solution before it is developed and implemented.

Flowcharts can be hand drawn or created using a number of packages including Microsoft Office products, LibreOffice, GoogleDocs, and various web applications such as <https://www.draw.io/>.

Some of the most common flowchart symbols that used for programming are shown in the diagram along with their intended purpose for the symbol. Lines with arrows indicate the flow of the problem solving process.



Scenario

You are required to develop a systematic process to find a predetermined number. The process developed is represented in a flowchart. Using the flowchart, we can check and verify the logical process toward the problem.

Required Resources

- This lab can be done with paper and pencil or a PC with internet access (or office productivity applications, such as Microsoft Office, LibreOffice, and GoogleDocs).

Part 1: List the logical steps required to solve a problem

The problem is to develop a process to find a predetermined number. The process can be programmed as a simple computer game. A player is asked to think about an integer number between 0 and 128, The program will use the bisection method to find the number.

Step 1: List the steps needed to solve the problem.

- a. Ask the player to think about an integer number between 0 and 128.
- b. Set **a** as the lower end, **b** as the high end, and **t** as the time of calculation
- c. Set initial values, **a** = 0, **b** = 128, **t** = 0
- d. Calculate the average number between a and b. Set it as M.
- e. Set **t** = **t** + 1
- f. Ask the player if **M** is the correct number:
 - If yes, print "The number you thought of is M and I guessed it **t** tries." End the process.
 - Else
 - If **t** = 6
 - If yes, print "I am sorry that I cannot guess it after 6 attempts." End the process.
 - Else
 - Ask the player if **M** is larger than the correct number:
 - If yes, set **a** = M, jump to Step d.
 - Else
 - Set **b** = M, jump to Step d.

Questions:

Can the process catch if the number the player has chosen is 0 or 128? Why or why not?

Because the method used is bisection, the test number is an average of low and high ends. The average number is set as an integer. Therefore, the process cannot catch 0 or 128

If 0 or 128 cannot be caught, what should be done to correct it?

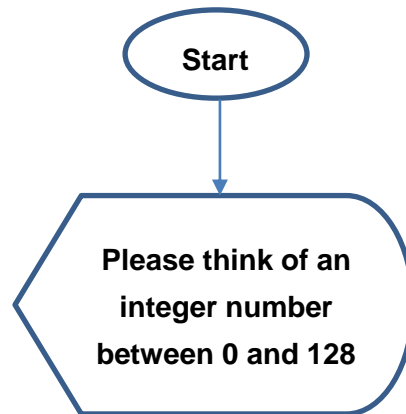
Answers vary. From the problem itself, we can prevent a player from choosing 0 or 128. For example, specify, "Please think a number between 1 and 127 inclusively". However, a better solution is to modify the process to check if 0 or 128 is the correct number before calculation starts.

Part 2: Draw the Flowchart

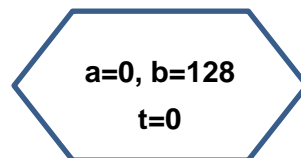
Step 1: Use appropriate flowchart symbols for each functions.

Because the list of process steps is identified, we can use flowchart symbols to represent each step.

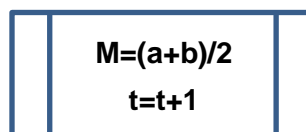
- a. Use an oval symbol as Start and a Display symbol to ask questions. Use a line to link them:



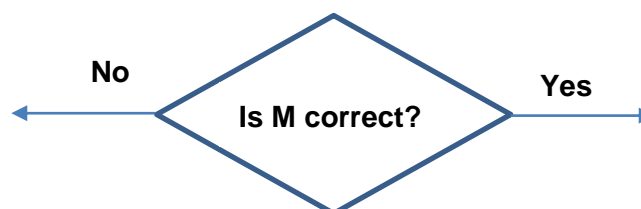
- b. Use a preparation symbol to make initial assignment:



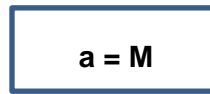
- c. Use a predefined process symbol to define a process function or routine:



- d. Use a decision symbol to represent a condition test:

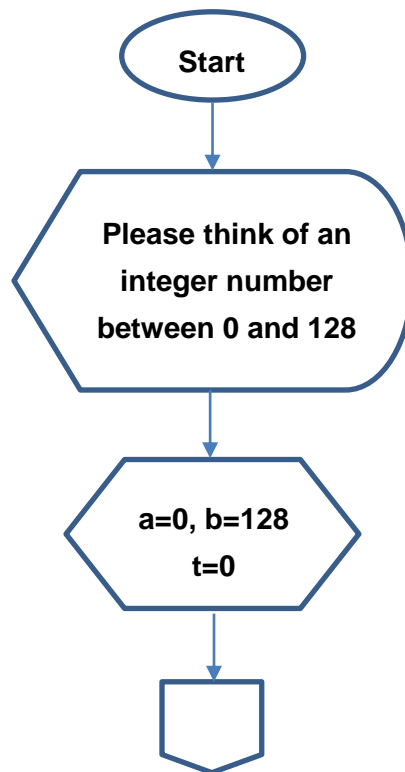


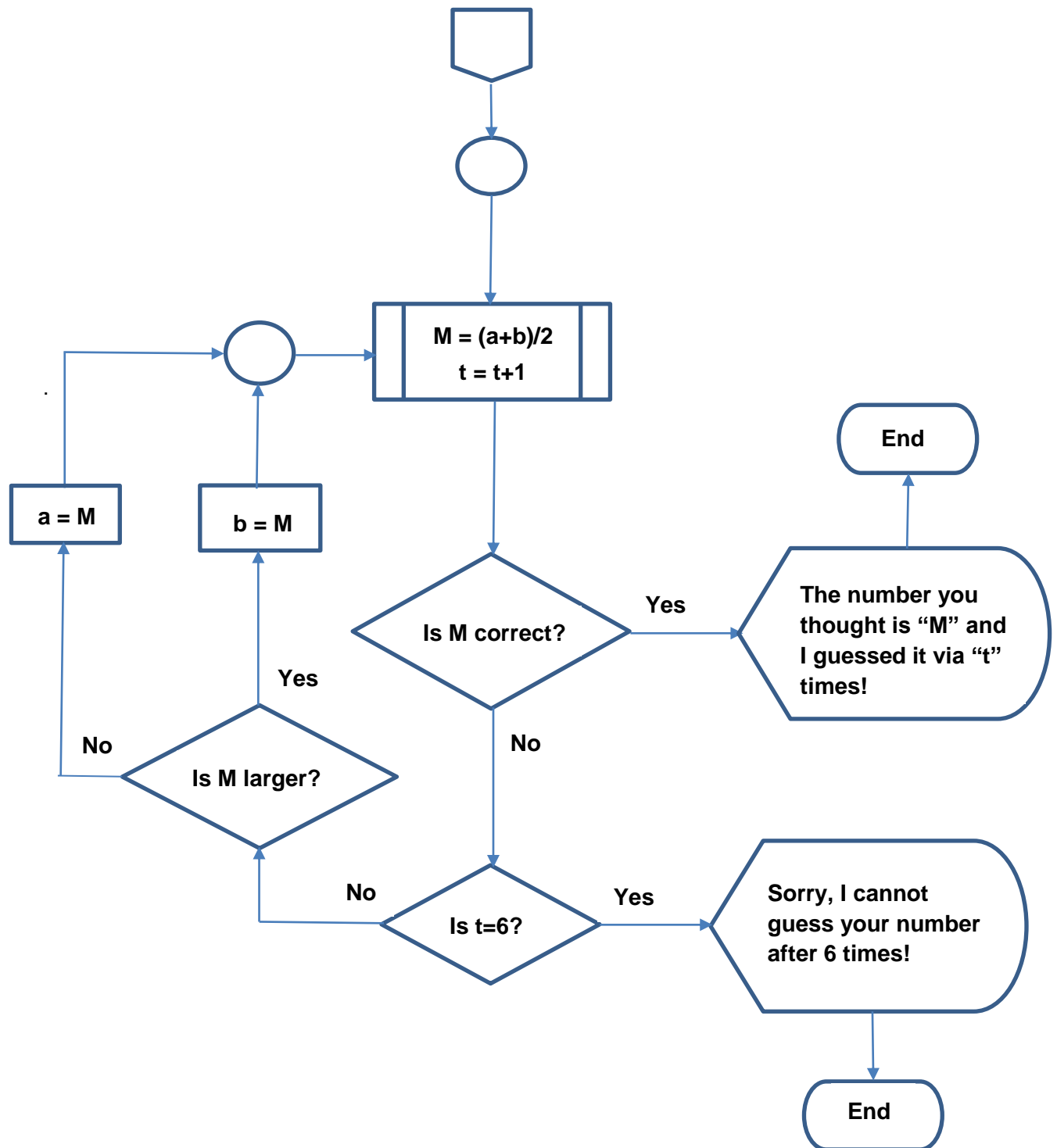
- e. Use a process symbol to represent an operation:



Step 2: Draw the complete flowchart.

Now we can use symbols to draw a complete flowchart. We will use the **Off Page Connector** and **Connector** to extend the flowchart to next page :





Reflection

What is the significance of testing if $t=6$?

128 is 2^7 . With bisection method, the maximum number needed to find a number within the range of 1 to 127 is 6.

Where should the test for the numbers 0 and 128 be placed?

To reduce unnecessary processing, these two tests should be performed as soon as we get the input from the player, for example, before the initial values for the parameters are assigned.