Lab - Create a Process Flowchart

Objectives

Part 1: List the Logical Steps to Solve a Problem

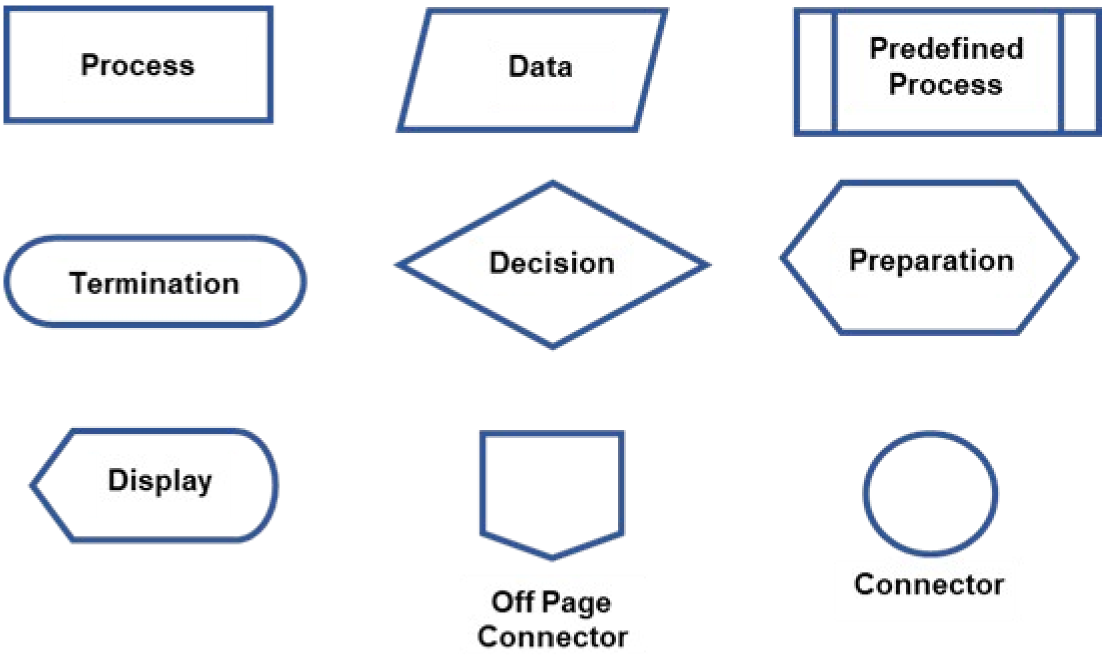
Part 2: Draw the Flowchart

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 used for programming are shown in the diagram along with the 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.

Instructions

Part 1: List the Logical Steps 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.

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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 in 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? Explain.

This process can't catch if the number chosen is 0 or 128 because it runs by finding the integer average of a and b, which are never equal. This results in an M that will never reach either of those numbers.

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

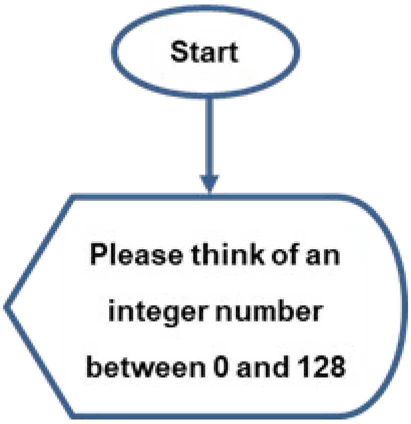
The program should execute a check at t = 6 for a = 0 and b = 128 and if either is true, that number should be returned.

Part 2: Draw the Flowchart

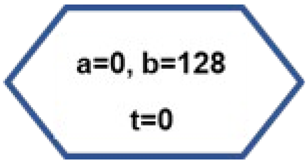
Step 1: Use appropriate flowchart symbols for each function.

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

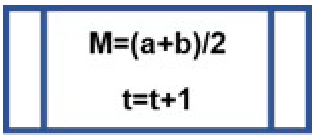
a. Use an oval symbol as Start and a Display symbol to ask questions. Use a line to link them:



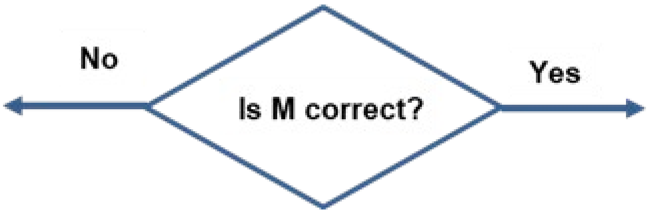
b. Use a preparation symbol to make initial assignment of values:



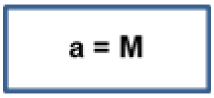
c. Use a predefined process symbol to define a process function or routine:



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

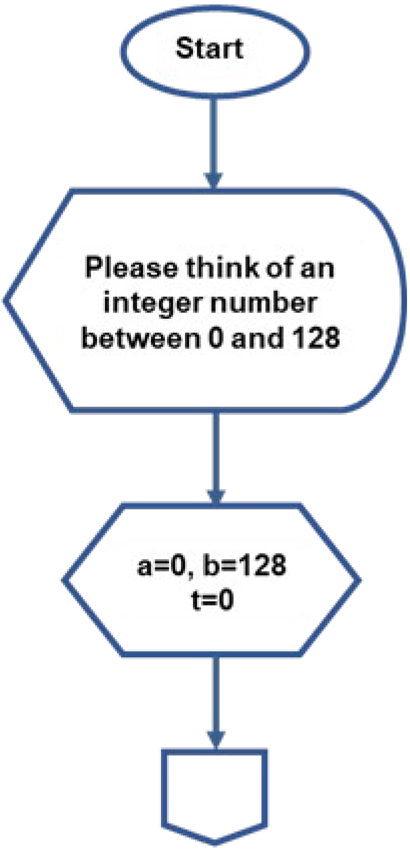


e. Use a process symbol to represent an operation:

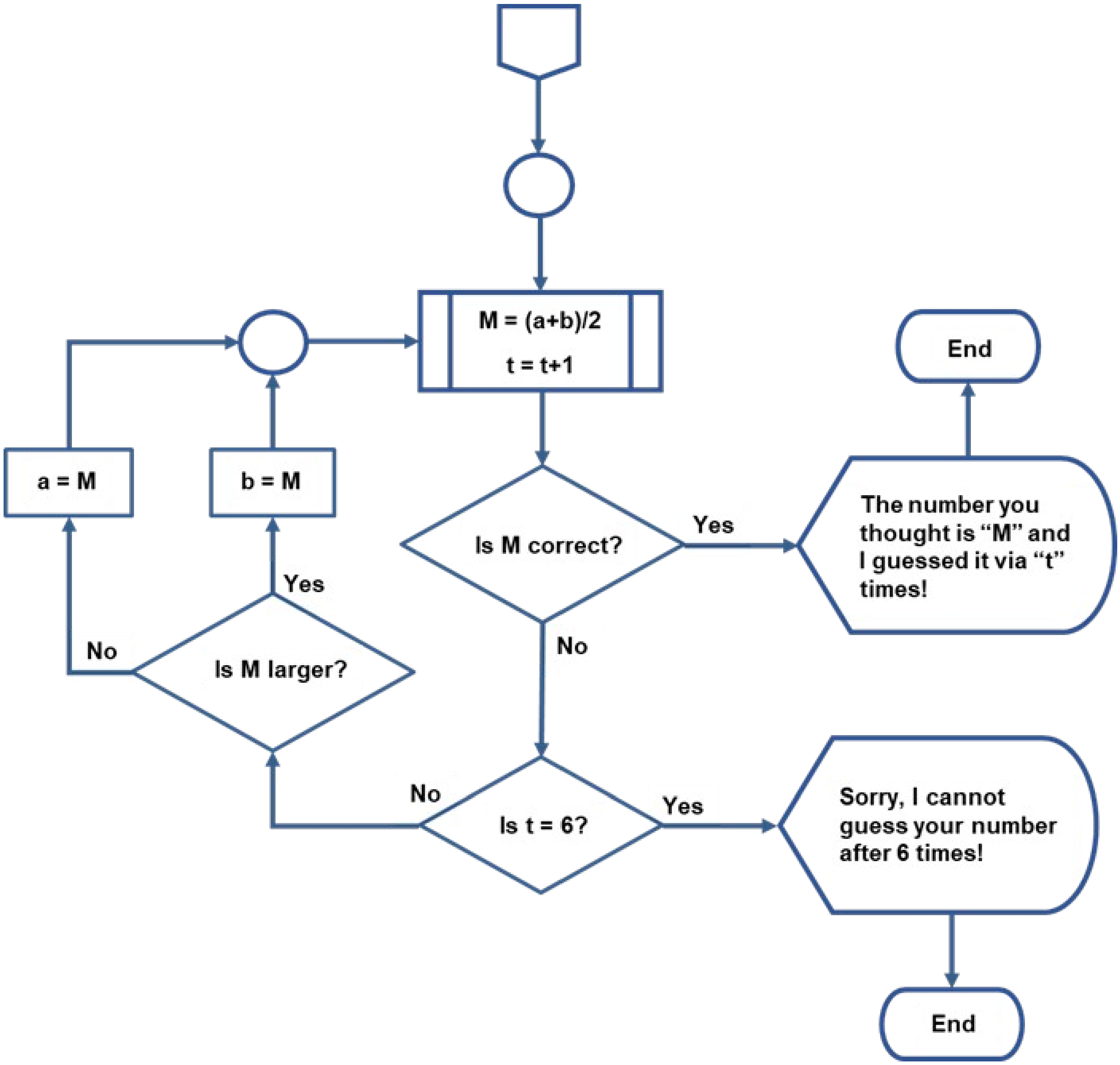


Step 2: Draw the complete flowchart.

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:



The flowchart can continue on the next page with the Off Page Connector and Connector.


M = (a+b)/2
t = t+1
End
a = M
b = M
Is M correct?
Yes
The number you thought is "M" and I guessed it via "t" times!
Yes
No
Is M larger?
No
No
Is t = 6?
Yes
Sorry, I cannot guess your number after 6 times!
End

Reflection

1. What is the significance of testing if t=6?

At t = 6, a and b are 1 unit apart, which would make M never change in further calculations. Stopping the program there ensures it doesn't unnecessarily run.

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

The program should execute a check at t = 6 for a = 0. If that is true, it should set M to 0 and, if it is false, it should set M to 128.