

**CL-118 Programming  
Fundamentals**

**LAB – 02**

**Problem solving with decision and  
iterative structures using Scratch**

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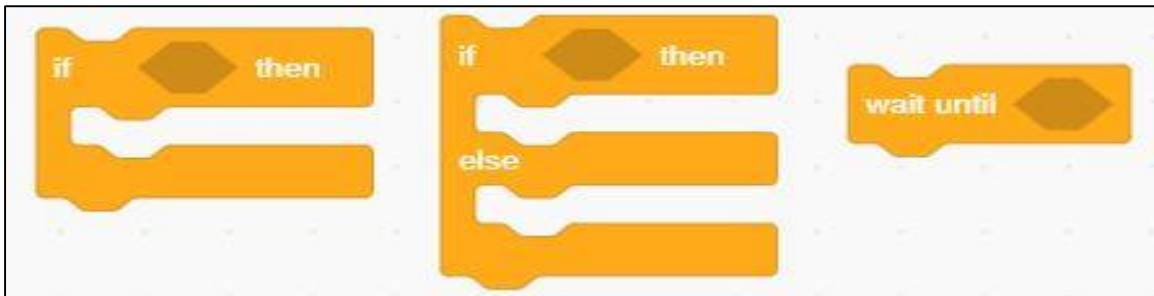
NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES

Fall 2021

## Introduction to Decision and Iterative Structures

**Decision Structure:** A statement or a set of statements that is executed when a particular condition is “True” and ignored when the condition is “False”.

In scratch, we use the following control diagrams for decision structure.



**Example:** Given a number as an input by a user, check if the number is a negative number or a positive number.

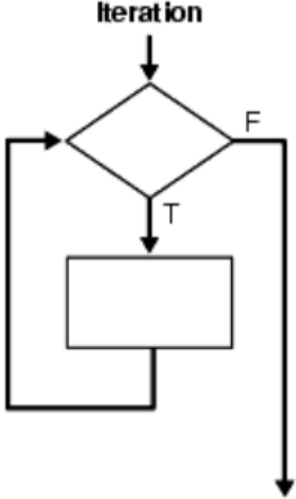
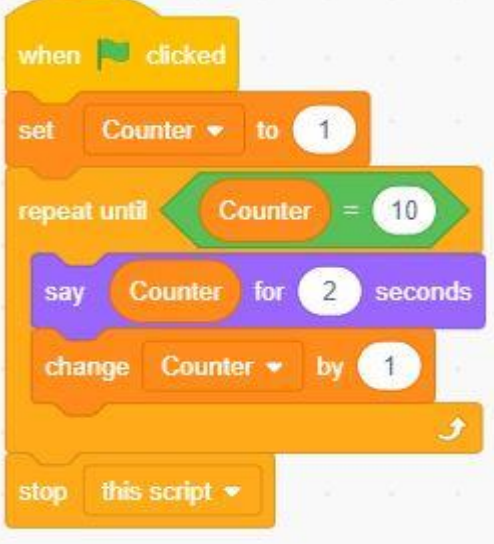

<u>Flowchart of Decision Structure</u>	<u>Scratch Diagram</u>	<u>Output</u>
<pre> graph TD     Start([Start]) --&gt; Selection{ }     Selection -- T --&gt; PathT[ ]     Selection -- F --&gt; PathF[ ]     PathT --&gt; Join(( ))     PathF --&gt; Join     Join --&gt; End([End])         </pre> <p>The flowchart illustrates a selection structure. It starts with a 'Selection' label pointing to a diamond-shaped decision node. Two paths emerge from the diamond: one labeled 'T' (True) leading to a rectangular process box, and another labeled 'F' (False) leading to another rectangular process box. Both paths converge at a circular join node, which then leads to an 'End' node.</p>	<pre> when green flag clicked ask Any Number and wait set Number to answer if answer &lt; 0 then say It's a negative number for 2 seconds else think It's a positive number for 2 seconds         </pre> <p>The Scratch diagram shows a script starting with a 'when green flag clicked' event block. It follows with an 'ask Any Number and wait' block, then a 'set Number to answer' block. An 'if' block checks the condition 'answer &lt; 0'. If true, it says 'It's a negative number' for 2 seconds. If false, it thinks 'It's a positive number' for 2 seconds.</p>	<p>The output shows the Scratch stage with a character (a girl) standing in front of a blackboard. A speech bubble above the character says 'It's a positive number'. In the top left corner, a variable 'Number' is shown with the value '15'.</p>

**Iterative Structure:** The statements that cause a set of statements to be executed repeatedly either for a specific number of times or until some condition is satisfied are known as iteration statements.


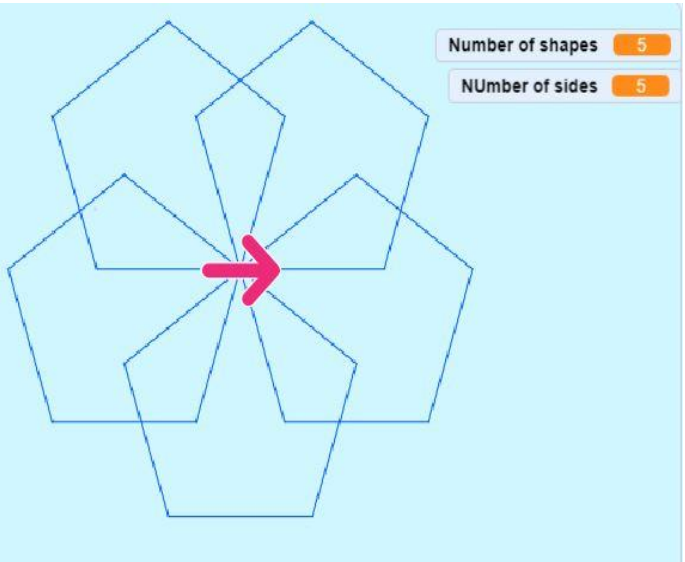
In scratch, we use the following control diagrams for iterative structures:



**Example:** Set a counter to 1 and repeat until the given condition is satisfied. In this case, the given condition is counter =10.

Flowchart of Iterative Structure	Scratch Diagram	Output
		

**Example:** Draw a pentagon with the help of repeat and pen diagrams. Repeat the shape for five times.

Scratch Diagram	Output
	

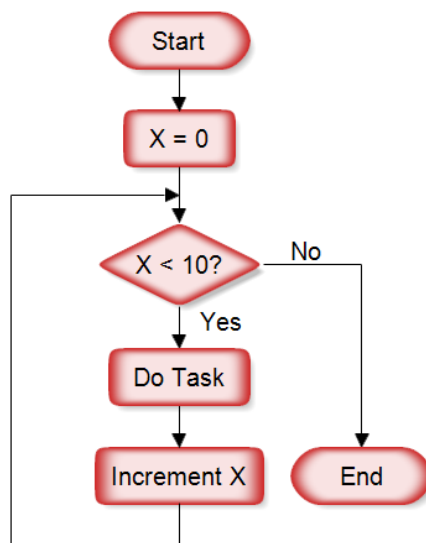
## Exercise Questions

**QUESTION # 1:** Take a number as an input from a user. Check if the number is an even number or an odd number. Draw a flowchart on your notebook. Convert the flowchart into scratch diagram.

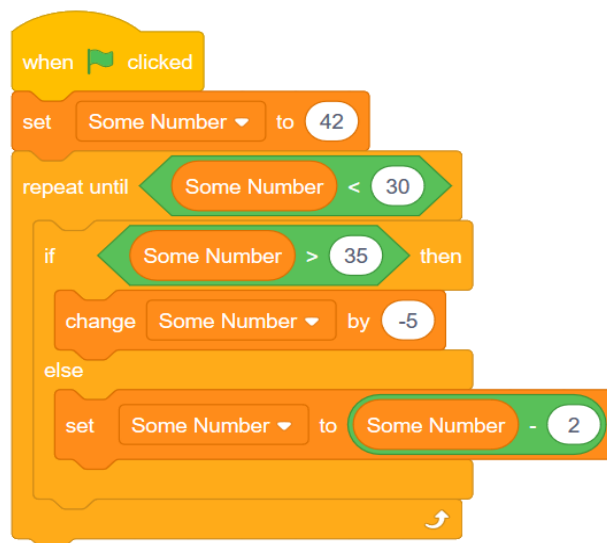
**QUESTION # 2:** You are supposed to create a mark sheet. There are total five subjects. Each subject has equal marks i.e., 100, therefore total marks are 500. Take marks of five subjects as an input from the user. Calculate the percentage. If the percentage is below 50, he/she is pass else he/she is fail. Draw a flowchart on your notebook. Convert the flowchart into scratch diagram.

**QUESTION # 3:** Draw a hexagon that has six sides. Repeat the hexagon for the same number of times as of its size.

**QUESTION # 4:** Given below is a flow chart. Identify the decision and iterative structures in it. Convert the flow chart in to scratch diagram.



**QUESTION # 5:** Given below is a scratch diagram. Write a description of the diagram as well as draw it's flowchart on your notebook.



**QUESTION # 6:** Create a scratch program that takes a number from user and prints its table till 20.

**QUESTION # 7:** Create a scratch program where you display a conversation between two characters. The story should have at least 5 dialogues for each character.

**QUESTION # 8:** Create a translate application in which user enters a sentence and your program should translate that sentence into any foreign language (e.g. Arabic, French, etc.)

**QUESTION # 9:** Create a scratch program that takes an alphabet from user and decides whether that alphabet is a vowel or a consonant

Good Luck 😊