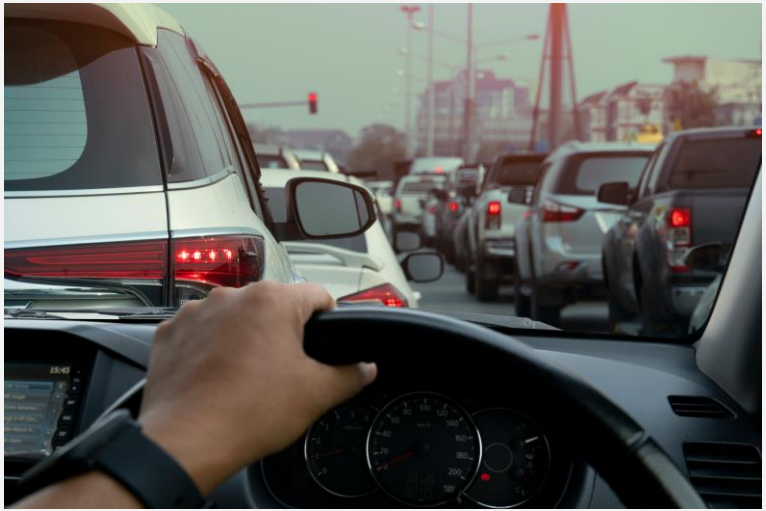
Think and Tell

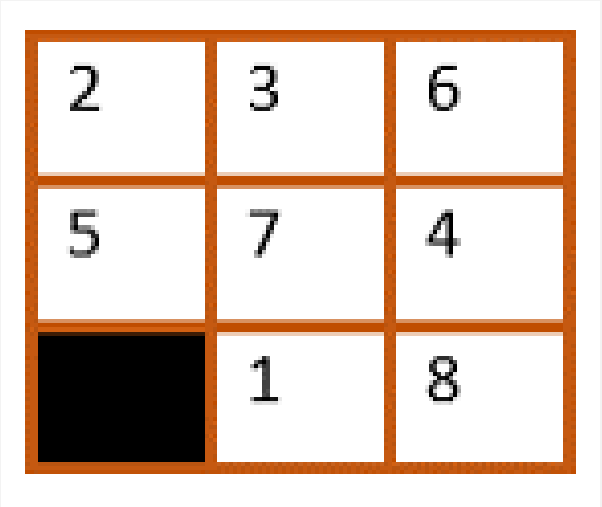


What do you do when you get stuck in a traffic jam and have a flight to catch?

Snow Trekking

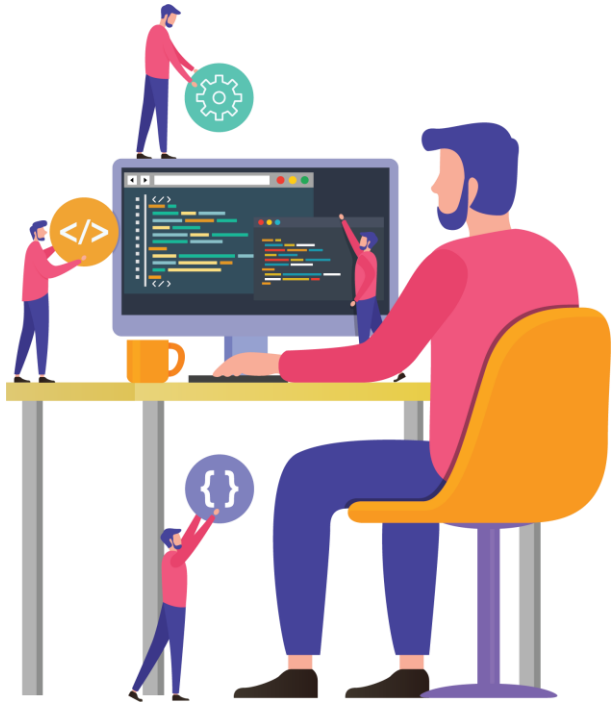
What will you do to prepare yourself for a snow trek?

Slider Puzzle



- Have you ever solved a slider puzzle?
- What technique did you use to solve it?
- Can a computer solve a 3 × 3 slider puzzle on its own?

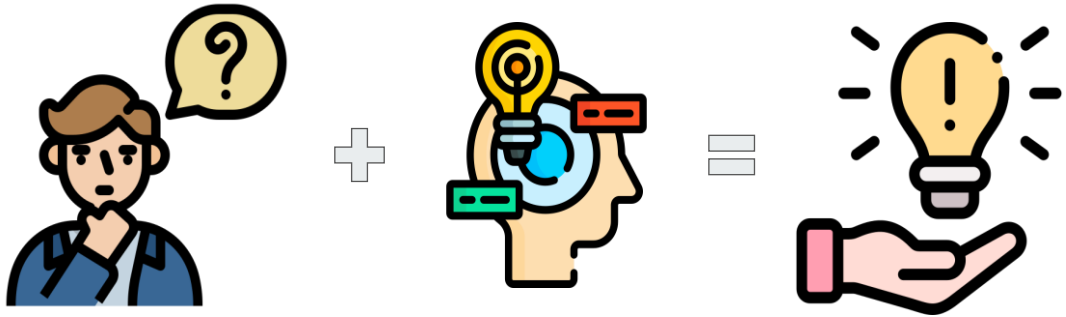
Decompose a Problem into Computational Steps



Learning Objectives

- Use problem solving tools and techniques
- Solve problems using algorithms
- Represent solutions using flowcharts
- Draw flowcharts using Raptor
- Write pseudocode to identify solutions
- Create Scratch programs

Steps Required to Solve Problems



Problems Thinking

1. What is problem solving?
2. Why is it important for programmers to have this skill?

Steps Required to Solve Problems

- Read the problem statement
- Analyze what needs to be done
- Define the steps required to solve the problem
- If the problem is too big to be solved, break it down into subproblems
- If you are stuck at any point, then
    - Rethink the steps defined
    - Derive pointers from similar problems solved earlier

Input - Process - Output

A computer system:

- Accepts input from the user
- Processes the input
- Generates the output

Input - Process - Output

Input

Process

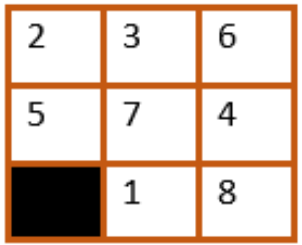
Output

How are clothes washed in a fully automatic washing machine?

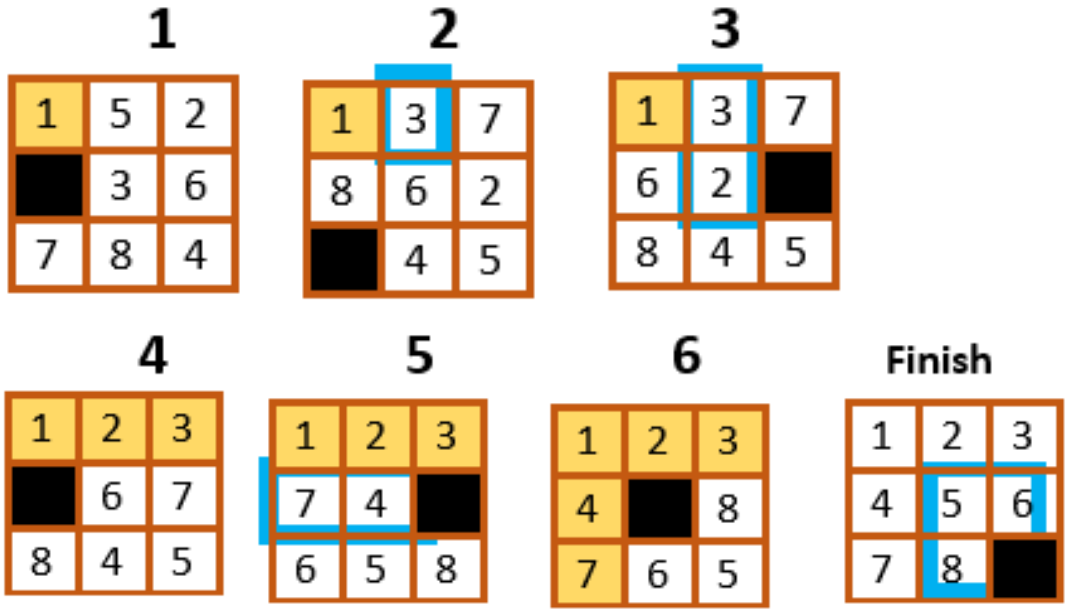
- Input: dirty clothes, detergent, and water
- Process: wash the clothes
- Output: clean the clothes

Problem Solving Using a Computer

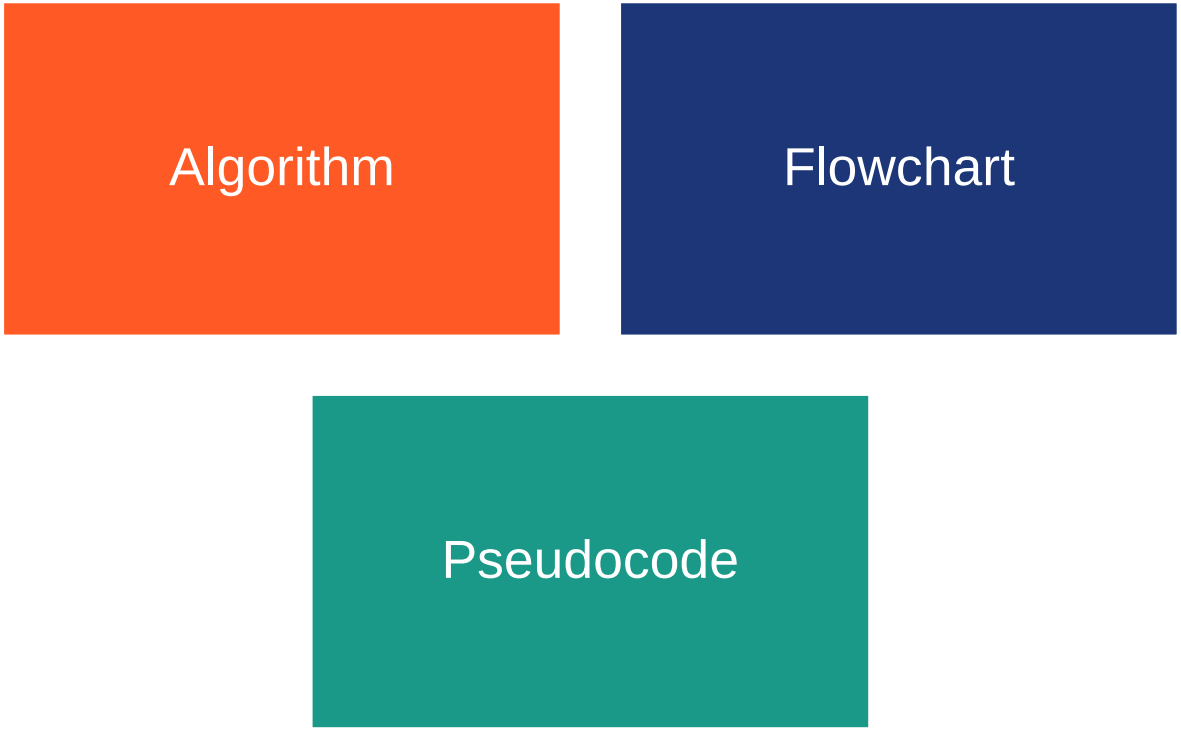
Slider puzzle



Steps to solve:



Problem Solving Tools and Techniques



Algorithm

Determine whether a given number is even or odd.

Step 1: Start

Step 2: Accept a number.

Step 3: Divide the number by 2.

Step 4: If the remainder is 0, the number is even.

Step 5: If the remainder is not 0, the number is odd.

Step 6: End

Algorithm

How do you withdraw cash from an ATM machine?

Step 1: Start

Step 2: Insert your ATM card for the machine to check.

Step 3: Enter the PIN for the ATM to validate.

Step 4: Press the ‘Cash with Receipt’ button.

Step 5: Specify the amount you wish to withdraw.

Step 6: Collect your ATM card.

Step 7: Wait till the machine counts the cash.

Step 8: Collect the amount and statement from the ATM machine.

Step 9: End

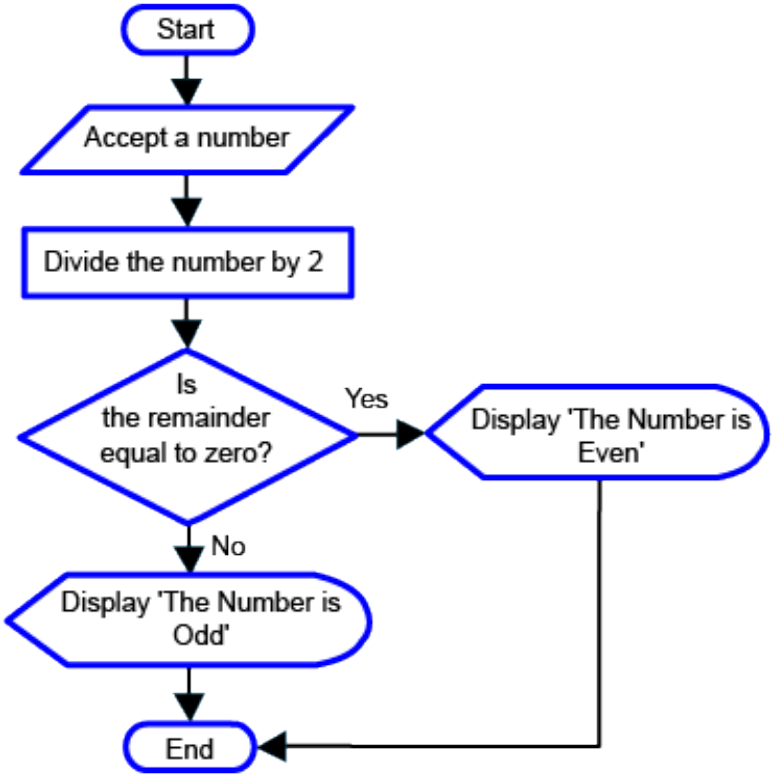
Algorithm

Let us learn more about algorithms.

- A sequence of steps are required to solve a problem
- Each step clearly lists the action to be performed
- Specific operations are applied to the input to obtain the solution of the problem

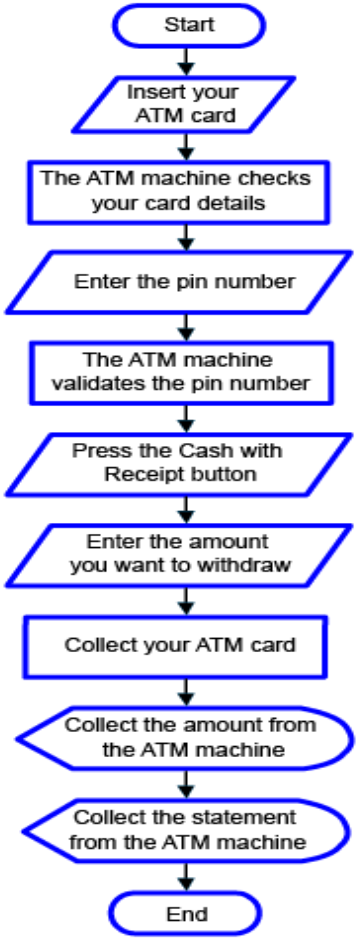
Flowchart

Shows whether a given number is even or odd.



Flowchart

Demonstrates the steps required to withdraw cash from an ATM machine.

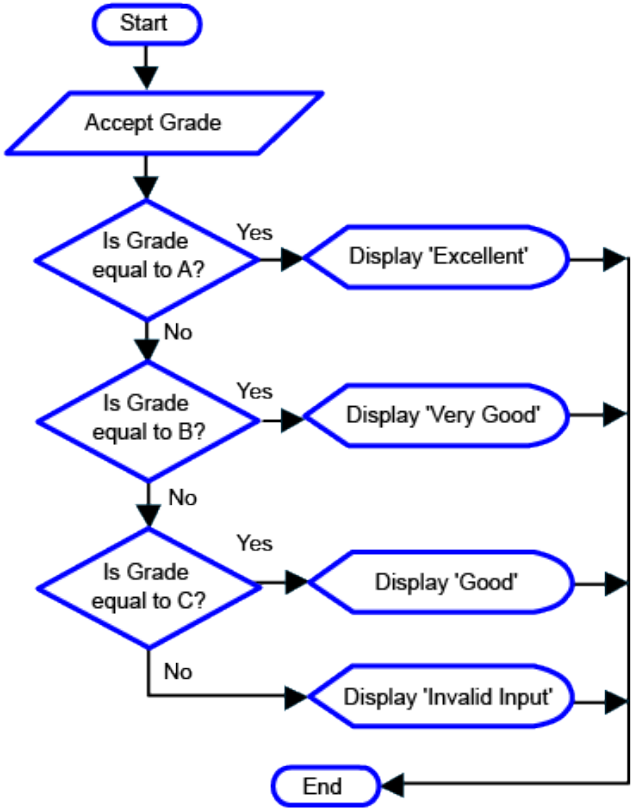


Flowchart

Displays the feedback given to the students on the scores obtained.

Grade A: Excellent
Grade B: Very Good
Grade C: Good

If any other grade is entered by the user instead of A, B, or C, the message ‘Invalid Input’ should be displayed.



Flowchart

Let us learn more about flowcharts.

- A graphical representation of an algorithm
- Shows the flow of a program or a process
- Contains a set of symbols where each symbol represents a specific activity
- Accepts instructions and data as inputs, processes them and displays the result as the output

Let’s Draw a Flowchart!

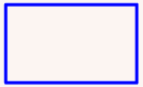
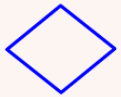
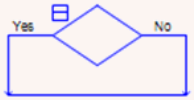
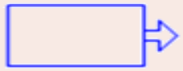
At a store, the unit price of an item is $50 and there is a 10% discount on any purchase made above $400. Take the number of items purchased by the customer as input and display the amount that the customer needs to pay.

Source: https://www.codeavail.com/

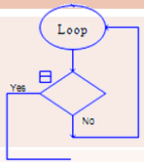
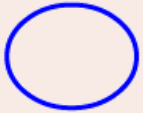
What is a Raptor?

- A flowchart-based programming language
- Helps in visualizing algorithms and limits syntactic complexity

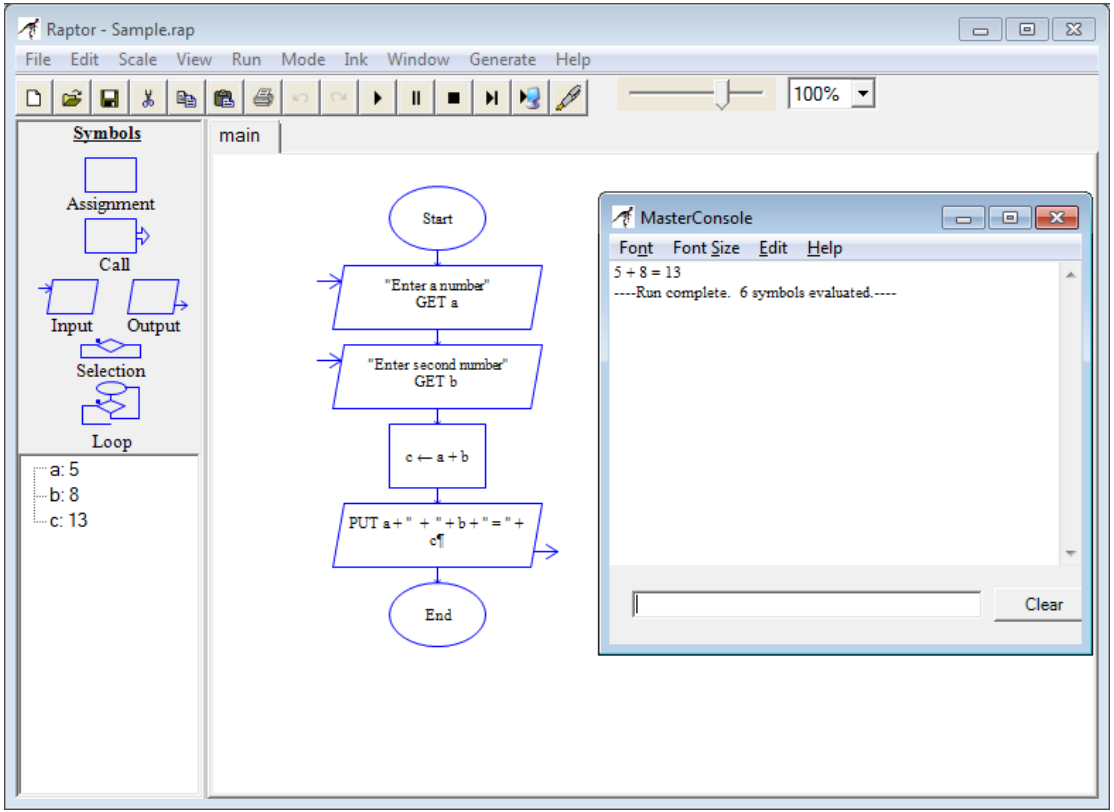
Drawing a Flowchart

Flowchart Symbol	Raptor Symbol	Activity	Description
		Input	Takes input from the user
		Process	Specifies an operation or a calculation
		Output	Displays the output to the user
		Decision	Specifies a condition
		Procedure/ Subroutine	Defines a procedure or subroutine

Drawing a Flowchart

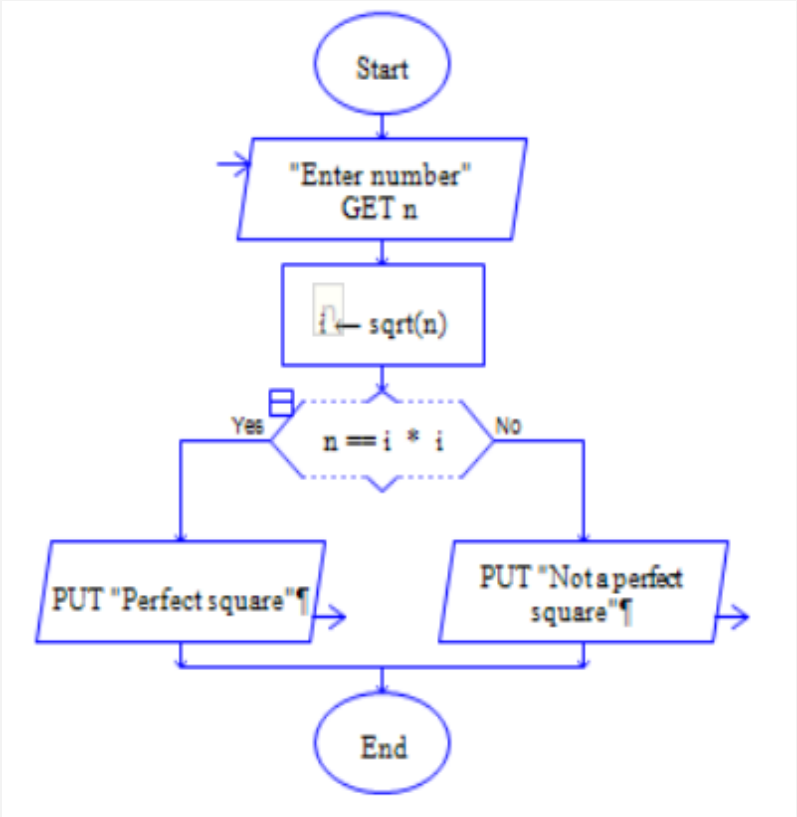
Flowchart Symbol	Raptor Symbol	Activity	Description
NA		Loop	Indicates a repetitive process
		Initiator/ Terminator	Indicates the beginning or the end of a flowchart
	NA	On page connector	Connects one step to another in a flowchart on the same page
	NA	Off page connector	Connects one step to another in a flowchart on a different page
	NA	Annotation	Inserts comments

Raptor Environment



Raptor Demo

Displays whether a given number is a perfect square or not.



```
begin
character Light, Action
accept Light
if (Light==”Red”)
begin
        Action=”Stop”
end
else if (Light==”Amber”)
begin
        Action=”Slow down to stop”
end
else
begin
         Action=”Continue Driving”
end
end
```

Pseudocode

- A detailed yet readable description of what an algorithm must do
- Expressed in a formally styled natural language rather than in a programming language
- Used as an initial step in the process of developing programs

Pseudocode

Take the cost price and selling price of an item as input and display the profit gained or the loss incurred while purchasing this item.

```
BEGIN
GET CP
GET SP
BEGIN IF
    IF SP > CP
      SET PROFIT = SP – CP
      PRINT “The profit gained is $” + PROFIT
    ELSE
      SET LOSS = CP – SP
      PRINT “The loss incurred is $” + LOSS
END IF
END
```

Let’s Write a Pseudocode!

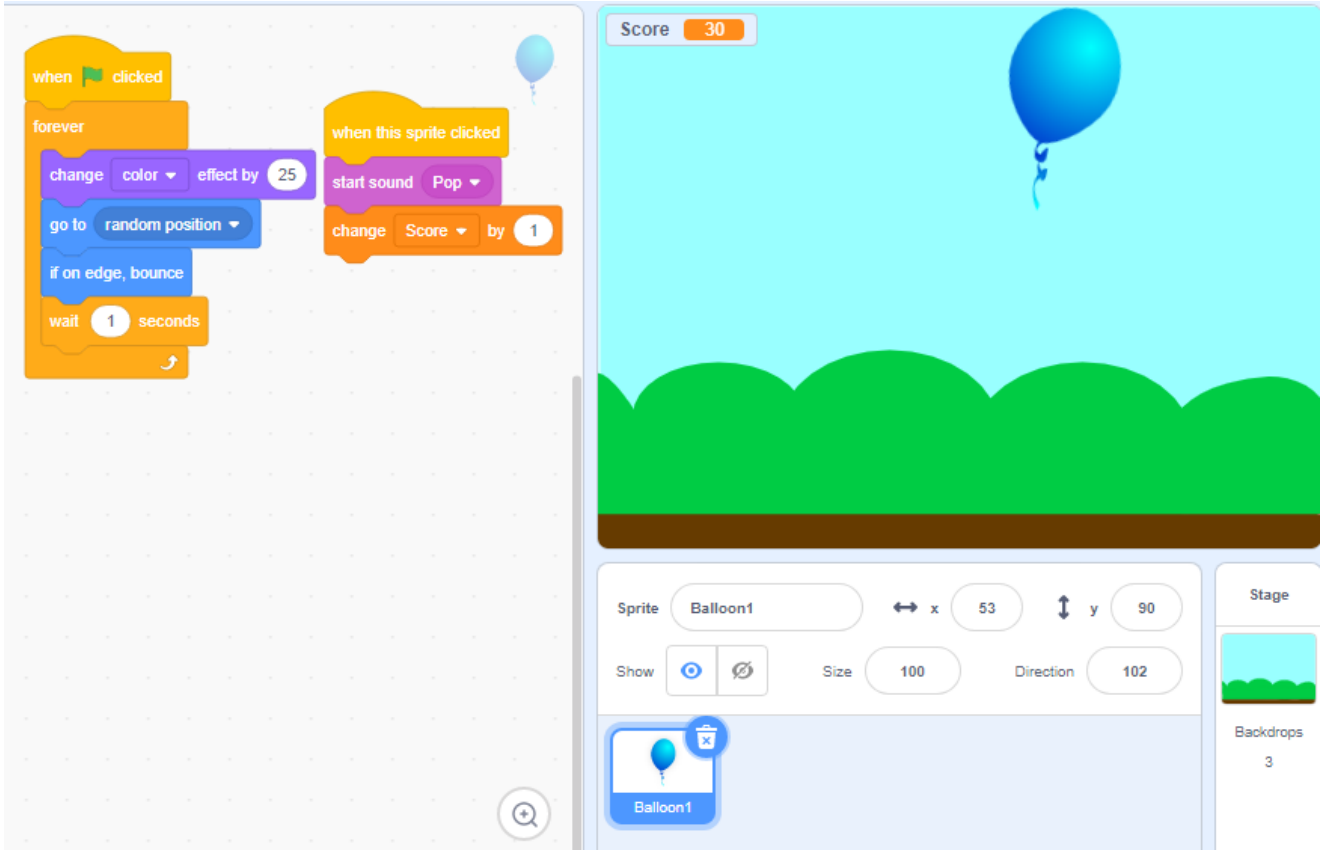
Calculate and display the sum of the first 10 natural numbers.

Source: https://indipick.blogspot.com/
https://www.freelogovectors.net/

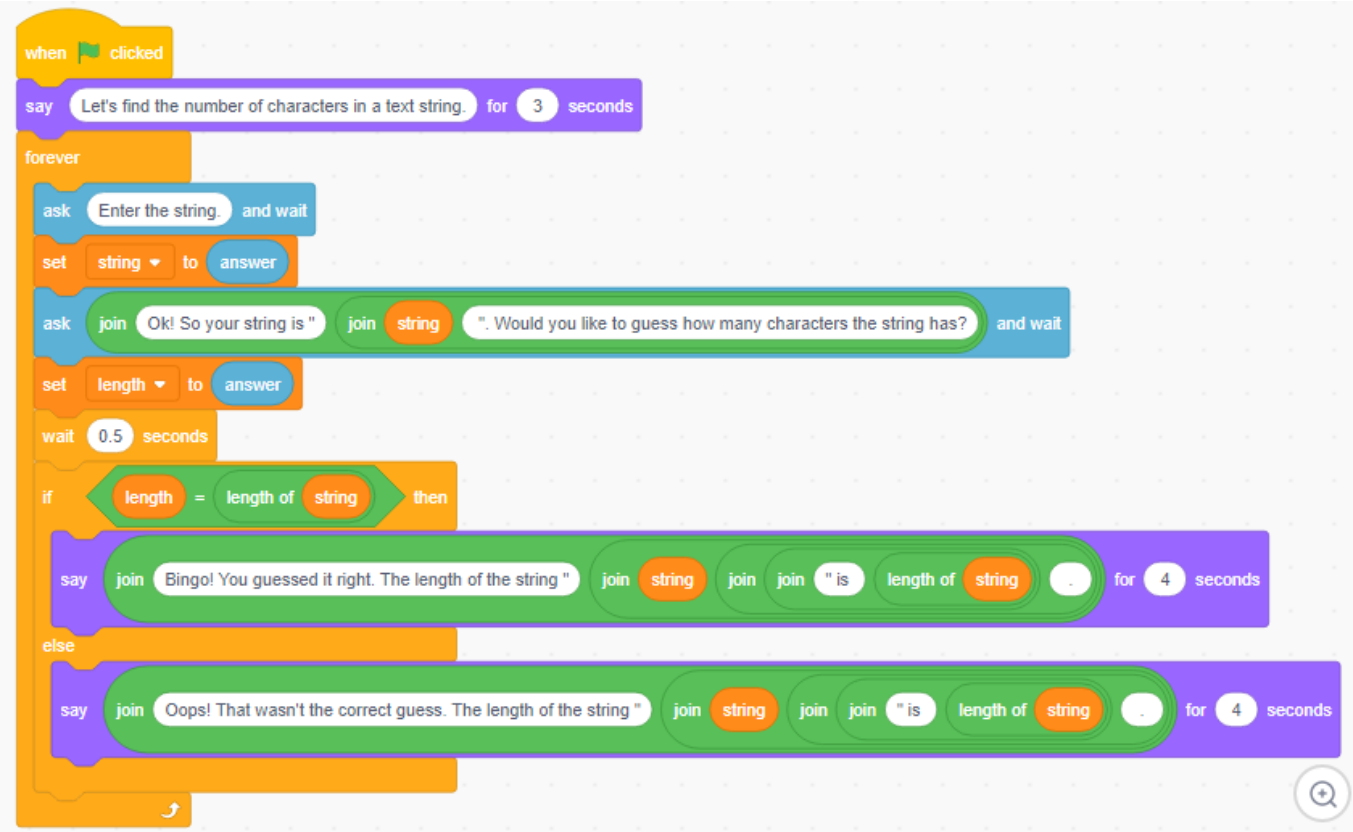
Scratch

- A visual programming language
- Can be used to create interactive stories, games, and animations
- Enables students to create projects that express their ideas
- Helps learners enhance their creativity and thinking skills

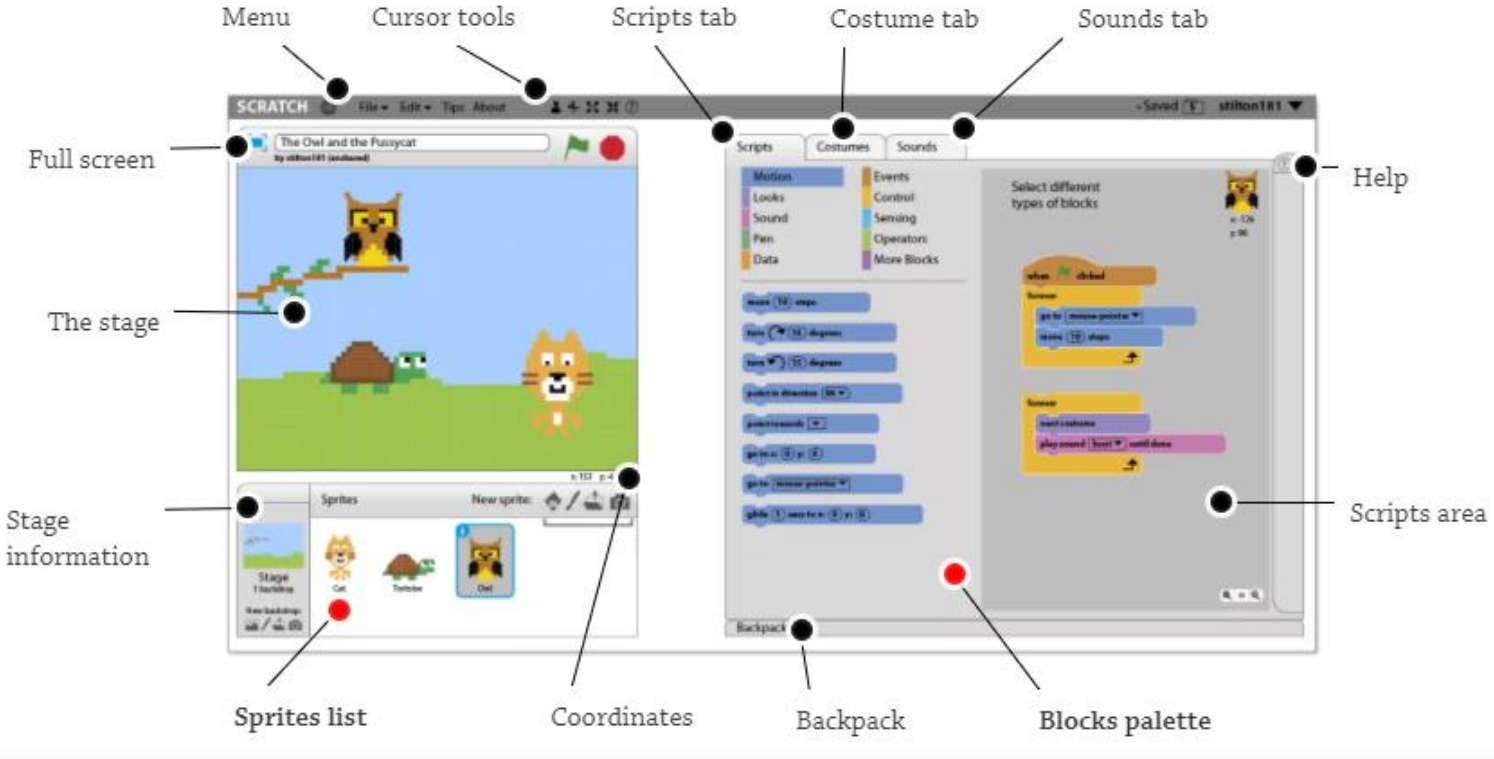
Scratch Demo



Let’s Run a Scratch Program



Scratch Environment

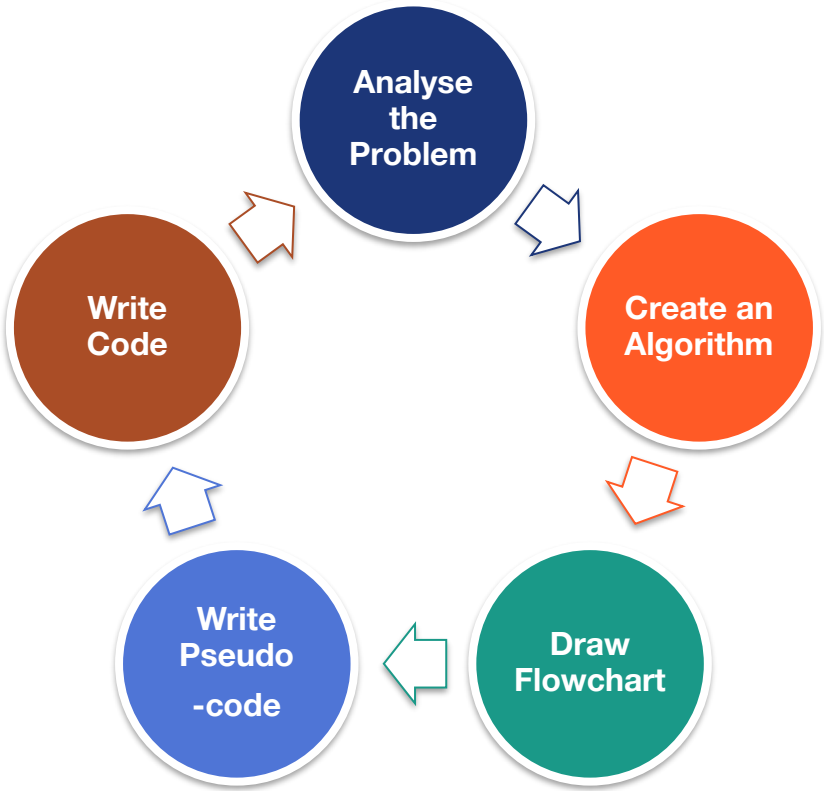


Interactive Demo

Take the distance covered and the speed of travel as input and then display the time taken for the journey.

DEMO

Problem Solving Using A Computer



Key Takeaways

- Tools and techniques for problem solving
- Algorithms with clearly defined steps
- Flowcharts using the Raptor tool
- Pseudocodes for solving problems
- Creating and running Scratch programs