# Algorithms and Flowcharts

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# Algorithms

- Programming is a process of problem solving
- A typical programming task can be divided into two phases:
- ***Problem solving phase***
  - produce an ordered sequence of steps that describe solution of problem
  - this sequence of steps is called an ***algorithm***
- ***Implementation phase***
  - implement the program in some programming language

# Algorithms

- Accordingly; An *algorithm* specifies a series of steps that perform a particular computation or task.

- To write any algorithm
  1. Read the problem at least three times
  2. Define input
  3. Write the steps line by line that perform a given task
  4. Define output

# Example1

- Write an algorithm to calculate the area of circle

# Example1

Step1: Start
Step2: Input radius
Step 3: Set pi ← 3.14
Step 4: area ← pi * radius * radius
Step 5: print area
Step 6: End

# Example 2

- Write an algorithm to read the temperature in Fahrenheit and Convert it to Celsius

# Example 2

Step1: Start

Step 2: Input temperature in Fahrenheit (F)

Step 3: Celsius(C) ← 5/9*(F-32)

Step 4: Print C

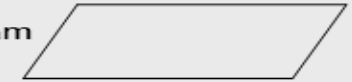
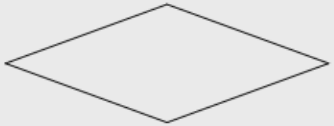
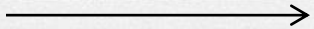
Step5: End

# Flowchart

- Flowchart is the graphical representation of an algorithm with the help of different symbols, shapes and arrows in order to demonstrate a process or a program.

- Generally it include the start point, end points, inputs, outputs, possible paths and the decisions that lead to these possible paths.

# Flowchart Symbols

| Name | Symbol | Use In Flowchart |
| --- | --- | --- |
| Oval |  | Denotes the beginning or end of the program |
| Parallelogram |  | Denotes an input operation **and output operation** |
| Rectangle |  | Denotes a process to be carried out e.g. addition, subtraction, division etc. |
| Diamond |  | Denotes a decision (or branch) to be made. The program should continue along one of two routes. (e.g. IF/THEN/ELSE) |
| Arrow |  | Denotes the direction of logic flow in the program |

# Example 3

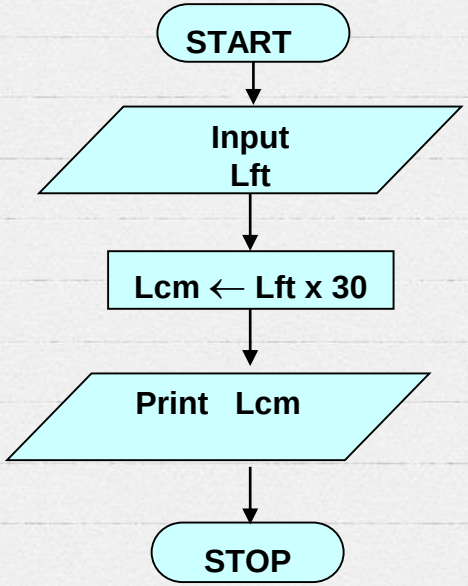
- Write an algorithm and draw a flowchart to convert the length in feet to centimeter.

# Example 3

**Algorithm**

- Step1: Start
- Step 2:  Input Lft
- Step 3: Lcm ← Lft x 30
- Step 4: Print Lcm
- Step 5: End

**Flowchart**



# Example 4

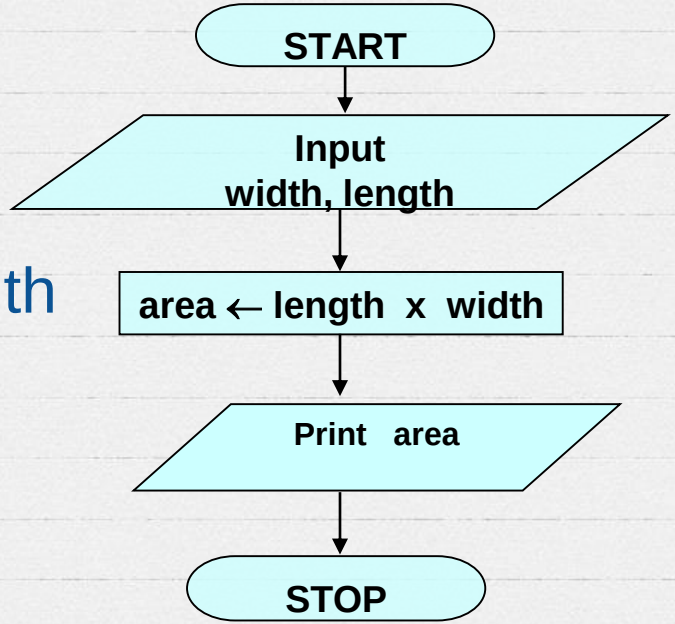
Write an algorithm and draw a flowchart that will read the two sides of a rectangle and calculate its area.

# Example 4

**Algorithm**

- Step1: Start
- Step 2: Input width, length
- Step 3: area ← length x width
- Step 4: Print area
- Step 5: End

**Flowchart**



# Example 5

- Write an algorithm and draw a flowchart that will calculate the roots of a quadratic equation

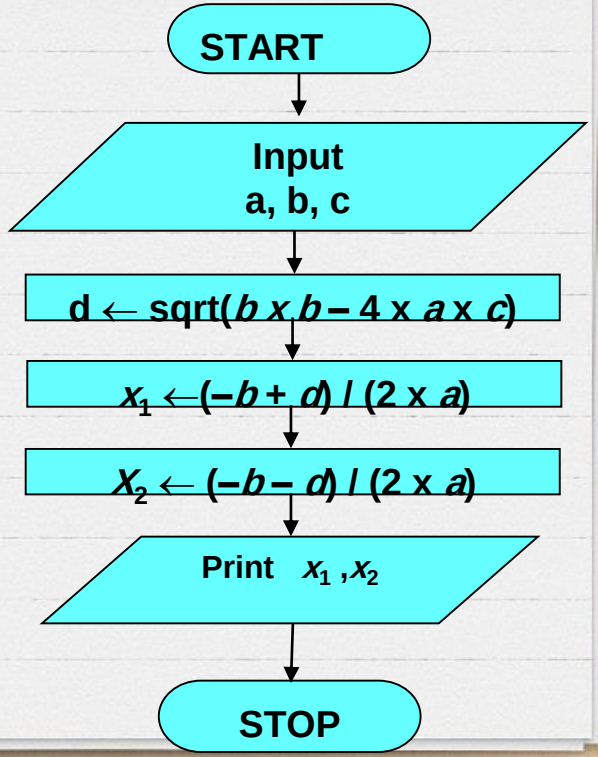
$$ax^2 + bx + c = 0$$

- Hint: **d** = sqrt ( $b^2 - 4ac$ ), and the roots are: ***x*1** = (–*b* + *d*)/2*a* and ***x*2** = (–*b* – *d*)/2*a*

# Example 5

- **Algorithm**:
- Step 1: Start
- Step 2: Input a, b, c
- Step 3: $d \leftarrow$ sqrt ( $b \times b - 4 \times a \times c$ )
- Step 4: $x1 \leftarrow (-b + d) / (2 \times a)$
- Step 5: $x2 \leftarrow (-b - d) / (2 \times a)$
- Step 6: Print $x1$, $x2$
- Step 7: End

## Flowchart



# Assignment 1

- Draw a flowchart for the problem in Example 1 and 2 .
- Write an algorithm and draw a flowchart to swap between two number
- Write an algorithm and draw a flowchart that read two numbers and print their multiplying.

# Thanks!