LECTURE TWO

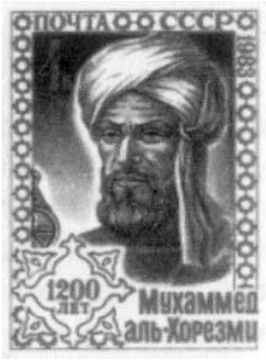

Fundamentals of
Programming


Python Programming


Python
Programming

Algorithm

It is a finite sequence of instructions, explicit step-by-step procedure for solving a problem.

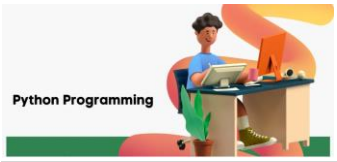


- The study of algorithms began with mathematicians and was a significant area of work in the early years.
- The goal of those early studies was to find a single, general algorithm that could solve all problems of a single type.
- Named after 9th century, Abu Abdullah Muhammad ibn Musa al-Khwarizmi who lived in Baghdad and worked at the Dar al-Hikma

Flowcharts

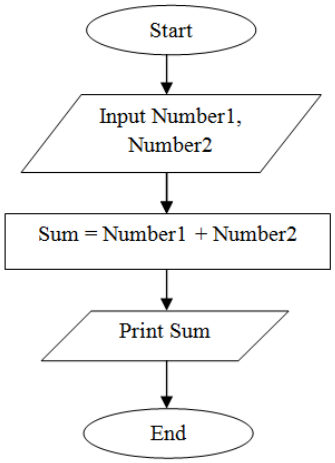
A flowchart is a graphical representation of an algorithm. The main symbols used to draw a flowchart are shown in following figure.

Symbol	Name	Usage
	Line	Represents the flow from one component to the next
	Process	An action
	Subroutine	Calls a subroutine
	Input/ Output	An input or output
	Decision	A yes/no/true/false decision
	Terminator	The start or end of the process



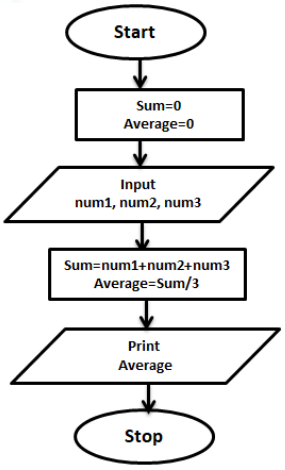
Example (1): Design an algorithm and the corresponding flowchart for input two number and output their addition (summation).

Step 1: Start
Step 2: Read x, y
Step 3: sum = x + y
Step 4: Print sum
Step 5: End



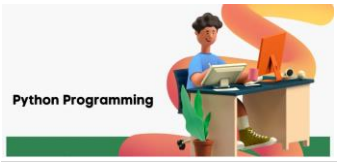
Example (2): Design an algorithm and the corresponding flowchart for input three number and output their average.

Step 1: Start
Step 2: Read n1, n2, n3
Step 3: sum = n1 + n2 + n3
Step 4: average = sum /3
Step 5: Print average
Step 6: End



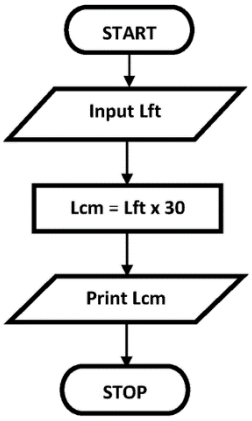
Example (3): Design an algorithm for input two number and computes the arithmetic operators.

Step 1: Start
Step 2: Read a, b
Step 3: sum = a + b
Step 4: sub = a – b
Step 5: mul = a * b
Step 6: div = a / b
Step 7: Print sum, sub, mul,div
Step 8: End



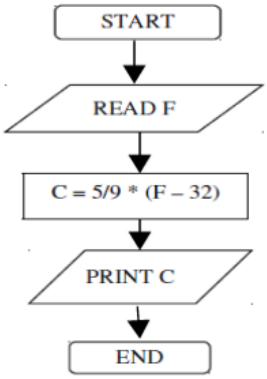
Example (4): Write an algorithm and the corresponding flowchart to read length in feet and convert to centimeter.

Step 1: Start
Step 2: Read feet
Step 3: centimeter = feet *30
Step 4: Print centimeter
Step 5: End



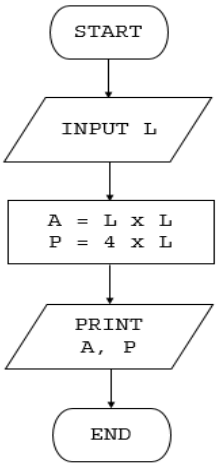
Example (5): Write an algorithm and the corresponding flowchart to read temperature in Fahrenheit and convert to Celsius.

Step 1: Start
Step 2: Read Fahrenheit
Step 3: Celsius = (5/9) * (Fahrenheit – 32)
Step 4: Print Celsius
Step 5: End



Example (6): Write an algorithm and the corresponding flowchart to read length of slide and compute area and circumference (perimeter) of square.

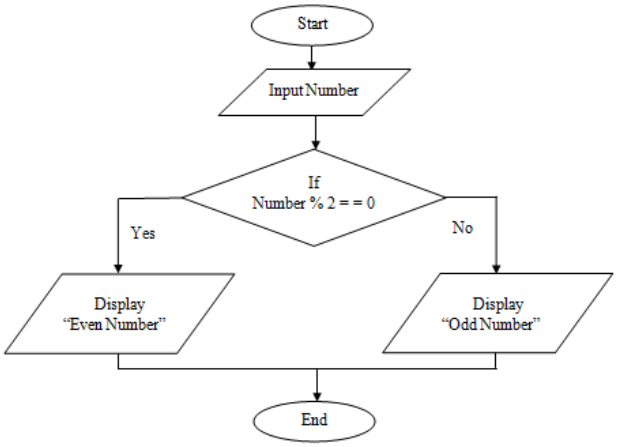
Step 1: Start
Step 2: Read slide
Step 3: area of square = slide * slide
Step 4: perimeter of square = 4* slide
Step 5: Print area of square, perimeter of square
Step 6: End



Example (7): Write an algorithm and the corresponding flowchart to read number and check if it's even or

Odd.

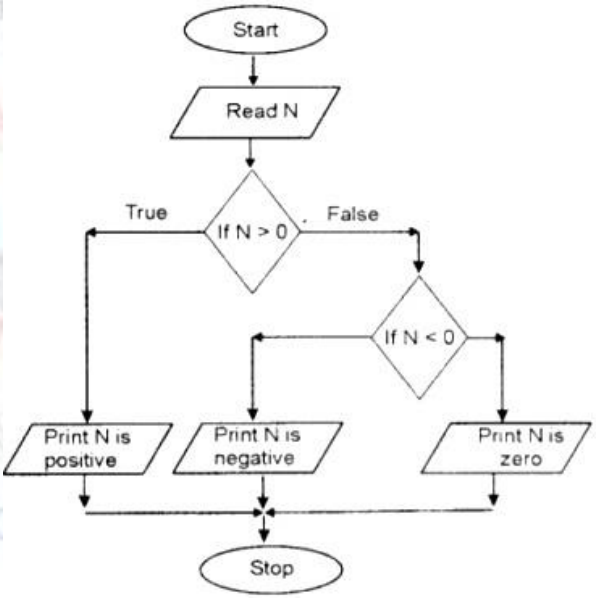
Step1: Start
Step2: Read x
Step3: If x mod 2=0 then print "even"
Otherwise print "odd"
Step4: End



Example (8): Write an algorithm and the corresponding flowchart to read number and check if it's positive or negative.

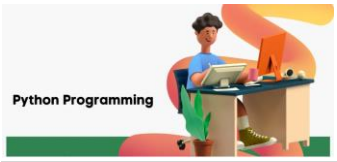
Step1: Start
Step2: Read x
Step3: If x greater than 0 then Print "positive"
Otherwise If x less than 0 then print "negative"
Otherwise print "zero"

Step4: End



Example (9): write an algorithm to find the greater number between two numbers

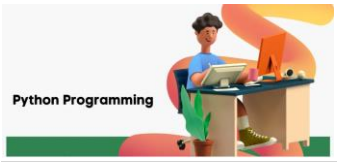
Step1: Start
Step2: Read A, B
Step3: If A greater than B then C=A
Step4: if B greater than A then C=B
Step5: Print C
Step6: End



Example (10): Write an algorithm enter the marks for student and print the student grade.

Mark	Grade
>= 85	Excellent
>=75<85	Very Good
>=65<75	Good
>=50<65	Pass
<50	Fail

Step1: Start
Step2: Read x
Step3: If x >= 85 then print "Excellent"
Step4: If x >= 75 and x < 85 then print "Very Good"
Step5: If x >= 65 and x < 75 then print "Good"
Step6: If x >= 50 and x < 65 then print "Pass"
Step7: If x < 50 then print "Fail"
Step8: End



WORK SHEET (1)

Homework Write an algorithm and draw a flowchart to read length in millimeter and convert to centimeter.

Homework Write an algorithm and draw a flowchart to read length of width and height and compute area and circumference (perimeter) of rectangle.

Homework Write an algorithm to read length of radios and compute area and circumference (perimeter) of circle.

Homework 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: x1 = (–b + d)/2a and x2 = (–b – d)/2a

Homework write an algorithm to find the result of equation:

$$f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$$

Homework Write algorithm and draw a flowchart to read a cities of Iraq as number and print the estimation to refer it.

Hint: 1 Baghdad, 2 Basra, 3 Mosul, 4 Erbil