Chapter 7 Questins and Answers
Flowcharts and Pseudocodes

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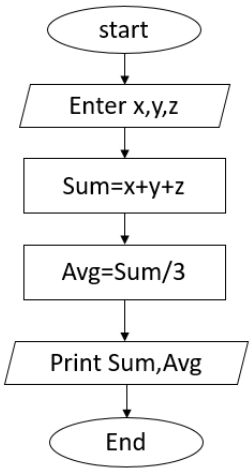
Use both flowchart and Pseudocode to describe the algorithm that accepts three marks for a student, and then displays their sum and average.

Flowchart	Pseudocode
	Start Enter x,y,z Sum=x+y+z Avg=sum/3 Print Sum, Avg End

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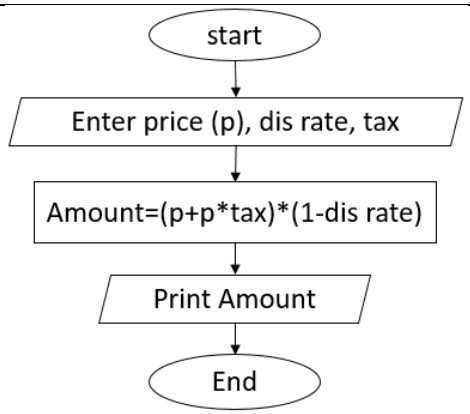
Suppose that a store makes discount on its items. Design an algorithm (using Flowchart and Pseudocode) that calculates the amount of money that a customer has to pay on purchasing an item, adding to it the required tax, where the following data are given: the price of the item before discount, the discount rate, and the tax rate. (Assume the discount is calculated after considering the TAX.)

Flowchart	Pseudocode
	Start Enter price, discount rate, tax Amount=(price+price*tax)*(1-dicount rate) Print Amount End

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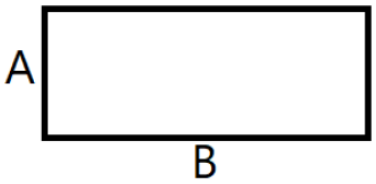
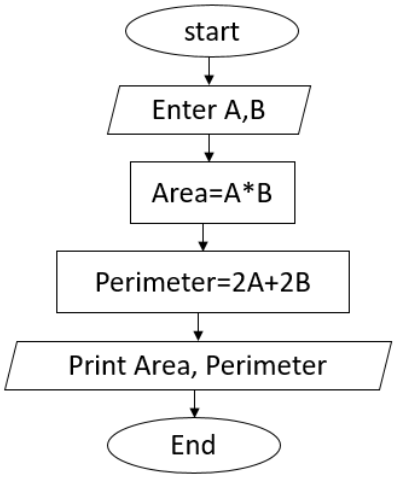
1) Finding the area and perimeter of a rectangle, assuming the length and width (A and B) are given as an input.



Flowchart	Pseudocode
	Start Enter A,B Area=A*B Perimeter=2A+2B Print Area, Perimeter End

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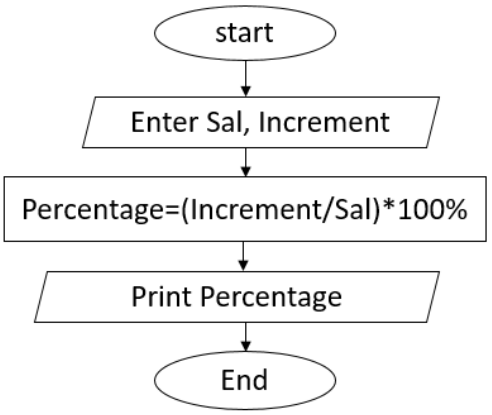
2) Calculating the percentage of increment in the salary of an employee, when inputting the salary before increment, and the value of increment.

Flowchart	Pseudocode
	Start Enter Sal, Increment Percentage=(increment/Sal)*100% Print Percentage End

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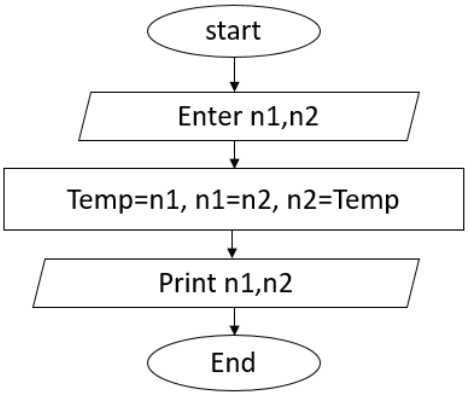
3) Reading two numbers N1 and N2 and swapping their values.

Flowchart	Pseudocode
	Start Enter n1, n2 Temp=n1, n1=n2, n2=Temp Print n1, n2 End

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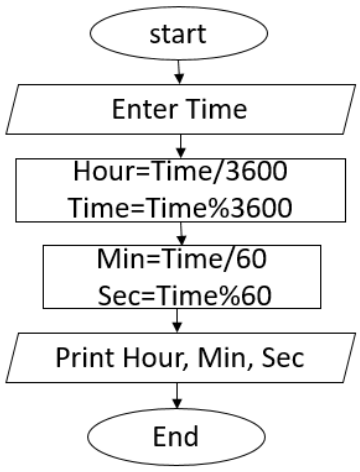
4) Reading a number that represents elapsed time in seconds. The algorithm displays how many hours, minutes and seconds this number contains. **For example,** if the number of input seconds is 8500, then the output is: 2 Hours, 21 Minutes, 40 Seconds.

Flowchart	Pseudocode
	Start Enter Time Hour=Time/3600, Time=Time%3600 Min=Time/60, Sec=Time%60 Print Hour, Min, Sec End

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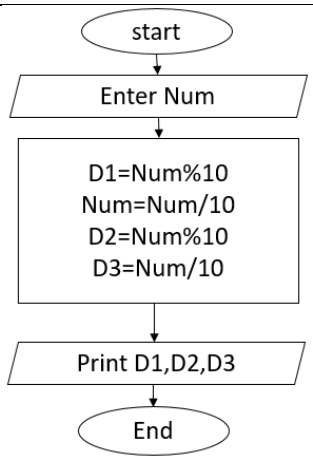
5) Reading a *three-digit* number and printing each digit separately from right to left.

If the number is 479, the algorithm will print: **9 7 4**

Flowchart	Pseudocode
	Start Enter Num D1=Num%10, Num=Num/10 D2=Num%10, D3=Num/10 Print D1,D2,D3 End

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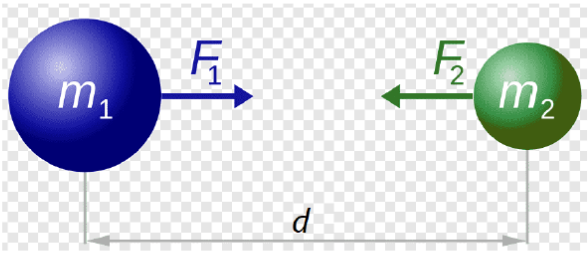
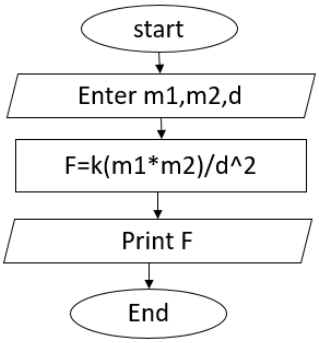
6) Newton's law states that the force F, between two bodies of masses M1 and M2 is given by:

$$F = k\left(\frac{M_1 M_2}{d^2}\right)$$



in which k is the gravitational constant and d is the distance between the bodies. The value of k is 6.67 X 10^{-8} dyn.cm²/g². Design an algorithm that prompts the user to input the masses of the bodies, and the distance between the bodies. The algorithm calculates and outputs the force between the bodies.

Flowchart	Pseudocode
	Start Enter m1,m2,d F=k(m1*m2)/d^2 Print F End

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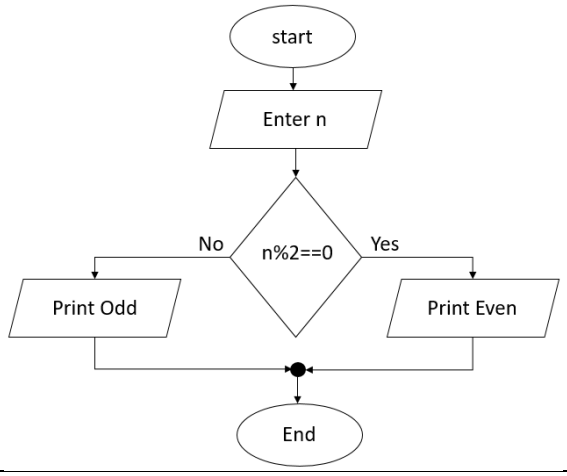
Design an algorithm that reads a number and displays whether it is ODD or EVEN.

Flowchart	Pseudocode

	Start
	Enter n
	if (n%2==0) then
	  print "Even"
	else
	  print " Odd"
	end

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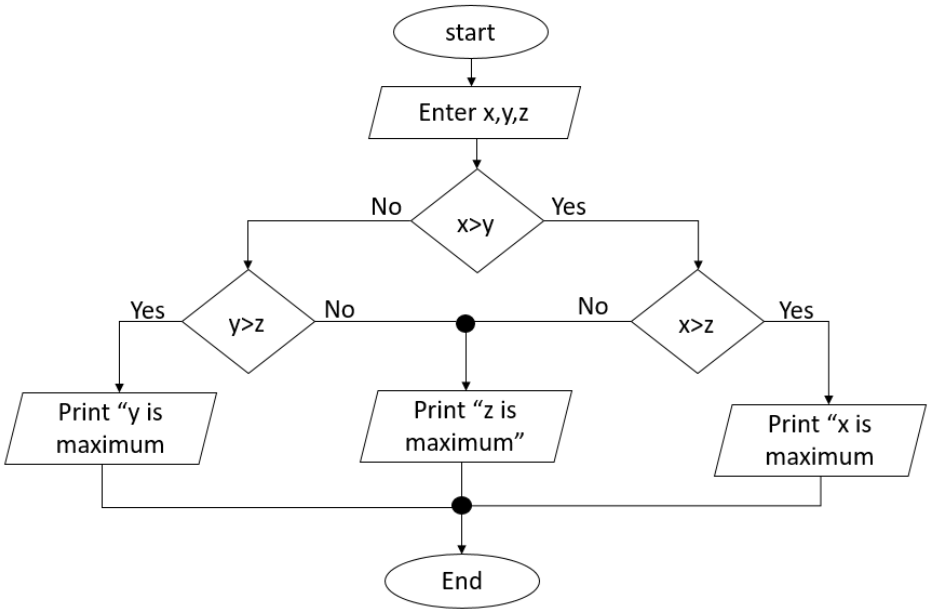
Design an algorithm that reads three numbers, then find and output the maximum entered value.

Flowchart	Pseudocode

	Start
	Enter x,y,z
	if (x>y) then
	  if (x>z) then
	  print " x is the maximum"
	  else
	  print " z is the maximum"
	else
	  if (y>z) then
	  print " y is the maximum"
	  else
	  print " z is the maximum"
	end

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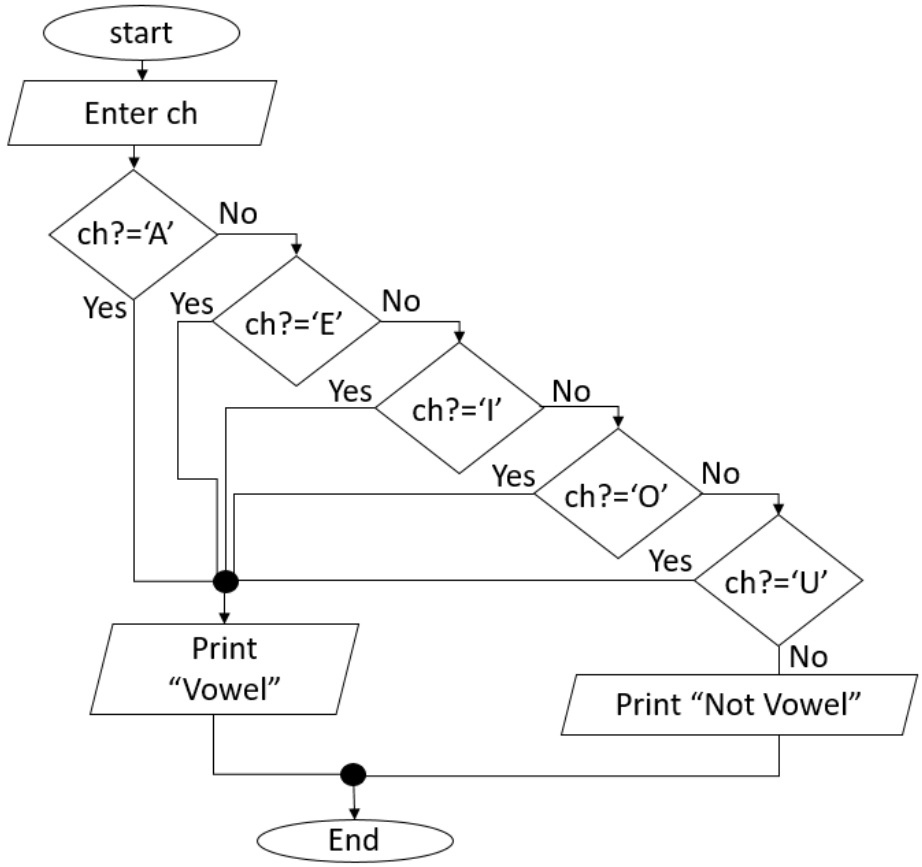
Write an algorithm, that reads a character, then determine whether it is VOWEL letter or not. Note: Vowels letters are: A, E, I, O, U.

Flowchart	Pseudocode

	Start
	Enter ch
	if(ch=='A') then
	print " Vowel"
	else if(ch=='E') then
	print " Vowel"
	else if(ch=='I') then
	print " Vowel"
	else if(ch=='O') then
	print " Vowel"
	else if(ch=='U') then
	print " Vowel"
	else
	print " Not Vowel"
	End

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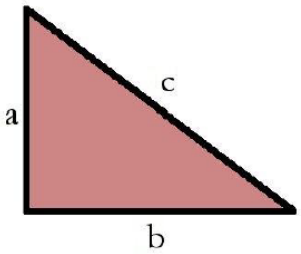
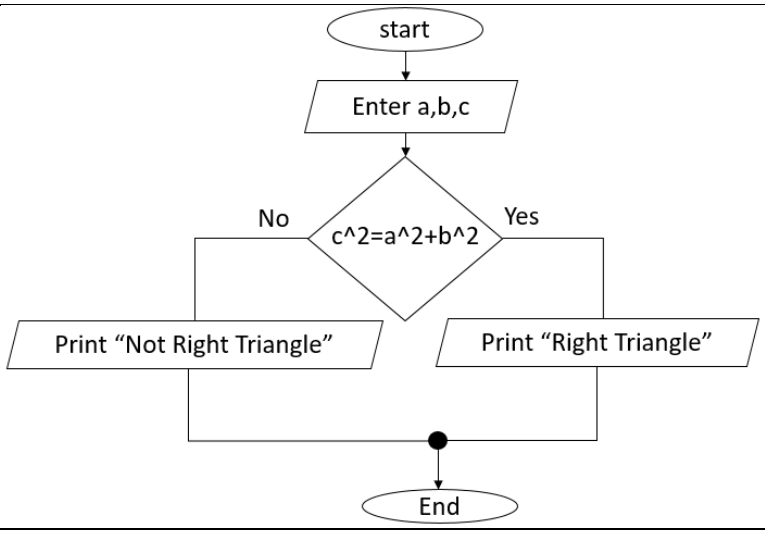
1) The inputs are three numbers (a, b and c), representing the measurements of a triangle, the output should indicate if the inputs can form a right triangle (has the largest angle = 90), this can be done by using well-known equation: ($c^2 = a^2 + b^2$).



Flowchart	Pseudocode

	Start
	Enter a,b,c
	If (c^2=a^2+b^2) then
	Print " Right Triangle"
	Else
	Print " Not Right Triangle"

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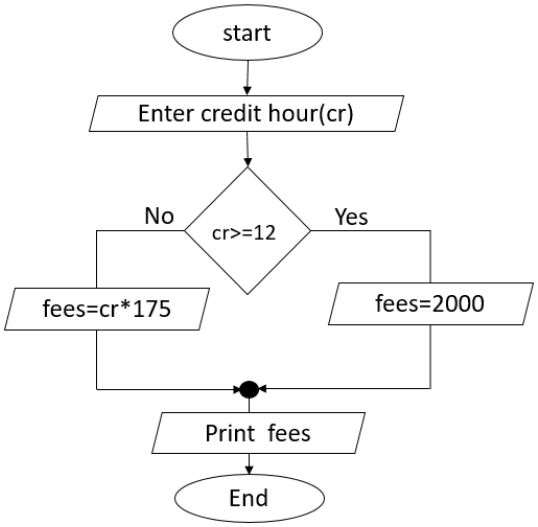
2) In some universities, the student is full-time, when he registers (12) credit hours or more, or part-time if he registers less than (12) credit hours. Use the credits as input to print the tuition fees for that student, given that full-time fees are fixed at (2000), and the part-time fees are calculated as (the number of credits × 175).



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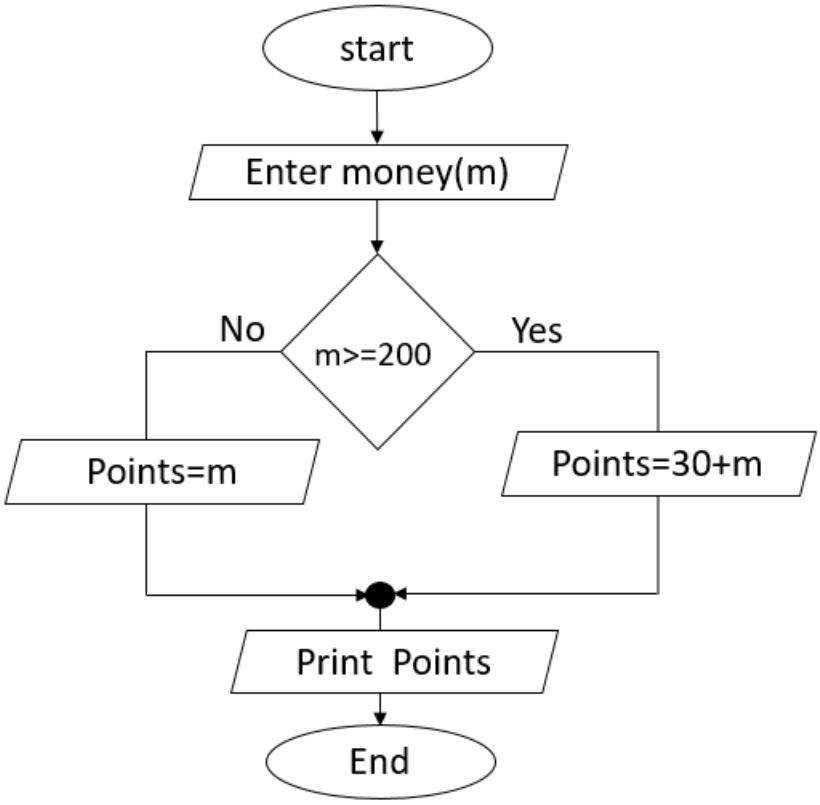
3) The input is the total money spent at the mall, and the output is the number of points earned. For all customers, the awarded points are (1 point per 1 spent dollar), and if a customer spends more than (200) dollars, then he will get (30) more points.



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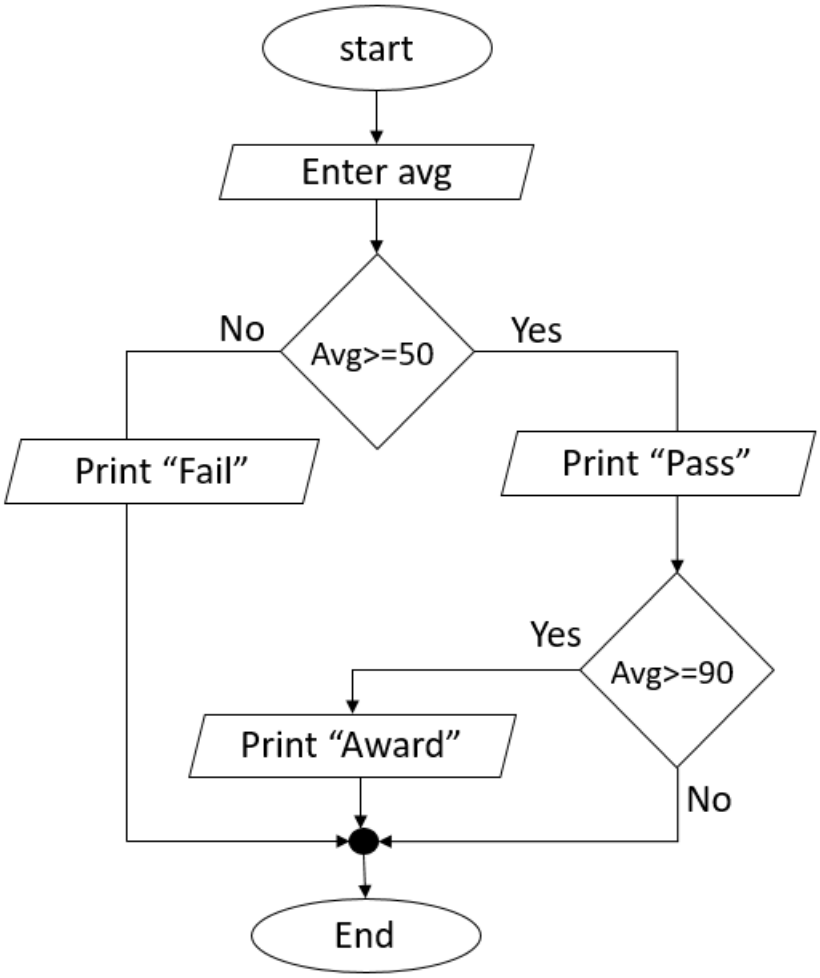
4) The input is the student average in the school's final year, the output should be (Pass) if the grade is greater than or equal to (50%), or (Fail) otherwise. Also, as an additional output, the word (Awarded) should be printed if the average was (95%) or more.



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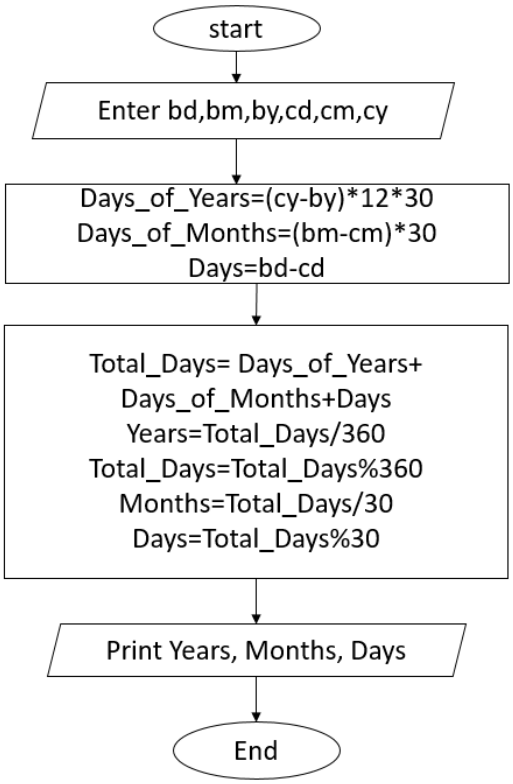
5) Input the birthdate of a person (***bd/bm/by***) and the current date (***cd/cm/cy***), and calculate and display his age. (Assume the month to be 30 days).



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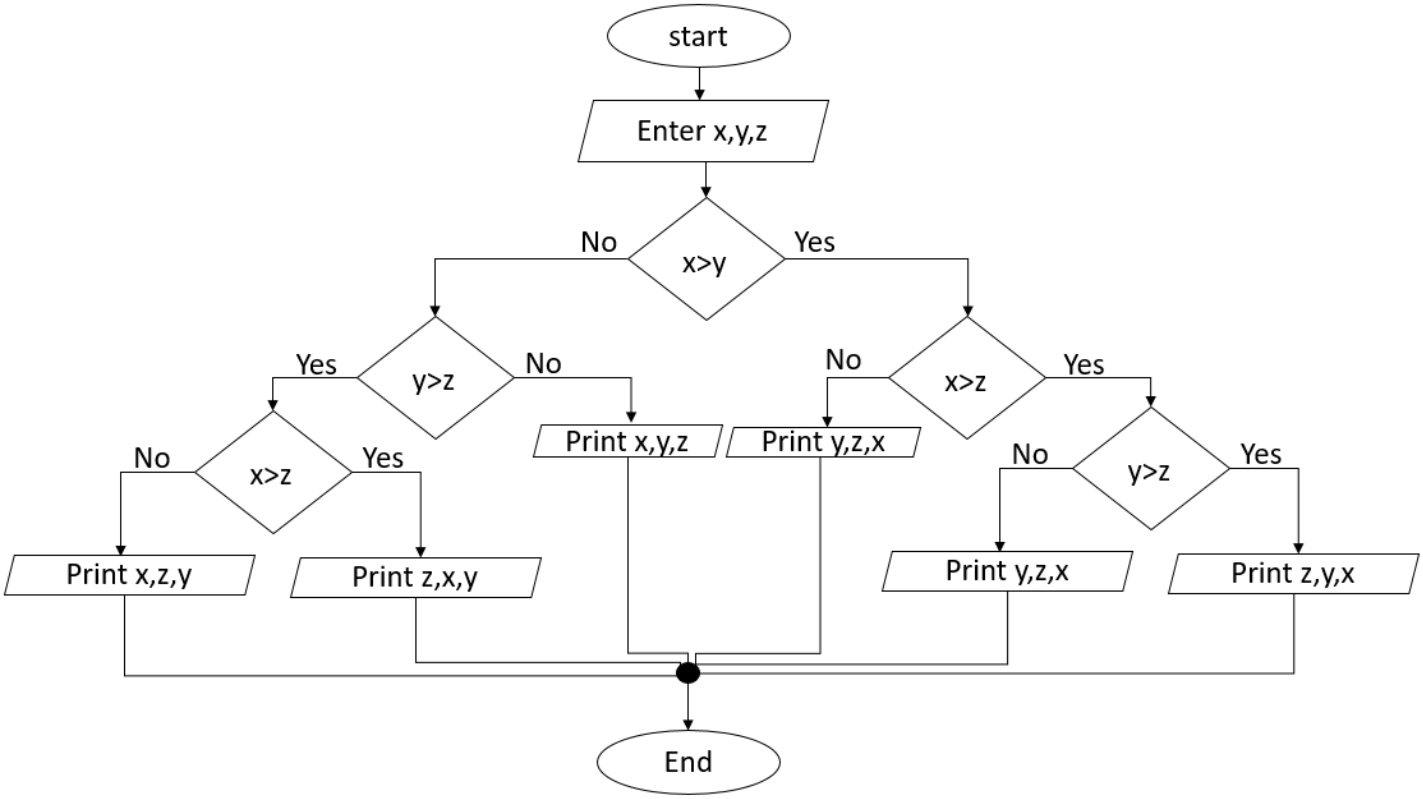
6) Prompting the user to enter three integer numbers, and then displaying the numbers in ascending order.



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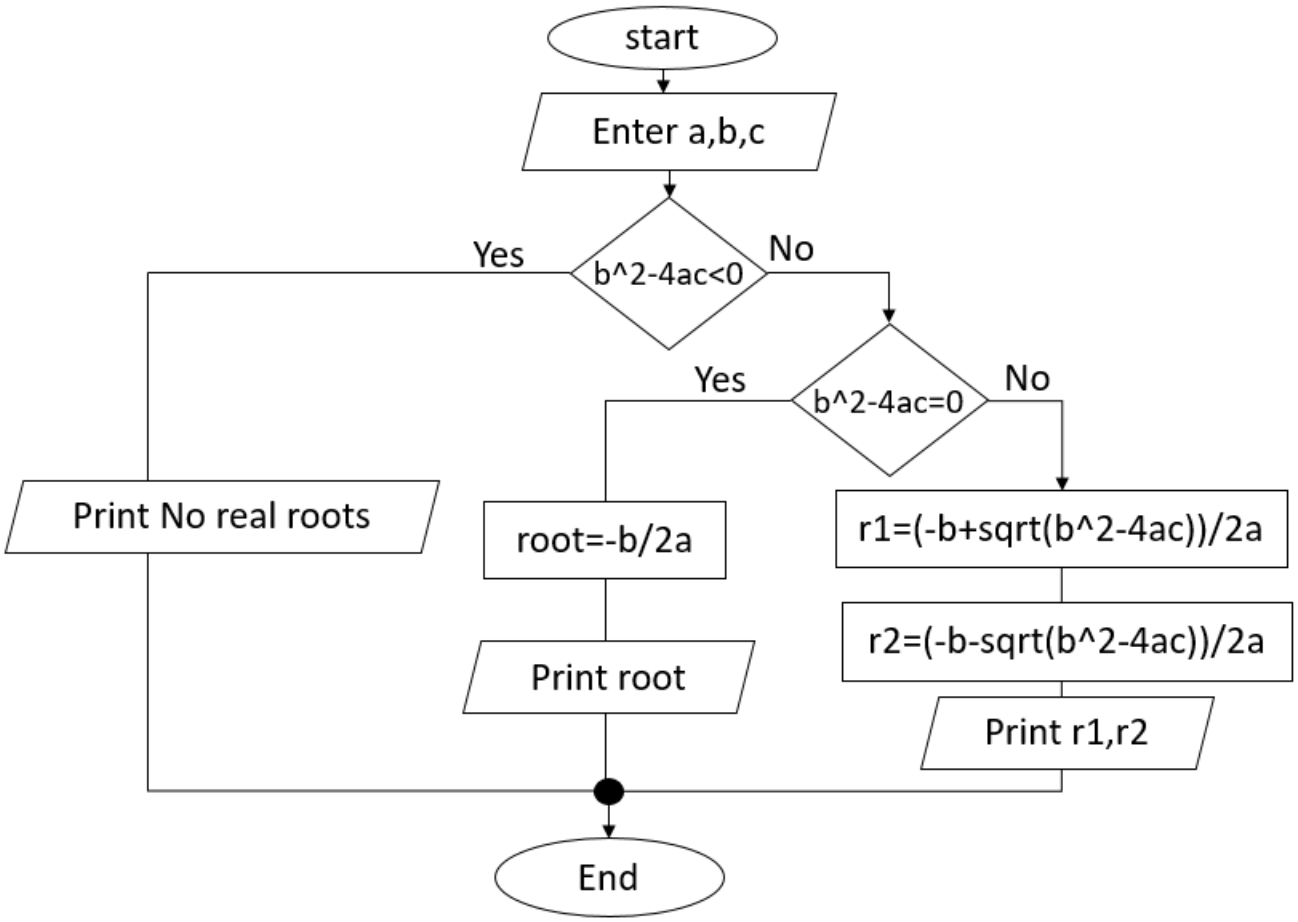
7) Read the coefficients *a*, *b* and *c* of the ***quadratic equation:*** ax^2+bx+c, then calculate and display the roots of the equation.

- When the Discriminant $b^2 - 4ac$ is negative, then NO real roots.
- When the Discriminant $b^2 - 4ac$ is ZERO, then there is single root ($r = -b / 2a$).
- When the Discriminant $b^2 - 4ac$ is positive, then there are two roots $r1$ and $r2$:

$$r1, r2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$



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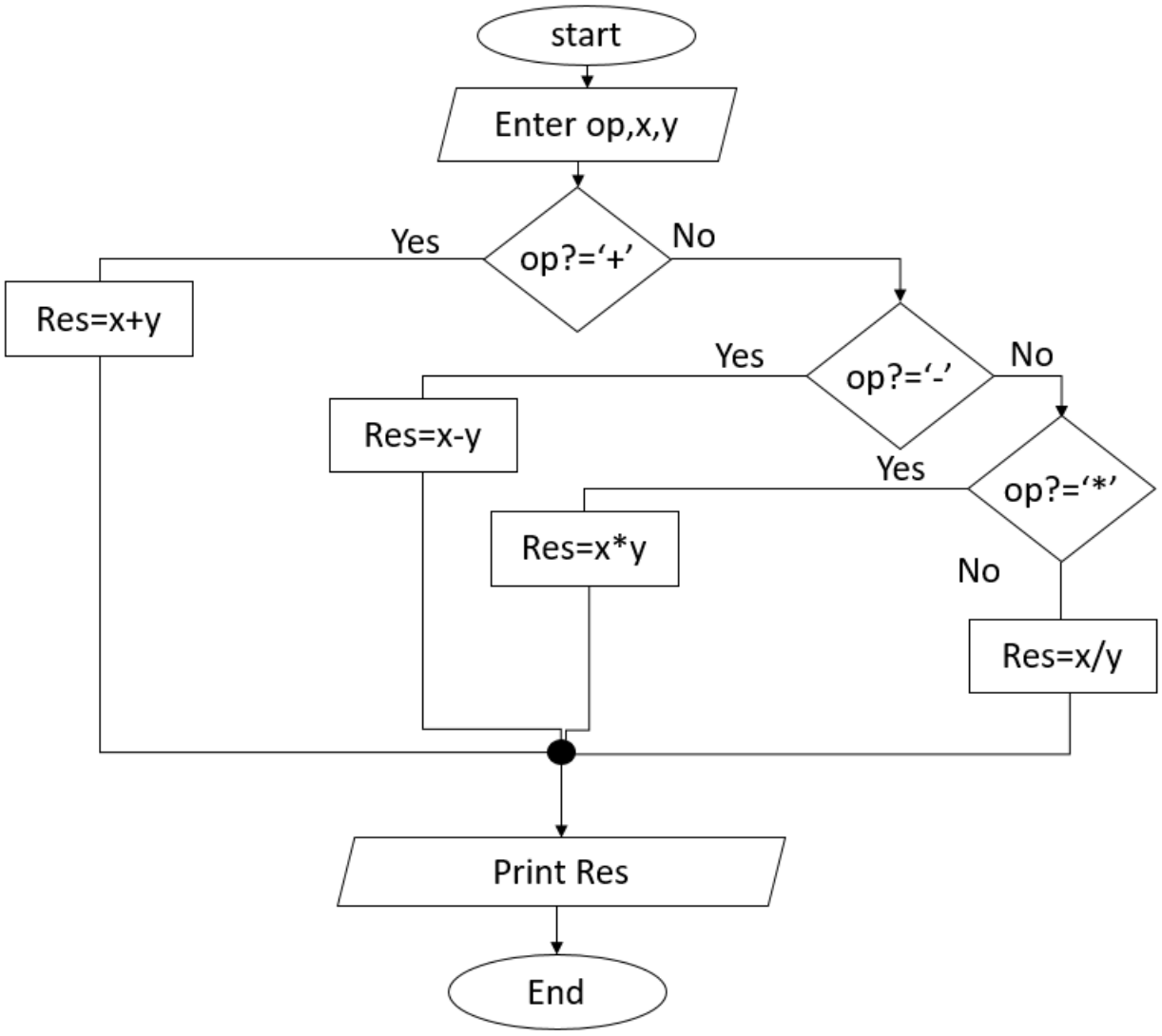
8) Calculator Algorithm: Input two numbers and the operation to be performed. The output is the result of applying the operation on the two numbers. The algorithms supports Addition ('+'), Subtraction ('-'), Multiplication ('*'), and Division ('/').



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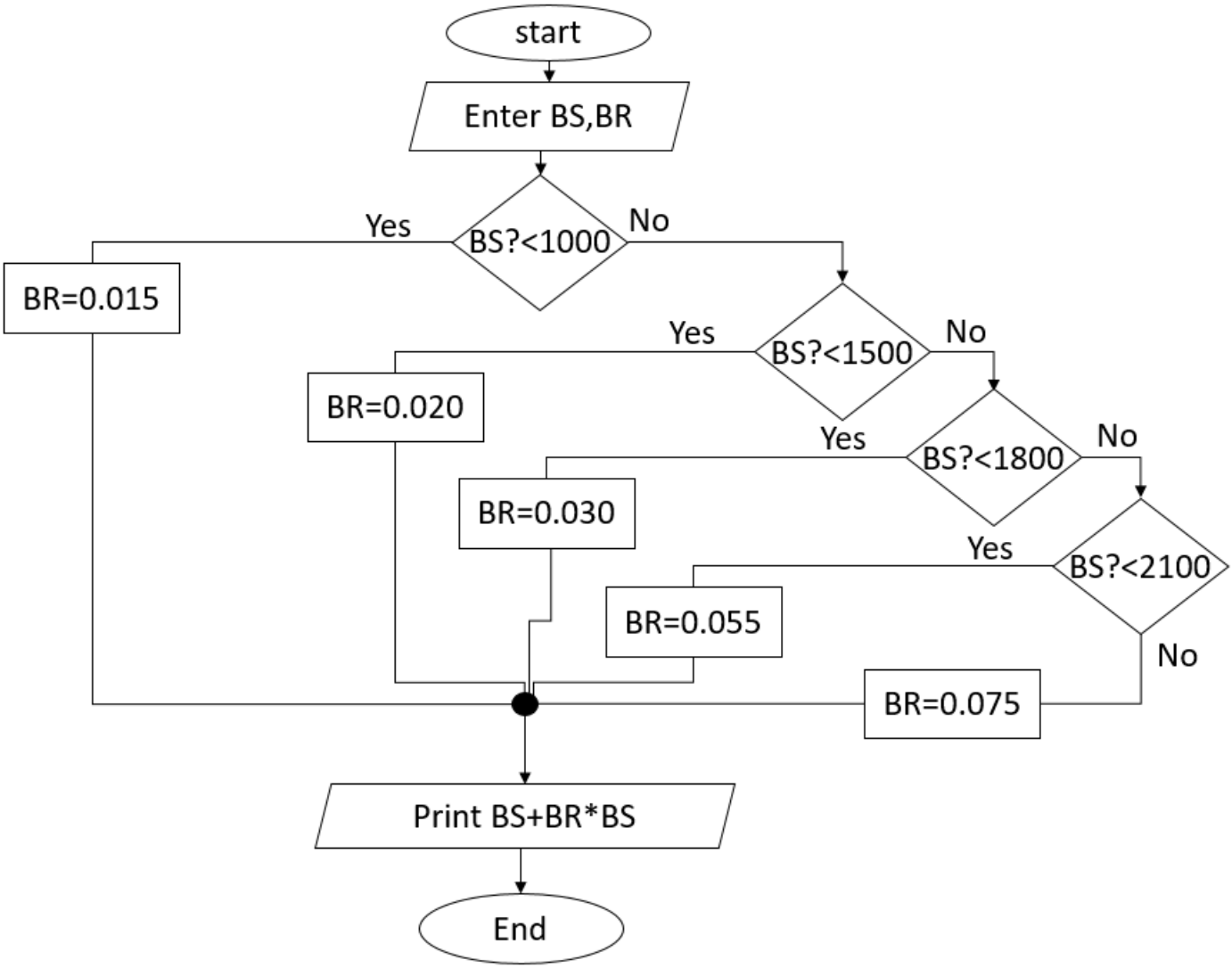
9) The input is one number representing base salary (BS), the output should be the amount of net salary (NS), which is calculated using the equation: (NS = BS + Bonus). The bonus is calculated by multiplying the base salary with its respective bonus rate. Bonus rates are listed in the following table:

Base Salary Domain	Bonus Rate
Less than (1000)	0.015
1000 - 1499	0.020
1500 - 1799	0.030
1800 - 2099	0.055
(2100) and more	0.075



Chapter 7 Loop Questins and Answers
Flowcharts and Pseudocodes

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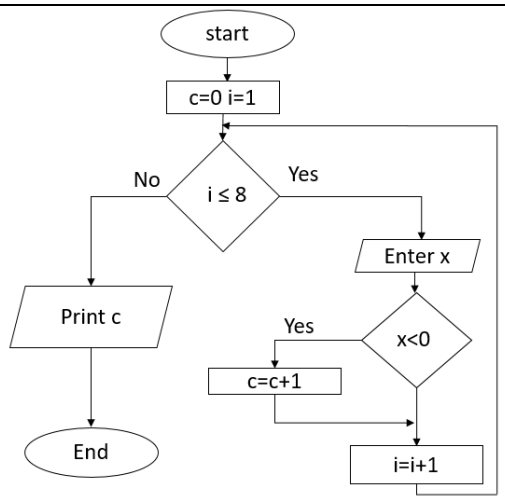
1) Read eight numbers and print how many negative numbers were entered.

Flowchart	Pseudocode

	Start
	Set c=0, i=1
	While (i<=8)
	Enter x
	If (x<0)
	c=c+1
	i=i+1
	Print c
	End

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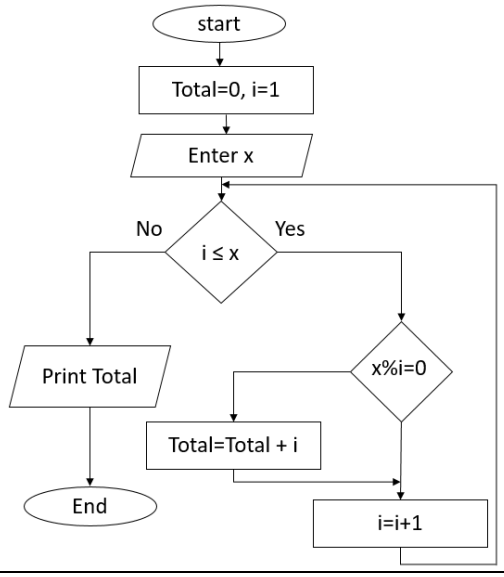
2) Read a number and calculate and display the sum of its divisors.

Example: if the user inputs (15) then the divisors will be: (1, 3, 5, 15) and the output will be their total (24).

Flowchart	Pseudocode

	Start
	Set Total=0, i=1
	Enter x
	While (i ≤ x)
	If (i divides x)
	Total =Total +i
	i=i+1
	Print Total
	End

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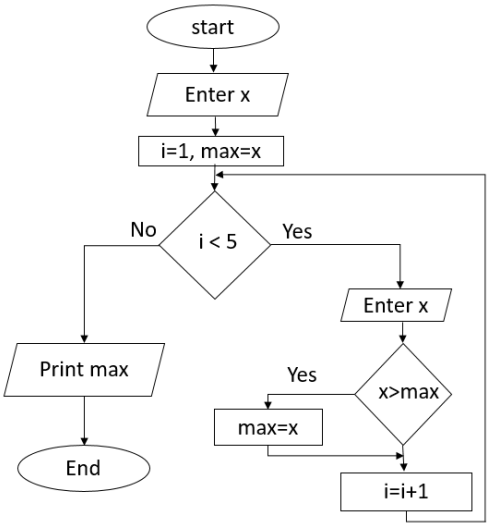
3) Input five numbers and determine the maximum one.

Flowchart	Pseudocode

	Start
	Enter x
	Set i=1, max=x
	While (i < 5)
	  Enter x
	  If (x>max)
	  max=x
	  i=i+1
	Print max
	End

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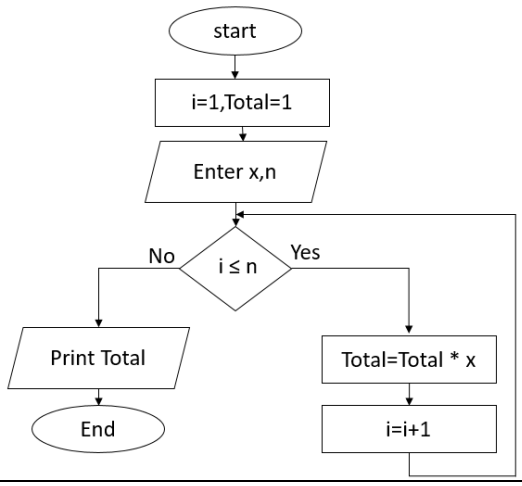
4) Read two integers **X** and **n**, and prints the value of **X** raised to **n** (i.e. X^n).

Note: $X^n = \underbrace{X * X * X * \ldots X}_{n \text{ times}}$

Flowchart	Pseudocode

	Start
	Set i=1, Total=1
	Enter x,n
	While (i ≤ n)
	  Total=Total*x
	  i=i+1
	Print Total
	End

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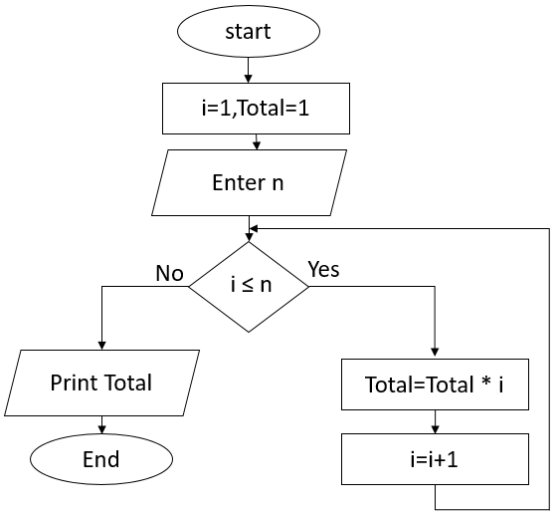
5) Input a positive number **N** and prints out its factorial (i.e. **N!**)

Note: $\mathbf{N! = \underbrace{N * (N-1) * (N-2) * \ldots * 2 * 1}_{n \text{ times}}}$

Flowchart	Pseudocode

	Start
	Set i=1, Total=1
	Enter n
	While (i ≤ n)
	  Total=Total*i
	  i=i+1
	Print Total
	End

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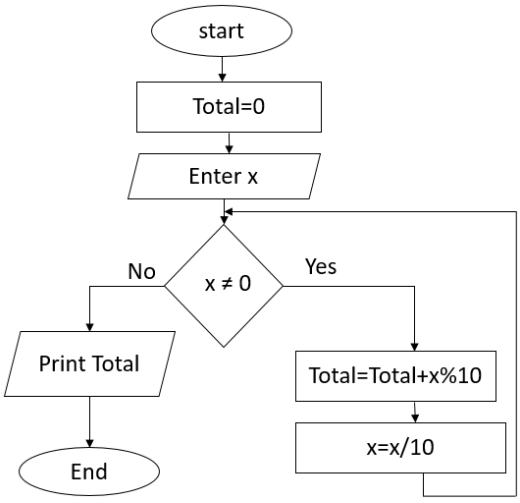
6) Compute the total of the digits, for some entered integer. An integer is a number without fraction.

Flowchart	Pseudocode

	Start
	Set Total=0
	Enter x
	While (x≠0)
	  Total=Total+x%10
	  x=x/10
	print Total
	End

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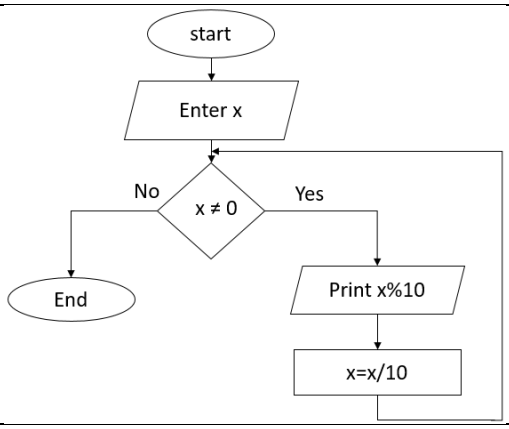
7) Display a positive integer number, which is entered by the user, in reversed order.

Example: when the input is (2753), the output will be (3572).

Hint: use remainder and division by (10).

Flowchart	Pseudocode
	Start Enter an integer x While (x≠0) Print x%10 (print the reminder) x=x/10 End

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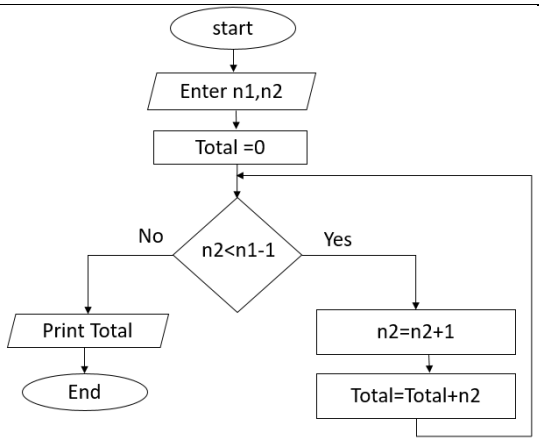
8) Compute the sum of all integers between two entered values (n1) and (n2), given that (n1) should be greater than (n2).

Flowchart	Pseudocode
	Start Enter n1,n2 Set Total to 0 While (n2 < n1-1) n2=n2+1 Total =Total +n2 Print Total End

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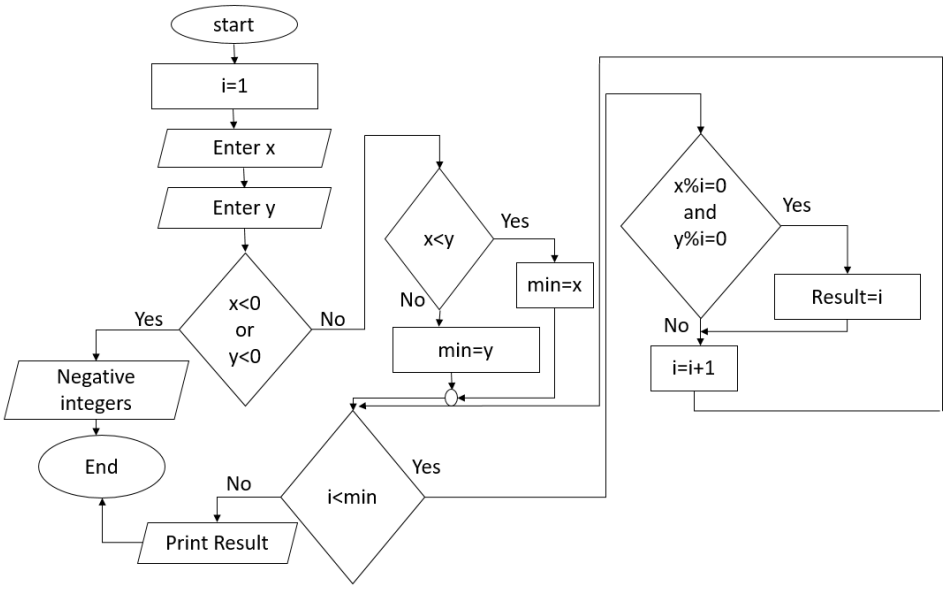
9) Find the greatest common divisor (GCD) of two positive integers. If any of these numbers is not positive, print a suitable message.

Flowchart	Pseudocode

	Start
	Set i equal 1
	Enter x,y
	If (x < 0 or y < 0)
	  Print "negative number"
	Else
	  If (x<y) then
	  min=x
	  else
	  min=y
	  while (i<min)
	  if (i divides x and i divides y)
	  Result = i
	  i = i +1
	print Result
	Stop

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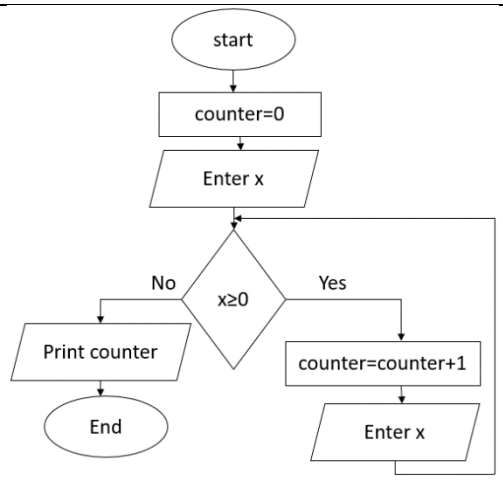
10) The user enters as much numbers as possible, this should continue if the input was not negative. After a negative number is entered, the input stops, and the output should be the count of the entered values. Do not include the last negative value into the count.

Example: if the entered values were (1, 6, 0, 4, 8, 11, 36, 2, -10), the output should be (8).

Flowchart	Pseudocode

	Start
	Set counter to zero
	Enter x
	While (x≥0)
	  counter=counter+1
	  Enter x
	Print counter
	End

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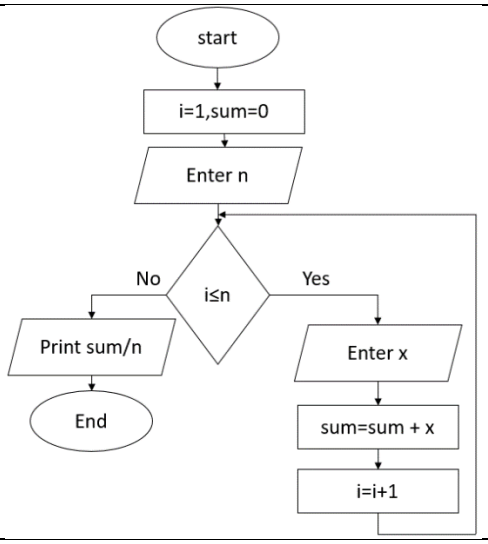
11) The user enters a positive integer (n), this is followed by entering more (n) numbers, and then output their average. Example: if the user first enters (5) to be stored as (n), then he should enter (5) other values, like: (9, 7, 3, 6, 10), the total of these values = 9 + 7 + 3 + 6 + 10 = 35, and their average is (35 ÷ 5) = 7, so the output is (7).

Flowchart	Pseudocode

	Start
	Set i=0, sum=0
	Enter n
	While (i ≤ n)
	  Enter x
	  Sum=sum + x
	  i=i+1
	print sum/n
	End

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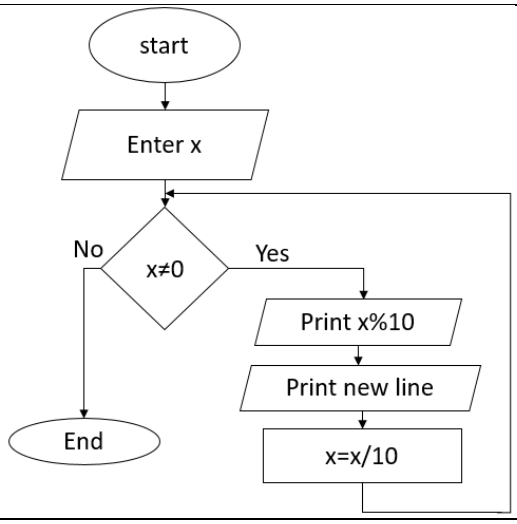
12) Write a C++ program that prompts the user to enter an integer number, and prints the digits of this number on separate lines: For Example: if the entered number is 65082 your program displays:

2
8
0
5
6

Flowchart	Pseudocode

	Start
	Enter x
	While (x≠0)
	  Enter x%10
	  Print new line
	  x=x/10
	End

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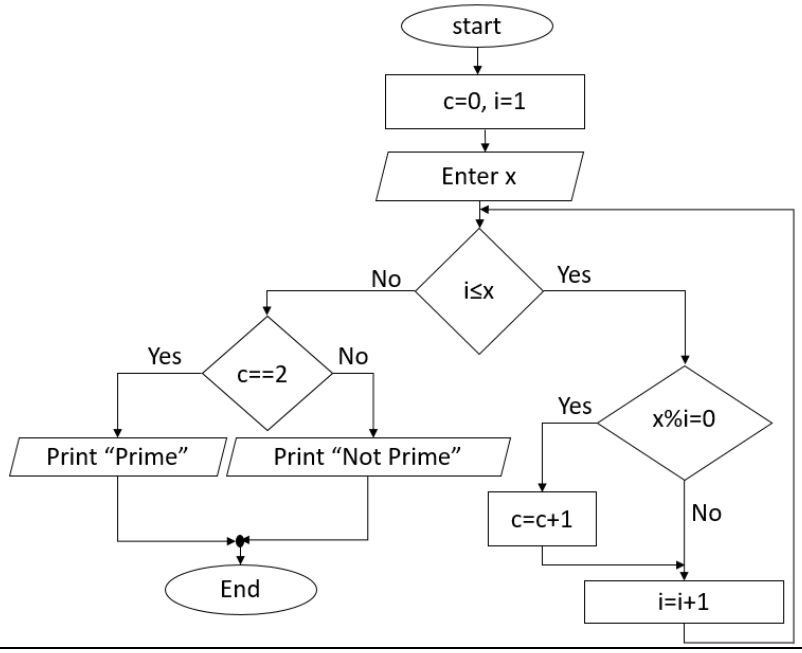
13) Enter an integer number and determine whether it's a PRIME number or not. (*Note:* a PRIME number only divides on itself and 1).

Flowchart	Pseudocode

	Start
	Set c=0, i=1
	Enter x
	While (i≤x)
	  If(x%10) then
	  c=c+1
	  i=i+1
	If(c==2) then print "Prime"
	Else print "not Prime"
	End