MY FIRST BOOK

SOLVING SOME PROBLEMS IN LET US C BY YASHAVANT KANETKAR TEXTBOOK

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Contents

CHAPTER - 1: GETTING STARTED

PROBLEM 1.1

Temperature of a city in Farenheit degrees is input through the keyboard. Write a program to convert this temperature into Centigrade degrees.

ALGORITHM

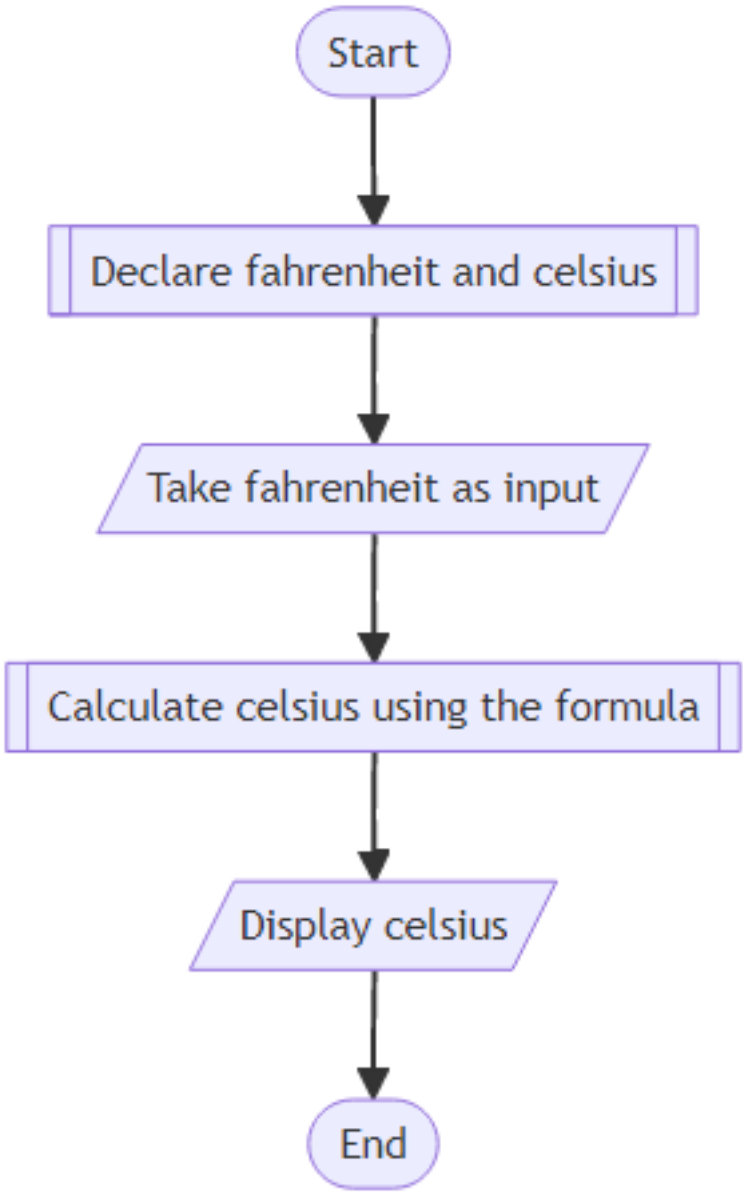
1. Start
2. Declare float variables Farenheit and celsius
3. Take farenheit as input

4. Calculate Celsius from the formula celsius = ((farenheit - 32) / 1.8)
5. Display the farenheit and celsius values
6. Stop

PSEUDOCODE

```
DECLARE FLOAT farenheit, celsius
INPUT farenheit
ASSIGN celsius to ((farenheit - 32) / 1.8);
DISPLAY "Value in farenheit is: "
DISPLAY farenheit
DISPLAY "Value in celsius is: "
DISPLAY celsius
```

FLOWCHART



PROBLEM 1.2

The length and breadth of a rectangle and radius of a circle are input through the keyboard. Write a program to calculate the area and perimeter of the rectangle,

and the area and circumference of the circle.

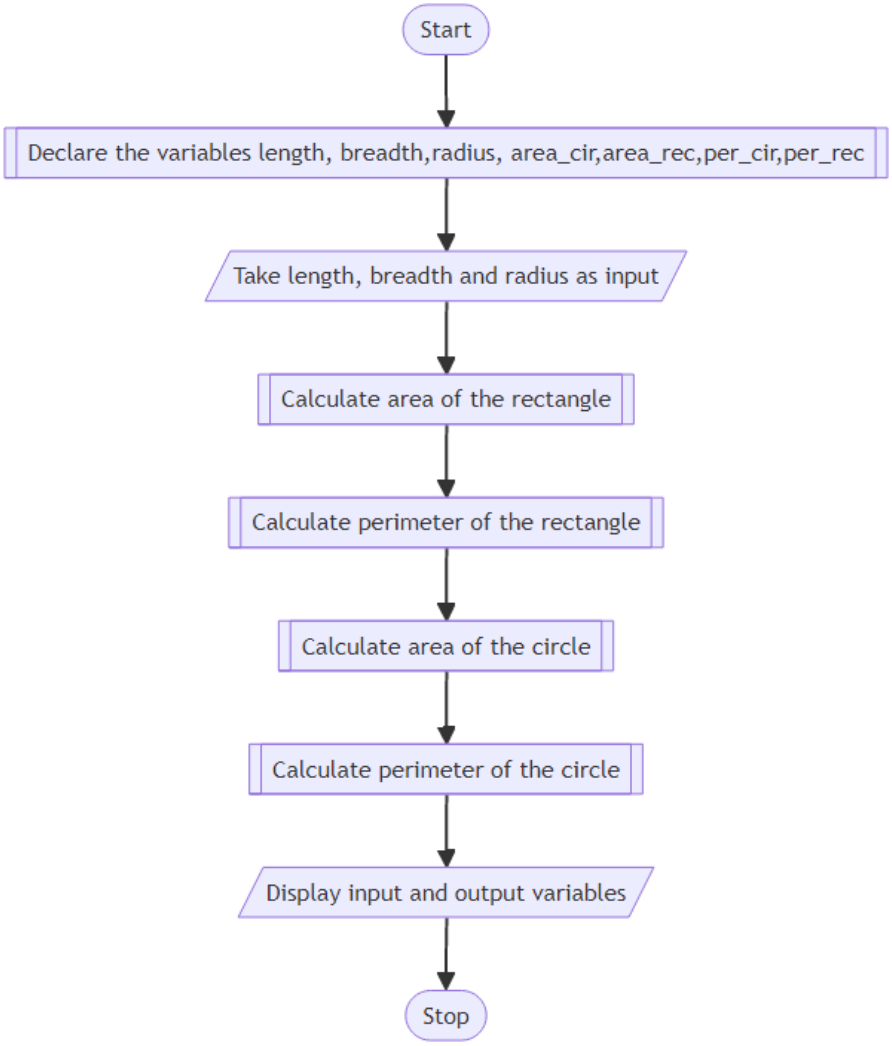
ALGORITHM:

1. Start
2. Declare float variables length, breadth,radius, area_cir,area_rec,per_cir,per_rec
3. Take length, breadth and radius as input
4. Calculate the area of the rectangle using the formula area_rec = length*breadth;
5. Calculate the perimeter of the rectangle using the formula per_rec = 2*(length+breadth);
6. Calculate the area of the circle using the formula area_cir = 3.14*radiusˆ2;
7. Calculate the perimeter of the circle using the formula per_cir = 2* 3.14 *radius;
8. Display the input and output variables
9. Stop

PSEUDOCODE:

```
DECLARE FLOAT length, breadth,radius, area_cir,area_rec,per_cir,per_rec
INPUT length,breadth,radius
ASSIGN area_rec to length*breadth
ASSIGN per_rec to 2*(length+breadth)
ASSIGN area_cir to 3.14*radiusˆ2
ASSIGN per_cir to 2*3.14*radius
DISPLAY "The length of the rectangle:"
DISPLAY length
DISPLAY "The breadth of the rectangle:"
DISPLAY breadth
DISPLAY "The radius of the circle:"
DISPLAY radius
DISPLAY "The area of the rectangle:"
DISPLAY area_rec
DISPLAY "The perimeter of the rectangle:"
DISPLAY per_rec
DISPLAY "The area of the circle:"
DISPLAY area_cir
DISPLAY "The perimeter of the circle:"
DISPLAY per_cir
```

FLOWCHART:



PROBLEM 1.3

Paper of size A0 has dimensions 1189 cm x 841 mm. Each subsequent size A(n) is defined as A(n-1) cut in half, parallel to its shorter sides. Thus, a paper of size A1 would have dimensions 841 mm x 594 mm. Write a program to calculate and print the paper sizes A1 to A8.

ALGORITHM:

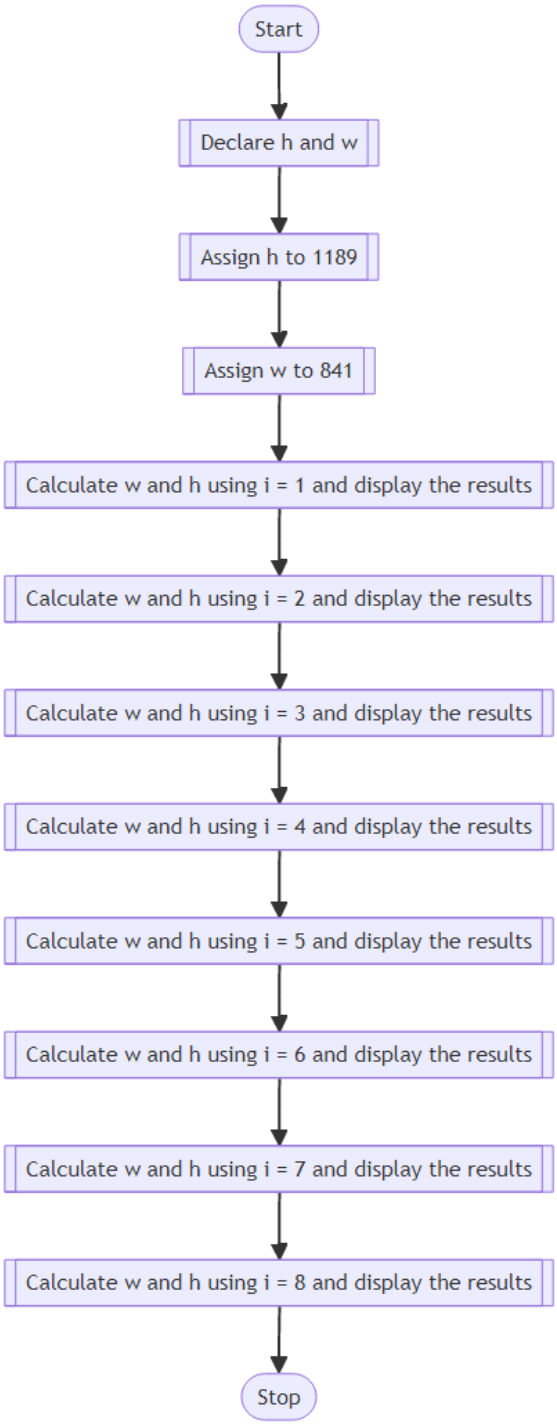
1. Start

2. Declare float variables h and w.
3. Assign h to 1189 and w to 841.
4. Display “size of A0: h x w”
5. Calculate the size of A1 as: w = 2^(-0.25 - 0.5 * i) * 1000,h = 2^(0.25 - 0.5 * i) * 1000, taking i as 1.
6. Repeat Step 5 for i = 2 to i= 8
7. Display the sizes of A1 to A8.
8. Stop

PSEUDOCODE:

```
DECLARE FLOAT h,w
ASSIGN h to 1189
ASSIGN w to 841
DECLARE INTEGER i
ASSIGN i to 0
DISPLAY "Size of A0: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 1) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 1) * 1000
DISPLAY "Size of A1: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 2) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 2) * 1000
DISPLAY "Size of A2: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 3) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 3) * 1000
DISPLAY "Size of A3: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 4) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 4) * 1000
DISPLAY "Size of A4: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 5) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 5) * 1000
DISPLAY "Size of A5: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 6) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 6) * 1000
DISPLAY "Size of A6: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 7) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 7) * 1000
DISPLAY "Size of A7: hxw"
ASSIGN w to 2^(-0.25 - 0.5 * 8) * 1000
ASSIGN h to 2^(0.25 - 0.5 * 8) * 1000
DISPLAY "Size of A8: hxw"
```

FLOWCHART


Start
Declare h and w
Assign h to 1189
Assign w to 841
Calculate w and h using i = 1 and display the results
Calculate w and h using i = 2 and display the results
Calculate w and h using i = 3 and display the results
Calculate w and h using i = 4 and display the results
Calculate w and h using i = 5 and display the results
Calculate w and h using i = 6 and display the results
Calculate w and h using i = 7 and display the results
Calculate w and h using i = 8 and display the results
Stop

CHAPTER-2: C INSTRUCTIONS

PROBLEM 2.1

If a five-digit number is input through the keyboard, write a program to calculate the sum of its digits.

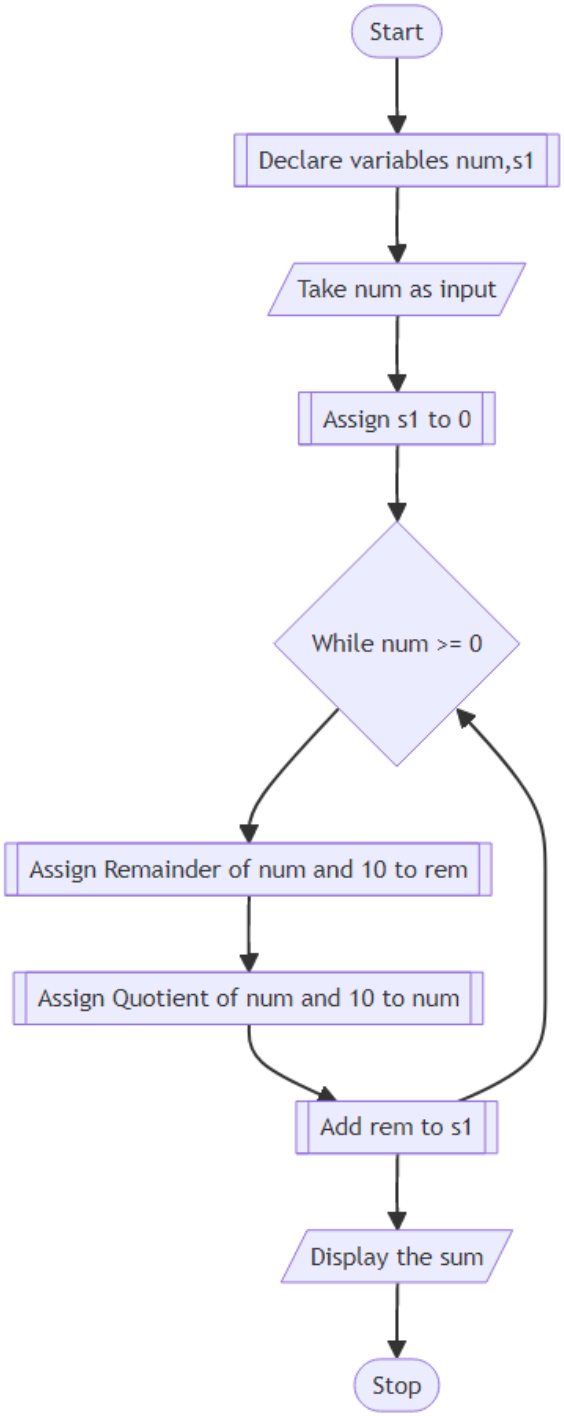
ALGORITHM

1. Start
2. Declare int variables num,and s1
3. Take num as input
4. Assign s1 to 0
5. divide num by 10 and store the remainder in variable rem.
6. add rem to sum.
7. divide num by 10 and re-assign num to be the quotient.
8. Repeat steps 5-7 until num becomes less than or equal to zero
9. display the sum s1.
10. Stop

PSEUDOCODE

```
DECLARE INTEGER num,s1
INPUT num
ASSIGN s1 to 0
WHILE num <= 0
    ASSIGN Remainder(num,10) to rem
    ASSIGN num/10 to num
    ADD rem to s1
ENDWHILE
DISPLAY "The sum of digits of number is: "
DISPLAY s1
```

FLOWCHART


Start
Declare variables num,s1
Take num as input
Assign s1 to 0
While num >= 0
Assign Remainder of num and 10 to rem
Assign Quotient of num and 10 to num
Add rem to s1
Display the sum
Stop

PROBLEM 2.2

Write a program to recieve Cartesian Coordinates (x,y) of a point and convert them into polar coordinates (r,phi) **Hint: r = sqrt(x^{2+y}2), phi = tan^-1(y/x)**

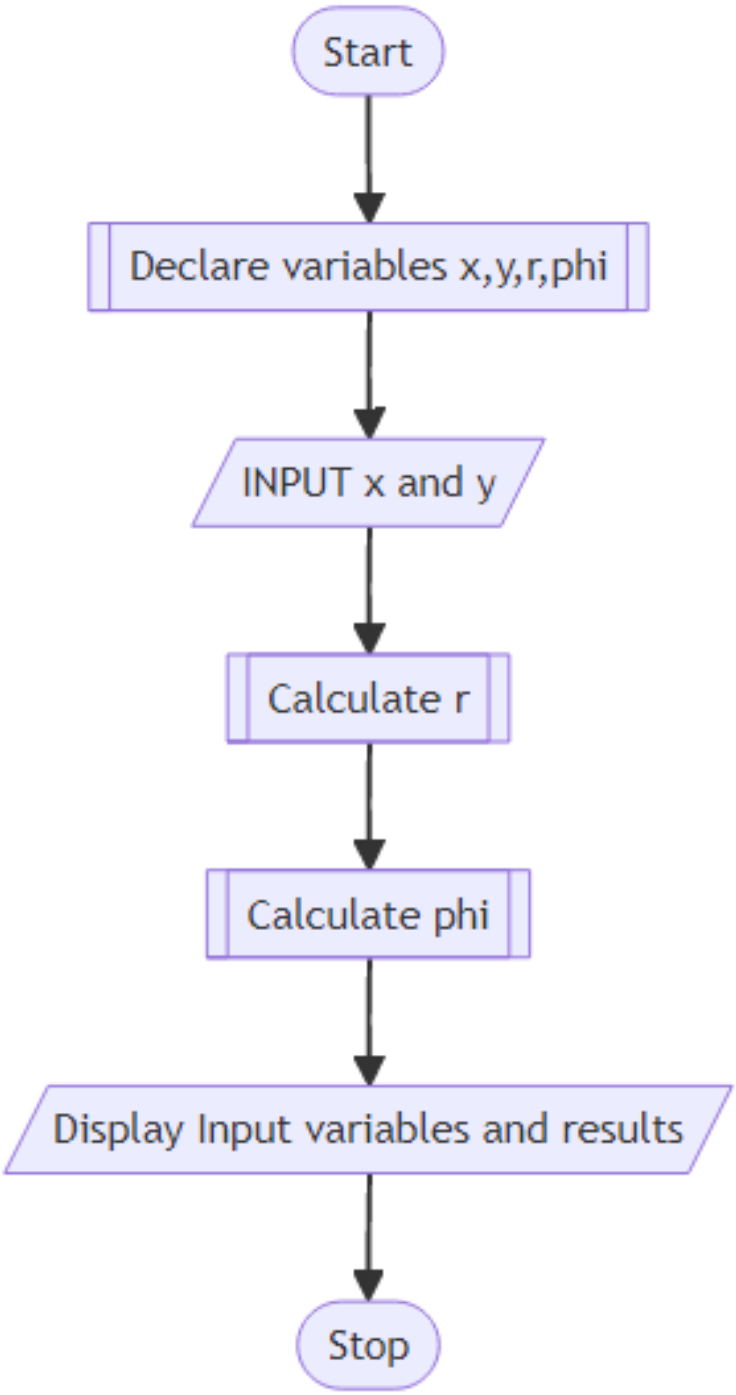
ALGORITHM

1. Start
2. Declare float variables x,y,r,phi
3. Take x and y as input
4. Calculate r using the formula r = sqrt(x^{2+y}2)
5. Calculate phi using the formula phi = tan^-1(y/x)
6. Display the input variables and results
7. Stop

PSEUDOCODE

```
DECLARE FLOAT x,y,r,phi
INPUT x,y
ASSIGN r to SQUARE ROOT (x square + y square)
ASSIGN phi to INVERSE TANGENT(y/x)
DISPLAY "Cartesian Co-ordinates: "
DISPLAY x and y
DISPLAY "Polar Coordinates: "
DISPLAY r and phi
```

FLOWCHART


Start
Declare variables x,y,r,phi
INPUT x and y
Calculate r
Calculate phi
Display Input variables and results
Stop

PROBLEM 2.3

Write a program to recieve values of latitude(L1,L2) and longitude(G1,G2), in degrees, of two places on earth and output the distance between the distance(D) between them in nautical miles. The formula for the distance in nautical miles is: **D = 3963 cos-1(sin L1 sin L2+ cos L1 cos L2*cos(G2-G1))**

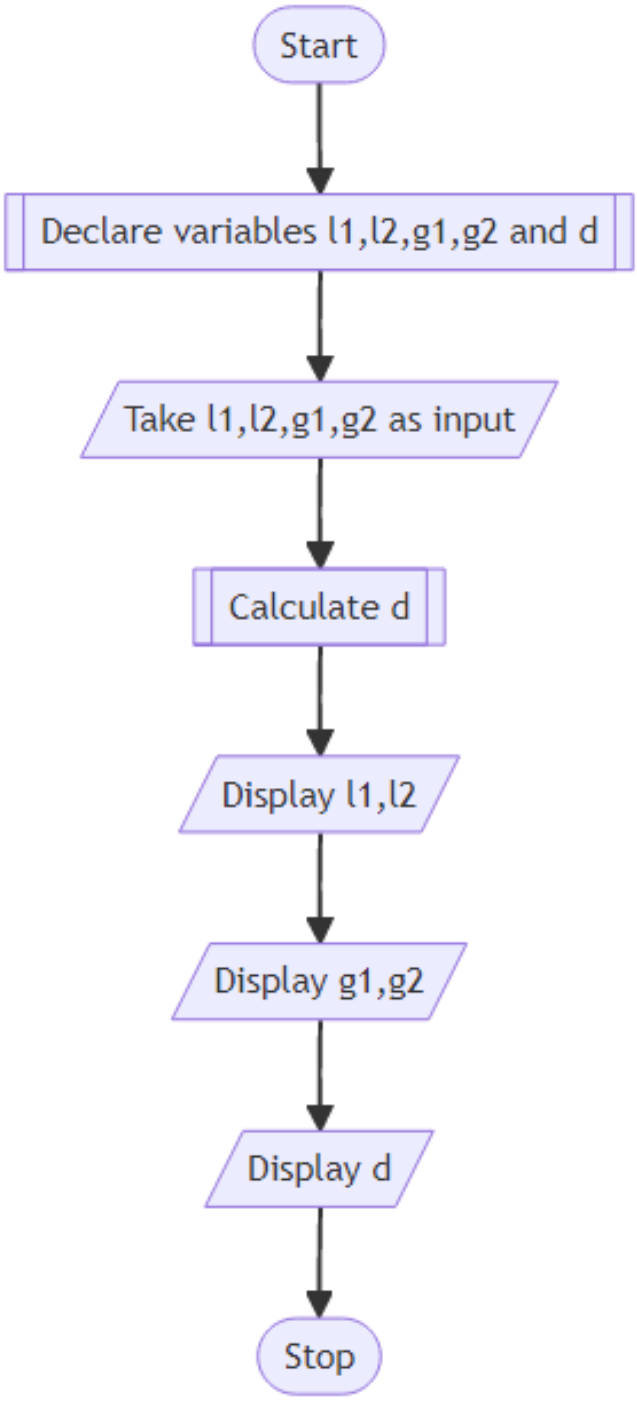
ALGORITHM:

1. Start
2. Declare float variables l1,l2,g1,g2 and d
3. Take l1,l2,g1 and g2 as input
4. Calculate d using d = 3963 cos-1(sin L1 sin L2+ cos L1 cos L2*cos(G2-G1))
5. Display the input and results
6. Stop

PSEUDOCODE

```
DECLARE FLOAT l1,l2,g1,g2,d
INPUT l1,l2,g1,g2
ASSIGN d to 3963 cos-1(sin L1 sin L2+ cos L1 cos L2*cos(G2-G1))
DISPLAY "Latitudes: "
DISPLAY l1,l2
DISPLAY "Longitudes: "
DISPLAY g1,g2
DISPLAY "Distance in nautical miles: "
DISPLAY d
```

FLOWCHART


Start
Declare variables l1,l2,g1,g2 and d
Take l1,l2,g1,g2 as input
Calculate d
Display l1,l2
Display g1,g2
Display d
Stop

PROBLEM 2.4

Wind chill factor is the felt air temperature on exposed skin due to wind. The wind chill temperature is always lower than the air temperature, and is calculated using the following formula: wcf = 35.74+0.6215t +(0.4275t - 35.75)*vˆ0.16 where t is temperature, v is wind velocity. Write a program to recieve values of t and v and calculate wcf.

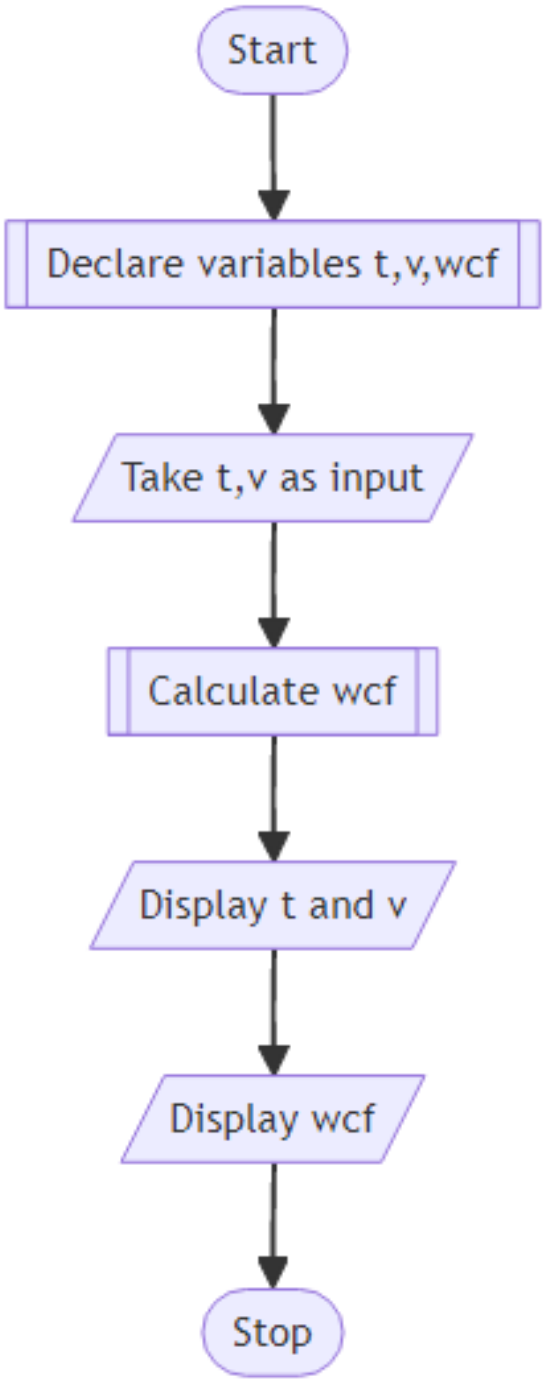
ALGORITHM

1. Start
2. Declare float variables t,v and wcf
3. Take t and v as input
4. Calculate wcf using: wcf = 35.74+0.6215t +(0.4275t - 35.75)*vˆ0.16
5. Display the inputs and results.
6. Stop

PSEUDOCODE

```
DECLARE FLOAT t,v,wcf
INPUT t,v
ASSIGN wcf to 35.74+0.6215t +(0.4275t - 35.75)*vˆ0.16
DISPLAY "Temperature : "
DISPLAY t
DISPLAY "Velocity : "
DISPLAY v
DISPLAY "Wind chill factor : "
DISPLAY wcf
```

FLOWCHART


Start
Declare variables t,v,wcf
Take t,v as input
Calculate wcf
Display t and v
Display wcf
Stop

PROBLEM 2.5

If value of an angle is input through the keyboard, write a program to print all its trigonometric ratios.

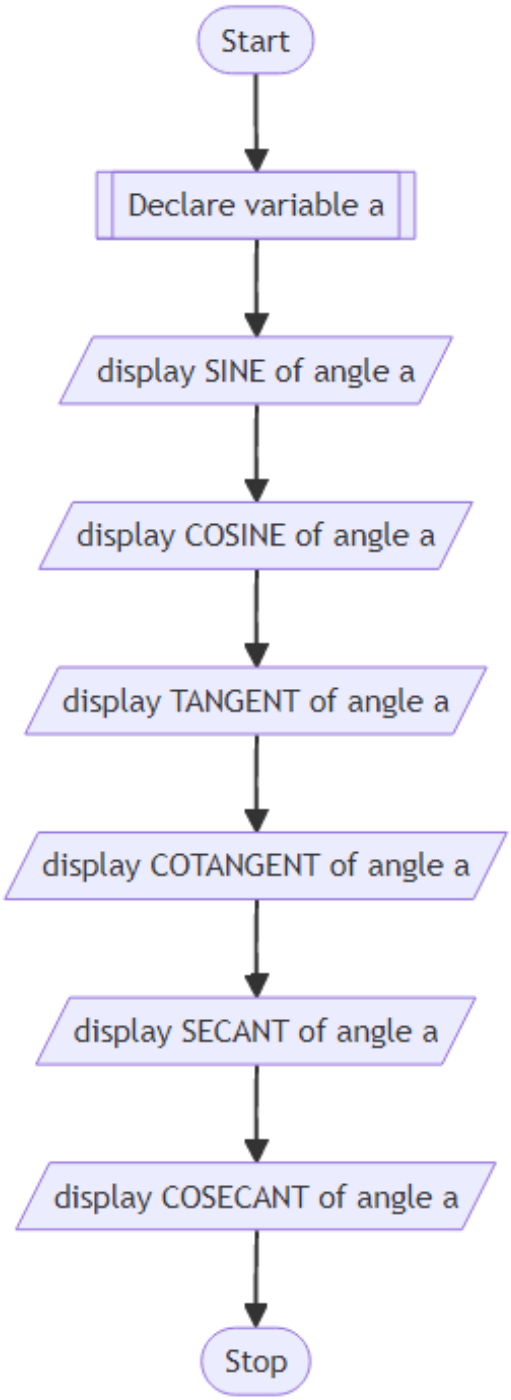
ALGORITHM

1. Start
2. Declare float variable a
3. Calculate sin(a) and print the result
4. Calculate cos(a) and print the result
5. Calculate tan(a) and print the result
6. Calculate cot(a) and print the result
7. Calculate sec(a) and print the result
8. Calculate cosec(a) and print the result
9. Stop

PSEUDOCODE

```
DECLARE FLOAT a
DISPLAY "SINE of angle a is : sin(a)"
DISPLAY "COSINE of angle a is : cos(a)"
DISPLAY "TANGENT of angle a is : tan(a)"
DISPLAY "COTANGENT of angle a is : cot(a)"
DISPLAY "SECANT of angle a is : sec(a)"
DISPLAY "COSECANT of angle a is : cosec(a)"
```

FLOWCHART


Start
Declare variable a
display SINE of angle a
display COSINE of angle a
display TANGENT of angle a
display COTANGENT of angle a
display SECANT of angle a
display COSECANT of angle a
Stop

PROBLEM 2.6

Two numbers are input through two locations c and d. Write a program to interchange contents of c and d.

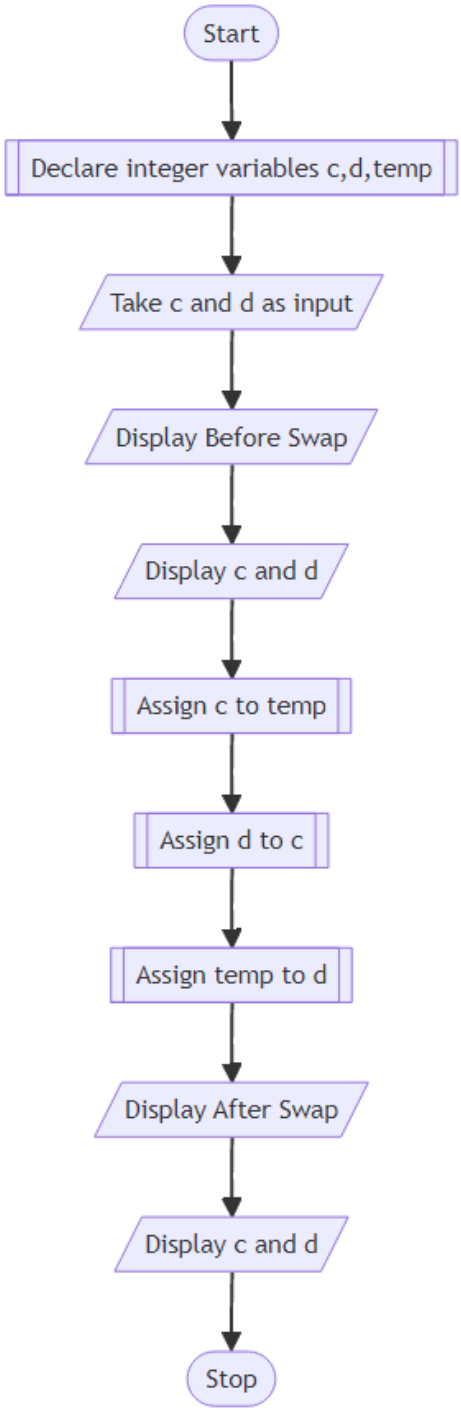
ALGORITHM

1. Start
2. Declare integer variables a and b
3. Declare another variable temp
4. Take a and b as input
5. Display the values of the variables before swap
6. Assign a to temp
7. Assign b to a
8. Assign temp to b
9. Display values of a and b'
10. Stop

PSEUDOCODE

```
DECLARE INTEGER a and b
DECLARE INTEGER temp
INPUT a,b
DISPLAY "Before Swap"
DISPLAY a,b
ASSIGN a to temp
ASSIGN b to a
ASSIGN temp to b
DISPLAY "After Swap"
DISPLAY a,b
```

FLOWCHART


Start
Declare integer variables c,d,temp
Take c and d as input
Display Before Swap
Display c and d
Assign c to temp
Assign d to c
Assign temp to d
Display After Swap
Display c and d
Stop

CHAPTER - 3: CONDITIONAL STATEMENTS

PROBLEM 3.1

A five-digit number is entered through the keyboard. Write a program to obtain the reversed number and to determine whether the original and reversed numbers are equal or not

ALGORITHM

1. Start
2. Declare integer variable num, and an array a
3. Take num as input
4. Take the remainder of num and 10 and add to the array.
5. Reassign num to integer division of num and 10
6. Repeat steps 4 and 5 until num<=0
7. Declare a variable s
8. Multiply 2**(length(a)-i) to the ith element of a, and add to the variable s
9. Repeat step 8 for each element in a
10. check if s is equal to num:

    a. If yes, display “Pallindrome”
    b. Else, display “Not pallindrome”

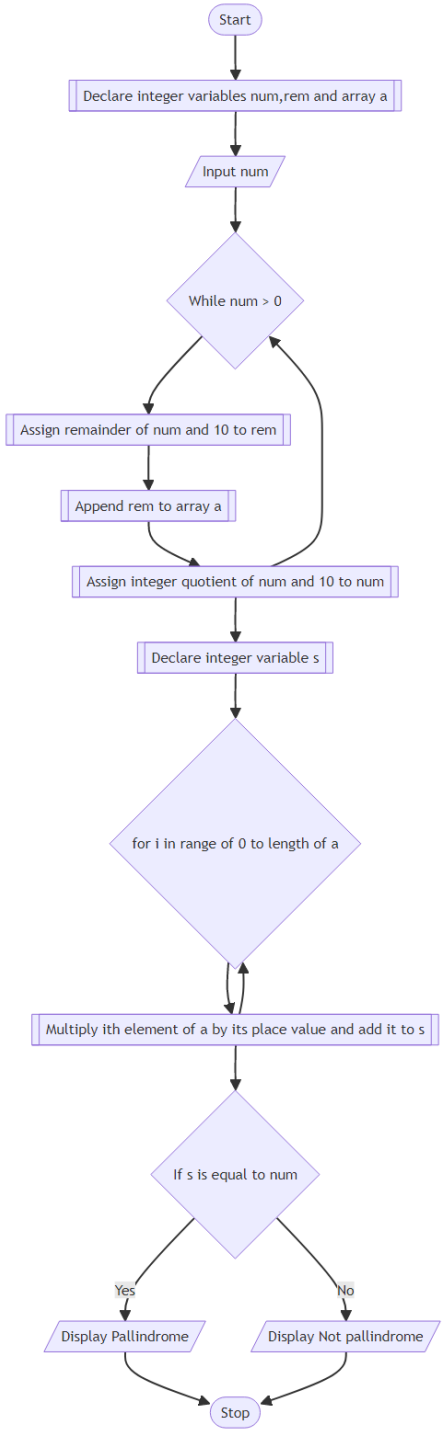
11. Stop

PSEUDOCODE

```
FUNCTION CountDigits(INTEGER num)
    DECLARE INTEGER result and ASSIGN 0 to it
    WHILE num != 0
        ASSIGN num/10 to num
        INCREMENT result
    ENDWHILE
    RETURN result
ENDFUNCTION

FUNCTION main
    DECLARE INTEGER num,rem,temp,n
    INPUT num
    ASSIGN CountDigits(num) to n
    DECLARE INTEGER ARRAY a[n]
    ASSIGN num to temp
    WHILE temp>0
        ASSIGN REMAINDER(temp,10) to rem
        APPEND rem to ARRAY a
        ASSIGN temp/10 to temp
```

```
    ENDWHILE
    DECLARE INTEGER s = 0
    FOR i IN RANGE OF 0 to length(a)
        ASSIGN s to s*10 + a[i]
    ENDFOR

    IF s is equal to num
        DISPLAY "Pallindrome"
    ELSE
        DISPLAY "Not Pallindrome"
    ENDIF
ENDFUNCTION
```

FLOWCHART


Start
Declare integer variables num,rem and array a
Input num
While num > 0
Assign remainder of num and 10 to rem
Append rem to array a
Assign integer quotient of num and 10 to num
Declare integer variable s
for i in range of 0 to length of a
Multiply ith element of a by its place value and add it to s
If s is equal to num
Yes
No
Display Pallindrome
Display Not pallindrome
Stop

PROBLEM 3.2

If ages of Ram, Shyam and Ajay are input through the keyboard, write a program to determine the youngest of the three

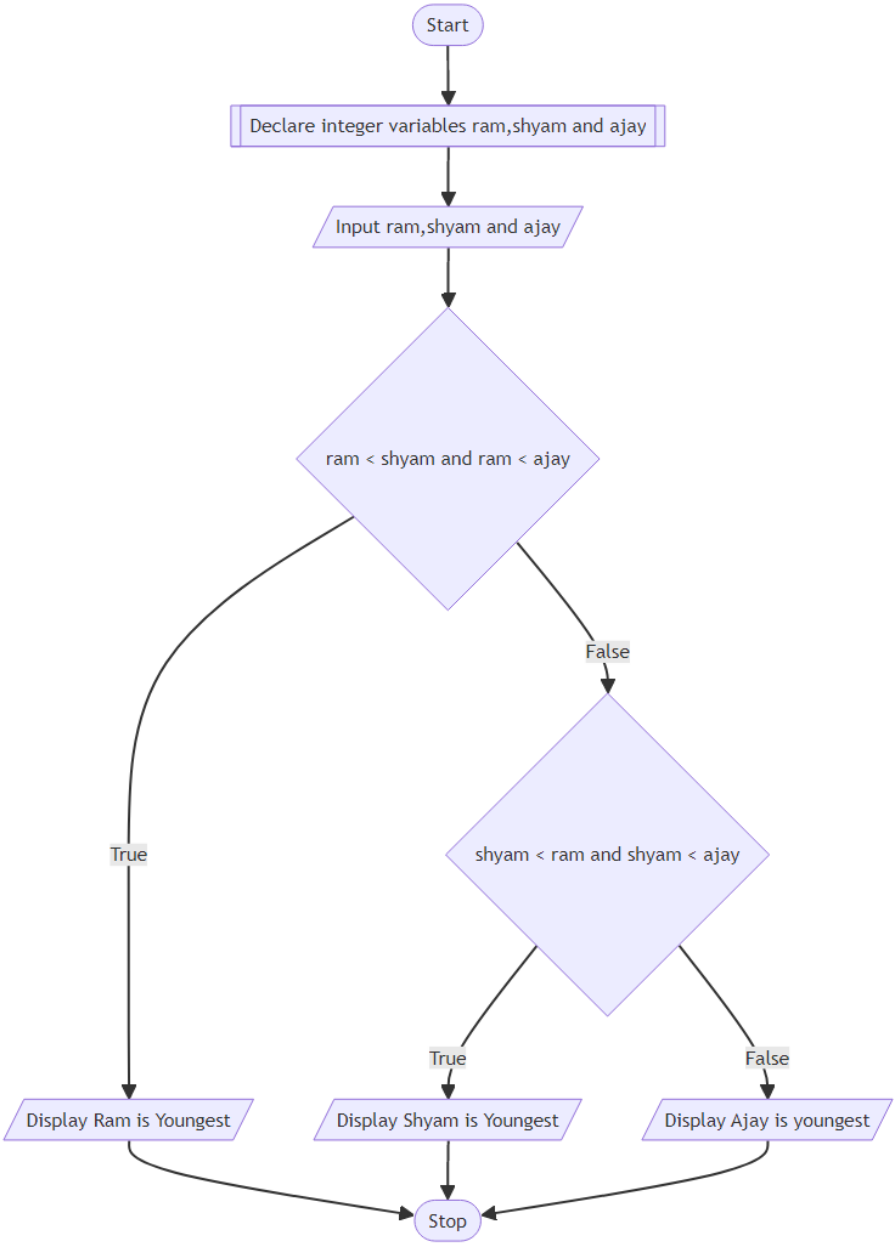
ALGORITHM

1. Start
2. Declare integer variables ram, shyam and ajay
3. Input ram, shyam and ajay
4. If ram is less than both shyam and ajay, display “ram is youngest”.
5. Else if shyam is less than both ram and ajay, display “shyam is youngest”.
6. Else display “Ajay is youngest”
7. Stop

PSEUDOCODE

```
DECLARE INTEGER ram,shyam,ajay
INPUT ram,shyam,ajay
IF ram < shyam and ram < ajay
    DISPLAY "Ram is youngest"
ELSE IF shyam < ram and shyam < ajay
    DISPLAY "Shyam is youngest"
ELSE
    DISPLAY "Ajay is youngest"
ENDIF
```

FLOWCHART


Start
Declare integer variables ram,shyam and ajay
Input ram,shyam and ajay
ram < shyam and ram < ajay
True
False
shyam < ram and shyam < ajay
True
False
Display Ram is Youngest
Display Shyam is Youngest
Display Ajay is youngest
Stop

PROBLEM 3.3

Write a program to check whether a triangle is valid or not, if three angles of the triangle are entered through the keyboard. A triangle is valid if the sum of all the three angles is equal to 180 degrees

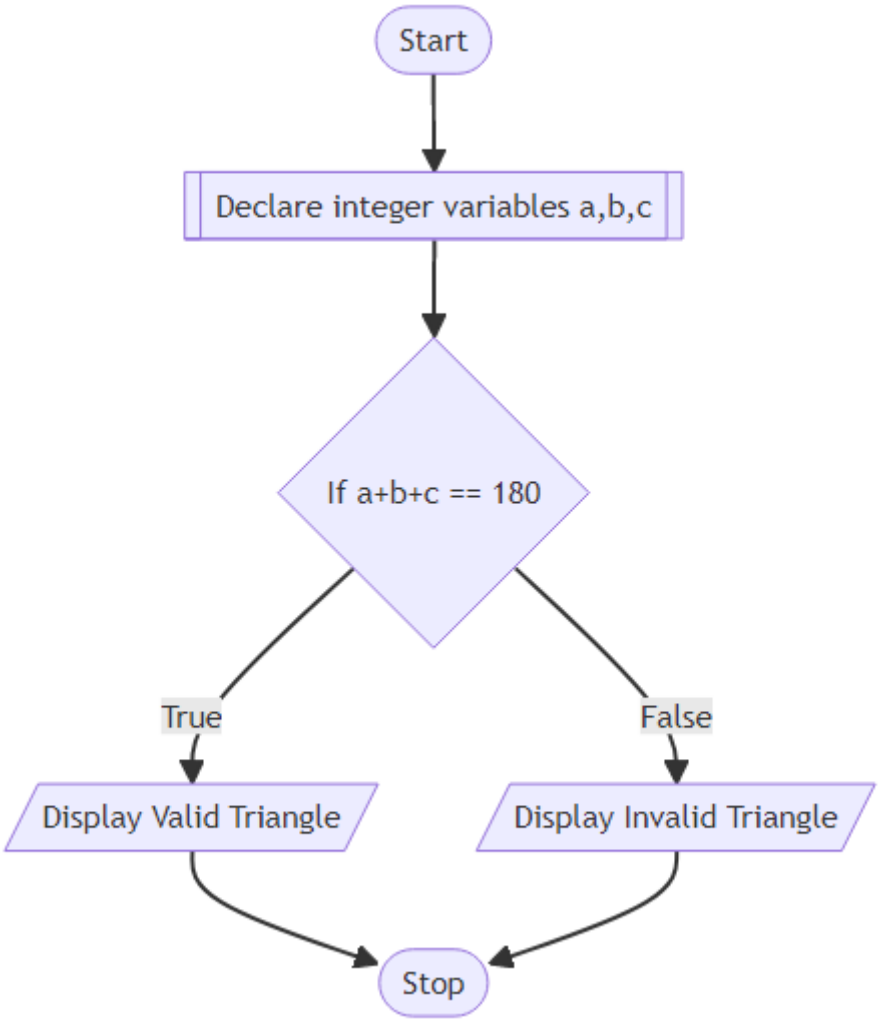
ALGORITHM

1. Start
2. Declare integer variables a,b,c
3. If a+b+c == 180, display “Valid Triangle”
4. Else, display “Invalid triangle”
5. Stop

PSEUDOCODE:

```
DECLARE INTEGER a,b,c
INPUT a,b,c
IF a+b+c == 180
    DISPLAY "Valid Triangle"
ELSE
    DISPLAY "Invalid Triangle"
ENDIF
```

FLOWCHART



PROBLEM 3.4

Write a program to find the absolute value of a number entered through the keyboard

ALGORITHM

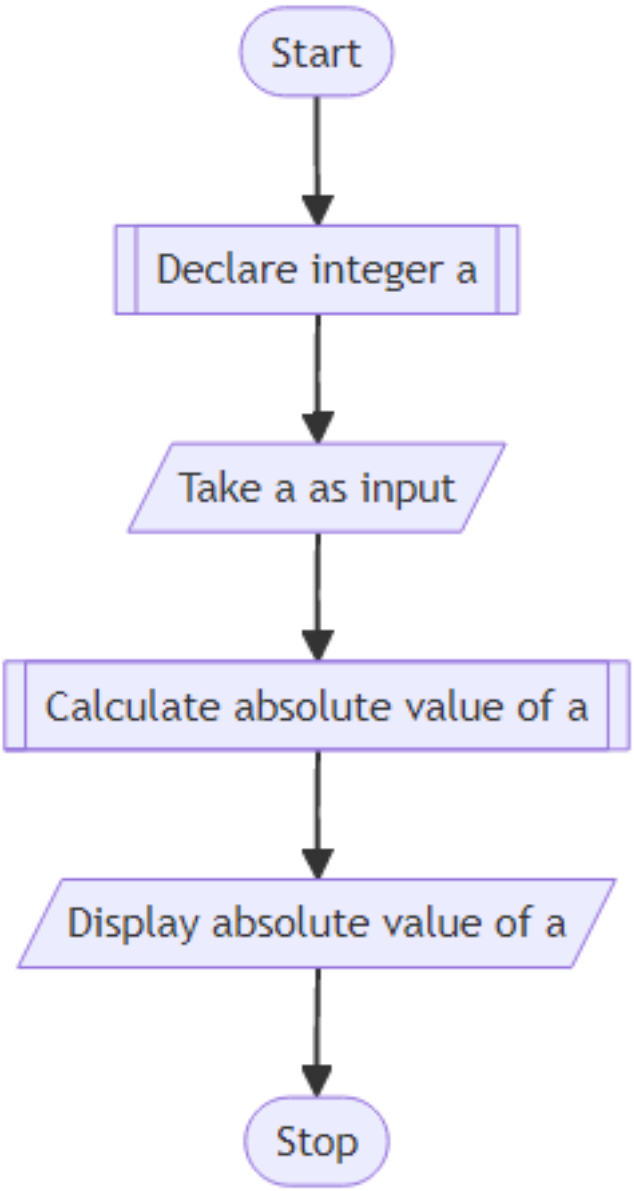
1. Start
2. Declare variable a
3. Input a

4. Calculate abs(a)
5. Display “Absolute value:”,abs(a)
6. Stop

PSEUDOCODE

```
DECLARE INTEGER a
INPUT a
DISPLAY "Absolute value of a: "
DISPLAY abs(a)
```

FLOWCHART



PROBLEM 3.5

Given the length and breadth of a rectangle, write a program to find whether the area of the rectangle greater than its perimeter. For example, the area of

the rectangle with length = 5 and breadth = 4 is greater than its perimeter

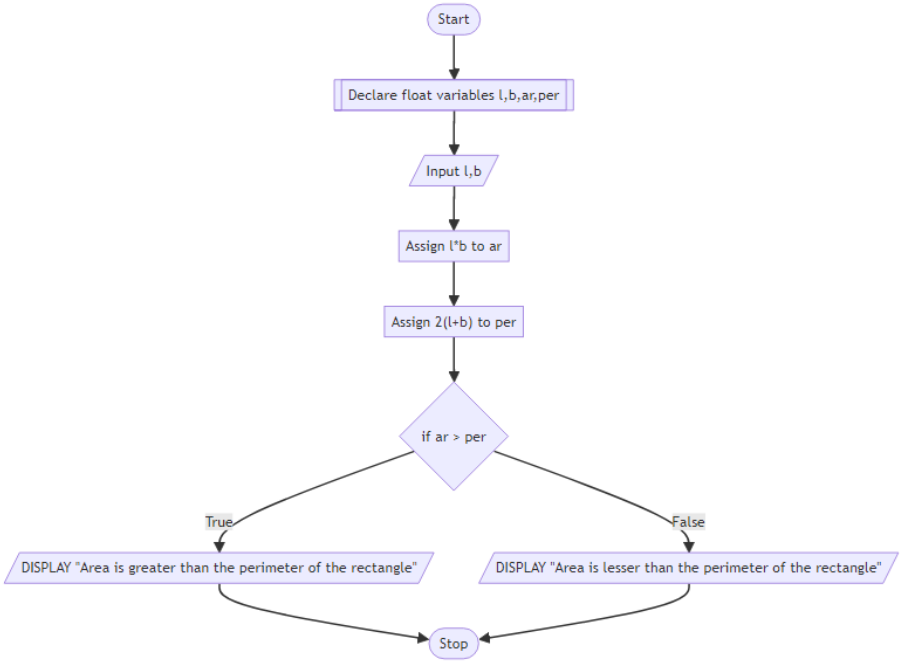
ALGORITHM

1. Start
2. Declare float variables l,b,ar,per
3. Assign l*b to ar
4. Assign 2(l+b) to per
5. If ar > per, display “Area is greater than the perimeter of the rectangle”
6. Else, display “Area is lesser than the perimeter of the rectangle”
7. Stop

PSEUDOCODE

```
DECLARE FLOAT l,b,ar,per
INPUT l,b
ASSIGN l*b to ar
ASSIGN 2(l+b) to per
IF ar > per
    DISPLAY "Area is greater than the perimeter of the rectangle"
ELSE
    DISPLAY "Area is lesser than the perimeter of the rectangle"
ENDIF
```

FLOWCHART



PROBLEM 3.6

Given the three points X(x1,y1), Y(x2,y2) and Z(x3,y3), write a program to check if the three points fall on straight line.

Condition for collinearity:

$$Slope(XY) = Slope(YZ) = Slope(XZ)$$

WHERE,

$$Slope(XY) = \frac{y2 - y1}{x2 - x1}$$

$$Slope(YZ) = \frac{y3 - y2}{x3 - x2}$$

$$Slope(XZ) = \frac{y3 - y1}{x3 - x1}$$

ALGORITHM

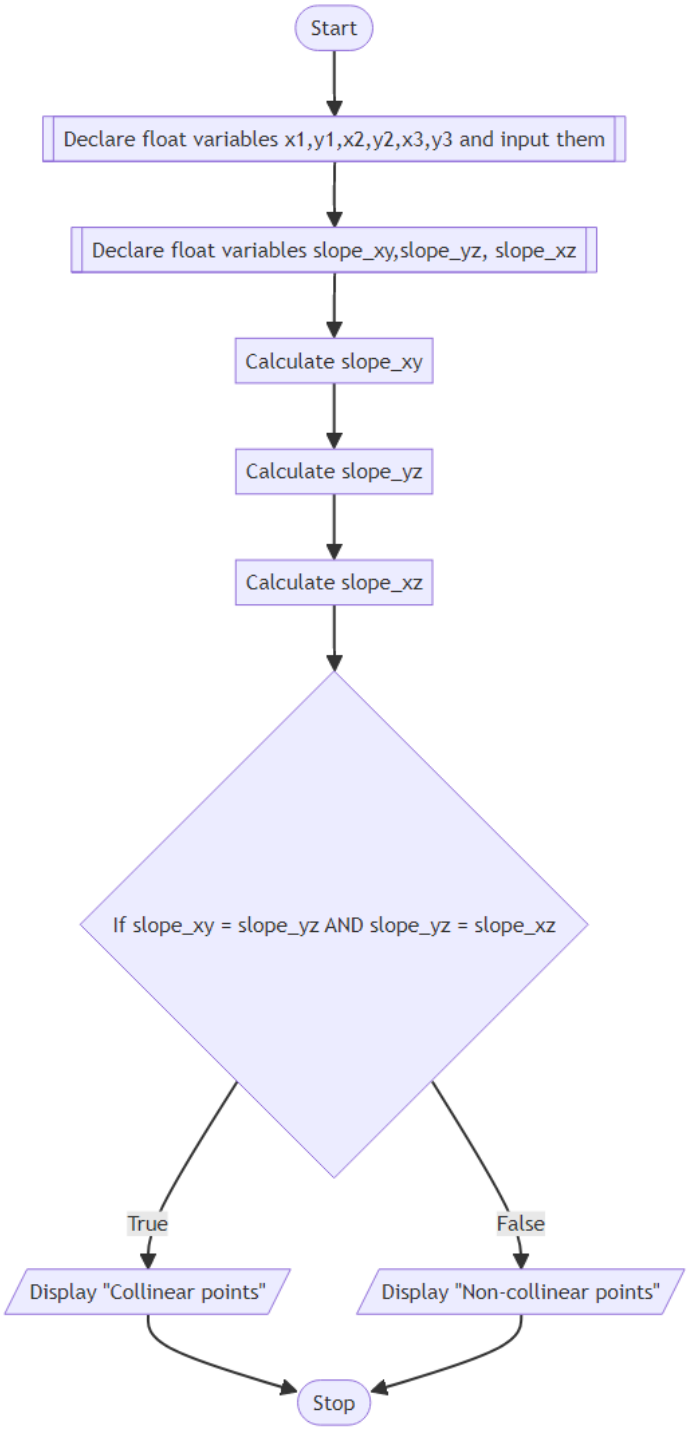
1. Start
2. Declare float variables x1,y1,x2,y2,x3,y3,slope_xy,slope_yz,slope_xz

3. Input x1,y1,x2,y2,x3,y3
4. Assign (y2-y1)/(x2-x1) to slope_xy
5. Assign (y3-y2)/(x3-x2) to slope_yz
6. Assign (y3-y1)/(x3-x1) to slope_xz
7. If slope_xy = slope_yz and slope_yz = slope_xz, Display “Collinear points”
8. Else, display “non-collinear points”
9. Stop

PSEUDOCODE

```
DECLARE FLOAT x1,y1,x2,y2,x3,y3
DECLARE FLOAT slope_xy,slope_yz,slope_xz
INPUT x1,y1,x2,y2,x3,y3
ASSIGN (y2-y1)/(x2-x1) to slope_xy
ASSIGN (y3-y2)/(x3-x2) to slope_yz
ASSIGN (y3-y1)/(x3-x1) to slope_xz
IF slope_xy = slope_yz AND slope_yz = slope_xz
    DISPLAY "Collinear points"
ELSE
    DISPLAY "Non-collinear points"
ENDIF
```

FLOWCHART


Start
Declare float variables x1,y1,x2,y2,x3,y3 and input them
Declare float variables slope_xy,slope_yz, slope_xz
Calculate slope_xy
Calculate slope_yz
Calculate slope_xz
If slope_xy = slope_yz AND slope_yz = slope_xz
True
False
Display "Collinear points"
Display "Non-collinear points"
Stop

PROBLEM 3.7

Given the coordinates C(x,y) of the center of the circle and its radius r, write a program that will determine whether a point P(h,k) lies inside the circle, on the circle, or outside the circle.

Distance between P(x,y) and centre C(h,k) is:

$$D = \sqrt{(x-h)^2 + (y-k)^2}$$

> If $D < r$, the point lies inside the circle.
> If $D = r$, the point lies on the circle.
> If $D > r$, the point lies outside the circle.

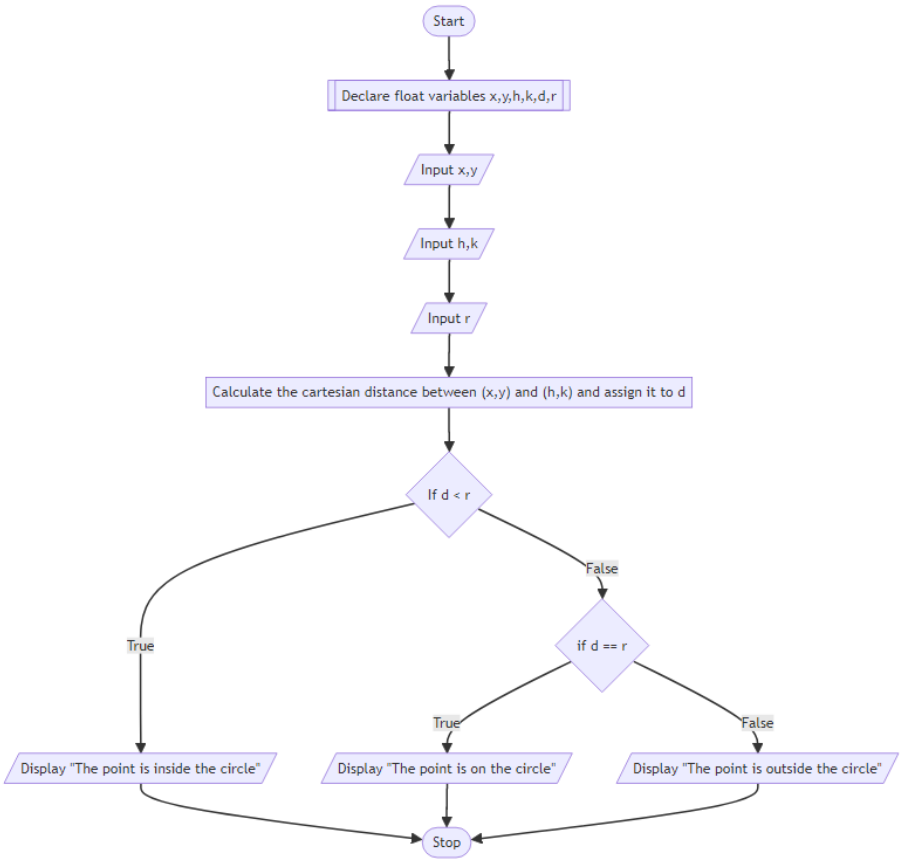
ALGORITHM

1. Start
2. Declare float variables x,y,h,k,d,r
3. Input x,y
4. Input h,k
5. Input r
6. Calculate the cartesian distance between (x,y) and (h,k) and assign it to d
7. If d < r, display “The point is inside the circle”
8. Else If d = r, display “The point is on the circle”
9. Else, display “The point is outside the circle”
10. Stop

PSEUDOCODE

```
DECLARE FLOAT x,y,h,k,d,r
INPUT x,y
INPUT h,k
INPUT r
ASSIGN sqrt((x-h)^2 + (y-k)^2) to d
IF d < r
    DISPLAY "The point is inside the circle"
ELSE IF d = r
    DISPLAY "The point is on the circle"
ELSE
    DISPLAY "The point is outside the circle"
ENDIF
```

FLOWCHART



PROBLEM 3.8

Given a point (x,y), write a program to find out if it lies on X-axis, Y-axis or origin.

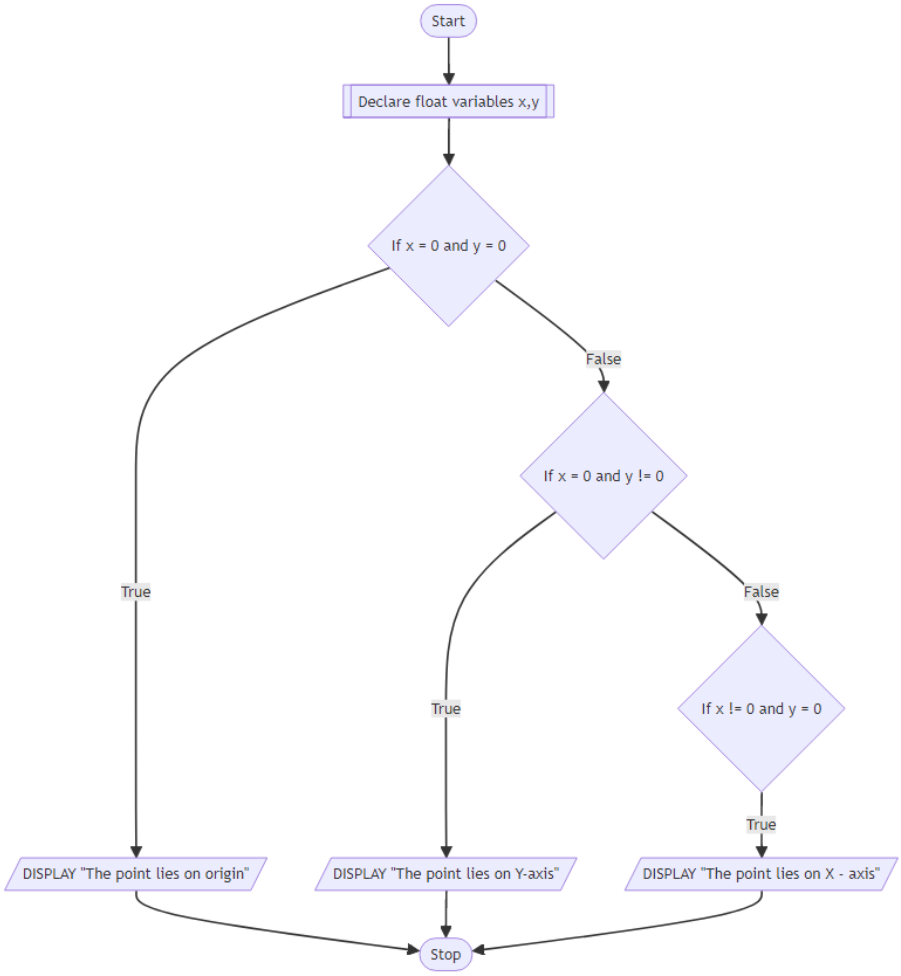
ALGORITHM

1. Start
2. Declare float variables x and y
3. If x == 0 and y == 0, display “The point lies on origin”
4. Else if x = 0 and y!= 0, display “The point lies on Y-axis”
5. Else if x!= 0 and y = 0, display “The point lies on X-axis”
6. Stop

PSEUDOCODE

```
DECLARE FLOAT x,y
IF x = 0 AND y = 0
    DISPLAY "The point lies on origin"
ELSE IF x = 0 AND y != 0
    DISPLAY "The point lies on Y - axis"
ELSE IF x != 0 AND y = 0
    DISPLAY "The point lies on X - axis"
ENDIF
```

FLOWCHART



PROBLEM 3.9

According to Gregorian Calendar, it was Monday on the date 01/01/01. If any year is input through the keyboard, write a program to find out what is the day on 1st January of this year.

Year = 200

1st january 01 to 1st january 200 = 365*200 (without considering leap years) + DAYS IN LEAP YEARS

odd days = 365*200+DAYS IN LEAP YEARS/7

No.of odd days	Week day
0	Monday
1	Tuesday
2	Wednesday
3	Thursday
4	Friday
5	Saturday
6	Sunday

ALGORITHM

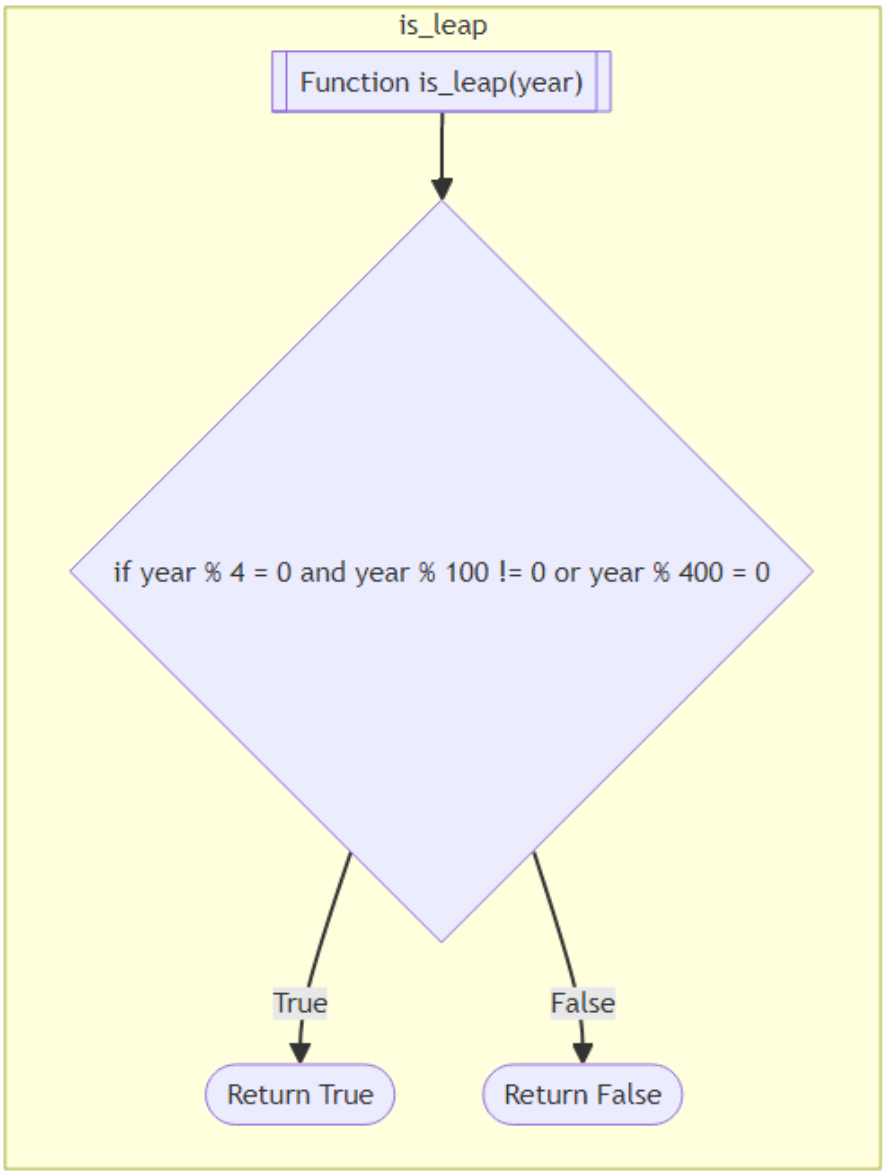
1. Start
2. Declare the integer variables year,odd_days
3. Input year
4. Create a helper function is_leap(year) to determine whether the given year is a leap year or not
5. Run a loop from integer i = 0 to year-1
6. In that loop, check if each i is a leap year or not using the helper function defined above.
7. If the condition is true, add 366 to odd_days
8. Else, add 365 to odd_days
9. After the loop, assign the remainder of odd_days and 7 back to odd_days
10. Declare an string array weekdays with the days of week from monday to sunday
11. Display "The day of the week at 01.01.year is weekdays[odd_days]"
12. Stop

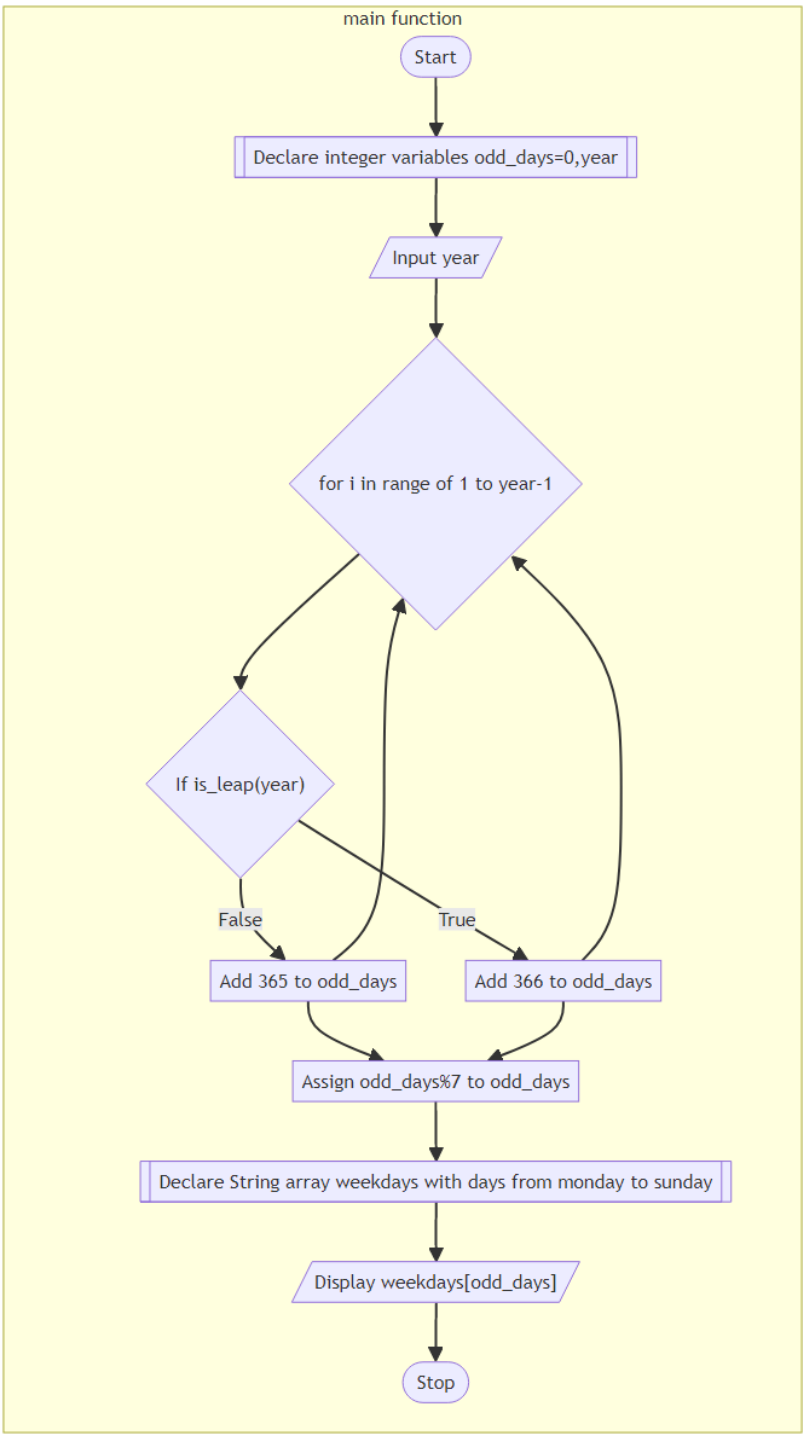
PSEUDOCODE

```
DECLARE INTEGER odd_days,year
INPUT year
ASSIGN 0 to odd_days
FUNCTION is_leap(year)
```

```
    IF REMAINDER(year,4) = 0 AND REMAINDER(year,100) != 0 OR  REMAINDER(year,400) = 0
        RETURN True
    ELSE
        RETURN False
    ENDIF
ENDFUNCTION

FUNCTION main
    FOR INTEGER i = 1 to year-1
        IF is_leap(year) == True
           ADD 366 to odd_days
        ELSE
            ADD 365 to odd_days
        ENDIF
    ENDFOR
    ASSIGN odd_days%7 to odd_days

    DECLARE STRING ARRAY weekdays
    ASSIGN ["Monday","Tuesday","Wednesday","Thursday","Friday","Saturday","Sunday"] to a

    DISPLAY weekdays[odd_days]

ENDFUNCTION
```

FLOWCHART


is_leap
Function is_leap(year)
if year % 4 = 0 and year % 100 != 0 or year % 400 = 0
True
False
Return True
Return False


main function
Start
Declare integer variables odd_days=0,year
Input year
for i in range of 1 to year-1
If is_leap(year)
False
True
Add 365 to odd_days
Add 366 to odd_days
Assign odd_days%7 to odd_days
Declare String array weekdays with days from monday to sunday
Display weekdays[odd_days]
Stop