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Program 3.1

AIM: Write a C program to read a character and classify it as a vowel, consonant, digit or special symbol.

Algorithm: Character Classification

Step 1: Start
Step 2: Let ch be a character variable
Step 3: Read a character(ch) from the user.
Step 4: Check whether ch is a, e, i, o, u or A, E, I, O, U.
- If yes, display **"Vowel"**.

Step 5: Otherwise, check whether ch is an alphabet (A-Z or a-z).
- If yes, display **"Consonant"**.

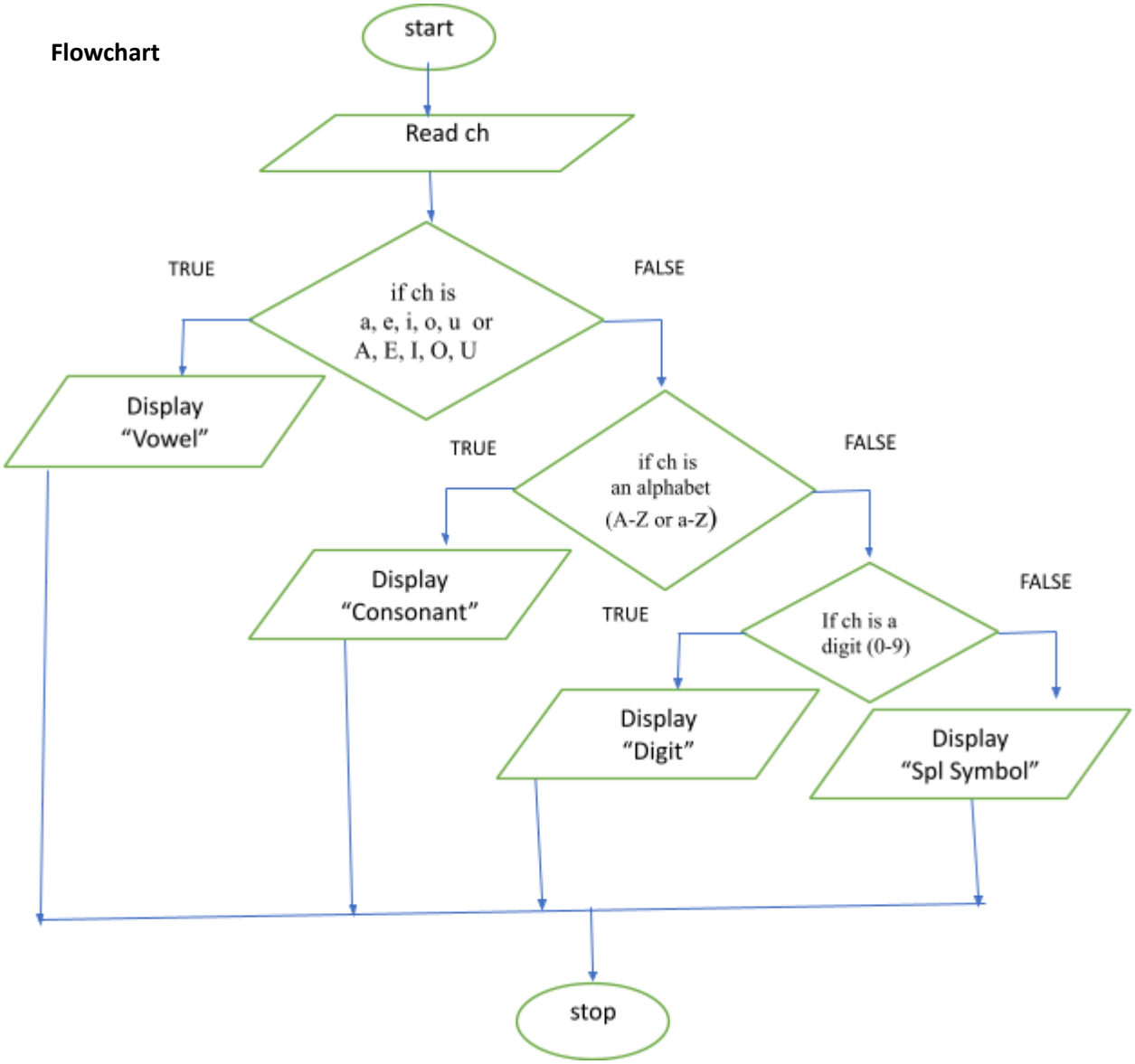
Step 6: Otherwise, check whether ch is a digit (0-9).

- If yes, display **"Digit"**.

Step 7: Otherwise, display **"Special Symbol"**.

Step 8: Stop**.**

Flowchart



C Program

```
#include <stdio.h>

int main()
{
    char ch;

    printf("Enter a character: ");
    scanf("%c", &ch);

    if (ch == 'a' || ch == 'e' || ch == 'i' ||
        ch == 'o' || ch == 'u' ||
        ch == 'A' || ch == 'E' || ch == 'I' ||
        ch == 'O' || ch == 'U')
    {
        printf("Vowel");
    }
```

```
    else if ((ch >= 'a' && ch <= 'z') ||
            (ch >= 'A' && ch <= 'Z'))
    {
        printf("Consonant");
    }
    else if (ch >= '0' && ch <= '9')
    {
        printf("Digit");
    }
    else
    {
        printf("Special Symbol");
    }

    return 0;
}
```

Sample Input & output

```
Enter a character: H
Consonant
```

```
Enter a character: 9
Digit
```

```
Enter a character: A
Vowel
```

```
Enter a character: &
Special Symbol
```

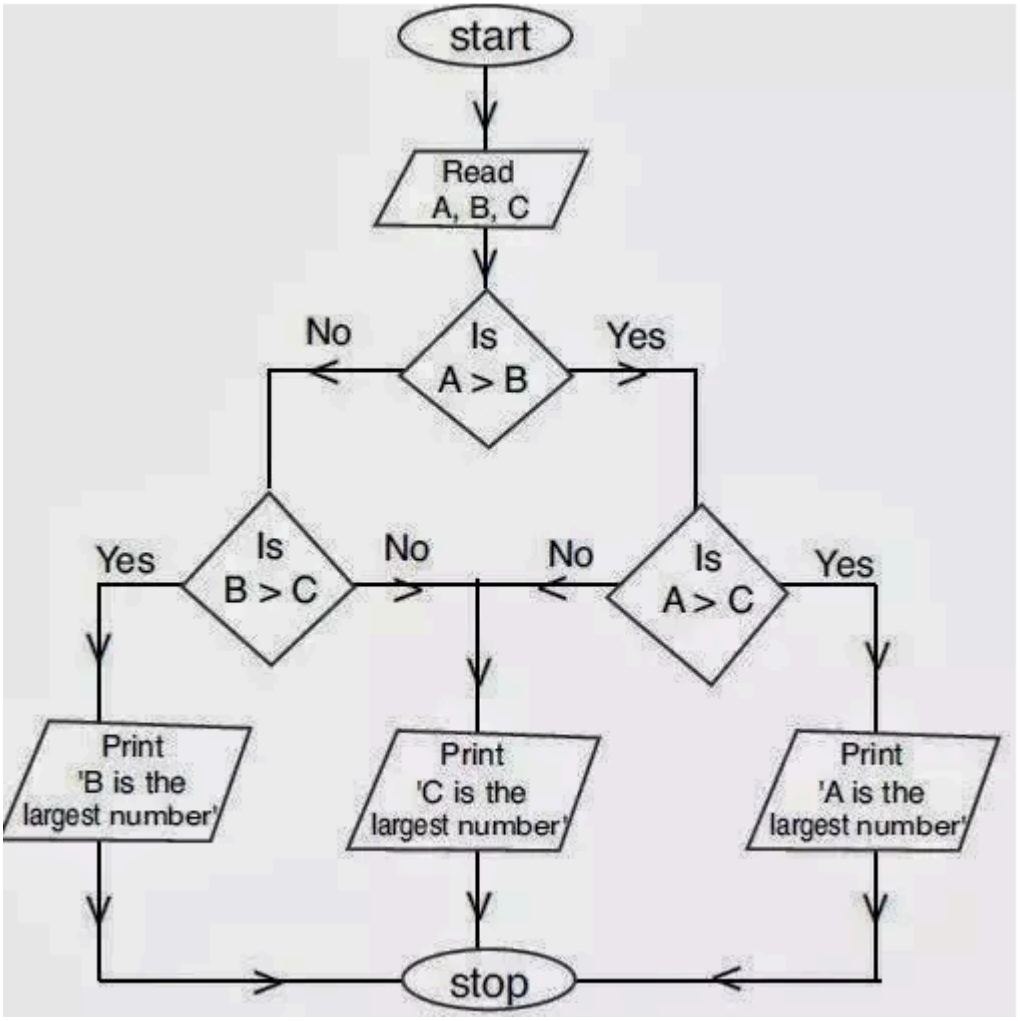
Program 3.2

AIM: Write a C program to find the largest of three numbers using nested if-else.

Algorithm: Largest of Three Numbers Using Nested if-else

1. **Start**
2. Declare three integer variables `a`, `b`, `c` and a variable `largest`.
3. Read three numbers `a`, `b`, and `c`.
4. Check whether `a > b`.
    - If **Yes**, check whether `a > c`.
        - If **Yes**, assign `a` to `largest`.
        - Otherwise, assign `c` to `largest`.
    - If **No**, check whether `b > c`.
        - If **Yes**, assign `b` to `largest`.
        - Otherwise, assign `c` to `largest`.
5. Display `largest`.
6. **Stop**.

Flowchart



C Program

```
#include <stdio.h>

int main()
{
    int a, b, c, largest;

    printf("Enter three numbers: ");
    scanf("%d%d%d", &a, &b, &c);

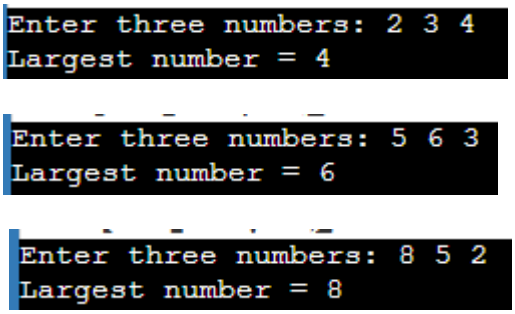
    if (a > b)
    {
        if (a > c)
            largest = a;
        else
            largest = c;
    }
    else
    {
        if (b > c)
            largest = b;
```

```
        else
            largest = c;
    }

    printf("Largest number = %d", largest);

    return 0;
}
```

Sample Input & output



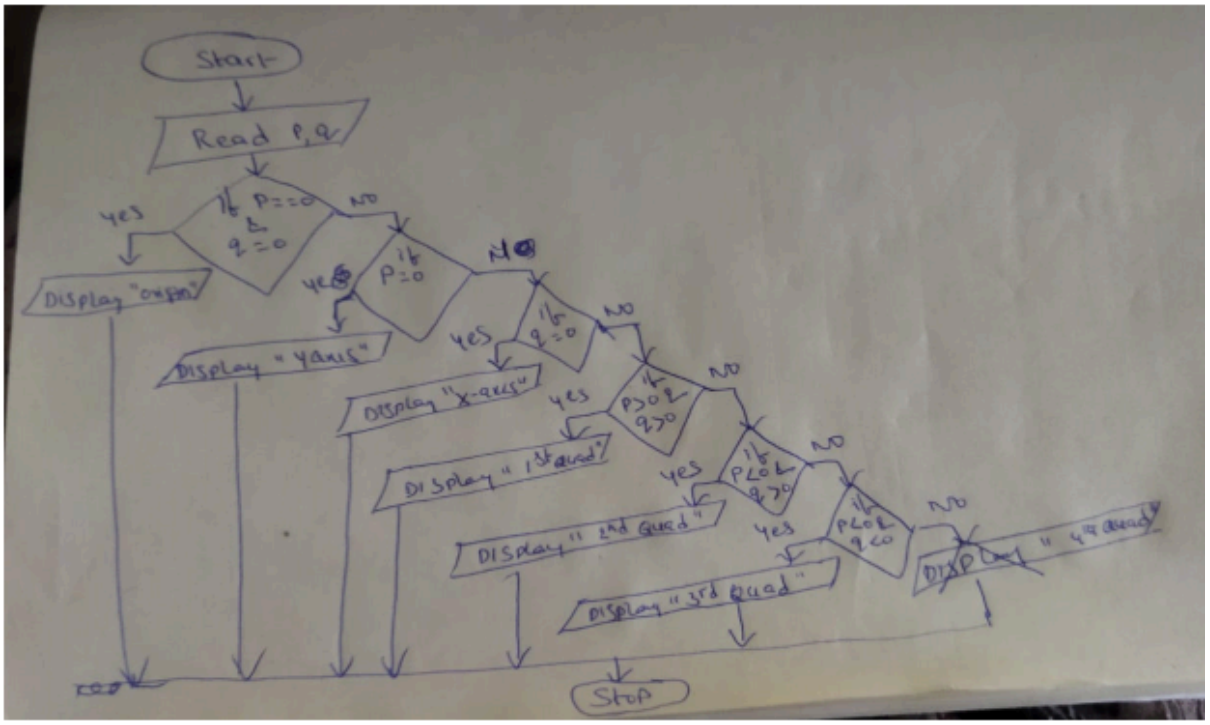
Program 3.3

AIM : Accept a point (p,q) in 2D space as input and find the region in space that this point belongs to. A point could belong to one of the four quadrants, or it could be on one of the two axes, or it could be the origin

ALGORITHM :

STEP 1 : start
STEP 2 : Read p,q
STEP 3 : If p=0 and q=0 then display “origin” goto step10
STEP 4 : If p=0 and q!=0 then display “ Y axis “ goto step10
STEP 5 : If p!=0 and q=0 then display “ X axis “ goto step10
STEP 6 : If p>0 and q>0 then display “ 1st Quadrant “ goto step10
STEP 7 : If p<0 and q>0 then display “ 2nd Quadrant “ goto step10
STEP 8 : If p<0 and q<0 then display “ 3rd Quadrant “ goto step10
STEP 9 : If p>0 and q<0 then display “ 4th Quadrant “ goto step10
STEP 10: stop

FLOWCHART:



PROGRAM :

```c
#include<stdio.h>
int main()
{
    float p,q;
    printf("Enter the point (p,q) : ");
    scanf("%f %f",&p,&q);
    printf("\nThe point  (%.1f %.1f) is on : ",p,q);
    if((p==0) && (q==0))
      printf("Origin");
    else if(p==0)
      printf("y-axis");
    else if(q==0)
      printf("x-axis");
    else if((p>0)&&(q>0))
      printf("First Quadrant");
    else if((p<0)&&(q>0))
      printf("Second Quadrant ");
    else if((p<0)&&(q<0))
      printf("Third Quadrant");
    else
      printf("Fourth Quadrant");
return 0;
}
```

OUTPUT :

```
Enter the point (p,q) : 0 0

The point  (0.0 0.0) is on : Origin
```

```
Enter the point (p,q) : 1 2

The point  (1.0 2.0) is on : First Quadrant
```

```
Enter the point (p,q) : -2 5

The point  (-2.0 5.0) is on : Second Quadrant
```

```
Enter the point (p,q) : -3 -6

The point  (-3.0 -6.0) is on : Third Quadrant
```

```
Enter the point (p,q) : 2 -4

The point  (2.0 -4.0) is on : Fourth Quadrant
```

```
Enter the point (p,q) : 0 -5

The point  (0.0 -5.0) is on : y-axis
```

```
Enter the point (p,q) : 5 0

The point  (5.0 0.0) is on : x-axis
```

Program 3.4

AIM : Write a C program to find the given year is a leap year or not.

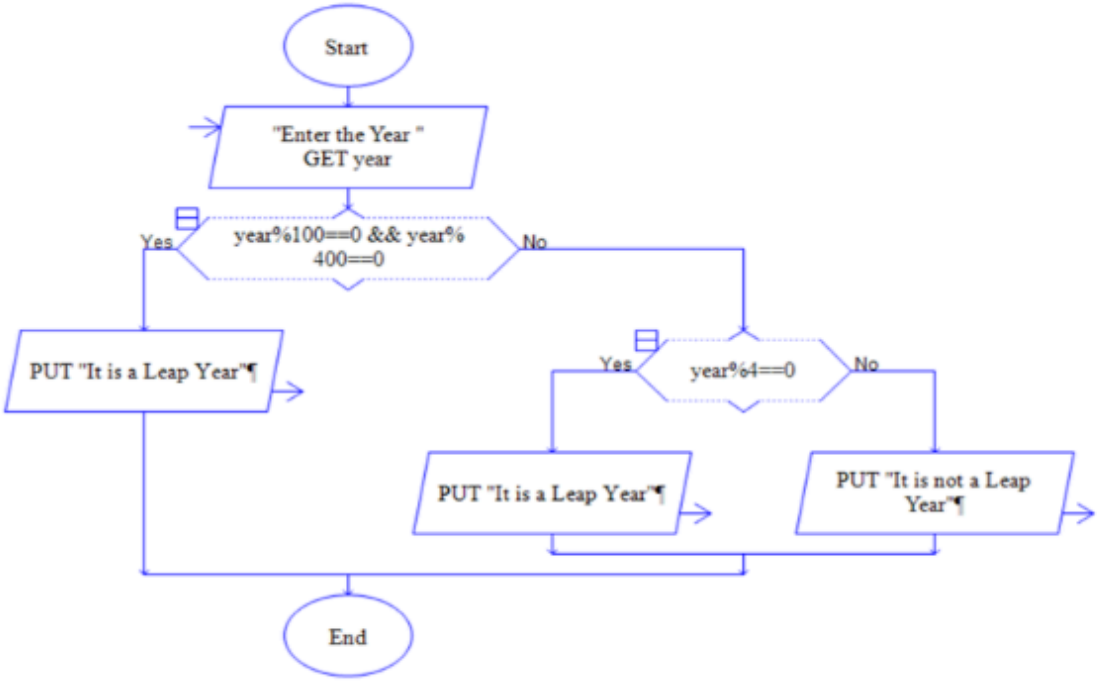
FORMULA :

A year is a leap year if the following conditions are satisfied:
1. The year is multiple of 400.
2. The year is multiple of 4 and not multiple of 100.

ALGORITHM :

STEP 1 : Start
STEP 2 : Read year
STEP 3 : If year%4=0 and (year%100 =0 or year %400=0) then
then go to step 4 otherwise go to step 5.
STEP 4 : print it is a leap year goto step 6
STEP 5 : print it is not a leap year
STEP 6 : stop

Flowchart:



PROGRAM :

```c
#include<stdio.h>
int main()
{
    int y;
    printf("Enter the Year : ");
    scanf("%d",&y);
    if(y%100==0)
    {
        if (y%400 == 0)
           printf("%d is a leap year ",y);
        else
            printf("%d is not a leap year ",y);
    }
    else
    {
        if (y%4 == 0)
           printf("%d is a leap year ",y);
        else
            printf("%d is not a leap year ",y);
    }
 return 0;
}
```

OUTPUT :

```
Enter the Year : 1900
1900 is not a leap year
```

```
Enter the Year : 2000
2000 is a leap year
```

```
Enter the Year : 1996
1996 is a leap year
```

```
Enter the Year : 1999
1999 is not a leap year
```

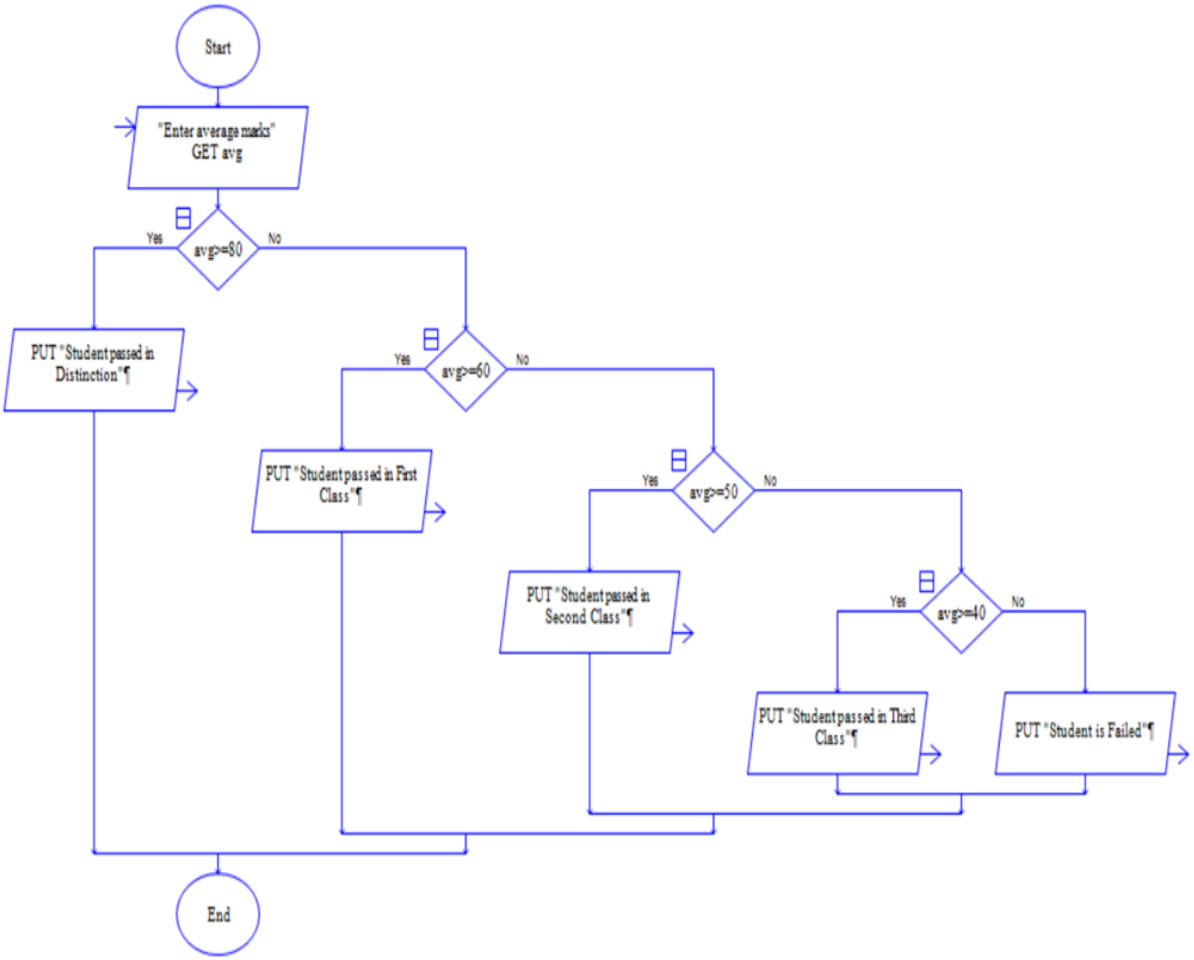
Program 3.5

AIM : write a C program to find the grade of a student using switch statement.

ALGORITHM :

STEP 1 : Start
STEP 2 : Read the avg marks of the student
STEP 3 : Check the (avg>=80) then display outstanding grade go to step 8
STEP 4 : Check the (avg<80)&(avg>=60) then display grade 1st class go to step 8
STEP 5 : Check (avg<60) & (avg>=50) then display grade 2nd class then go to step 8
STEP 6 : Check (avg<50) and (avg>=40) then display grade 3rd class then go to step 8
STEP 7 : Check (avg<40) then display grade fail
STEP 8 : Stop

FLOWCHART:



PROGRAM :

```
 #include<stdio.h>
void main()
 {
  int marks;
  printf("\n enter the average marks \t");
  scanf("%d",&marks);
  switch(marks/10)
  {
  case 0:
  case 1:
  case 2:
  case 3:   printf("\n fail \n");
                break;
  case 4:   printf("\n third class \n");
                break;

  case 5:  printf("\n second class \n");
                break;
  case 6: printf("\n first class \n");
                break;
  case 7:
  case 8:
```

```
 case 9:
 case 10 :    printf("\n distinction \n");
 } }
```

OUTPUT :

```
enter the average marks      30
 fail
enter the average marks      48
 third class

enter the average marks      57
 second class

enter the average marks      65
 first class

enter the average marks      80
 distinction
```

Program 3.6

AIM : Write a C program that accept three positive integers as input and check if they form the sides of a Right triangle. Print YES if they form one, and NO if they do not.

FORMULA:

Right angle triangle follows Pythagoras theorem.

consider the triangle with sides a, b, c Where “a” is the perpendicular, “b” is the base, “c” is the hypotenuse. According to the definition, the Pythagoras Theorem formula is given as:

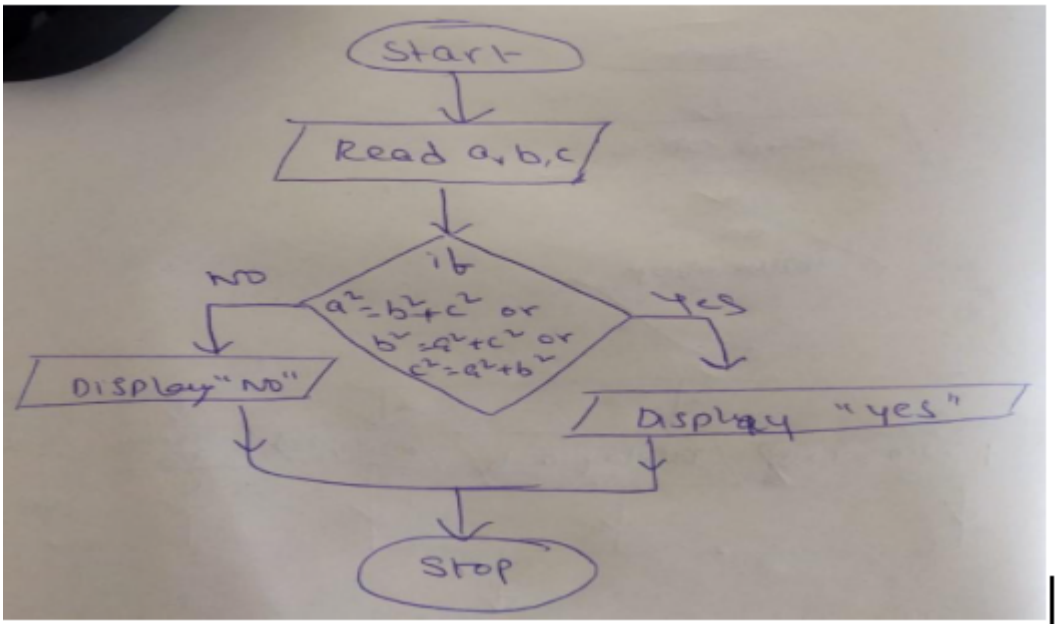
Hypotenuse^2 = Perpendicular^2 + Base^2

$c^2 = a^2 + b^2$

ALGORITHM :

Step1 : Start
Step2 : Read a, b, c
Step3 : If a*a= b*b+c*c or b*b= a*a +c*c or c*c = a*a + b*b then
Display “YES” otherwise display “NO
Step 4 : stop

FLOWCHART



PROGRAM :

```c
#include<stdio.h>
int main()
{
    int a,b,c;
    printf("Enter the sides of Triangle :");
    scanf("%d %d %d",&a,&b,&c);
    if((a*a==b*b+c*c)||(b*b==a*a+c*c)||(c*c==a*a+b*b))
      printf("YES It forms Right Angle Triangle");
    else
      printf("NO IT Doesn't Form Right Angle Triangle");
 return 0;
}
```

OUTPUT :

```
Enter the sides of Triangle :3 4 5
YES It forms Right Angle Triangle
```

```
Enter the sides of Triangle :10 20 30
NO IT Doesn't Form Right Angle Triangle
```

Program 3.7

AIM : Write a C program to generate electricity bill.

SLAB RATES :

UNITS	Unit-Cost
0-30	1.90
31-75	3.00
76-125	4.50
126-225	6.00
226-400	8.75
>400	9.75

Ex : if the number of units is 250 it will calculate the bill as

= 30X1.90 + 45X3.00 + 50X4.50 + 100x6.00 + 25X8.75
= 57 + 135 + 225 + 600 + 218.75
= 1235.75

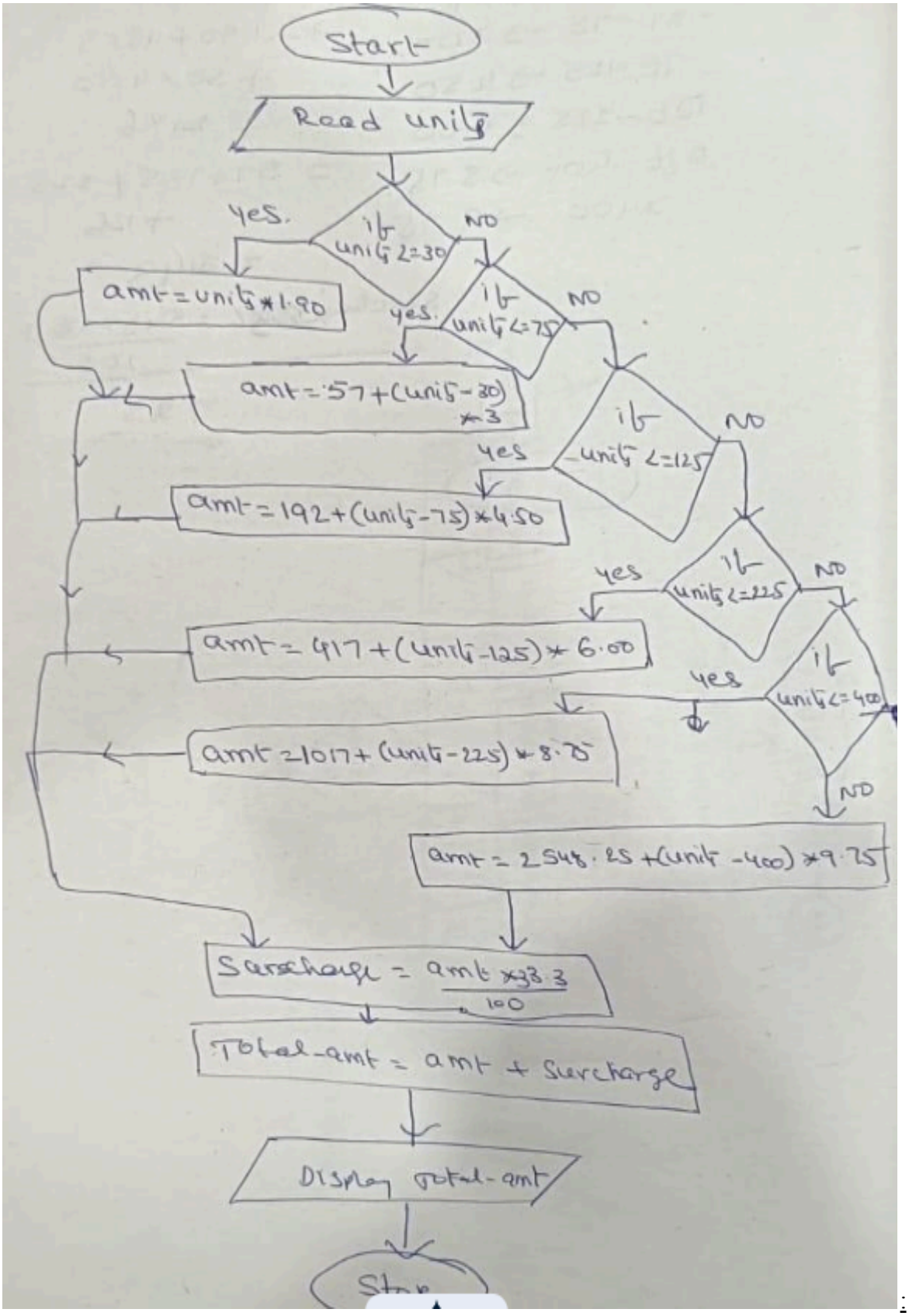
Surcharge = 33.3%

Total bill = 1235.75 + 1235.75x1/3 = 1235.75+411.92 = 1648

ALGORITHM :

STEP 1 : START
STEP 2 : Read units
STEP 3 : If units<=30 them amt=units * 1.90 goto Step 9
STEP 4 : If units<=75 them amt=57+(units-30) * 3.00 goto Step 9
STEP 5 : If units<=125 them amt=192+(units-75) * 4.50 goto Step 9
STEP 6 : If units<=225 them amt=417+(units-125) * 6.00 goto Step 9
STEP 7 : If units<=400 them amt=1017+(units-225) * 8.75 goto Step 9
STEP 8 : If units>400 them amt=2548.25+(units-400) * 9.75
STEP 9 : calculate sur_charge=amt*33.3/100
STEP 10 : calculate total_amt= amt+sur_charge
STEP 11 : display total_amt
STEP 12 : stop

FLOWCHART:


Start
Read units
if units <=30
yes.
NO
amt = units * 1.90
if units <=75
yes.
NO
amt = 57 + (units - 30) * 3
if units <=125
yes
NO
amt = 192 + (units - 75) * 4.50
if units <=225
yes
NO
amt = 417 + (units - 125) * 6.00
if units <=400
yes
NO
amt = 1017 + (units - 225) * 8.75
amt = 2548.25 + (unit - 400) * 9.75
Surcharge = amt * 33.3 / 100
Total_amt = amt + Surcharge
Display total_amt
Stop

PROGRAM

```c
#include<stdio.h>
int main()
{
    int unit;
    float amt, total_amt, sur_charge;
     printf("enter total units consumed:");
     scanf("%d",&unit);
    if(unit<=50)
          amt=unit*0.50;
    else if(unit<=150)
          amt=25+((unit-50)*0.75);
    else if(unit<=250)
           amt=100+((unit-150)*1.20);
    else
           amt=220+((unit-250)*1.50);

    sur_charge=amt*0.20;
    total_amt=amt+sur_charge;
    printf("electricity bill=Rs%2f",total_amt);
    return 0;
}
```

OUTPUT :

```
enter total units consumed:200
electricity bill=Rs192.000000
```

Program 3.8

AIM: Write a menu-driven C program to compute the area of various geometrical shapes (circle, rectangle, triangle, square) using switch-case.

Formula

Area of circle $A = \pi r^2$

Area of Rectangle **Area = length × width (A = l * w)**

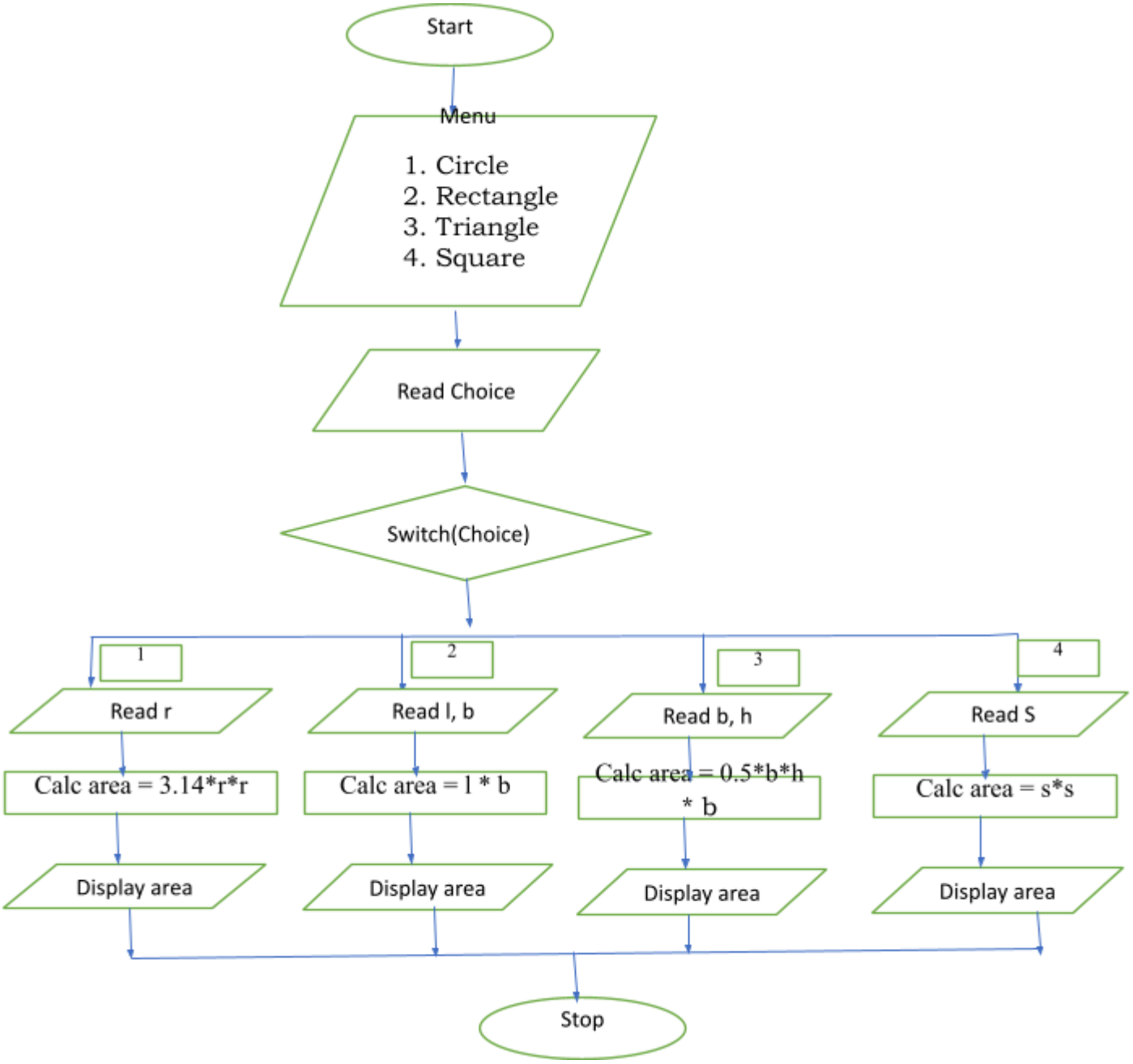
Area of Triangle $\boldsymbol{A = \frac{1}{2} \times base \times height}$ **(A= 0.5 * b * h)**

Area of Square $A = s^2$ (where s is the side length)

Algorithm: Menu-Driven Area Calculation Using switch-case

1. **Start**
2. Declare variables `choice`, `radius`, `length`, `breadth`, `base`, `height`, `side`, and `area`.
3. Display the menu:
    - `1. Circle`
    - `2. Rectangle`
    - `3. Triangle`
    - `4. Square`
4. Read the user's choice into `choice`.
5. If `choice = 1`:
    - Read the radius.
    - Calculate the area of the circle using `area = π × radius × radius`.
    - Display the area.
6. If `choice = 2`:
    - Read the length and breadth.
    - Calculate the area of the rectangle using `area = length × breadth`.
    - Display the area.
7. If `choice = 3`:
    - Read the base and height.
    - Calculate the area of the triangle using `area = ½ × base × height`.
    - Display the area.
8. If `choice = 4`:
    - Read the side.
    - Calculate the area of the square using `area = side × side`.
    - Display the area.
9. If the choice is not `1` to `4`, display **"Invalid choice!"**.
10. **Stop**.

Flowchart



C Program

```
#include <stdio.h>
int main()
{
    int choice;
    float radius, length, breadth, base, height, side, area;

    printf("----- AREA CALCULATION -----\n");
    printf("1. Circle\n");
    printf("2. Rectangle\n");
```

```
    printf("3. Triangle\n");
    printf("4. Square\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);

    switch (choice)
    {
        case 1:
            printf("Enter radius: ");
            scanf("%f", &radius);

            area = 3.14159 * radius * radius;
            printf("Area of Circle = %.2f", area);
            break;

        case 2:
            printf("Enter length and breadth: ");
            scanf("%f%f", &length, &breadth);

            area = length * breadth;
            printf("Area of Rectangle = %.2f", area);
            break;

        case 3:
            printf("Enter base and height: ");
            scanf("%f%f", &base, &height);

            area = 0.5 * base * height;
            printf("Area of Triangle = %.2f", area);
            break;

        case 4:
            printf("Enter side: ");
            scanf("%f", &side);

            area = side * side;
            printf("Area of Square = %.2f", area);
            break;

        default:
            printf("Invalid choice!");
    }

    return 0;
}
```

sample Input & output

```
----- AREA CALCULATION -----
1. Circle
2. Rectangle
3. Triangle
4. Square
Enter your choice: 1
Enter radius: 5
Area of Circle = 78.54
```

```
----- AREA CALCULATION -----
1. Circle
2. Rectangle
3. Triangle
4. Square
Enter your choice: 2
Enter length and breadth: 4 5
Area of Rectangle = 20.00
```

```
----- AREA CALCULATION -----
1. Circle
2. Rectangle
3. Triangle
4. Square
Enter your choice: 3
Enter base and height: 12 4
Area of Triangle = 24.00
```

```
----- AREA CALCULATION -----
1. Circle
2. Rectangle
3. Triangle
4. Square
Enter your choice: 4
Enter side: 5
Area of Square = 25.00
```

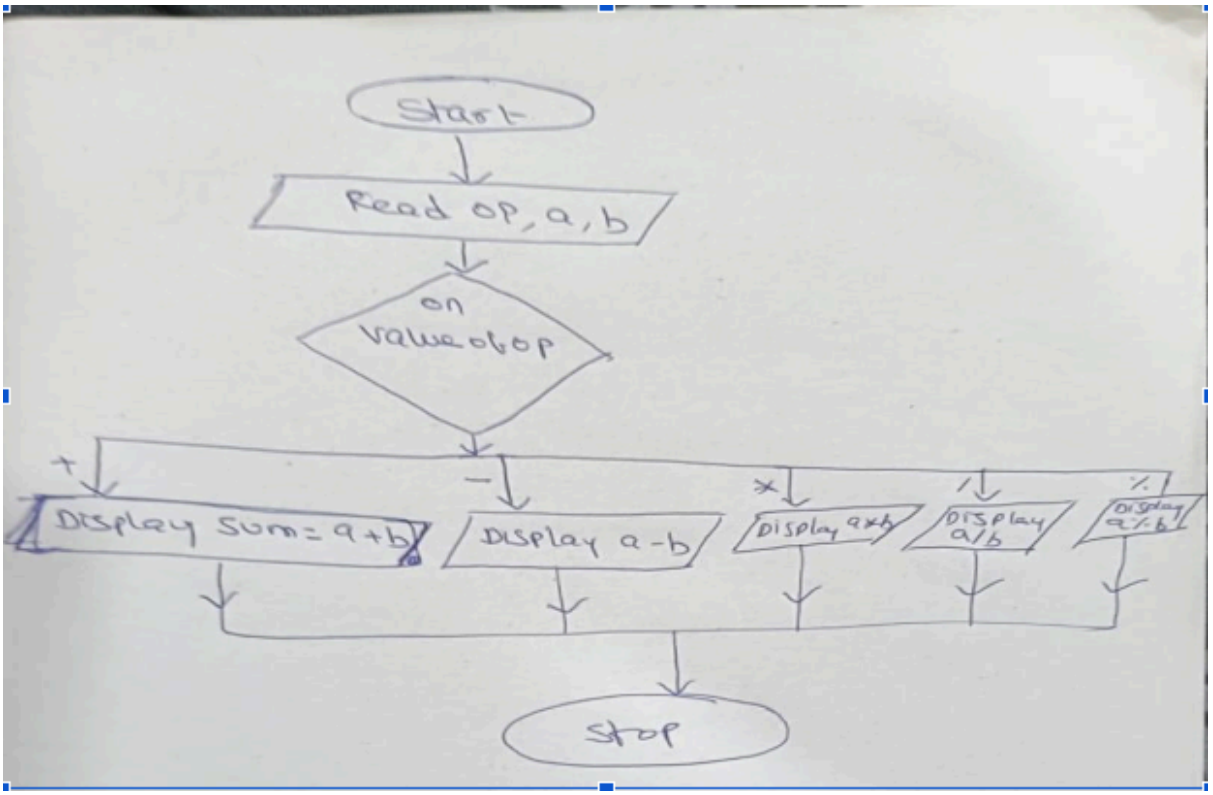
Program 3.9

AIM : Write a C program to simulate a calculator using switch case.

ALGORITHM :

STEP 1 : start
STEP 2 : Read op, a, b
STEP 3 : If op='+' then display sum=a+b goto step 8
STEP 4 : If op='-' then display difference=a-b goto step 8
STEP 5 : If op='*' then display product=a*b goto step 8
STEP 6 : If op='/' then display quotient =a/b goto step 8
STEP 7 : If op='%' then display remainder=a%b
STEP 8: stop

FLOWCHART:



PROGRAM :

```c
#include<stdio.h>
 #include<conio.h>
 int main()
 {
  int a,b;
  char op;
  printf(" Enter the operator : ");
  scanf("%c",&op);
  printf("\n enter any two numbers \t");
  scanf("%d %d",&a,&b);
   switch(op)
  {
  case '+' :   printf("\n sum = %d",a+b);
               break;
  case '-' :   printf("\n difference = %d",a-b);
               break;
  case '*' :   printf("\n product = %d",a*b);
               break;
  case '/' :   printf("\n quotient = %d",a/b);
               break;
  case '%' :   printf("\n remainder = %d",a%b);
               break;
  default  : printf(" Invalid operator ");
  }
  return 0;
}
```

OUTPUT :

```
Enter the operator : *

enter any two numbers   5 2

product = 10
```

Program 3.10

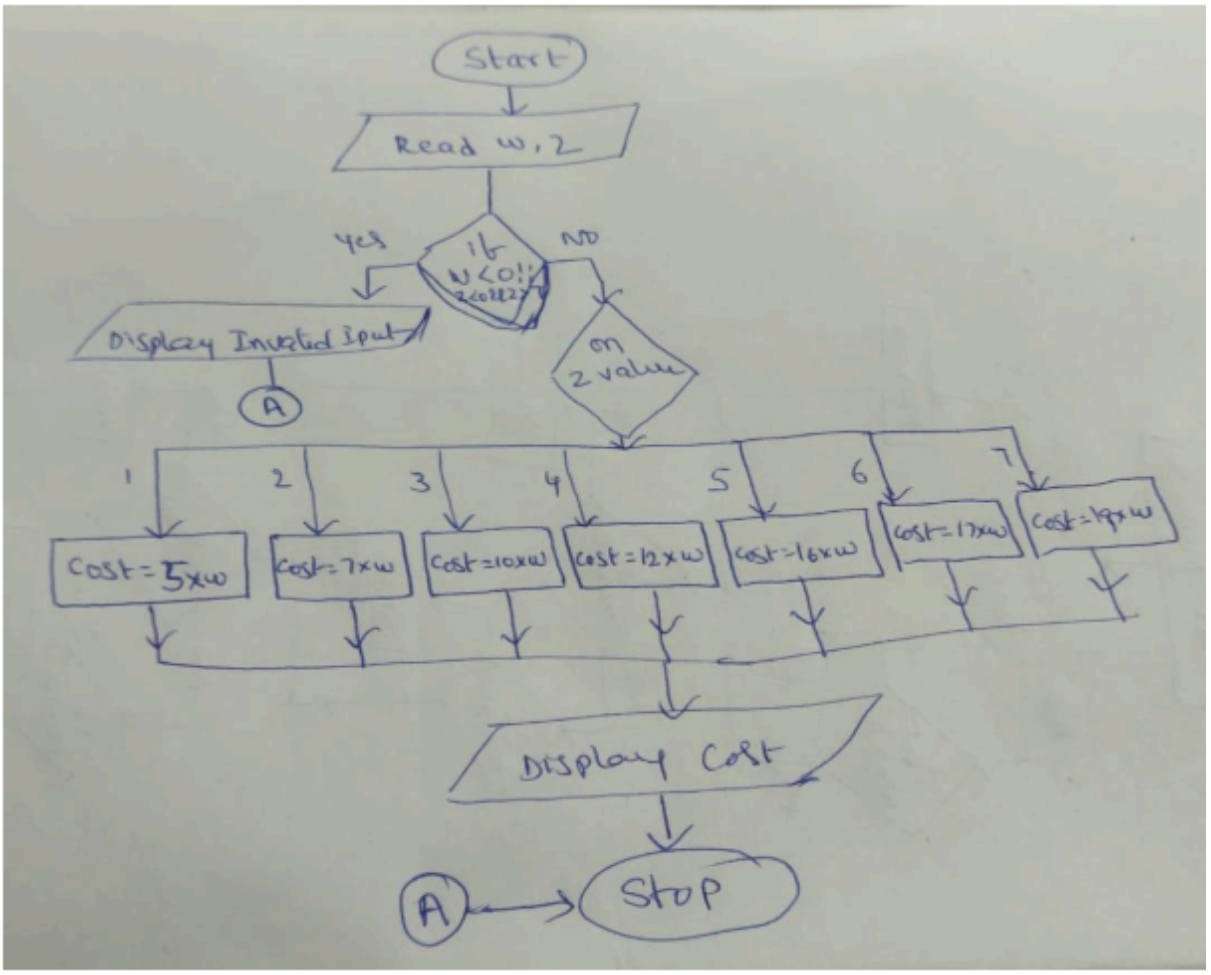
AIM : Write a C Program that takes the weight of the package (in kilograms) and the destination zone number as input and print the shipping cost amount. If input weight is less than 0 or zone number is out of given zones, then print `Invalid Input`.

Calculate the shipping cost as follows:
- For zone 1, the cost is Rs. 5 per kilogram.
- For zone 2, the cost is Rs. 7 per kilogram.
- For zone 3, the cost is Rs. 10 per kilogram.
- For zone 4, the cost is Rs. 12 per kilogram.
- For zone 5, the cost is Rs. 16 per kilogram.
- For zone 6, the cost is Rs. 17 per kilogram.
- For zone 7, the cost is Rs. 19 per kilogram.

ALGORITHM :

STEP 1 : START
STEP 2 : Read w,z
STEP 3 : If w<0 or zone<0 and zone>7 then display Invalid Input goto Step 12
STEP 4 : If zone=1 then cost=5*w goto step 11
STEP 5 : If zone=2 then cost=7*w goto step 11
STEP 6 : If zone=3 then cost=10*w goto step 11
STEP 7 : If zone=4 then cost=12*w goto step 11
STEP 8 : If zone=5 then cost=16*w goto step 11
STEP 9 : If zone=6 then cost=17*w goto step 11
STEP 10 : If zone=7 then cost=19*w goto step 11
STEP 11 : display cost
STEP 12 : stop

FLOWCHART:


Start
Read w, z
Yes
If w<0!!
z<0!!
No
Display Invalid Input
A
On 2 value
1
2
3
4
5
6
7
cost=5xw
cost=7xw
cost=10xw
cost=12xw
cost=16xw
cost=17xw
cost=19xw
Display Cost
A
Stop

Program

```c
#include<stdio.h>
#include<stdlib.h>
int main()
{
    double w,cost;
    int z;
    printf("Enter the weight and zone of package : ");
    scanf("%lf %d",&w,&z);
    if(w<0)
      printf("Invalid Input");
    else
    {
    switch(z)
    {
        case 1:cost=w*5.0;
            break;
        case 2:cost=w*7.0;
            break;
        case 3:cost=w*10.0;
            break;
        case 4:cost=w*12.0;
            break;
        case 5:cost=w*16.0;
            break;
        case 6:cost=w*17.0;
            break;
        case 7:cost=w*19.0;
            break;
        default:printf("Invalid Input");
                exit(0);
    }
    printf("cost of package = %.2lf",cost);
    }
 return 0;
}
```

OUTPUT :

```
Enter the weight and zone of package : 6 3
cost of package = 60.00
```