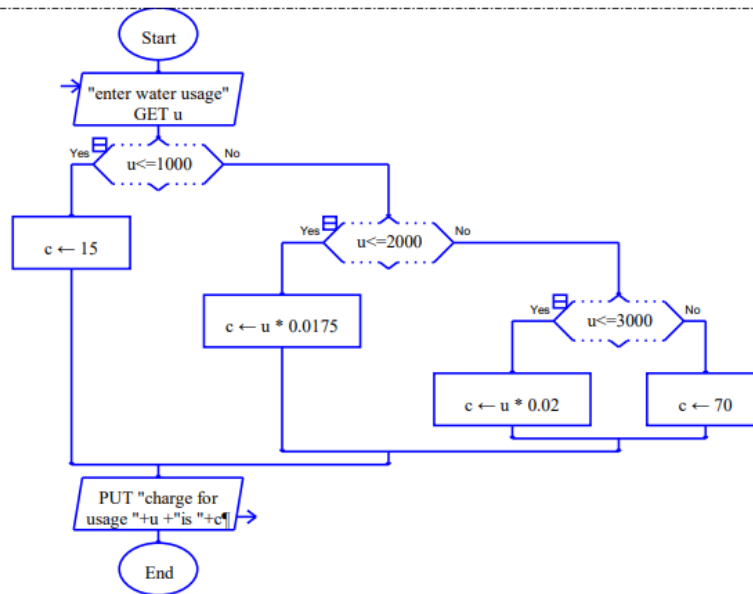


## UNIVERSITY LAB QUESTIONS

1. Calculate the flat rate of water bill used for Eureka Water Company (given in cubic feet of water), which charges the homeowner with one of the following:
  - a. A flat rate of Rs.100.00 for usage up to and including 1000 cubic feet.
  - b. Rs.1.05 per cubic foot for usage over 1000 cubic feet and up to and including 2000 cubic feet.
  - c. Rs.2.50 per cubic foot for usage over 2000 cubic feet and up to and including 3000 cubic feet.
  - d. A flat rate of Rs.750.00 for usage over 3000 cubic feet.

Write the algorithm, draw the flowchart to test the above problem using Raptor.

### Solution:



2. The Fantastic Floral Company sells to wholesale and retail buyers. The wholesale buyer needs a resale number in order to buy at no tax and to receive discounts. The retail buyer pays 6% tax. Given an amount of purchase, how much will the customer owe the company? These are the discounts given to the wholesale buyer

Amount < Rs.100

Discount = 2%

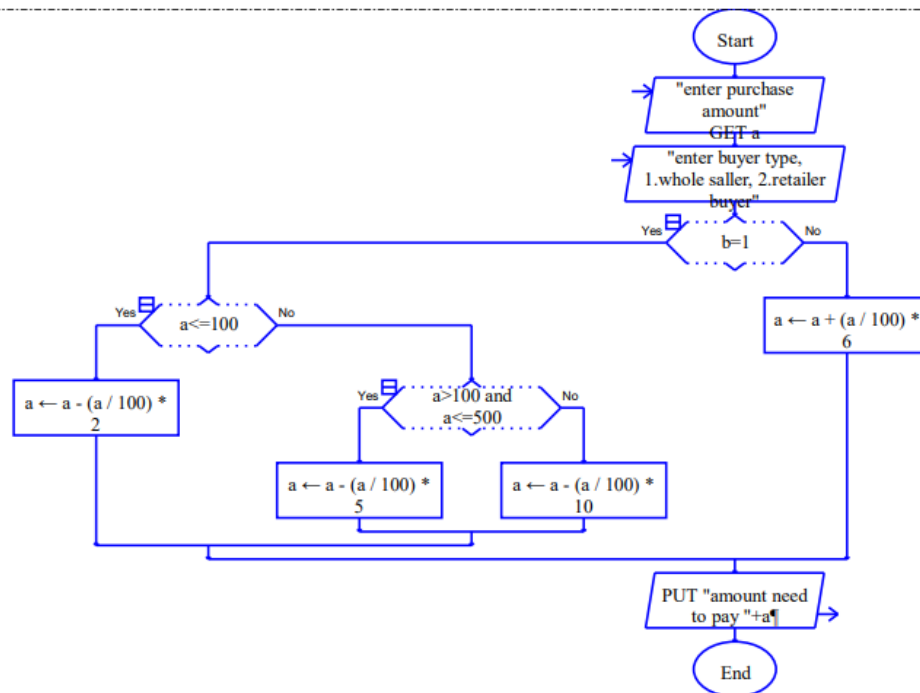
Amount >= Rs.100 and 500

Discount = 5%

Amount >= Rs. 500

Discount = 10%

**Solution:**



3. Using C, determine the Fibonacci series for the given N = 13 terms using recursive function and write its algorithm and flowchart.

Example: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144.

**Solution:**

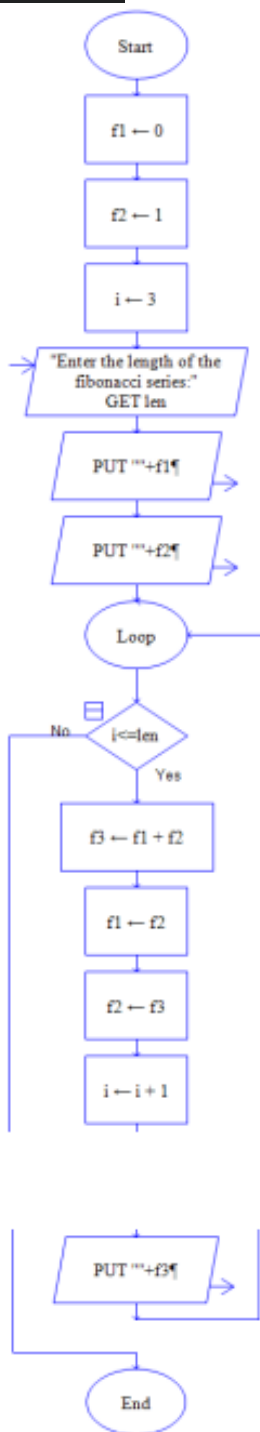
**Algorithm:**

1. Start
2. Declare variables i, f1, f2, f3
3. Initialize the variables, f1=0, f2=1, and i=3
4. Enter the number of terms of Fibonacci series to be printed
5. Print First two terms of series
6. Use loop for the following steps
  - ➔ f3=f1+f2
  - ➔ f1=f2
  - ➔ f2=f3
  - ➔ increase value of "i" each time by 1
  - ➔ print the value of f3
7. End

**/\* Program to generate Fibonacci series up to n terms using recursive function \*/**

```
#include<stdio.h>
int Fibonacci(int);
int main()
{
    int n, i = 0, c;
    scanf("%d",&n);
    printf("Fibonacci series\n");
    for ( c = 1 ; c <= n ; c++ )
    {
        printf("%d\n", Fibonacci(i));
        i++;
    }
    return 0;
}
int Fibonacci(int n)
{
    if ( n == 0 )
        return 0;
    else if ( n == 1 )
        return 1;
    else
        return ( Fibonacci(n-1) + Fibonacci(n-2) );
}
```

## Flow Chart

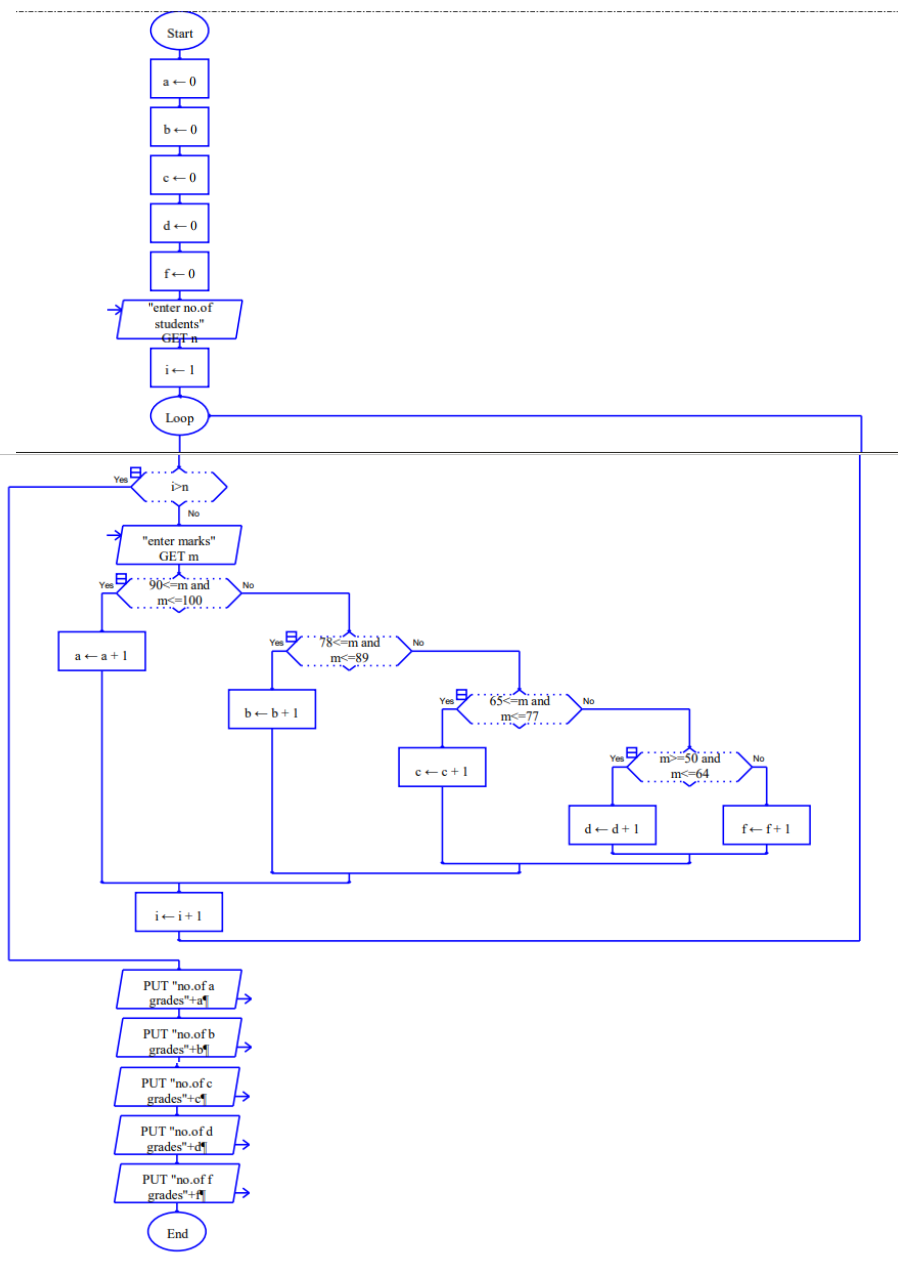


4. Mr. Johnson would like to know how many students secured A grades, B grades, C grades, D grades, and F grades on a test. He has N=15 students who took the test. He would like to enter the student number and the number grade for the test for each student. Develop the solution to print out each student's student number, marks, grade and the total number of A, B, C, D, and F grades. His grading scale is as follows:

Marks	Grades
90–100	A,
78–89	B,
65– 77	C,
50–64	D,
below 50	F

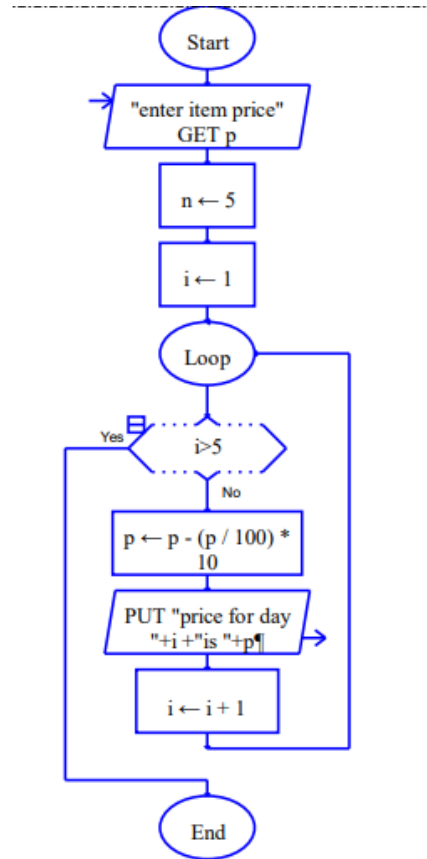
Write the algorithm, draw the flowchart to test the above problem using Raptor

**Solution:**



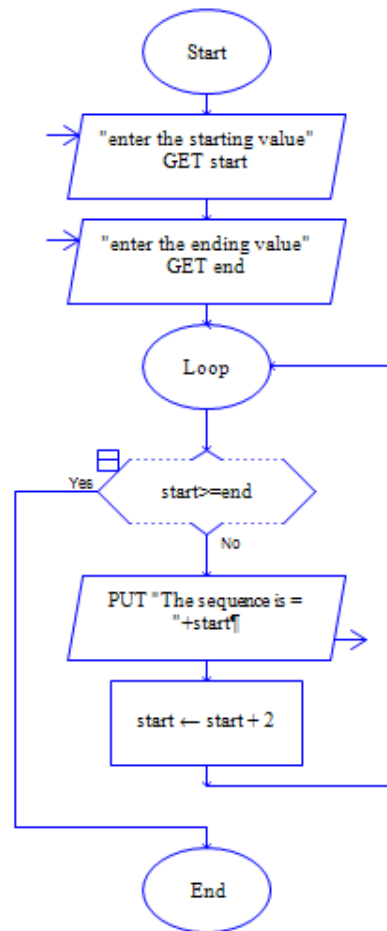
5. The Last Stop Boutique is having a five-day sale. Each day, starting on Monday, the price will drop 10% of the previous day's price. For example, if the original price of a product is Rs.200, the sale price on Monday would be Rs.180 (10% less than the original price). On Tuesday the sale price would be Rs.162 (10% less than Monday). On Wednesday the sale price would be Rs.145.80; on Thursday the sale price would be Rs.131.20; and on Friday the sale price would be Rs.118.10. Develop a solution that will calculate the price of an item for each of the five days, given the original price. Write the algorithm, draw the flowchart to test the above problem using Raptor

**Solution:**



6. Using a C program generate the natural numbers up to  $N = 50$  with a difference of 2 and write its algorithm and flowchart. Example: 21,23,25,27.....50

**Solution:**



**PROGRAM**

```
#include <stdio.h>
int main()
{
    int start, end;

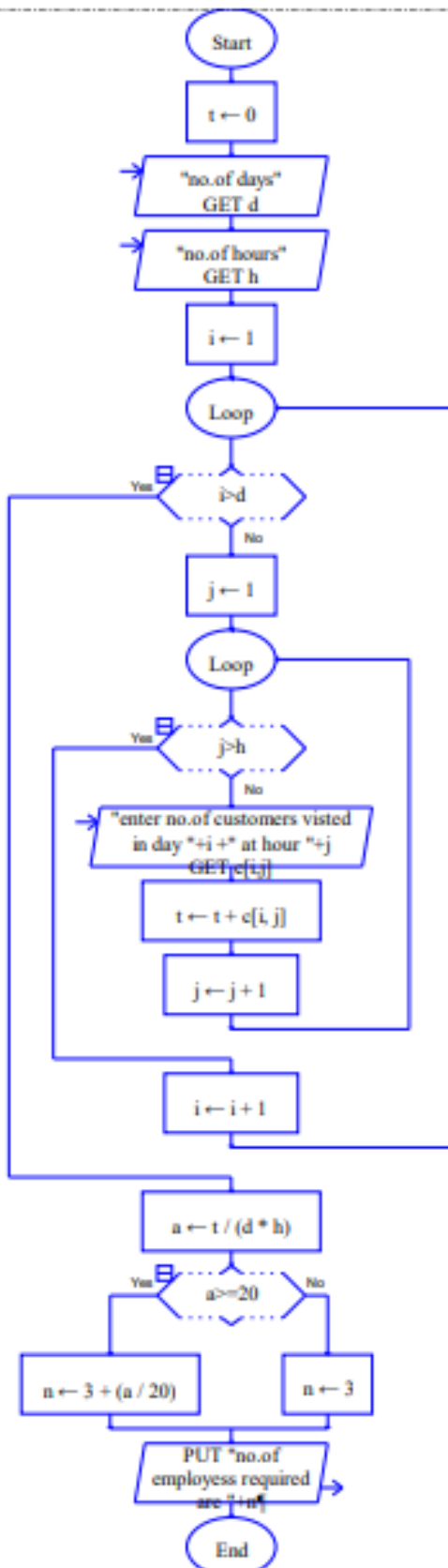
    printf("Enter the starting value: ");
    scanf("%d", &start);
    printf("Enter the ending value: ");
    scanf("%d", &end);

    printf("Numbers with a difference of 2:\n");

    for(int i = start; i <= end; i += 2)
    {
        printf("%d ", i);
    }
    return 0;
}
```

7. A restaurant manager wants to know how many employees are needed at the restaurant each hour of the day. The minimum number of employees needed at any hour is 3. After that, one additional employee is required for each 20 customers. The restaurant is open 8 hours a day. The manager has counted the number of customers each hour for 2 days. The manager will use the average number of customers for each hour over the 2 days to calculate the needed number of employees for each hour. Write the algorithm, draw the flowchart to test the above problem using Raptor.

**Solution:**



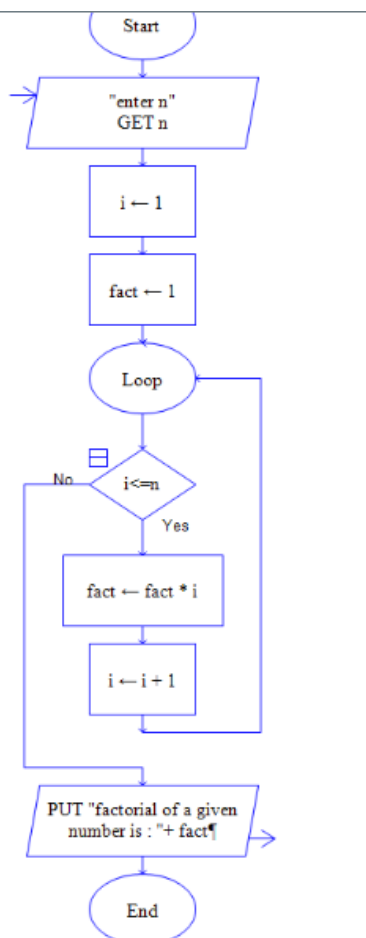


8. Find the factorial of N = 8 numbers using the C program in a recursive manner and write its algorithm and flowchart.

**Solution:**

```
#include <stdio.h>
int main()
{
    int n;
    printf("Enter a number: ");
    scanf("%d", &n);
    int factorial(int n)
    {
        if (n == 0)
        {
            return 1;
        }
        else
        {
            return n * factorial(n - 1);
        }
    }
    printf("Factorial of %d is %d", n, factorial(n));
    return 0;
}
```

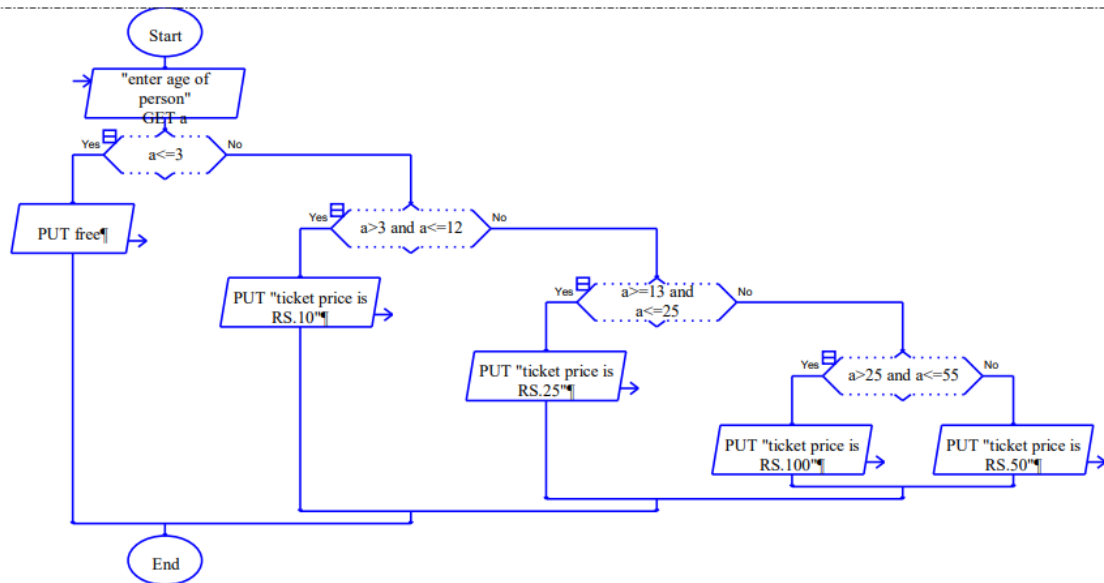
**FLOWCHART:**



9. An entry charge for The Dolby Theatre varies according to the age of the person. Develop a solution using raptor to print the ticket charge given the age of the person.

Age:	Amount
Over 55	Rs.50
21- 54	Rs.100
13 – 20	Rs. 25
3 – 12	Rs. 10
Under 3	Free

**Solution:**



10. Examine whether the following numbers are armstrong numbers or not using a C program and write the algorithm and flowchart.

(i) 371            (ii) 153            (iii) 500

**SOLUTION:**

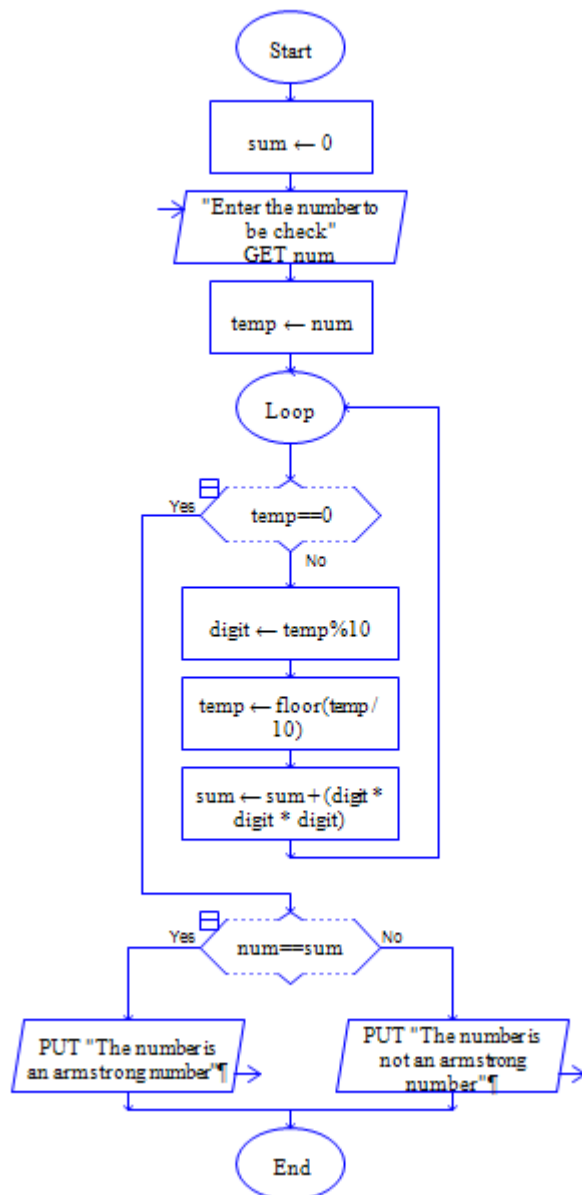
**Program:**

```
#include<stdio.h>
2
3int main() {
4
5    int n;
6    printf("Enter Number : ");
7    scanf("%d", &n);
8
9    int sum = 0;
10   int temp = n;
11
12   while(temp !=0) {
13       int digit = temp % 10;
14       temp = temp / 10;
15       sum = sum + digit * digit * digit ;
16   }
17
18   if (sum == n) {
19       printf("%d is an Armstrong Number \n", n);
20   }else {
21       printf("%d is Not an Armstrong Number \n", n);
22   }
23
24   return 0;
25}
```

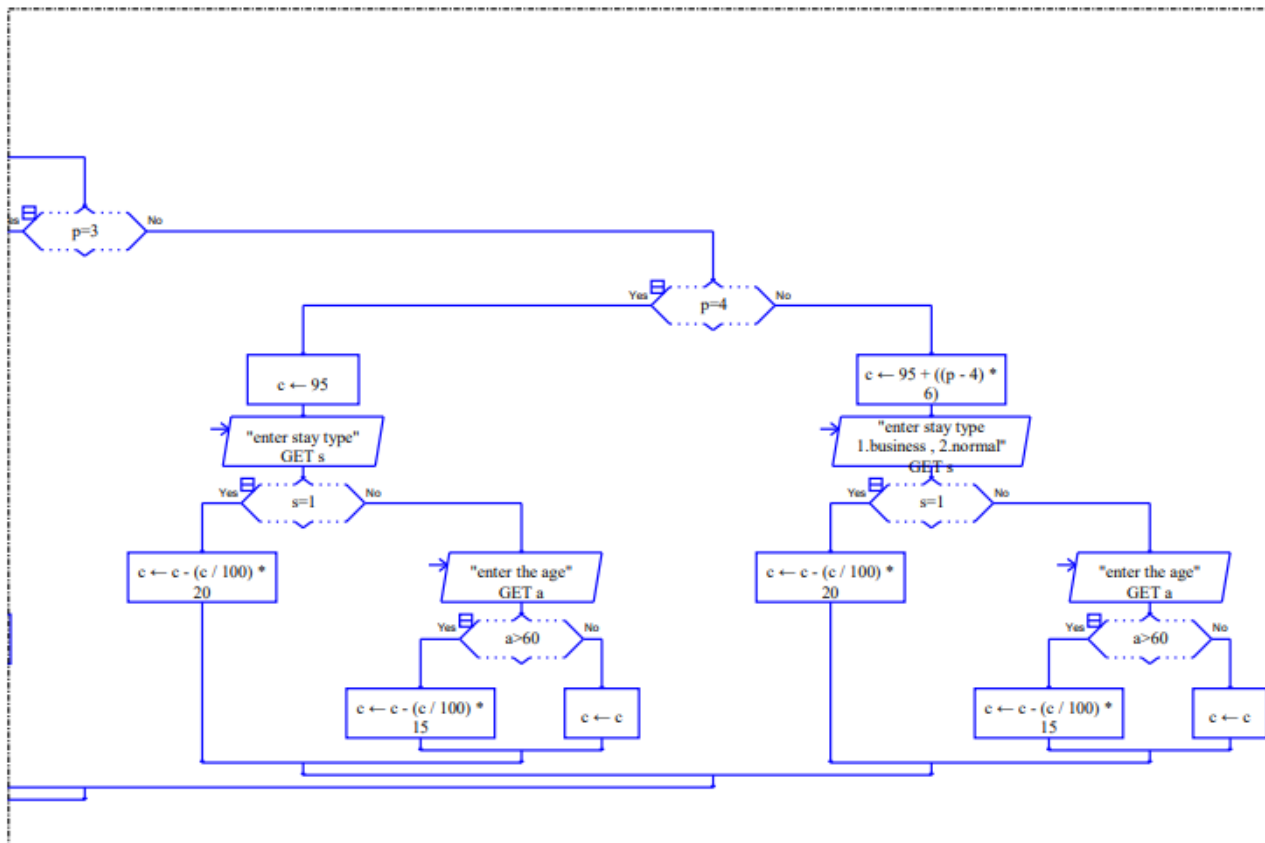
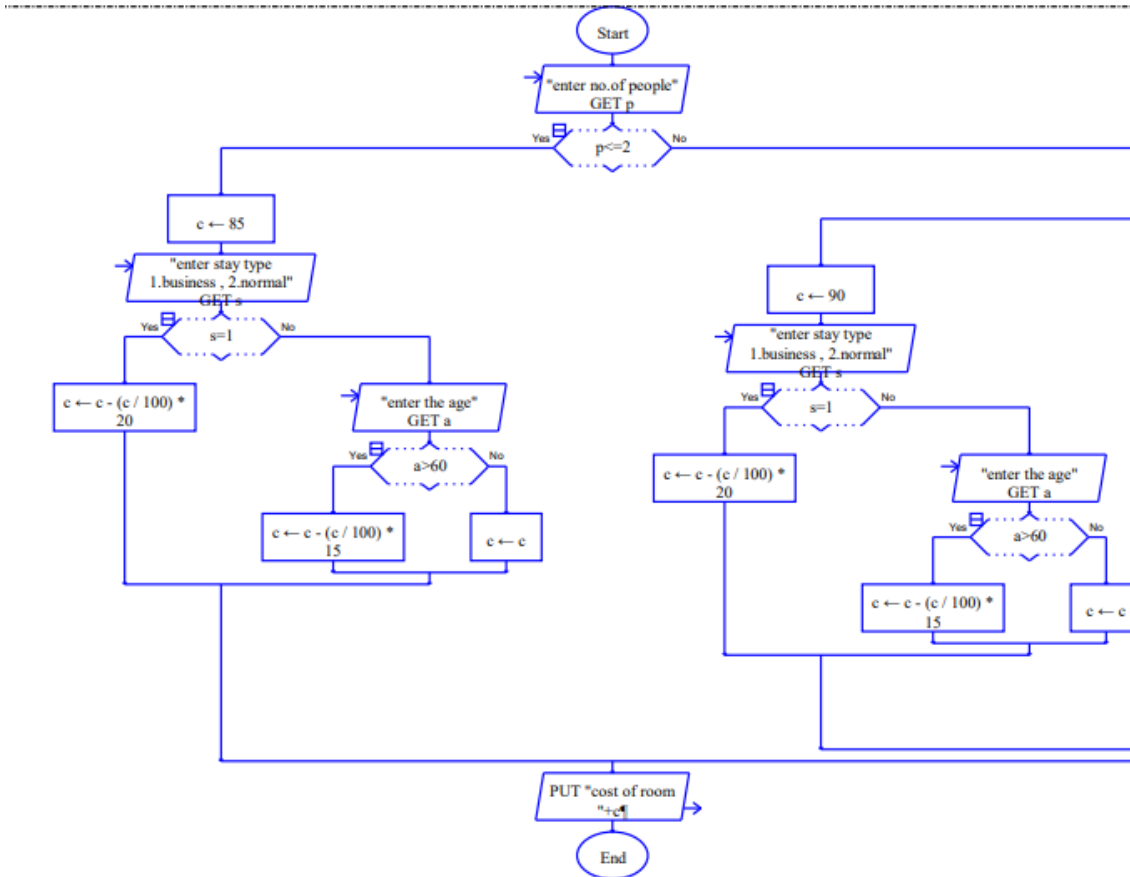
**Algorithm:**

```
1 Input : number n
2 Step 1: Start
3 Step 2: Read number n
4 Step 3: Initialize variable sum to 0 and temp to n
5 Step 4: If temp not equal to 0 Go to Step 5 , else Go to Step 9
6 Step 5: digit = temp % 10
7 Step 6: temp = temp / 10
8 Step 7: sum = sum + digit * digit * digit
9 Step 8: Repeat Step 4
10 Step 9: If sum is equal to n Print "Armstrong"
11 Step 10: Else Print "Not Armstrong"
12 Step 11: Stop
13 Output: Armstrong Number / not an Armstrong Number
```

**Flowchart:**



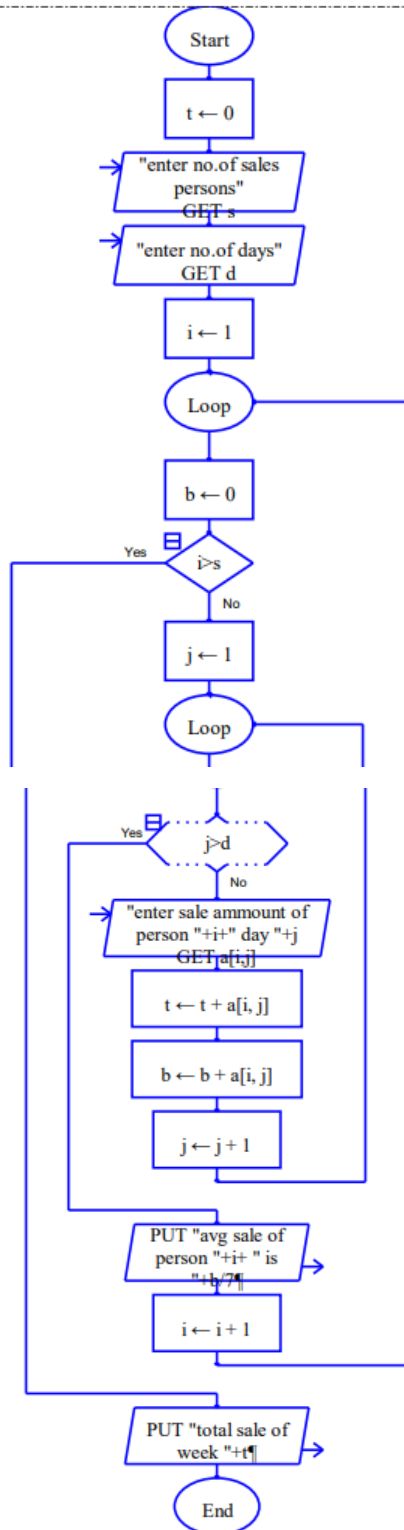
11. A company has 10 salespeople. The manager needs to know the average amount (in rupees) of sales for each salesperson for a week, and the total amount of sales for the store for the week. The store is open 7 days a week, and each salesperson gets 2 days off. The data are entered into a two-dimensional array with the days of the week as the columns and the salespeople as the rows. Develop an algorithm, draw the flowchart to test the above problem using Raptor.



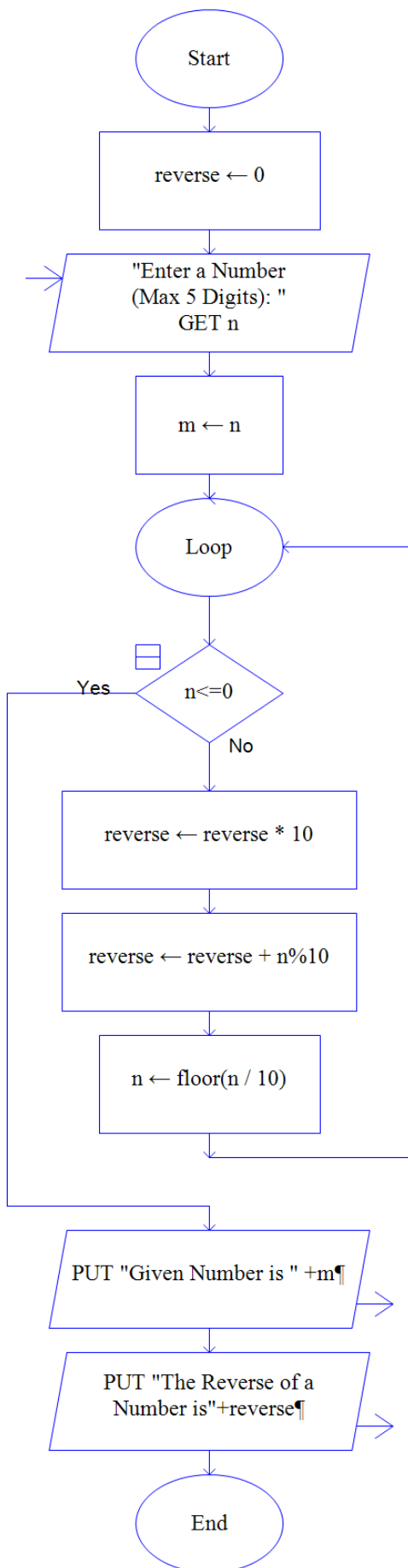
12. A hotel has a pricing policy as follows:

- i. 2 people: Rs.850
- ii. 3 people: Rs.900
- iii. 4 people: Rs.950
- iv. Additional people: Rs.6 per person

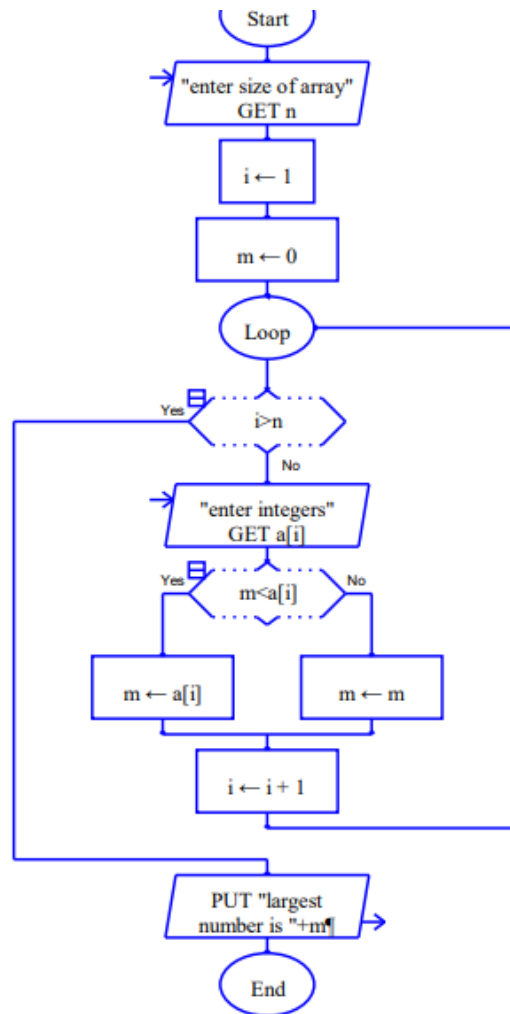
If the customer is staying on company business, there is a 20% discount. If the customer is over 60 years of age, there is a 15% discount. A customer does not receive both discounts. Given the above data, print the cost of the room. Write the algorithm, draw the flowchart to test the above problem using Raptor



13. Write an algorithm and program for reversing the digits of an integer number 2468 using C.  
Example: 8642



14. Using decision logic, find the biggest out of N numbers using Raptor and represent its algorithm and program design pictorially.

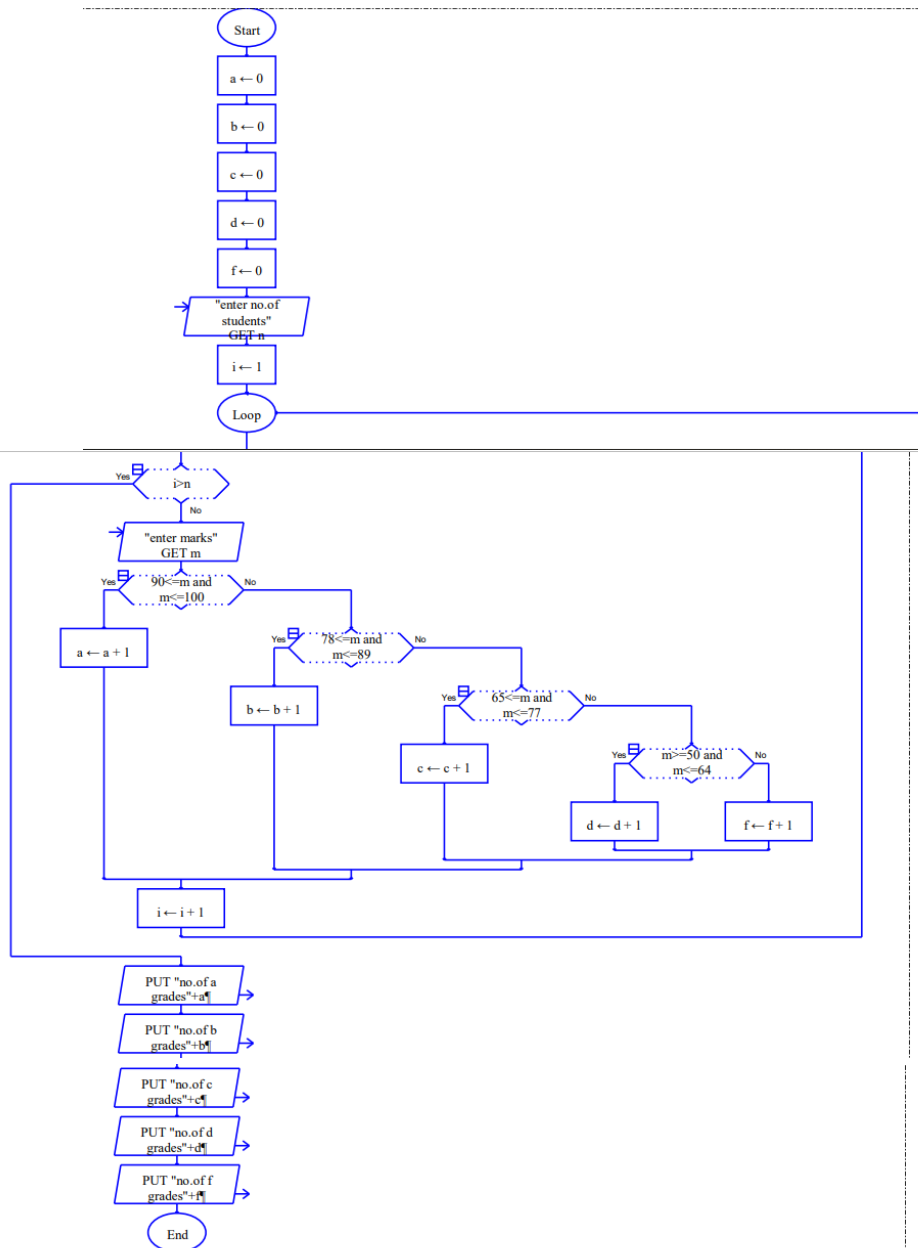




15. A teacher wants to know the grades of students based on the range of marks obtained. Help the teacher to find the grade of a student by designing a C program using a case control statement.

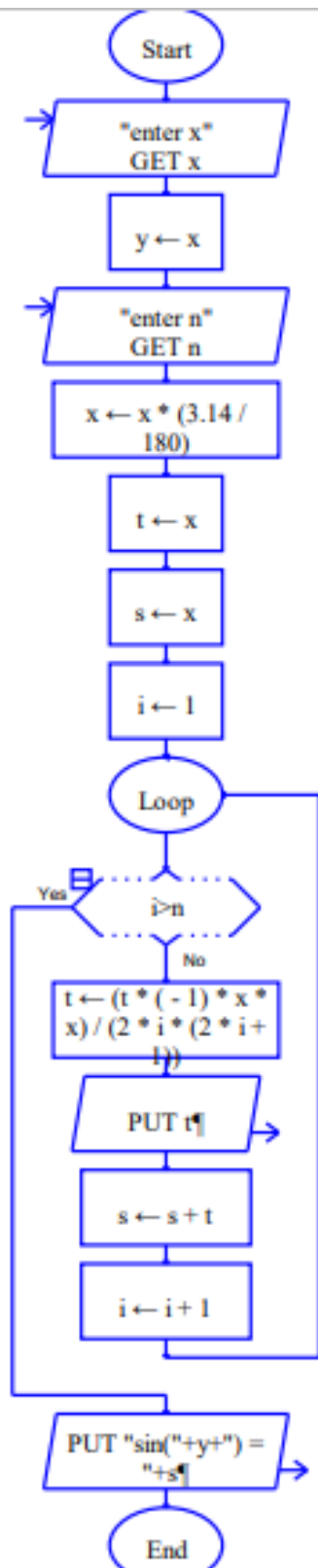
Marks Obtained	Grades
A	91 - 100
B	81 - 90
C	71 - 80
D	61 - 70
E	60 - 50
Fail	< 50

### Solution:

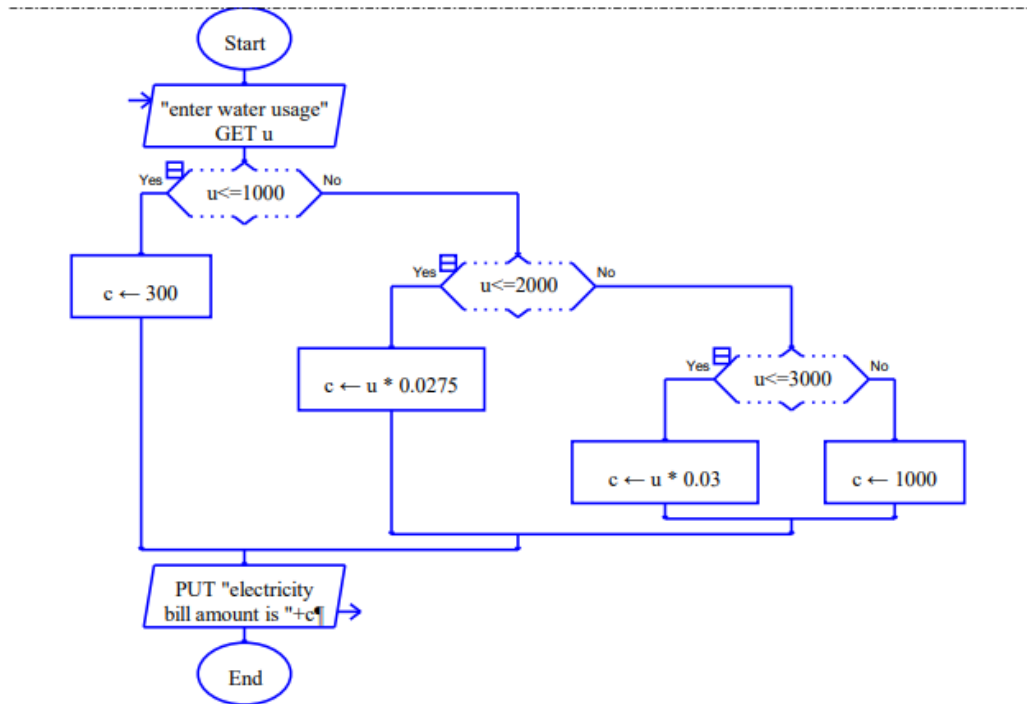


16. Obtain the value of  $\sin(x)$  for the given sequence

$x - x^3/3! + x^5/5! - x^7/7!$  using Raptor and writing its algorithm and flowchart.



17. Calculate the electricity bill which charges the house owner with one of the following: A bill rate of (i) Rs.300 for usage up to and including 1000 units, (ii) 0.0275 per unit for usage over 1000 units and up to and including 2000 units. (iii) 0.03 per unit for usage over 2000 units and up to and including 3000 units. (iv) A flat bill rate of Rs.1000 for usage over 3000 units. Draw the flowchart and test the above problem using Raptor.



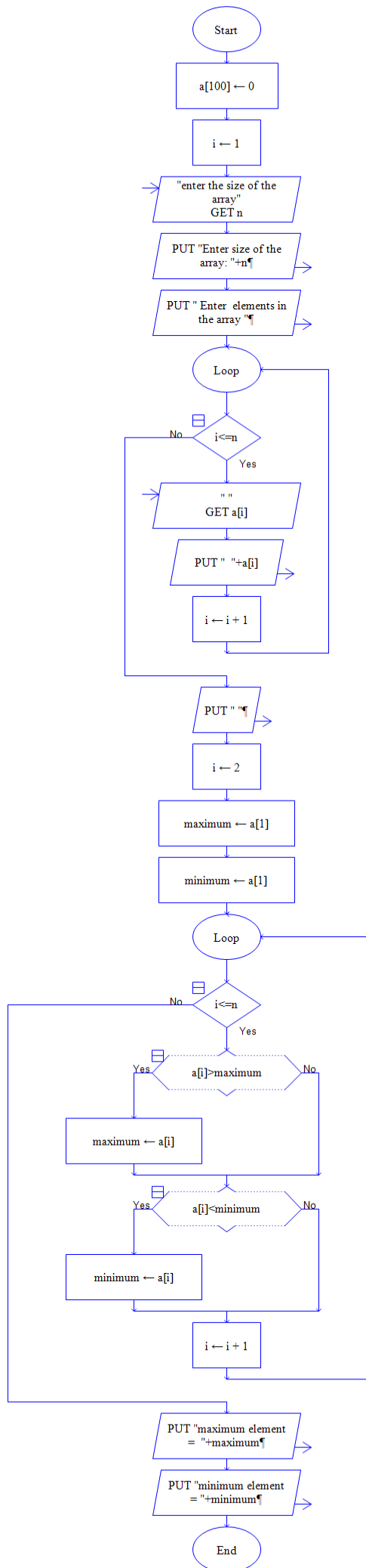
18. A kid wants to know the smallest and largest number jumbled in a box with numbers N= [ 5 2 36 18 25 30]. Using a C program, test the above and write its algorithm.

C program to find the smallest and largest element in an array:

```
#include<stdio.h>

int main()
{
    int a[50],i,n,large,small;
    printf("\nEnter the number of elements : ");
    scanf("%d",&n);
    printf("\nInput the array elements : ");
    for(i=0;i<n;++i)
        scanf("%d",&a[i]);
    large=small=a[0];
    for(i=1;i<n;++i)
    {
        if(a[i]>large)
            large=a[i];

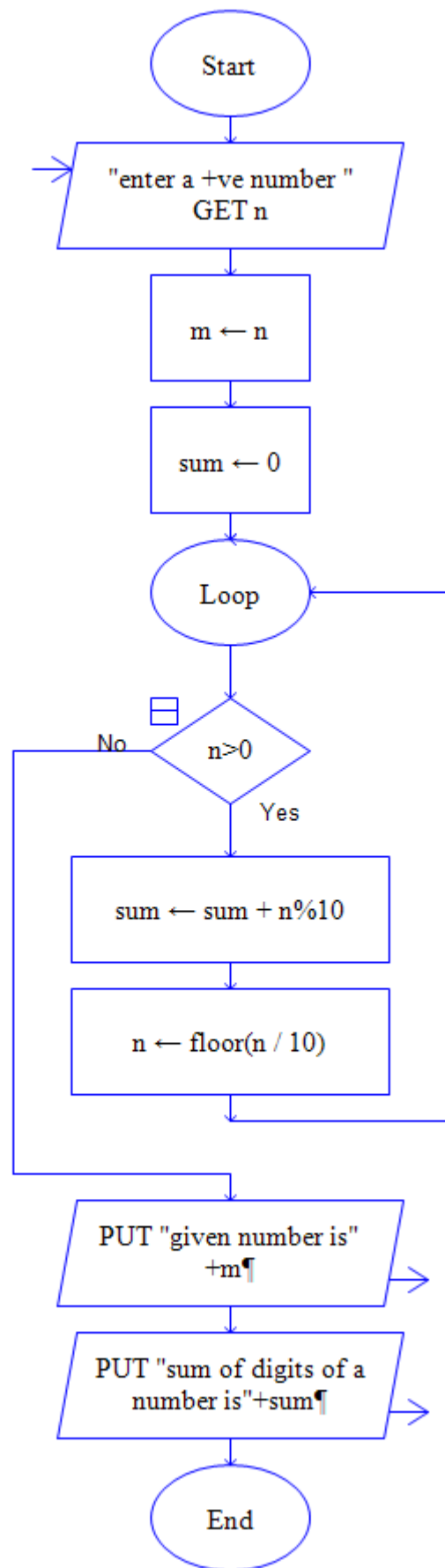
        if(a[i]<small)
            small=a[i];
    }
    printf("\nThe smallest element is %d\n",small);
    printf("\nThe largest element is %d\n",large);
    return 0;
}
```



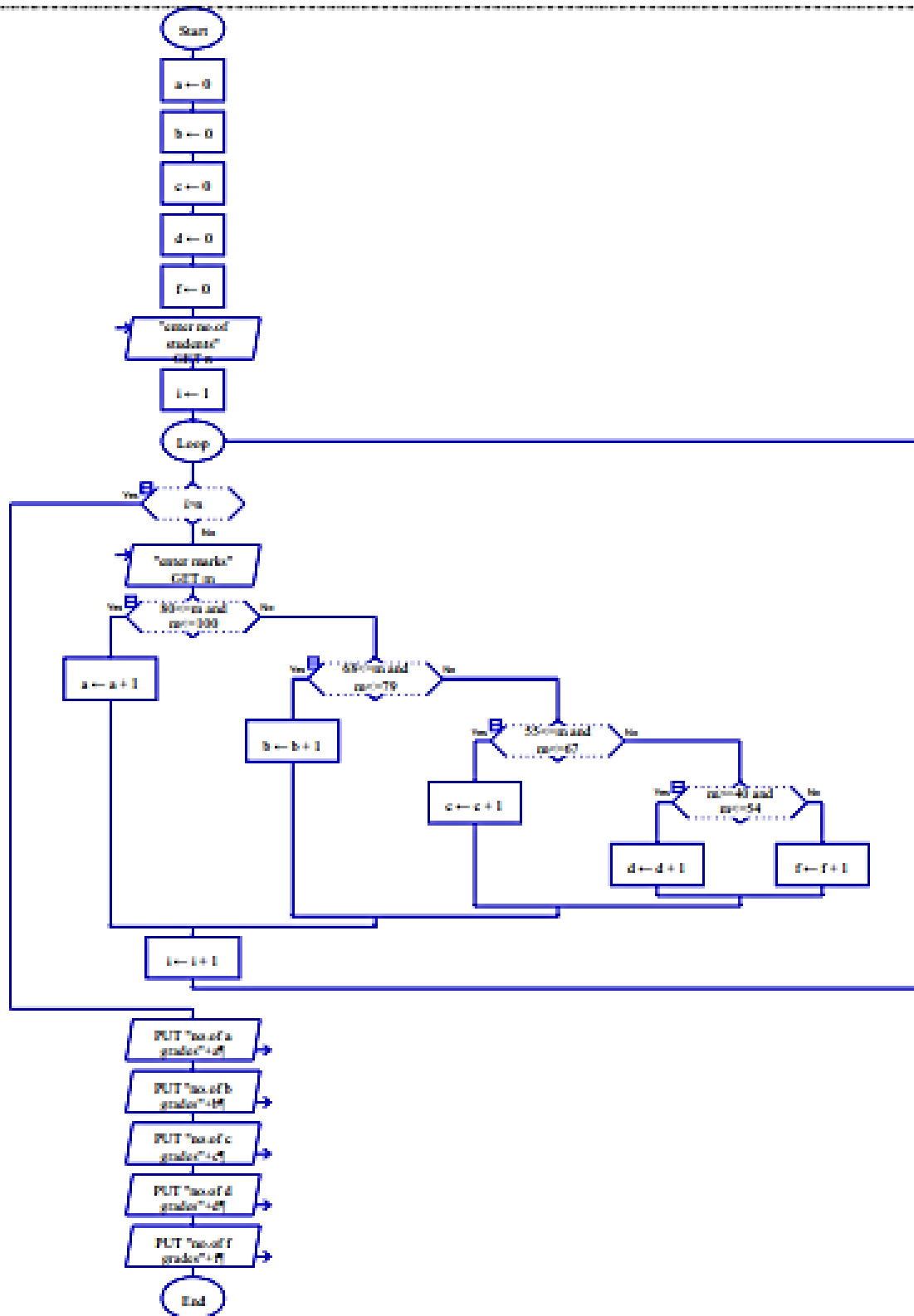
19. Draw a flowchart and write C code for summing all digits for the following integers. Example: 1234 and 674

C Program:

```
#include<stdio.h>
int main()
{
    int n,sum=0,m;
    printf("Enter a number:");
    scanf("%d",&n);
    while(n>0)
    {
        m=n%10;
        sum=sum+m;
        n=n/10;
    }
    printf("Sum is=%d",sum);
    return 0;
}
```



20. Mrs. Kala would like to know the grade count of her students. She has 10 students who took the test. She would like to enter the student number, marks and the grade for the test for each student. Develop the solution to print out each student's student number, marks, letter grade, and the total number of A, B, C, D and F grades. Her grading scale is as follows: 80–100 is an A, 68–79 is a B, 55– 67 is a C, 40– 54 is a D, and below 40 is an F. Write the algorithm, draw the flowchart to test the above problem using Raptor





21. Write an algorithm and flowchart to Sum the following sequence:

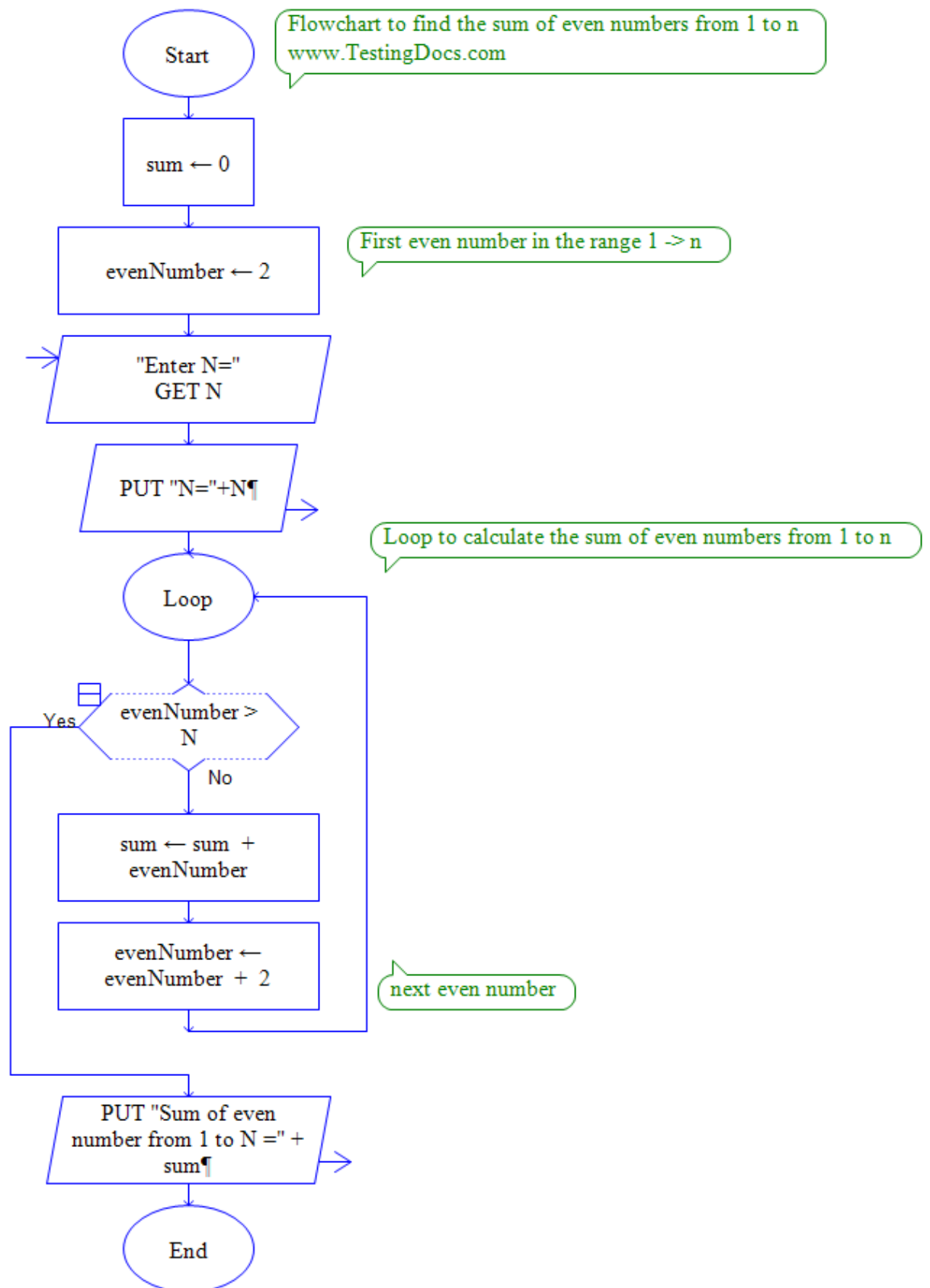
0,2,4,6,8,10,12,14,16,20,22,24,26,28,30 using C

### **SLOUTION**

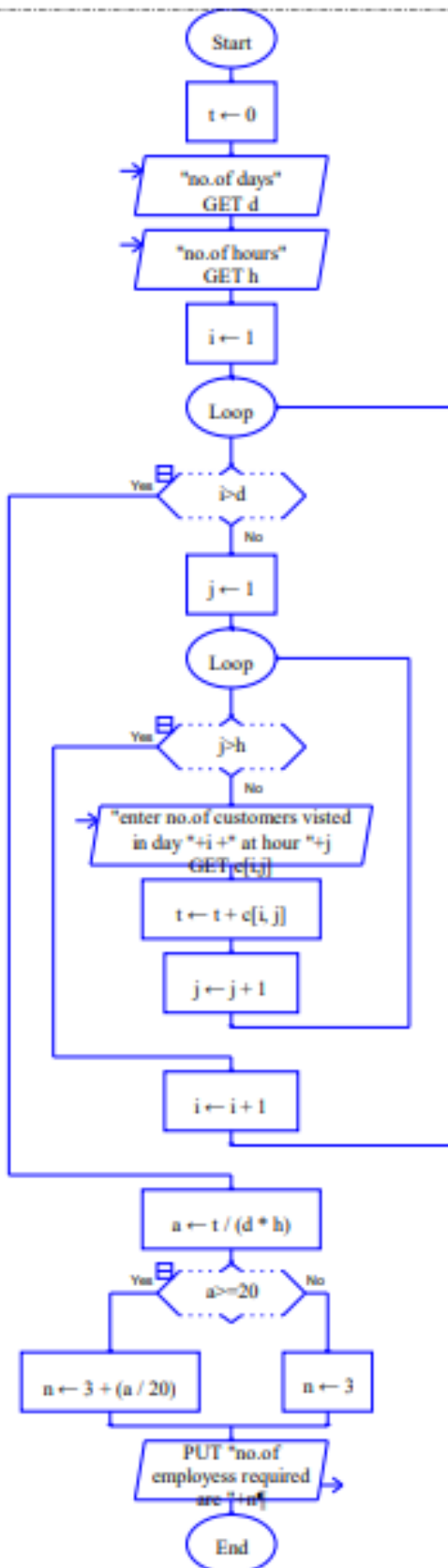
#### **C Program**

```
#include<stdio.h>

int main()
{
    int i,n,sum=0;
    printf("\nenter n:");
    scanf("%d",&n);
    for(i=0;i<=n;i++)
    {
        if(i%2==0)
        {
            printf("%d",i);
            sum=sum+i;
        }
    }
    printf("the sum of even number is %d",sum);
    return 0;
}
```



22. A manager wants to know how many employees are needed at the restaurant each hour of the day. The minimum number of employees needed at any hour is 3. After that, one additional employee is required for each 15 customers. The restaurant is open 6 hours a day. The manager has counted the number of customers each hour for 2 days. The manager will use the average number of customers for each hour over the 2 days to calculate the needed number of employees for each hour. Write the algorithm, draw the flowchart to test the above problem using Raptor

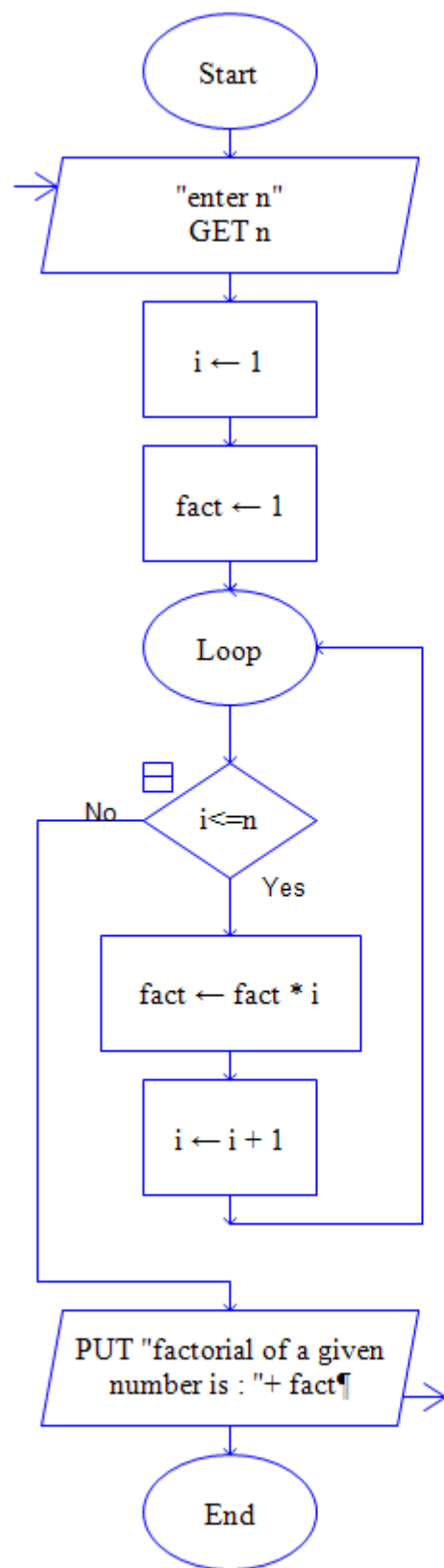


23. Obtain the product of all numbers preceding it for given number N= 5 using C and write the algorithm and flowchart. Example:  $1 \times 2 \times 3 \times 4 \times 5 = 120$ . (Factorial in c)

**C Program:**

```
#include<stdio.h>

int main()
{
    int i,fact=1,number;
    printf("Enter a number: ");
    scanf("%d",&number);
    for(i=1;i<=number;i++)
    {
        fact=fact*i;
    }
    printf("Factorial of %d is: %d",number,fact);
    return 0;
}
```



24. Write the algorithm to search a number 5 from the list of array of elements

Arr = [12,34,1,5,8,60] using linear search algorithm in C code.

**Algorithm:**

Linear\_Search(a, n, val), 'a' is the given array, 'n' is the size of given array, 'val' is the value to search

1. Step 1: set **pos** = -1
2. Step 2: set **i** = 1
3. Step 3: repeat step 4 while **i** <= n
4. Step 4: if **a[i]** == val
5. set **pos** = **i**
6. print pos
7. go to step 6
8. [end of if]
9. set **i** = i + 1
10. [end of loop]
11. Step 5: if **pos** = -1
12. print "value is not present in the array "
13. [end of if]
14. Step 6: exit

**C Program:**

```
#include <stdio.h>

int LINEAR_SEARCH(int inp_arr[], int size, int val)
{
    for (int i = 0; i < size; i++)
        if (inp_arr[i] == val)
            return i;
    return -1;
}

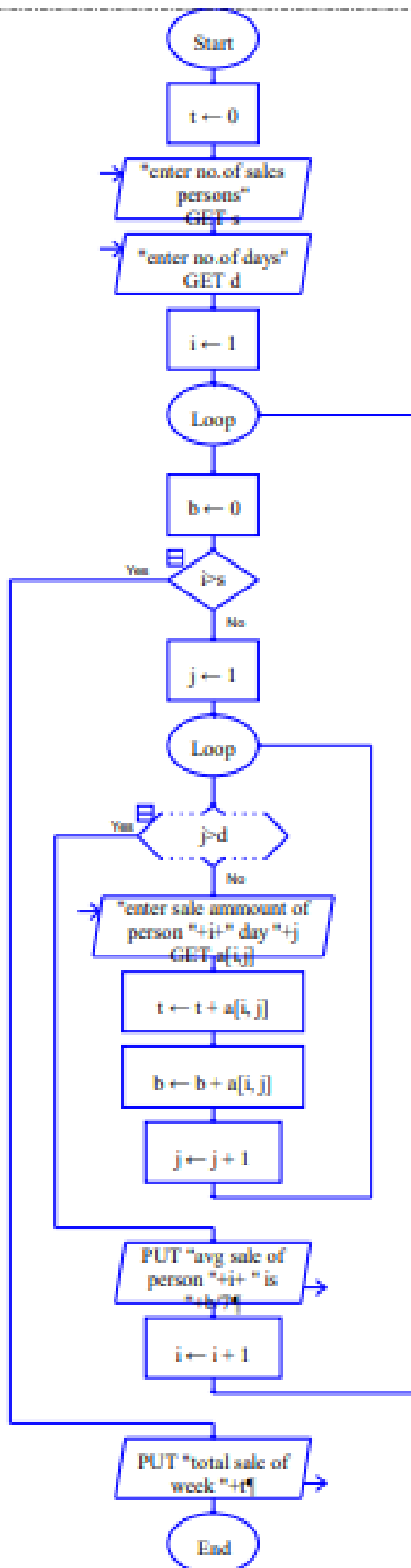
int main(void)
{
    int arr[] = { 10, 20, 30, 40, 50, 100, 0 };
    int key = 100;
    int size = 10;
    int res = LINEAR_SEARCH(arr, size, key);
    if (res == -1)
        printf("ELEMENT NOT FOUND!!");
}
```

```
else  
printf("Item is present at index %d", res);  
return 0;  
}
```

25. Draw a flowchart and write C code to test for the given numbers, the sum of the cubes of its digits is equal to the number itself. (i) 724 (ii) 407 (ii)370

**Same solution as Question Number 10**

26. There are 20 sales people in a company. The store is open 7 days a week, and each salesperson gets 2 days off. The manager needs to know the average dollar amount of sales for each salesperson for a week. The data are entered into a two-dimensional array with the days of the week as the columns and the salespeople as the rows. Develop an algorithm, draw the flowchart to test the above problem using Raptor.

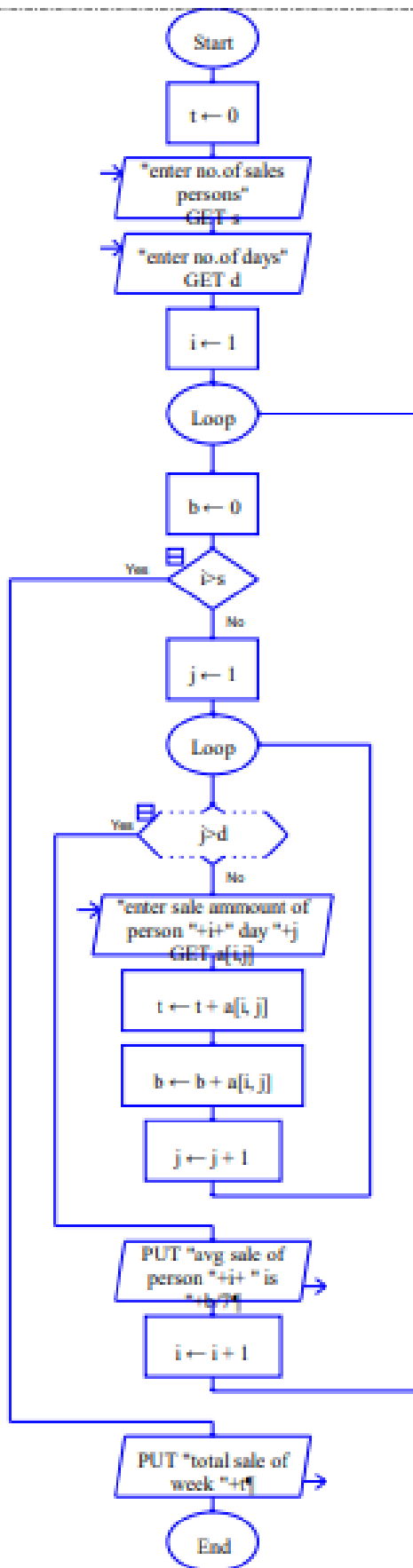




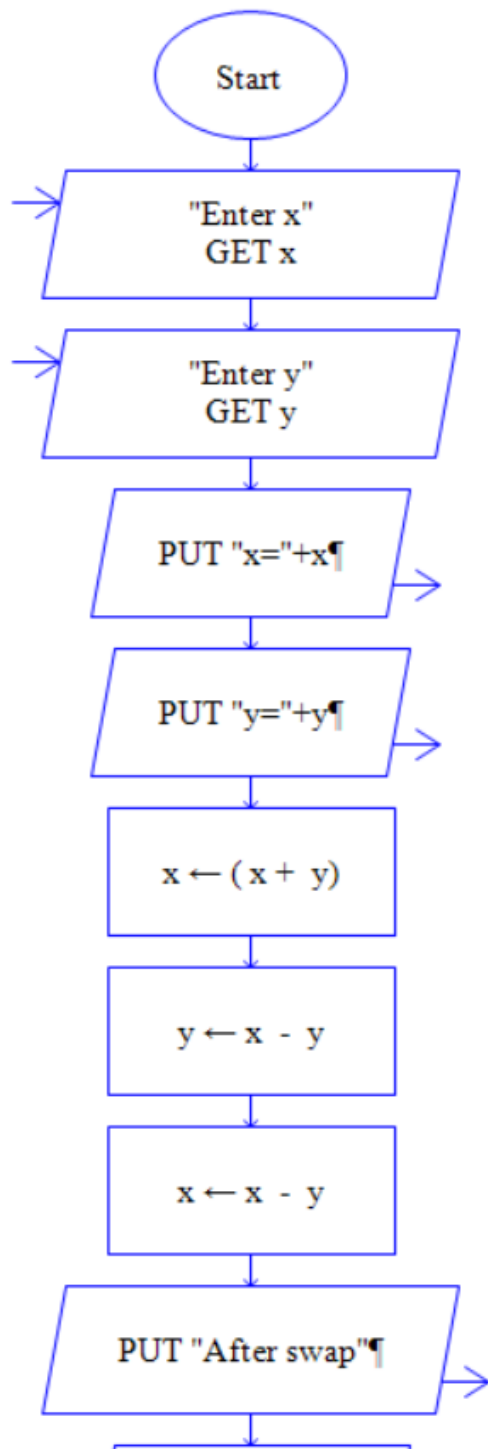
27. Write the algorithm and C code for summing up the digits of an integer number 5467 equals 22.

**Same solution as Question Number 19**

28. A hotel has a pricing policy as follows: 2 people: Rs.750, 3 people: Rs.950, 4 people: Rs.1050, Additional people: Rs.50 per person. If the customer is staying on company business, there is a 25% discount. If the customer is over 60 years of age, there is a 20% discount. A customer does not receive both discounts. Given the above data, print the cost of the room. Write the algorithm, draw the flowchart to test the above problem using Raptor



29. Draw a flowchart and write C code to swap the two numbers 17 and 53 without a temporary variable.



30. Write the algorithm and C code to calculate the average of 25 exam score marks and draw its flowchart.

**C program:**

**Here I have taken example with five numbers, but you can consider any number of integers**

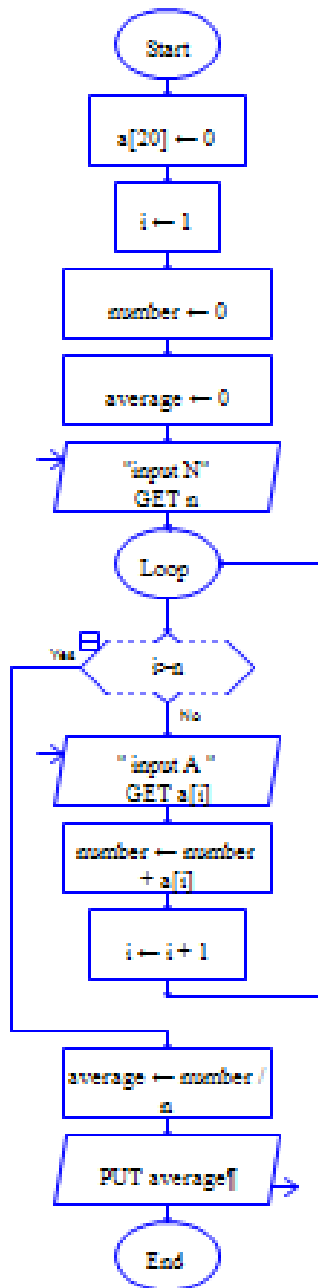
```
#include <stdio.h>

int main() {
    int i, total;
    int a[] = {0, 6, 9, 2, 7};
    int n = 5;

    total = 0;

    for(i = 0; i < n; i++)
    {
        total += a[i];
    }

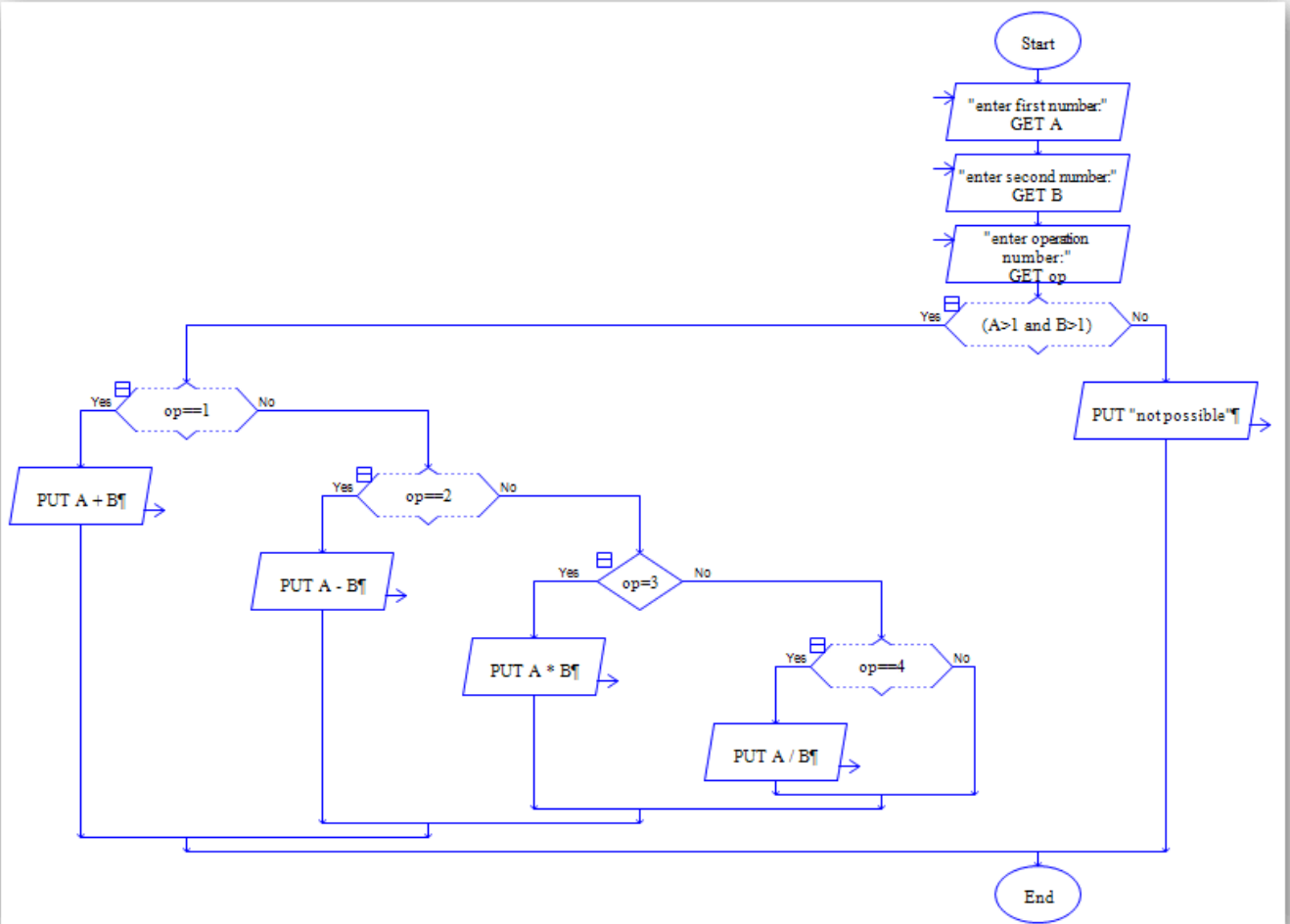
    printf("Average = %f\n", total/(float)n);
    return 0;
}
```



31. Write an algorithm, flowchart to design a simple calculator using Switch case and the test the above using C Code.

```
#include <stdio.h>

int main() {
    char op;
    double first, second;
    printf("Enter an operator (+, -, *, /): ");
    scanf("%c", &op);
    printf("Enter two operands: ");
    scanf("%lf %lf", &first, &second);
    switch (op) {
        case '+':
            printf("%.1lf + %.1lf = %.1lf", first, second, first + second);
            break;
        case '-':
            printf("%.1lf - %.1lf = %.1lf", first, second, first - second);
            break;
        case '*':
            printf("%.1lf * %.1lf = %.1lf", first, second, first * second);
            break;
        case '/':
            printf("%.1lf / %.1lf = %.1lf", first, second, first / second);
            break;
        default:
            printf("Error! operator is not correct");
    }
    Return 0:
}
```



32. Using C code, determine the maximum and minimum number from the set of elements present in  
magic = [ 10 5 20 15 8 25 30 40 45 100].

**Same as question number 18**



33. The Boutique company is having a sale for five days. Each day, starting on Monday, the price will drop 20% of the previous day's price. For example, if the original price of a product is Rs.200.00, the sale price on Monday would be Rs.160.00 (20% less than the original price). On Tuesday the sale price would be Rs.128 (10% less than Monday). On Wednesday the sale price would be Rs.115.20; on Thursday the sale price would be Rs.103.60; and on Friday the sale price would be Rs.93.32. Develop a solution that will calculate the price of an item for each of the five days, given the original price. Write the algorithm, draw the flowchart to test the above problem using Raptor.

**Same as question number 5**

34. Suppose there are two variables, A and B. Variable A exchanges its data with variable B and variable B exchanges its data with A. Generally, this is done with the data in memory. Use the above logic to test the program using C code and explain its algorithm. Given: A=50; B=75.

(Swapping –c program)

**Same as question number 29**

35. Mary has N students and would like to enter the student number and the grade for the test for each student. She would like to know how many A Grades, B Grades, C Grades, D Grades, E Grades and F Grades her students received on a test. She would like to Develop the solution to print out each student's student number, number grade, letter grade, and the total number of grades. Her grading scale is as follows: 90–100 is an A, 89–80 is a B, 79 – 70 is a C, 69 – 60 is a D, 59 – 50 is E and below 50 is an F. Write the algorithm, draw the flowchart to test the above problem using Raptor

**Same as question number 4**

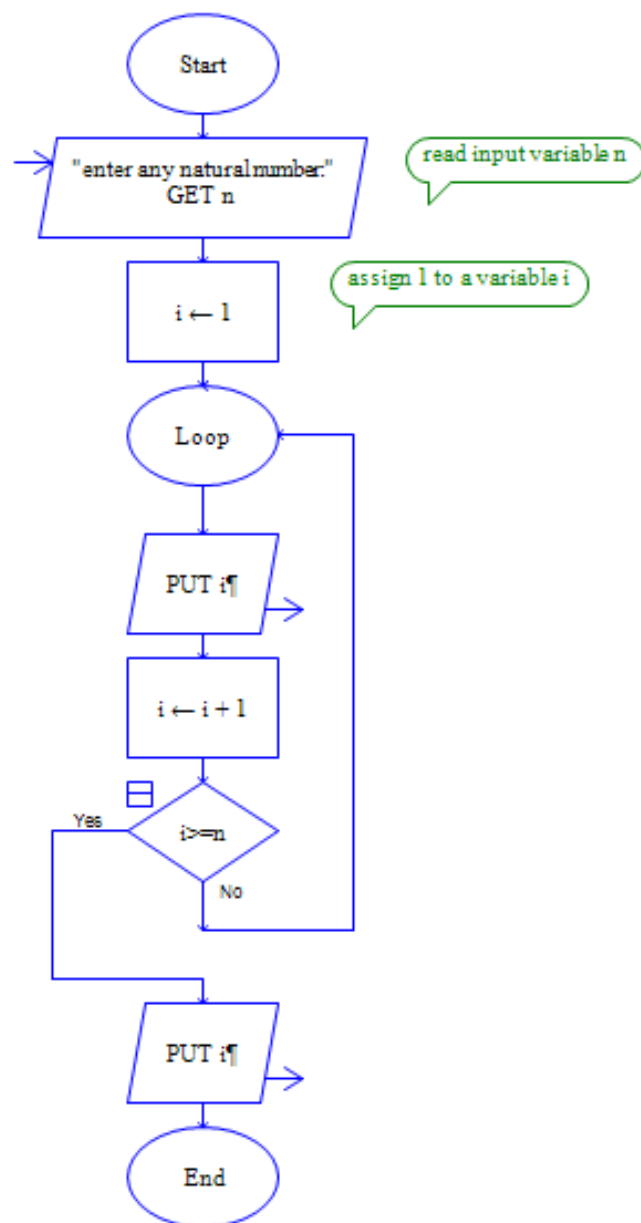
36. Write the C program and explain its algorithm to generate a series of whole numbers excluding zero and with a difference of 2. Example: 2,4,6.....20 (Even no generation)

**Same as Question Number 6**

37. Write the algorithm and C program to sum the N natural numbers for N = 15.

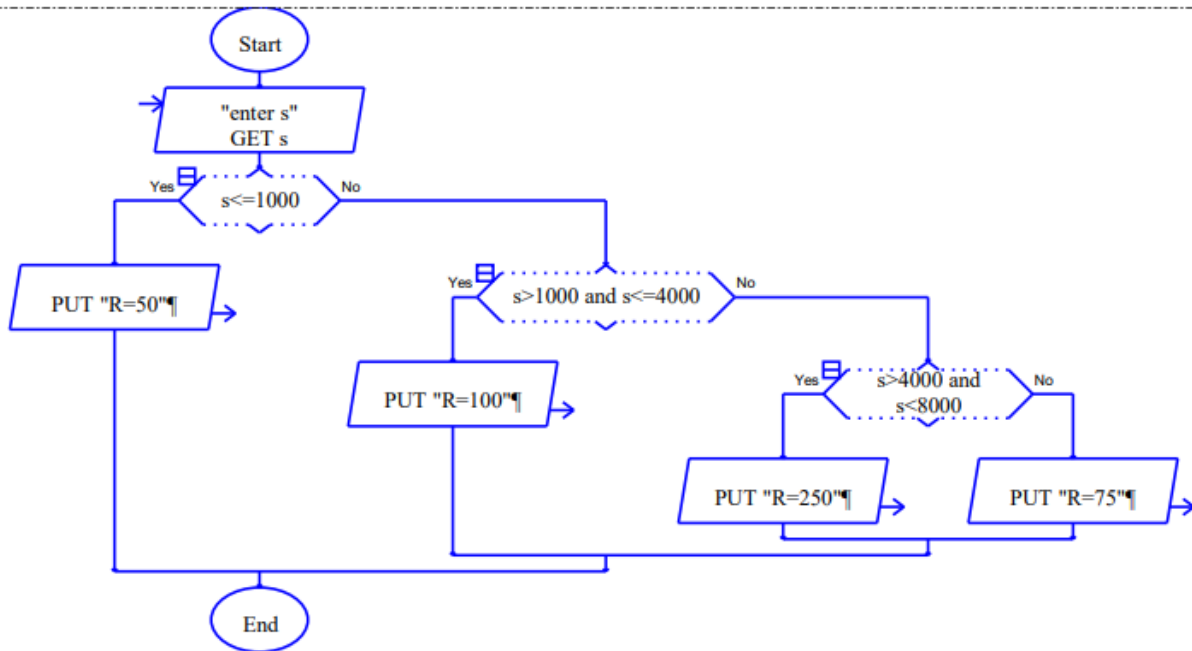
Example: 1+ 2 +3 + .....+15

```
#include <stdio.h>
#include <conio.h>
void main()
{
    int num, i, sum = 0; // declare local variables
    printf(" Enter a positive number: ");
    scanf("%d", &num); // take any positive number
    for (i = 0; i <= num; i++)
    {
        sum = sum + i; // at each iteration the value of i is added to the sum variable
    }
    printf("\n Sum of the first %d number is: %d", num, sum);
    getch();
}
```



38. Using decision logic, write the algorithms and draw the flowchart using raptor for the following set of conditions:

R = 50	for	S ≤ 1000
R = 100	for	S = 1001 – 4000
R = 250	for	S = 4001 – 8000
R = 75	for	S > 8000

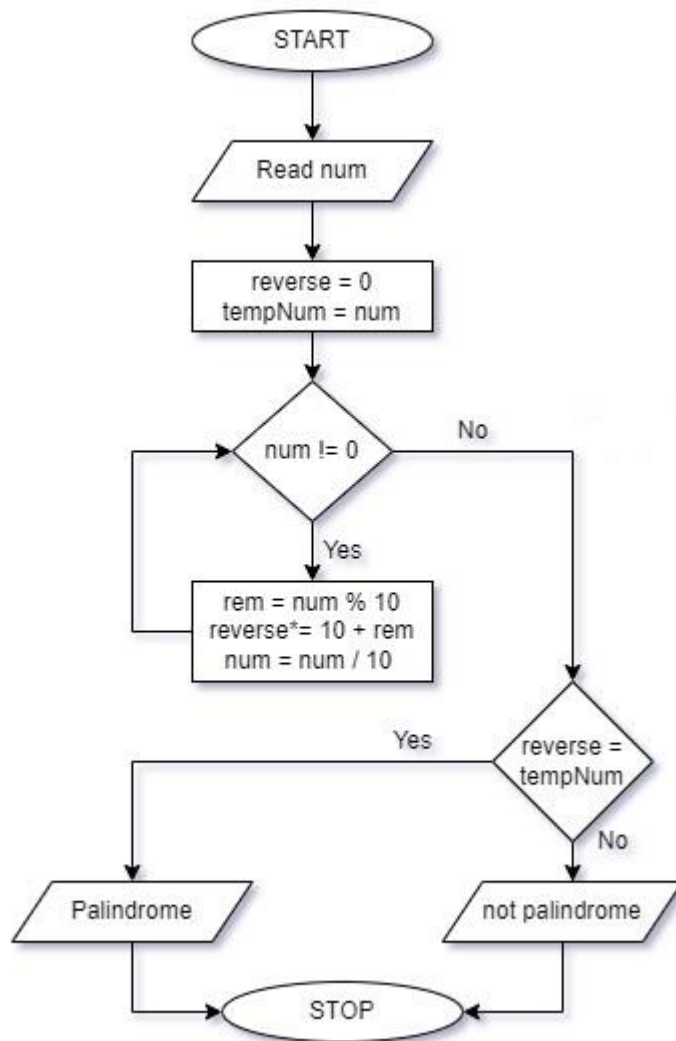


39. Check whether the given numbers are palindrome or not using C code (i)121 (ii)370. And write its algorithm and flowchart.

```
#include<stdio.h>

void main()
{
int num,x,t,sum=0;
printf("Enter a number:");
scanf("%d",&num);
t= num;
while(t!=0)
{
r=t%10;
sum=sum + r;
t=t/10;
}
if(num==sum)
{
printf ("%d is an palindrome Number.", num);
}
else
{
printf ("%d is not an palindrome Number.", num);
}
}
```





40. Mary Smith is looking for a bank that will give the most return on her money over the next five years. She has Rs.50,000 to put into a savings account. The standard equation to calculate the principal plus interest at the end of a period of time is  $\text{Amount} = P * (1 + I / M)^{(N * M)}$ . Estimate the above problem using Raptor and the amount obtained by her after 5 years.

