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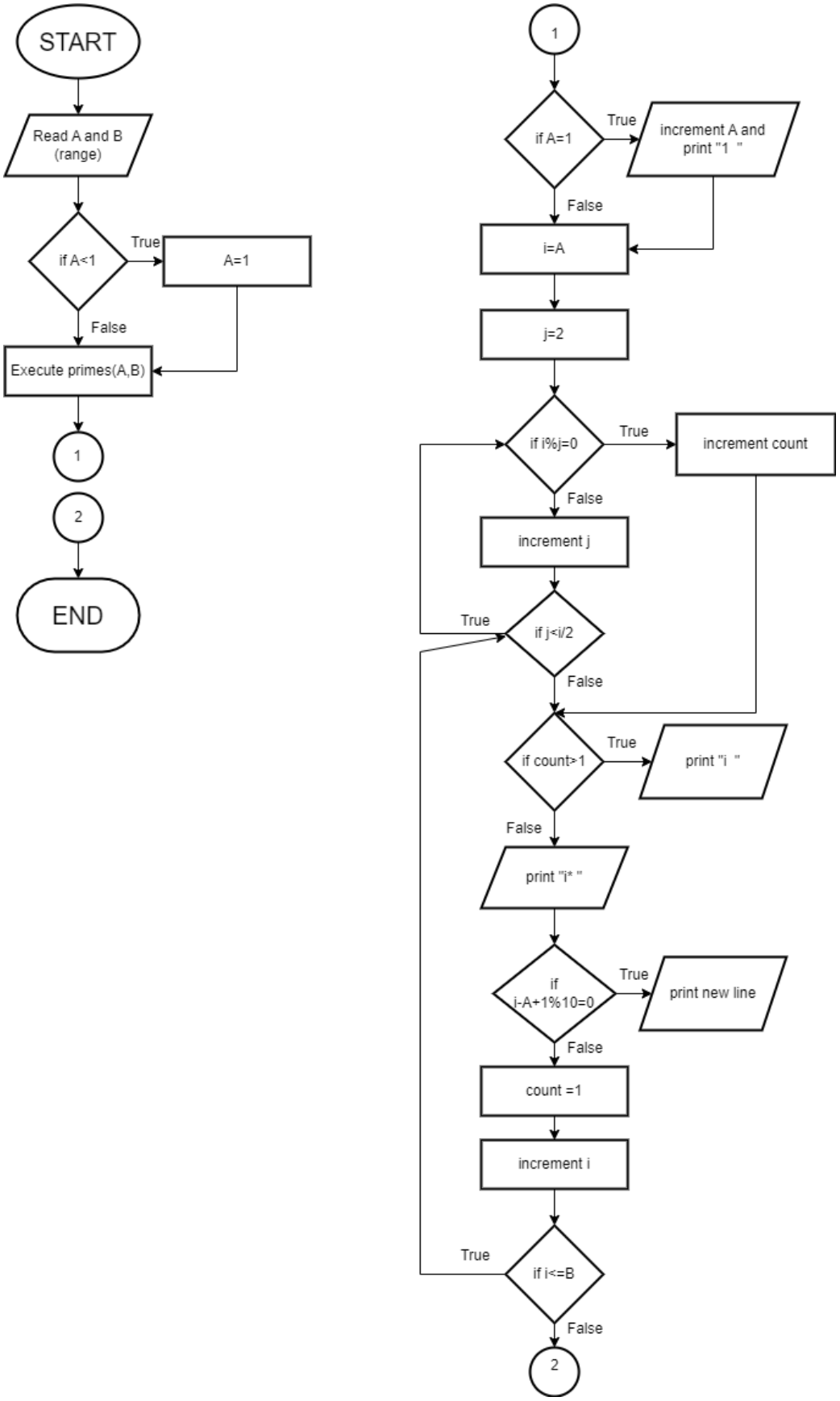
Experiment No.	3

AIM:	To apply the concept of functions to incorporate modularity
Program 1	
PROBLEM STATEMENT :	Write a function which takes a range as input. Print all the numbers in the range with '*' in front of prime numbers only.
ALGORITHM:	(The algorithm and flowchart have been written/made without the steps needed for the formatting of console output, as it was not mentioned in the question) Step 1: START Step 2: Read values for range and store them in A and B respectively. Step 3: Set A=1 if A<1. Step 4: Execute function primes(int a, int b) with A and B as arguments. Step 5: END Algorithm for function primes(int a, int b) : (start=a; end=b) Step 1: if start=1, increment start and print 1. step 2: i=start step 3: j=2 step 4: if i%j=0, increment count(initialised as 1) and jump to step 7. Step 5: increment j. step 6: if j<i/2, return to step 4. step 7: if count>1, print i followed by 2 spaces. Step 8: else print i followed by a '*' and a space. Step 9: if (i-start+1)%10=0, begin a new line. Step 10: Set count=1 Step 11: increment i Step 12: if i<=end, return to step 3.

FLOWCHART:


START
Read A and B (range)
if A<1
True
A=1
False
Execute primes(A,B)
1
2
END
1
if A=1
True
increment A and print "1 "
False
i=A
j=2
if i%j=0
True
increment count
False
increment j
if j<i/2
True
False
if count>1
True
print "i "
False
print "i* "
if i-A+1%10=0
True
print new line
False
count =1
increment i
if i<=B
True
False
2

PROGRAM:

```c
#include<stdio.h>
void primes(int start, int end){
    int count=1,x,offset,digits=1,y;
    printf("the numbers in the range %d to %d with the primes starred
are:\n",start,end);
    x=start;
    y=start;
    offset=start%10;
    while(y>=10){
        y=y/10;
        digits++;
    }
    for(int o=0;o<(offset-1)*(2+digits);o++){
        printf(" ");
    }
    if(start==1){
        start++;
        printf("1  ");
    }
    for(int i=start; i<=end; i++){
        for(int j=2;j<i/2;j++){
            if(i%j==0){count++;break;}
        }
        if(count>1){printf("%d  ",i);}
        else{printf("%d* ",i);}
        if((i-x+offset)%10==0){printf("\n");}
        count=1;
    }
}
int main(){
    int a,b,temp;
    printf("Enter the range(positive numbers)\n");
    scanf("%d %d",&a,&b);
    if(a>b || b<1){printf("invalid input\n");return 0;}
    if(a<1){a=1;}
    primes(a,b);
    return 0;
}
```

RESULT:

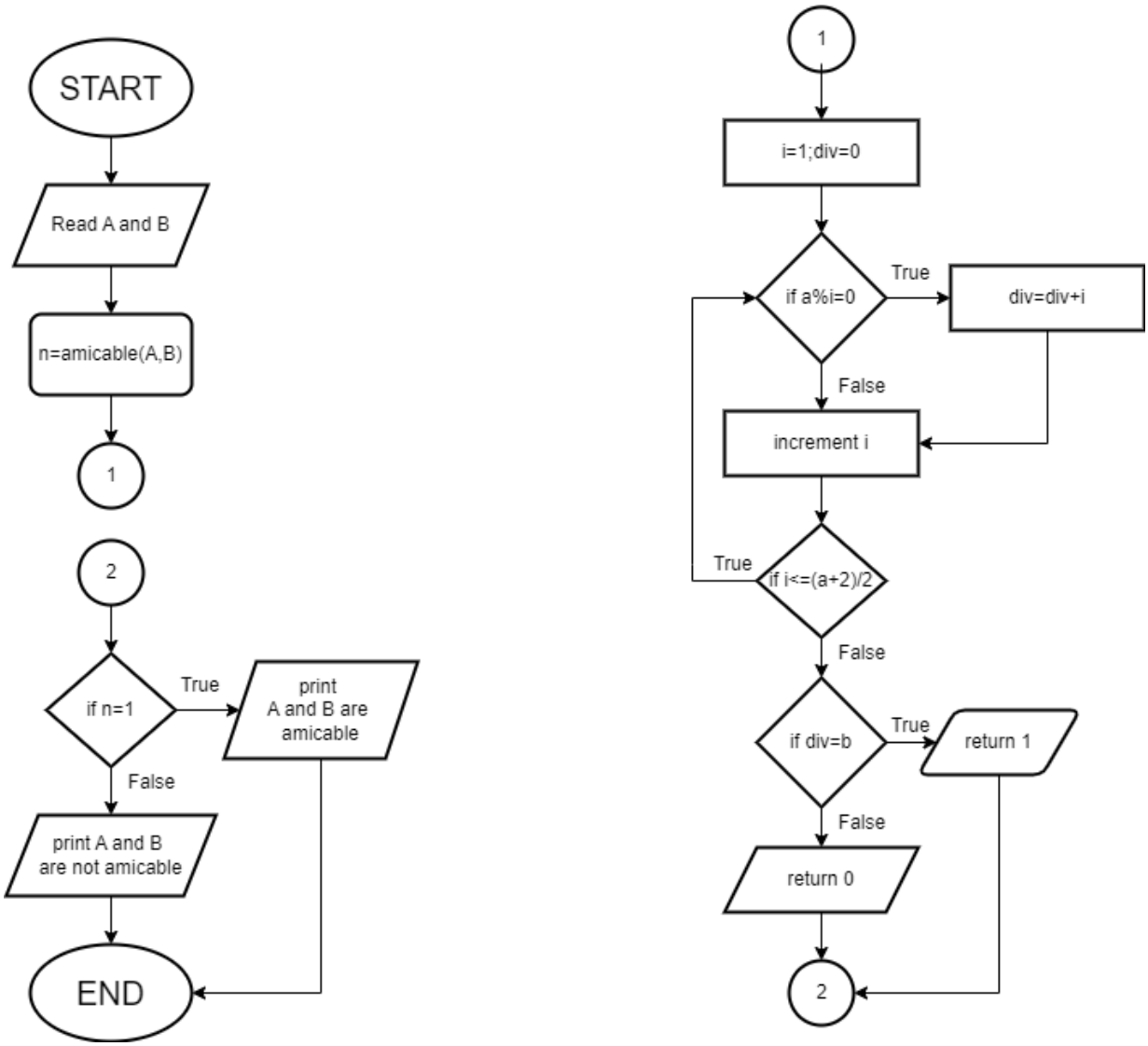
```
Enter the range(positive numbers)
1
100
the numbers in the range 1 to 100 with the primes starred are:
1   2* 3* 4* 5* 6   7* 8   9   10
11* 12   13* 14   15   16   17* 18   19* 20
21   22   23* 24   25   26   27   28   29* 30
31* 32   33   34   35   36   37* 38   39   40
41* 42   43* 44   45   46   47* 48   49   50
51   52   53* 54   55   56   57   58   59* 60
61* 62   63   64   65   66   67* 68   69   70
71* 72   73* 74   75   76   77   78   79* 80
81   82   83* 84   85   86   87   88   89* 90
91   92   93   94   95   96   97* 98   99   100
```

```
Enter the range(positive numbers)
237
295
the numbers in the range 237 to 295 with the primes starred are:
                                237   238   239* 240
241* 242   243   244   245   246   247   248   249   250
251* 252   253   254   255   256   257* 258   259   260
261   262   263* 264   265   266   267   268   269* 270
271* 272   273   274   275   276   277* 278   279   280
281* 282   283* 284   285   286   287   288   289   290
291   292   293* 294   295
```

Program 2

PROBLEM STATEMENT :	Write a function which takes as parameters two positive integers and returns TRUE if the numbers are amicable and FALSE otherwise. A pair of numbers is said to be amicable if the sum of divisors of each of the numbers (excluding the no. itself) is equal to the other number.
ALGORITHM:	Step 1: START Step 2: Read two numbers from input and store them in variables A and B. Step 3: if amicable(A,B)=1, print that A and B are amicable. Step 4: else print A and B are not amicable numbers. Step 5: END Algorithm for function amicable(int a,int b) (a and b are parameters and here, a=A,b=B) Step 1: i=1, div=0 Step 2: if a%i=0, set div to div+i Step 3: increment i Step 4: if i<(a+2)/2, return to step 2. Step 5: if div=b, return 1. Step 6: else return 0.

FLOWCHART:



PROGRAM:

```c
#include<stdio.h>
int amicable(int a, int b){
    int div=0;
    for(int i=1;i<(a+2)/2;i++){
        if(a%i==0){
            div=div+i;
        }
    }
    if(div==b){return 1;}
    else{return 0;}
}
int main(){
    int a,b;
    printf("Enter two numbers\n");
```

```
    scanf("%d %d",&a,&b);
    if(amicable(a,b))
    printf("The numbers %d and %d are amicable\n",a,b);
    else printf("The numbers %d and %d are not amicable\n",a,b);
    return 0;
}
```

RESULT:

```
Enter two numbers
1184
1210
The numbers 1184 and 1210 are amicable
```

```
Enter two numbers
1234
1324
The numbers 1234 and 1324 are not amicable
```

Program 3

PROBLEM STATEMENT:

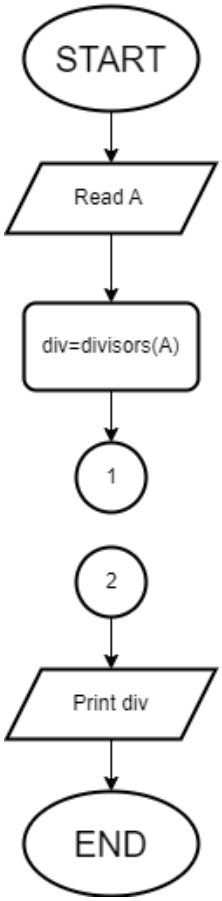
Write a function to find the sum of the proper divisors of a given number ‘n’. The proper divisors of a number ‘n’ are the numbers less than n that divide it evenly. they do not include n itself.

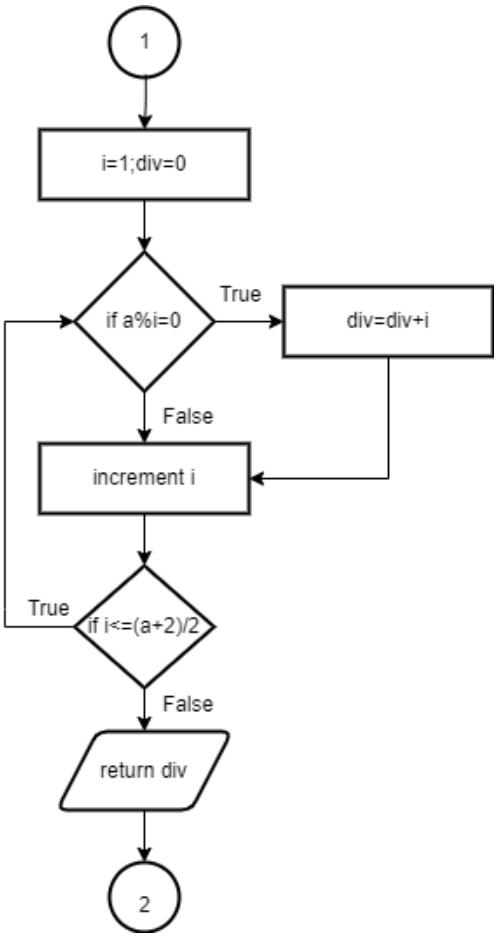
ALGORITHM:

Step 1: START
Step 2: Read number from input and store it in A.
Step 3: div=divisors(A)
Step 4: print div
Step 5: END

Algorithm for function divisors(int a) (here a is a parameter and a=A)
Step 1: div=0, i=1
Step 2: if a%i=0, set div to div+i
Step 3: increment i
Step 4: if i<(a+2)/2, return to step 2
Step 5: return div

FLOWCHART:





PROGRAM:

```c
#include<stdio.h>
int divisors(int a){
    int div=0;
    for(int i=1;i<(a+2)/2;i++){
        if(a%i==0){
            div=div+i;
        }
    }
    return div;
}
int main(){
    int a,div;
    printf("Enter a number\n");
    scanf("%d",&a);
    div=divisors(a);
    printf("The sum of the proper divisors of %d is %d\n",a,div);
    return 0;
}
```

RESULT:

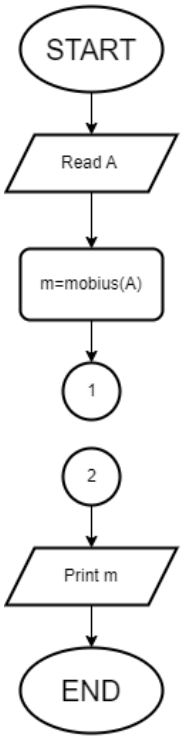
```
Enter a number
12
The sum of the proper divisors of 12 is 16
```

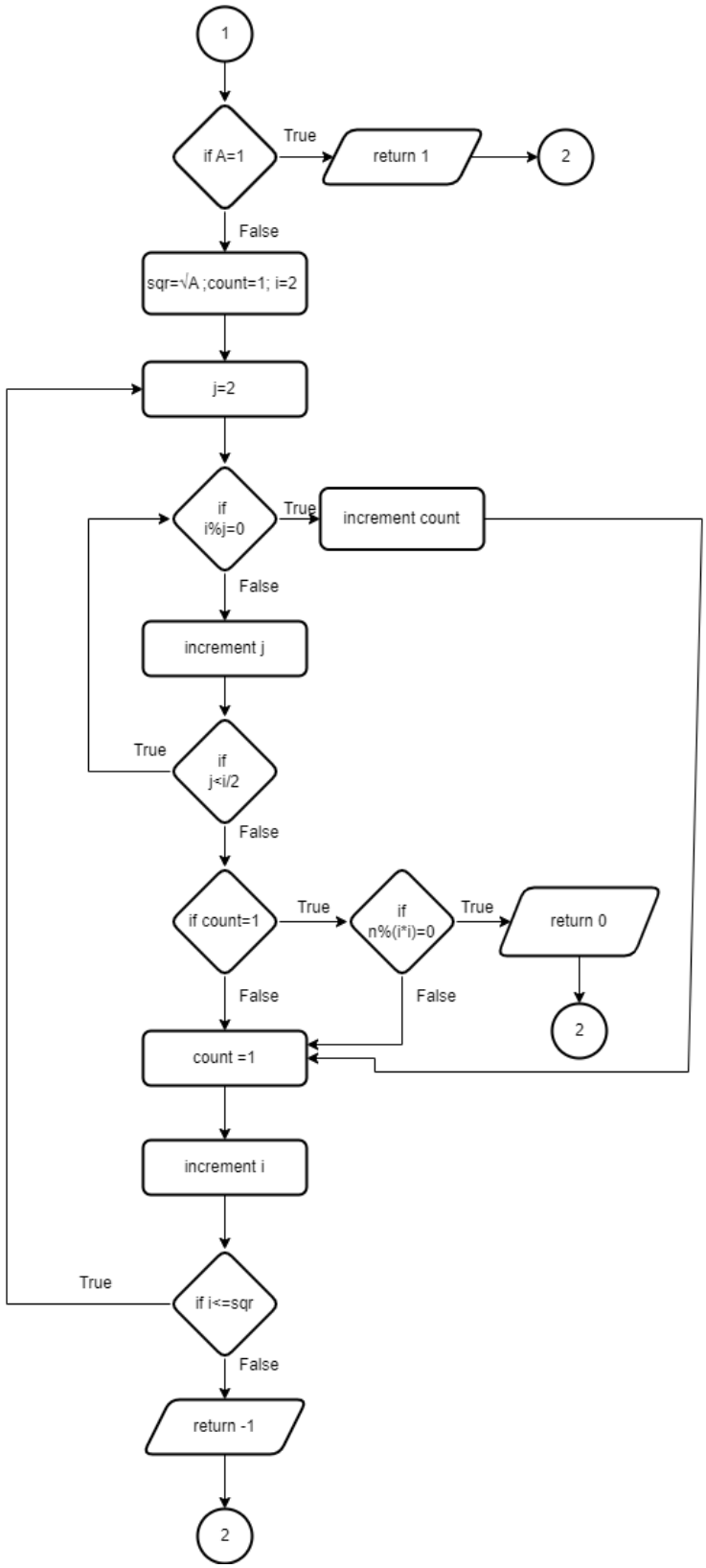
```
Enter a number
134
The sum of the proper divisors of 134 is 70
```

Program 4

PROBLEM STATEMENT:	The Mobius function M (N) is defined as M (N) = 1 if N=1 = 0 if any prime factor is contained in N more than once = (-1) if N is the product of p different prime factors Write a function MOBIUS as specified above.
ALGORITHM:	Step 1: START Step 2: read a number from input and store it in A Step 3: m=mobius(A) Step 4: print m Step 5: END Algorithm for the function mobius(n) (here n is a parameter and n=A) Step 1: if n=1, return 1 and terminate function. Step 2: sqr=√n, count=1, i=2 Step 3: j=2 Step 4: if i%j=0, increment count and jump to step 8. Step 5: increment j. Step 6: if j<i/2, return to step 4. Step 7: if count=1, if n%(i*i)=0, return 0 and terminate function. Step 8: set count=1 Step 9: increment i Step 10: if i<=sqr, return to step 3 Step 11: return -1 and terminate function.

FLOWCHART:


START
Read A
m=mobius(A)
1
2
Print m
END


1
if A=1
True
return 1
2
False
sqr=√A ;count=1; i=2
j=2
if i%j=0
True
increment count
False
increment j
if j<i/2
True
False
if count=1
True
if n%(i*i)=0
True
return 0
2
False
False
count =1
increment i
if i<=sqr
True
False
return -1
2

PROGRAM:

```c
#include<stdio.h>
#include<math.h>
int mobius(int n){
    if(n==1){return 1;}
    int sqr,count=1;
    sqr=sqrt(n);
    for(int i=2;i<=sqr;i++){
        for(int j=2;j<i/2;j++){
            if(i%j==0){count++;break;}
        }
        if(count==1){
            if(n%(i*i)==0){return 0;}
        }
        count=1;
    }
    return -1;

}
int main(){
    int n,m;
    printf("Enter a number\n");
    scanf("%d",&n);
    m=mobius(n);
    printf("The value of M(%d) is (M(n) is mobius function): %d\n",n,m);
return 0;
}
```

RESULT:

```
Enter a number
1
The value of M(1) is (M(n) is mobius function): 1
```

```
Enter a number
78
The value of M(78) is (M(n) is mobius function): -1
```

```
Enter a number
45
The value of M(45) is (M(n) is mobius function): 0
```