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<u>**SECTION:**</u> CSE-F

Design and Analysis Of Algorithms

CS23331

WEEK 2: FINDING TIME COMPLEXITY

PROGRAM 1:

AIM:

Convert the following algorithm into a program and find its time complexity using the counter method.

```
void function (int n)
{
            int i= 1;
   int s =1;
            while(s <= n)
            {
         i++;
              s += i;
            }
}
```

ALGORITHM:

Step 1: Initiliaze a counter variable c=0
Step 2: Place c++ after each statement
Step 3: Display c

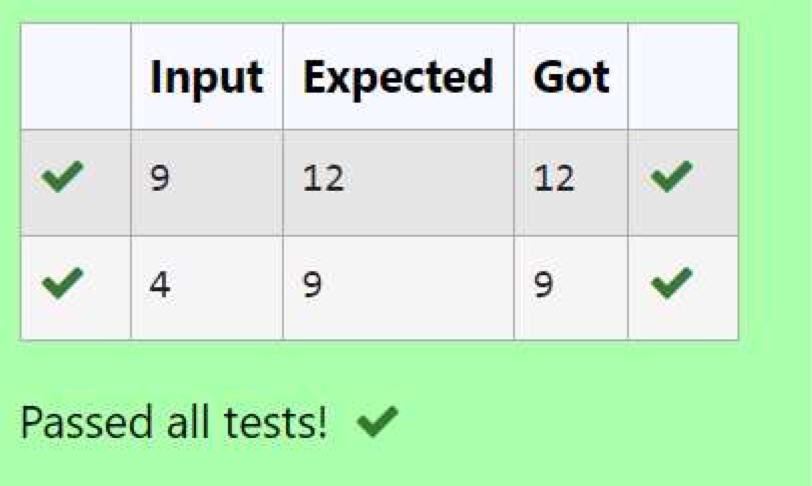
PROGRAM:

```
#include<stdio.h>

void func(int n)
{
    int c=1;
    int i=1;
    c+=1;
    int s=1;
    c+=1;
    while(s<=n)
    {
        c+=1;
        i+=1;
        c+=1;
        s+=i;
        c+=1;
    }
    printf("%d",c);
}

int main()
{
    int n;
    scanf("%d",&n);
    func(n);
}
```

OUTPUT:



	Input	Expected	Got	
✓	9	12	12	✓
✓	4	9	9	✓

Passed all tests! ✓

RESULT: Thus the program is executed successfully.

PROGRAM 2:

AIM:

Convert the following algorithm into a program and find its time complexity using the counter method.

```
void func(int n)
{
    if(n==1)
    {
      printf("*");
    }
    else
    {
     for(int i=1; i<=n; i++)
     {
       for(int j=1; j<=n; j++)
       {
          printf("*");
          printf("*");
          break;
       }
     }

  }
 }
```

ALGORITHM:

Step 1: initialize a counter variable c=0
Step 2: Place c++ after each iteration of a loop and declaration of a statement.
Step 3: Display c

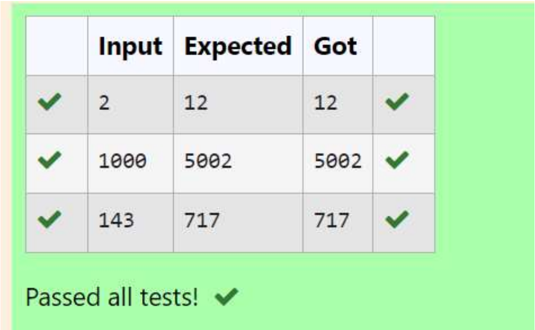
PROGRAM:

```
#include<stdio.h>
int c=0;

void func(int n)
{
    if (n==1)
    {
        c++;
        printf("*");
    }
    else
    {
        c++;
        for(int i=1;i<=n;i++)
        {
            c++;
            for(int j=1;j<=n;j++)
            {
                c++;
                //printf("*");
                c++;
                //printf("*");
                c++;
                break;
            }
            c++;
        }
        c++;
    }
    printf("%d",c);
}

int main()
{
    int n;
    scanf("%d",&n);
    func(n);
}
```

OUTPUT:



	Input	Expected	Got	
✓	2	12	12	✓
✓	1000	5002	5002	✓
✓	143	717	717	✓

Passed all tests! ✓

RESULT: Thus the program executed successfully.

PROGRAM 3:

AIM:

Convert the following algorithm into a program and find its time complexity using counter method.

```
 Factor(num) {
 {
          for (i = 1; i <= num;++i)
          {
    if (num % i== 0)
          {
        printf("%d ", i);
          }
           }
 }
```

ALGORITHM:

Step 1: initialize a variable c=0
Step 2: Place c++ after each iteration of a loop.
Step 3: display c

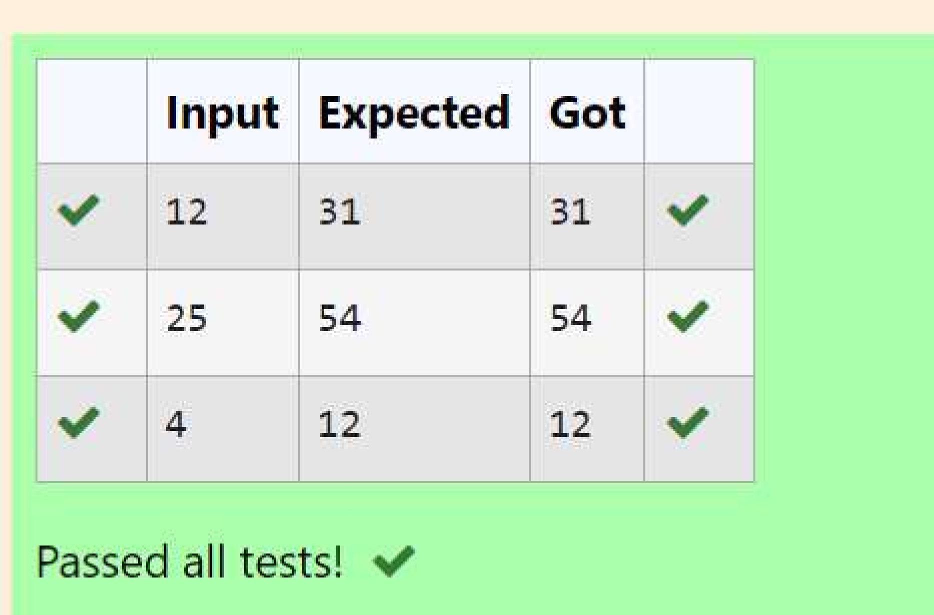
PROGRAM:

```
#include<stdio.h>

void fac(int n)
{
    int c=0;
    for(int i=1;i<=n;++i)
    {
        c++;
        if (n%i==0)
        {
            c++;
            //printf("%d ",i);
        }
        c++;
    }
    c++;
    printf("%d",c);
}
```

```
int main()
{
    int x;
    scanf("%d",&x);
    fac(x);
}
```

OUTPUT:



	Input	Expected	Got	
✓	12	31	31	✓
✓	25	54	54	✓
✓	4	12	12	✓

Passed all tests! ✓

RESULT: Thus the program is executed successfully.

PROGRAM 4:

AIM:

Convert the following algorithm into a program and find its time complexity using counter method.

```
void function(int n)
{
    int c= 0;
    for(int i=n/2; i<n; i++)
        for(int j=1; j<n; j = 2 * j)
            for(int k=1; k<n; k = k * 2)
                c++;
}
```

ALGORITHM:

Step 1: Initialize a counter variable c=0
Step 2: Place c++ after every loop
Step 3: display c

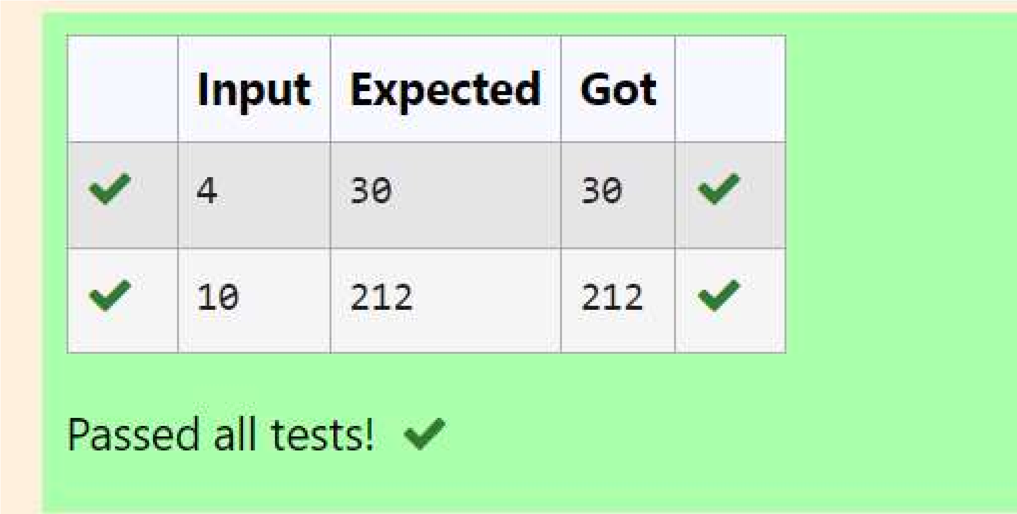
PROGRAM:

```
#include<stdio.h>

void function(int n)
{
    int c=0;
    int count=0;
    count++;
    for(int i=n/2;i<n;i++)
    {
        count++;
        for(int j=1;j<n;j=2*j)
        {
            count++;
            for(int k=1;k<n;k=k*2)
            {
                count++;
                c++;
                count++;
            }
            count++;
        }
        count++;
    }
    count++;
    printf("%d",count);
}

int main()
{
    int x;
    scanf("%d",&x);
    function(x);
}
```

OUTPUT:



	Input	Expected	Got	
✓	4	30	30	✓
✓	10	212	212	✓

Passed all tests! ✓

RESULT: Thus the program is executed successfully.

PROGRAM 5:

AIM:

Convert the following algorithm into a program and find its time complexity using counter method.

```
void reverse(int n)
{
  int rev = 0, remainder;
  while (n != 0)
        {
        remainder = n % 10;
        rev = rev * 10 + remainder;
          n/= 10;

        }
print(rev);
}
```

ALGORITHM:

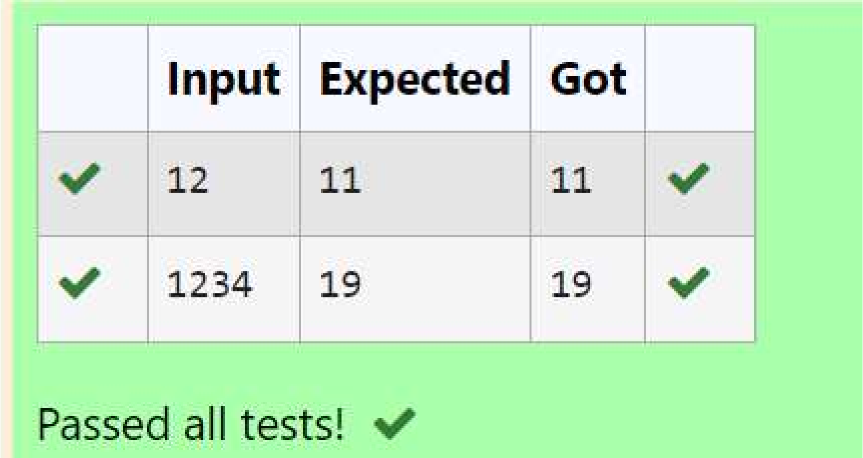
Step 1: Initialise the counter variable c=0
Step 2: After every iteration of a loop place a c++
Step 3: Display c

PROGRAM:

```
int count=0;
void reverse(int n)
{
  int rev = 0, remainder;
  count++;
  while (n != 0)
   {
      count++;
      remainder = n % 10;
      count++;
      rev = rev * 10 + remainder;
      count++;
      n/= 10;
      count++;
   }
   count++;
   //print(rev);
```

```
    count++;
}
int main()
{
    int n;
    scanf("%d",&n);
    reverse(n);
    printf("%d",count);
}
```

OUTPUT:



	Input	Expected	Got	
✓	12	11	11	✓
✓	1234	19	19	✓

Passed all tests! ✓

RESULT: Thus the program executed successfully.