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DEPT : B E COMPUTER SCIENCE AND ENGINEERING - B

Finding Time Complexity of Algorithms

a. Finding Complexity using Counter Method

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;

}

}
```

Note: No need of counter increment for declarations and scanf() and count variable printf() statements.

Input:

A positive Integer n

Output:

Print the value of the counter variable

Algorithm:

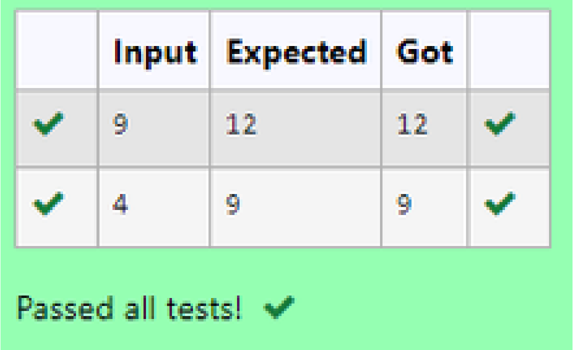
```
void function(int n){
    set count = 0
    set i = 1
    increment count by 1
    set s = 1
    increment count by 1
    while (s <=n){
        increment count by 1
        increment i by 1
        increment count by 1
        set s = s + i
        increment count by 1
    }
    increment count by 1
    print count
}
```

Program:

```
#include<stdio.h>
```

```
void function(int n){ int count=0; int i=1; count++

; int s=1; count++

;

while(s<=n){ count++; i++;

count++; s+=i;



count++;

}

count++; printf("%d",count);

}

int main(){ int n;

scanf("%d",&n); function(n);

}
```

Output:



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

Passed all tests! ✓

a. Finding Complexity using Counter Method

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;
}
}
}
}
```

Note: No need of counter increment for declarations and scanf() and count variable printf() statements.

Input:

A positive Integer n

Output:

Print the value of the counter variable

Algorithm:

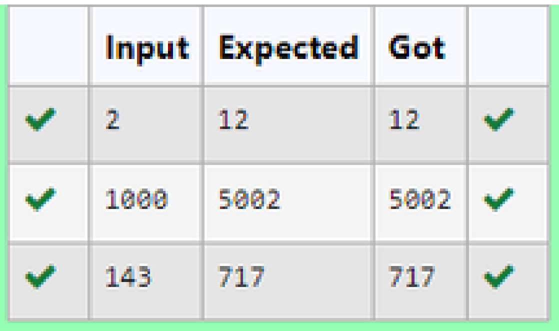
```
void func(int n){ initialize count to 0 if n = 1{

increment count by 1

print "*"

}

else{

increment count by 1


// outer loop from 1 to n for each i from 1 to n{

increment count by 1



// inner loop from 1 to n for each j from 1 to n {

increment count by 1



// simulate print statements with count increments increment count by 1 // first simulated printf("*") increment count by 1 // second simulated printf("*")


// exit inner loop immediately increment count by 1 // break statement

}

increment count by 1

}

increment count by 1
}

print count

}
```

Program:

```
#include<stdio. h>void func(int n)

{ int

count=0; if(n==1)

{ count++;


printf("*");

}

else

{count++;

for(int i=1; i<=n; i++)

{ count++;

for(int j=1; j<=n; j++)

{ count++;

//printf("*")

; count++;

//printf("*"); count++; break;

}

count++;

}

count++;
}

printf("%d",count);

}
```

```
int main(){ int n;

scanf("%d",&n)

; func(n);

}
```

Output:



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

a. **Finding Complexity using Counter Method**

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);

}

}

}
```

Note: No need of counter increment for declarations and scanf() and counter variable printf() statement.

Input:

A positive Integer n

Output:

Print the value of the counter variable

Algorithm:

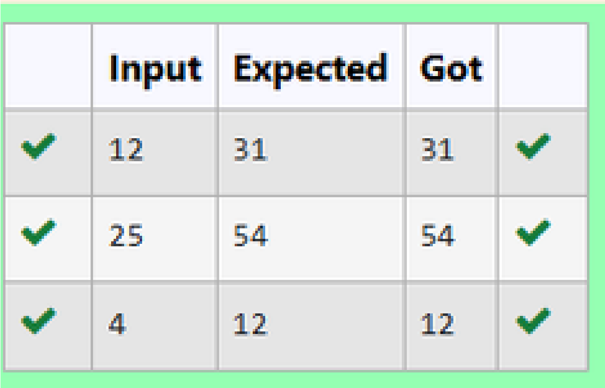
```
function Factor(num) { initialize count to 0

// loop from 1 to num

for each i from 1 to num { increment count by 1

// check if i is a factor of num if num modulo i equals 0 {
```

```
increment count by 1

// simulate printing i (e.g., printf("%d ", i);)
}

increment count by 1 // end of inner if-statement
}

increment count by 1 // after loop completion

print count
}
```

Program:

```
#include<stdio.h> void Factor(int num)
{ int count=0;
for (int i = 1; i <= num;++i)
{
count++;
if (num % i== 0)
{
count++;
//printf("%d ", i);
}
count++;
}

count++; printf("%d",count);

}



int main(){


int n; scanf("%d",&n); Factor(n);

}
```

Output:



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

a. **Finding Complexity using Counter Method**

Aim: Convert the following algorithm into a program and find its timecomplexity 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++;

}
```

Note: No need of counter increment for declarations and scanf() and count variable printf() statements.

Input:

A positive Integer n

Output:

Print the value of the counter variable

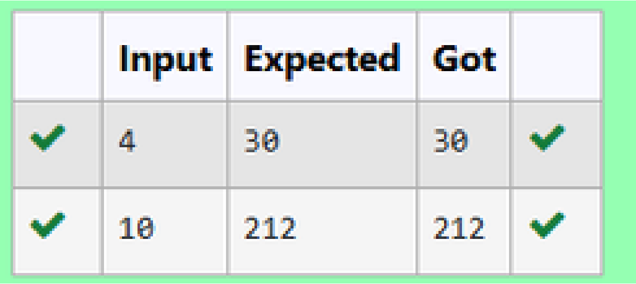
Algorithm:

```
function(n) {

initialize count to 0 initialize c to 0

increment count by 1

// outer loop: i goes from n/2 to n-1 for each i from n/2 to n-1 {

increment count by 1

// middle loop: j starts at 1 and doubles each iteration until j < n

for each j starting from 1 and doubling each time (j = 2 * j) until j < n { increment count by 1
// inner loop: k starts at 1 and doubles each iteration until k < n

for each k starting from 1 and doubling each time (k = k * 2) until k < n { increment count by 1

increment c by 1 increment count by 1

}

increment count by 1 // after inner loop ends

}

increment count by 1 // after middle loop ends

}

increment count by 1 // after outer loop ends

print count

}
```

Program:

```
#include<stdio.h> void function(int n)

{

int count=0; int c= 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 n;

scanf("%d",&n); function(n);

}
```

Output:



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

a. **Finding Complexity using Counter Method**

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);

}
```

Note: No need of counter increment for declarations and scanf() and count variable printf() statements.

Input:

A positive Integer n

Output:

Print the value of the counter variable

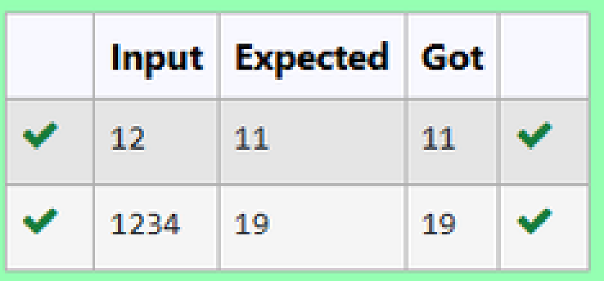
Algorithm:

```
function reverse(n) { initialize count to 0 initialize rev to 0 initialize remainder

increment count by 1 // for initialization

// loop until n is not equal to 0 while n is not equal to 0 {

increment count by 1 // start of loop
remainder = n modulo 10

increment count by 1 // after calculating remainder

rev = rev * 10 + remainder

increment count by 1 // after updating rev

n = n divided by 10

increment count by 1 // after updating n

}

increment count by 1 // after loop ends

// simulate printing rev (e.g., print(rev)) increment count by 1 // for print statement

print count

}
```

Program: #include<stdio.h> void reverse(int n)

```
{

int count=0; 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++; printf("%d",coun t);
}


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

Output:



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