

DSA through C++

Assignment-17

Doubt Class



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~~Q.1~~

Sum of first N natural numbers

```
int sum ( int n ) {
```

```
    if (n==1) return 1;  
    return n + sum (n-1);
```

- ① $\text{sum}(n) = 1+2+3+4+\dots+n$
- ② $n + \text{sum}(n-1) = 1+2+3+4+\dots+n-1 + n$
- ③ $n = 1$

y

Q.2

Sum of first N odd natural numbers

- ① sumOdd(n) $1 + 3 + 5 + \dots + n^{\text{th}} \text{ term}$
- ② $2 \times n - 1 + \text{sumOdd}(n-1)$ $1 + 3 + 5 + \dots + (n-1)^{\text{th}} \text{ term}$
 $+ 2 \times n - 1$
- ③ $n == 1$

int sumOdd(int n)

{

if ($n == 1$)

return 1;

return $2 \times n - 1 + \text{sumOdd}(n-1);$

4

Q. 3

Sum of first N even natural nos.

① sumEven(n) $2+4+6+\dots+n$ terms

② $2 \times n + \text{sumEven}(n-1)$ $2+4+6+\dots+(n-1)$ terms
+ $2n$

③ $n = 1$

2

int sumEven(int n)

{

if ($n == 1$)

return (2);

return $2 \times n + \text{sumEven}(n-1);$

}

Q. 4

Sum of Squares of first N natural nos.

```
int sumSq(int n)
{
    if (n==1)
        return 1;
    return n*n + sumSq(n-1);
```

- ① $\text{sumSq}(n) = 1^2 + 2^2 + 3^2 + \dots + n^2$
- ② $n^2 + \text{sumSq}(n-1) = 1^2 + 2^2 + 3^2 + \dots + (n-1)^2 + n^2$
- ③ $n == 1$

4

Q.5

Factorial

or

product of first N natural numbers

① fact(n)

$n * (n-1) * (n-2) * \dots * 3 * 2 * 1$

or
 $1 * 2 * 3 * \dots * n$

int fact(int n)

{

if ($n == 0$)

 return 1;

 return $n * \text{fact}(n-1);$

② $n * \text{fact}(n-1)$

$1 * 2 * 3 * \dots * (n-1)$

* n

③ $n == 0$

1

}

Q.6

Sum of digits | 431
 | 4+3+1

① sumdigits($\frac{x}{10}$) 4+3+1

② $x \% 10 + \text{sumdigits}(\frac{x}{10})$ 4+3
 +1

③ $x == 0$ 0

int sumdigits(int x)

{

if($x == 0$)

 return 0;

 return $x \% 10 + \text{sumdigits}(x / 10)$;

4

Q. 7

Print binary of Decimal number

Ex. $x = 25$

11001

x

11001

① dtob(~~25~~)

② dtob($\frac{x}{2}$)

printf("%d", ~~25 % 2~~);

1100

③ $x == 0$ print nothing

void dtob(int x)

{

if ($x > 0$)

dtob($x/2$);

printf("%d", $x \% 2$);

}

1

Q. 8

n^{th} term of Fibonacci Series

0	1	2	3	4	5	6	7	8	9	10
0	1	1	2	3	5	8	13	21	34	55...

int fib(int n)

{

if ($n == 0 \text{ || } n == 1$)

 return n;

 return fib(n-1) + fib(n-2);

}

①

$\text{fib}(10)$

55

②

$\text{fib}(9) + \text{fib}(8)$

34 + 21

③

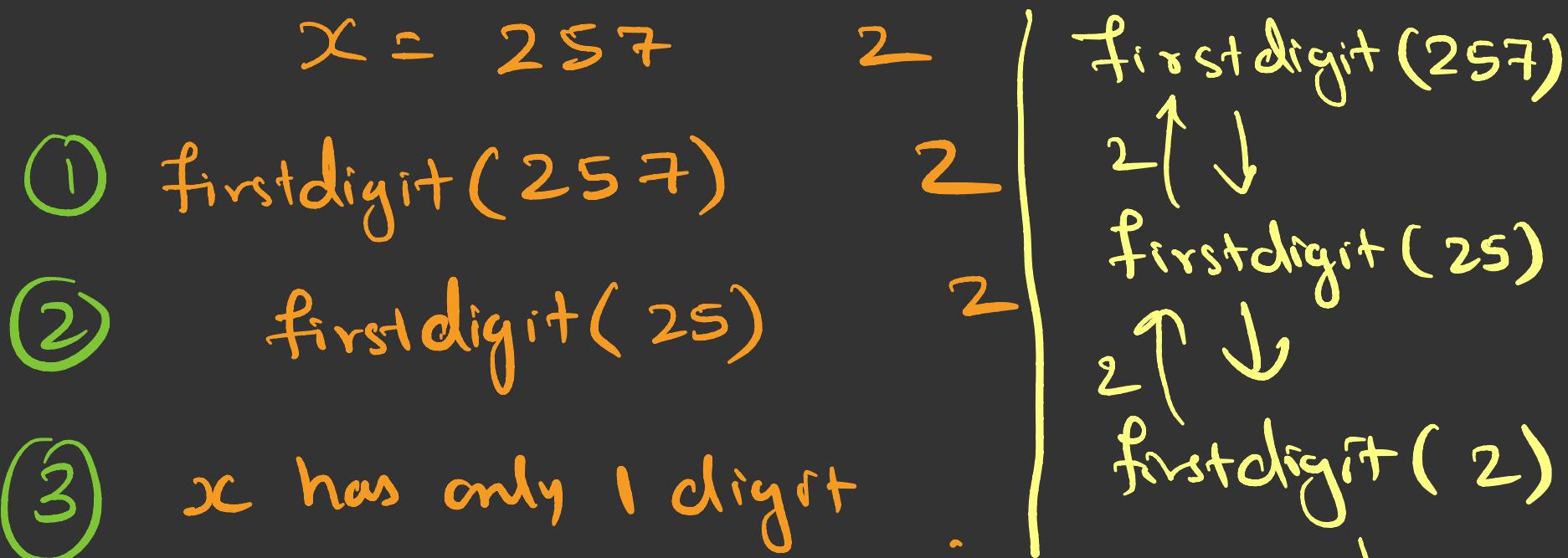
$n == 0$

0

$n == 1$

1

Find 1st digit of a number



```
int firstdigit( int x )  
{  
    if ( x/10 == 0 )  
        return x;  
    return firstdigit( x/10 );  
}
```

Tail Recursion

Q. 9

HCF of two numbers

int hcf(int a, int b)

{

```

if (a==0)
    return b;
if (b==0)
    return a;
if (a>=b)
    return hcf(a%b,b);
if (a<b)
    return hcf(a,b-a);
}

```

① $\text{hcf}(180, 75)$

15

② $\text{hcf}(30, 75)$

15

③ $a == 0$ b
 $b == 0$ a

1	1
2	3
3	5
4	5
5	6
6	75
9	
10	
12	
15	
18	
20	
30	
36	
45	
60	
90	
180	

30

$\text{hcf}(30, 75)$

1

2

3

5

6

10

15

30

$\text{hcf}(30, 15)$

$\text{hcf}(0, 15)$

Q.10

Calculate x^y 2^5

double power(double x, double y)

{

if ($y == 0$)

 return 1;

if ($y > 0$)

 return power(x, y-1) * x; ① power($2, 5$) $2 \times 2 \times 2 \times 2 \times 2$

② $y = +ve$

else

 return power(x, y+1) * $\frac{1}{x}$;

power($2, 4$)
* 2^x

$2 \times 2 \times 2 \times 2$
 $\times 2$

$y = -ve$
power(x, y+1)
* $\frac{1}{2}$

③ $y = 0$

1