Lets Upgrade

# Assignment Day-1

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## Q1 Find Time Complexity for following Scenerios :-

a)

```
for (i=1; i<=n; i++)
    for (j=i ; j<=n; j++)
        printf (" Hi ");
```

**Solution 1 a)** Here is the case of Nested for loops

→ Here outer for loop will Run/executed n times

→ Here inner for loop will be executed from i to n value i.e (n-i) times

So total times
Statement hi is printed
is

$$n * (n - i) \text{ times}$$

Here i will vary accordingly so total times printed

$$= n * (n-1) * (n-2) \cdots 1$$

$$= n + (n-1) + (n-2) \cdots 1$$

$$= 1 + 2 + 3 \cdots n$$

= Sum of first n natural No's

$$= \frac{n*(n+1)}{2}$$

$$= n^2 \rightarrow \text{degree}$$

So Time Complexity $= O(n^2)$

# Q2

i.e

**Q1 b)**

```
for(i=1; i<=n; i*=3)
  for(j=1; j<=n; j++)
    printF("Hello");
```

**Solution 1 b)**

This is also the case of Nested for loops

⇒ Here Inner for loop will be executed n times.

⇒ Here outer for Loop will be Executed in this way

i changes from

i= 1, 3, 9, 27, 81 ..... so on

$i = 3^0, 3^1, 3^2, 3^3 ..... 3^m$

Let say for last time it has Value = K

So we can compare

$$K = 3^n$$

Taking $\log_3$ (base 3) both sides

$$\log_3 K = \log_3 3^n$$

$$\log_3 K = n \log_3 3$$

$$\log_3 K = n \qquad \{\log_3 3 = 1\}$$

$$\therefore \boxed{n = \log_3 K}$$

So outer for loop will Run for $\log_3 K$ or simply $\log_3 n$

So total times hello printed

$$= n * \log_3 n$$

So Time Complexity $T(n) = O(n * \log_3(n))$