

21. 2. FOR LOOP DEDUCTION

1. SUPPOSE WE CAN WRITE ONLY INITIALIZATION AND RUN THE PROGRAM:

- **1.a.**

```
for(int i = 0 ; ; ){  
print(Hello);  
}
```

At every time $i = 0$, it will execute Hello infinite times.

- **1.b.**

```
for(int i = 6/3; ; ){  
print(Hello);  
}
```

*At every time $i = \frac{6}{3}$
 $= 2$, it will execute Hello infinite times.*

2. We can have only condition and can the run the for loop.

- **1.c. Finding GCD**

```
m = 100  
n = 5  
for(; m != n ;    ){  
if(m > n){  
    m = m - n;  
}  
else  
{  
    n = n - m;  
}  
  
} //For loop ends,
```

Output : 5

3. We can run for loop only with the updation.

```
int i = 0  
for(;    ; i ++ ){  
k = k + 1;  
}
```

The above loop will run infinite times.

And there is no time complexity calculation if loop executes for infinite times. Hence, we consider the second i.e., continuing only with the condition.

So what is the Time Complexity?

$m = 16$

$n = 3$

$for(; m \neq n ;)\{$

$if(m > n)\{$

$m = m - n;$

$\}$

$else$

$\{$

$n = n - m;$

$\}$

$\} // For loop ends,$

m=16	n=3
m=13	n=3
m=10	n=3
m=7	n=3
m=4	n=3
m=1	n=1

Therefore it runs upto $\lceil \frac{n}{3} \rceil$ times

and $O\left(\lceil \frac{n}{3} \rceil\right) = n$ times.