

$$\begin{aligned} \frac{N}{2^k} &= 1 \\ 2^k &= N \\ k &= \log_2 N \end{aligned}$$

$k = \log_2 N$

$[3, 10] \rightarrow 10 - 3 + 1$

$(3, 10) \rightarrow$

$[a, b] = b - a + 1$

A.P. $3, 6, 9, 12, 15, 18, 21$

$S_n = \frac{n}{2} (2a + (n-1)d)$

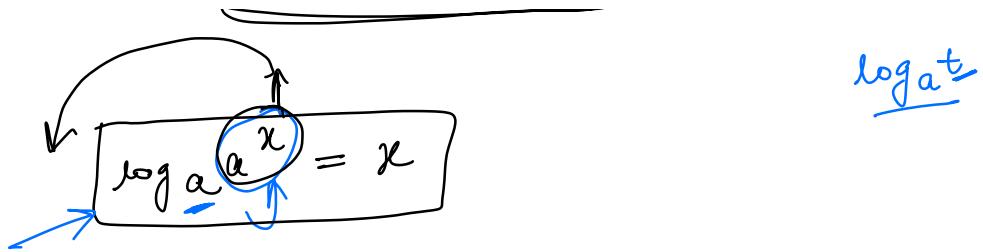
no. of terms \quad first term \quad common diff

G.P. $2, 6, 18, 54, 162$

common ratio

$S_n = \frac{a(r^n - 1)}{r - 1}$

$r < 1 \rightarrow S_\infty = \frac{a}{1-r}$



No of iterations -

① $\{ \text{void func (int N)} \}$

```

 $s=0;$ 
for ( int  $i=0$ ;  $i < n$ ;  $i++$  )
{
     $s=s+i;$ 
}

```

$[0, n)$
 $i=0 \rightarrow i \leq n$

0
1
2
3
4
5
 \vdots
 $n-1$

$\text{geten} = n \rightarrow O(n)$

② $\{ \text{void func (int n, int m)} \}$

```

 $s=0;$ 
for ( int  $i=0$ ;  $i < n$ ;  $i++$  )
{
    if (  $i \% 2$  )
         $s+=i;$ 
}

```

i
 $0 \rightarrow n-1$
 $\downarrow n$

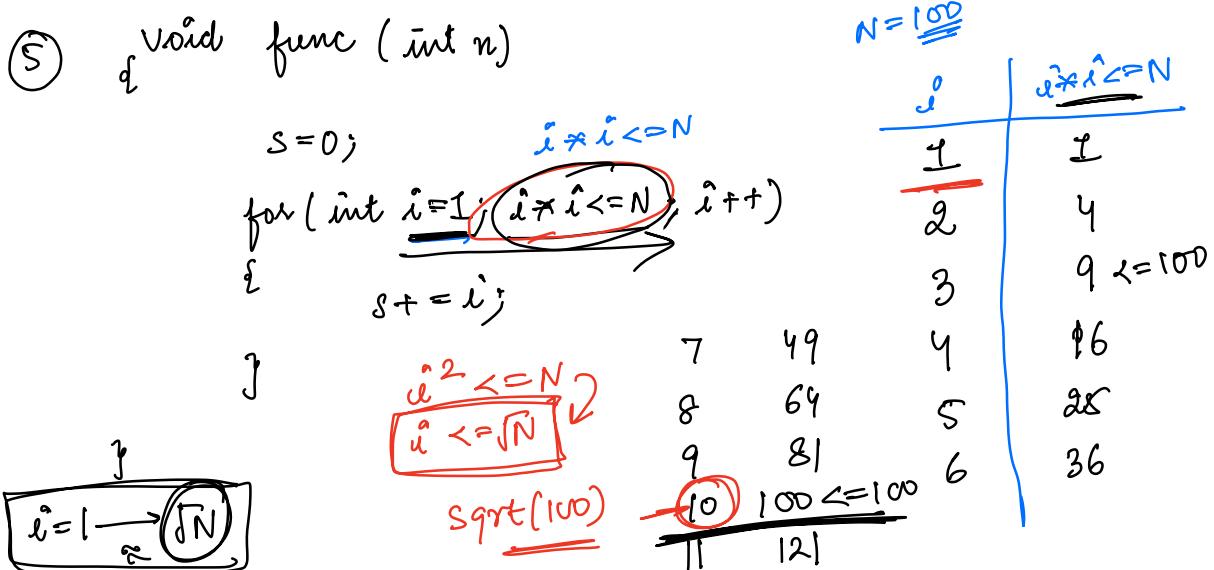
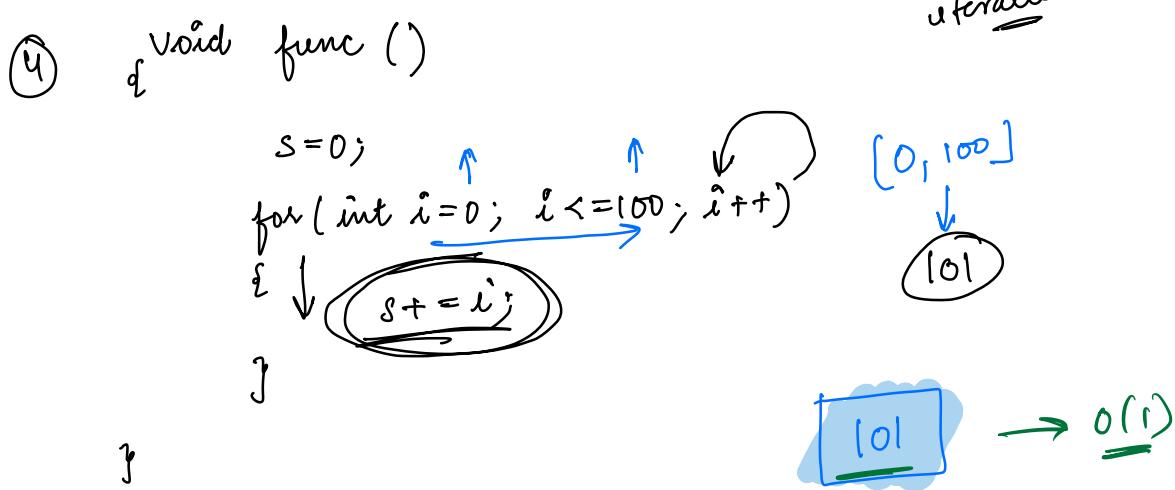
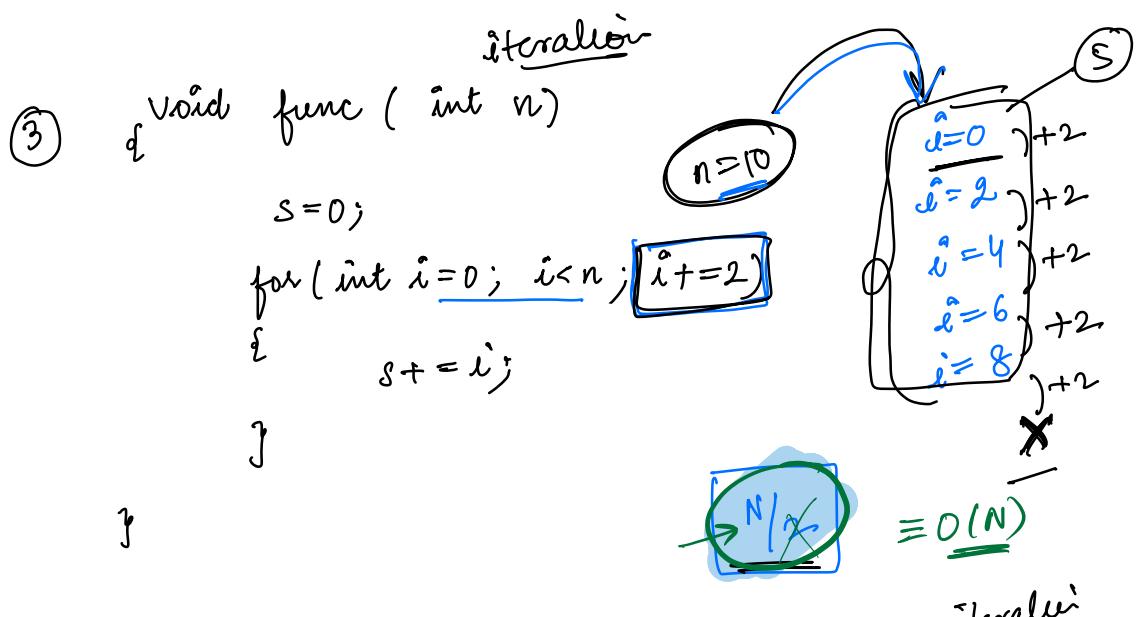
```

 $\frac{M}{2}$ 
for ( int  $j=0$ ;  $j < m$ ;  $j++$  )
{
    if (  $j \% 2 == 0$  )
         $s+=j;$ 
}

```

$0 \rightarrow m-1$

$N+M$
 $O(n+m)$



$$N = \underline{\underline{S^2}}$$
$$= \text{floor}(\sqrt{N})$$

7 -

$N = \begin{cases} 10 \\ 3-3 \end{cases}$

\sqrt{N}

$O(\sqrt{N})$

⑥ void func (int n)

$i = 11;$

while ($i > 1$)

$i = i / 2;$

$$\log_2 N$$

$$\begin{array}{c} \text{3-3} \\ \boxed{10} \\ \text{adj 2} \end{array}$$

1

7 void func (int n)

```

for (i=0; i <= N; i+=2)
    s = s + i;

```

$s = s + i;$

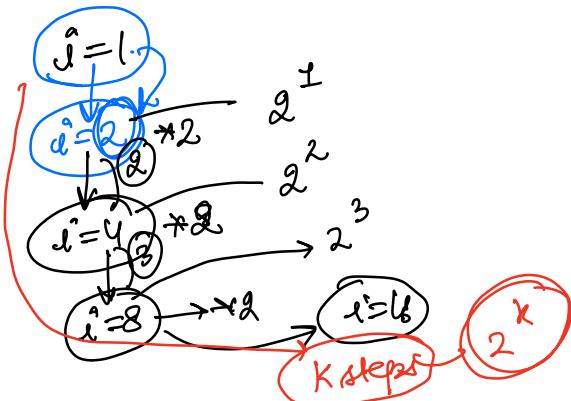
۳

$$2^k = N$$

$$\log_2 2^k = \log_2 N$$

$$k = \log_2 N$$

$$O(\log_2 N)$$



⑧ $\{ \text{void func (int } N)$

$s=0$

```
for(  $j=1; j \leq 10; j++$ )
{
    for(  $i=1; i \leq N; i++$ )
         $s = s + i * j;$ 
}
```

}

$j=1$
 $j=2$
 $j=3$
 \vdots
 $j=10$

$i=[1, N]$
 $i=[1, N]$
 $i=[1, N]$

$i=[1, N]$

N
 \overline{N}
 \overline{N}

$\overline{10 \times N} = O(N)$

⑧ $\{ \text{void func (int } n)$

$s=0$

```
for(  $j=1; j \leq N; j++$ )
{
    for(  $i=1; i \leq N; i++$ )
         $s = s + i * j;$ 
}
```

}

N^2
 $O(N^2)$

⑩ $\{ \text{void func (int } n)$

$s=0$

for($i=0$; $i < n$; $i++$)

{

{ for($j=0$; $j <= i$; $j++$)

{

$$s = s + i * j$$

}

}

$$1+2+3+\dots+n$$

$i=0$	$[0 \sim 0]$	1.
$i=1$	$[0 \sim 1]$	2.
$i=2$	$[0 \sim 2]$	3.
$i=3$	$[0 \sim 3]$	4.
$i=4$	$[0 \sim 4]$	5
\vdots	\vdots	
$i=n-1$	$[0 \sim n-1]$	n

$$\frac{n(n+1)}{2} = \cancel{\frac{n^2+n}{2}} O(n^2)$$

⑪ $\{ \text{void func (int } n)$

$s=0$

for($i=1$, $i <= n$; $i+=2$)

{

{ for($j=1$; $j <= i$; $j++$)

{

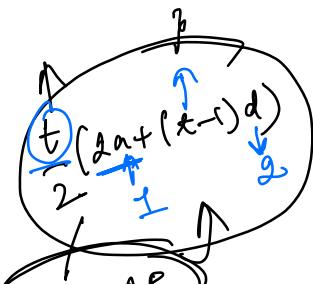
$$s = s + i * j$$

}

}

$i=1$	$[1 \sim 1]$	1.
$i=3$	$[1 \sim 3]$	3.
$i=5$	$[1 \sim 5]$	5.
$i=7$	$[1 \sim 7]$	7.
\vdots	\vdots	

$$1+3+5+7+\dots$$



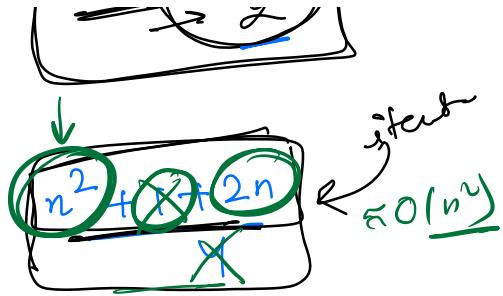
$$n=7 \quad n/2=3$$

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

$$S_t = A_1$$

$$\frac{(n+1)/2}{2} (2(1) + ((n+1)-1)2)$$

$$= \frac{(n+1)^2}{4}$$



A.P

$$3 = 6 - 9 - 12 - 15$$

$$S_t = \frac{t}{2} (2a_1 + (t-1)d)$$

$$= \frac{5}{2} (2*3 + (5-1)*3)$$

$$= \frac{5}{2} (6 + 12)$$

$$\frac{9}{2} \times 5 = 45$$

common diff

⑫ void func (int n)

$$s=0$$

for ($i=1$, $i \leq n$; $i++$) n

$n \log n$

for ($j=i$; $j \leq n$; $j=j*2$) $\log n$

{

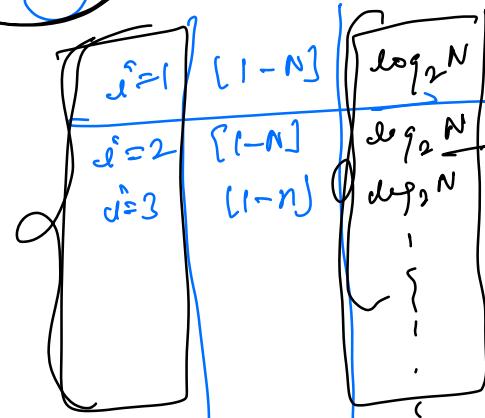
$$s=s+i*j$$

}

}

}

$N \log N$



13 void func (int n)

$s=0$

for ($i=1; i \leq (1 \ll N); i++$)

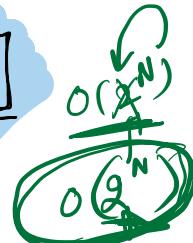
$s = s + i;$

}

}

$$\begin{array}{r} 0000000000 \\ 0000000010 \\ \sigma\sigma000100 \end{array} \begin{array}{l} 1 \rightarrow 2^0 = 1 \\ -2^1 = 2 \\ 2^2 = 2 \end{array}$$

2^N



14 void func (int n)

$s=0$

for ($i=1; i \leq N; i++$)

for ($j=1; j \leq (1 \ll i); j++$)

$s = s + i * j;$

}

}

}

}

x^{i-1}

2^1

2^2

2^3

$2^4 \dots 2^N$

$a \times (2^{n-1})$

$(2-1)$

$2-1$



$0(2^N)$

$i=1 [1 \rightarrow 2]$

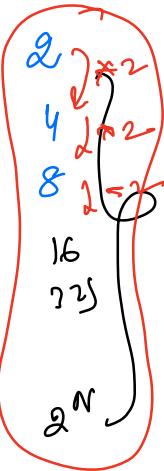
$i=2 [1-4]$

$i=3 [1-8]$

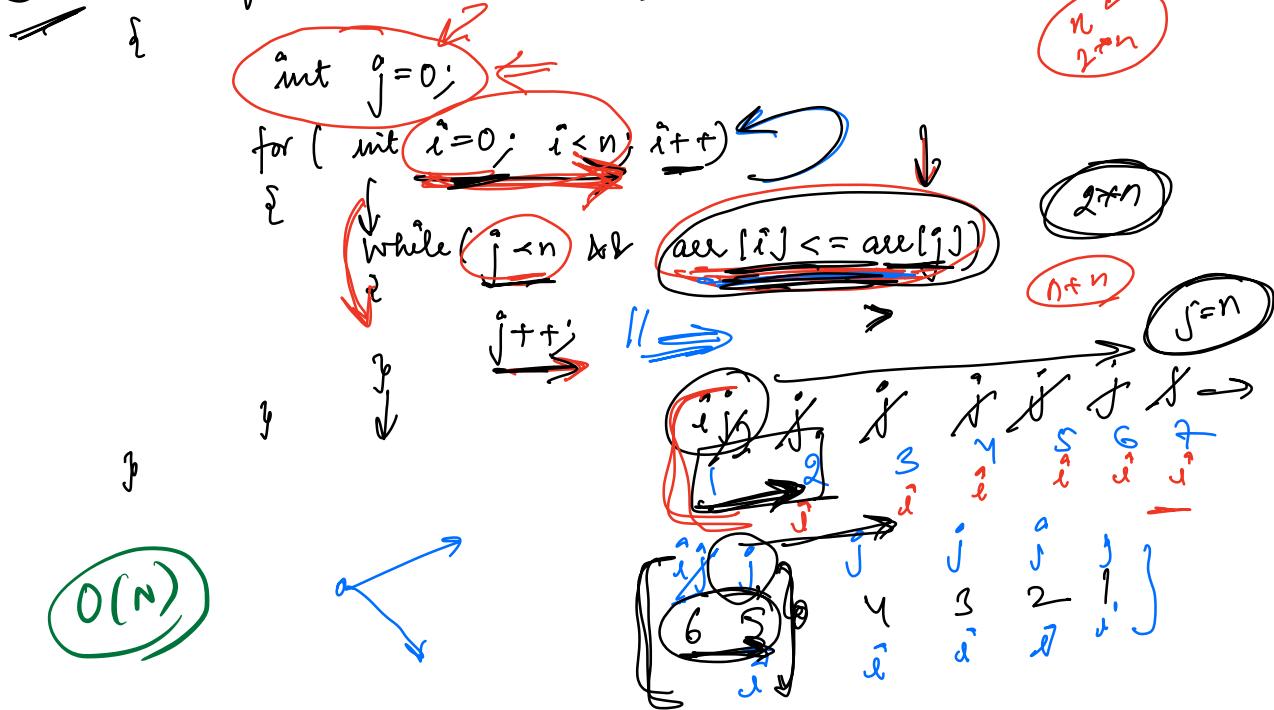
$i=4 [1-16]$

$i=5 [1-32]$

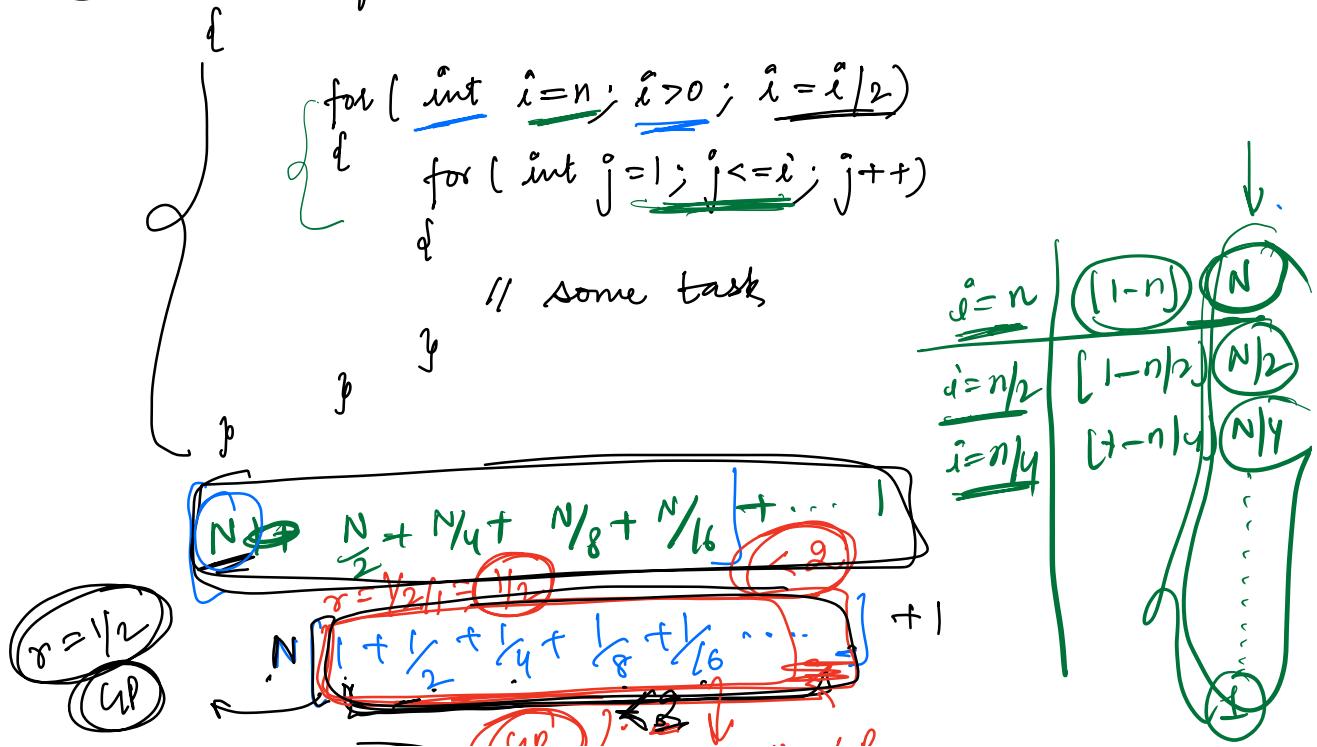
$i=N [1-2^N]$



(15) void fun (int arr[], int n)



(16) void fun (int arr[], int n)



$$O(N+1) \approx O(N)$$

$$\frac{a}{1-r} = \frac{1}{1-\frac{1}{2}} = 2$$

Infinite sum

$O()$

$$\frac{N}{2}$$

directly

$\begin{cases} \text{leave constant} \\ \text{leave lower order terms} \end{cases}$

$$N^2$$