

Number	Value	Work
1st	1 to 0	C
2nd	1 to 1	C
3rd	1 to 2	C
4th	1 to 3	C
...
n th step	1 to n-1	C
	<u>(n)</u>	

$C + C + C + C + \dots + C$
 $\Rightarrow (n \times C)$
 $O(n)$

Mam

$$\Rightarrow 2^0 + 2^1 + 2^2 + 2^3 + 2^4 + \dots + 2^{n-1}$$

Common ratio
G.P.

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

a = first term
n

$a = 2^0 = 1$
 $r = 2$
 $n \rightarrow n$

$$S_n = \frac{1 \cdot (2^n - 1)}{2 - 1}$$

$r \rightarrow$ Common ratio
 $n \rightarrow$ no. of terms.

Total no. of terms

$$S_n = (2^n - 1)$$

$$1 \rightarrow \frac{1}{2} \rightarrow \frac{1}{4} \rightarrow \frac{1}{8} \rightarrow \frac{1}{16} \rightarrow \frac{1}{32} \rightarrow \dots \rightarrow \frac{1}{2^n}$$

$\Rightarrow n = 2^k$

$\log_2 n \rightarrow k \log_2 2$
 $\log_2 n \rightarrow k \log_2 2 \rightarrow 1$
 $k = \log_2 n$

$\log_a b = \frac{\log b}{\log a}$
 $\log_2 a = 1$

No. of term

$$1 \rightarrow 2 \rightarrow 4 \rightarrow 8 \rightarrow 16 \rightarrow 32 \rightarrow \dots \rightarrow n$$

$2^0 \quad 2^1 \quad 2^2 \quad 2^3 \quad 2^4$

$\log_2 n = k$
 $k = \log_2 n$

$2^k = n$

④

$$\left\{ 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7} + \dots + \frac{1}{n} \right\}$$

$\sum_{x=1}^n \frac{1}{x} \sim \int_1^n \frac{1}{x} dx$

$\Rightarrow (\log n) + c$

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

⑤

```
for(int i=n ; i>=1; i= i/2) {
    System.out.println("hello");
}
```

$$\frac{N}{2^{k-1}} = 1$$

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

$$\log_2 N = (k-1) \log_2 2$$

$$k = \log_2 N$$

$$T = \log_2 N$$

Iteration	i = Value	Work
1st	$i = N/2^0$	c
2nd	$i = N/2^1$	c
3rd	$i = N/4, N/2^2$	c
4th	$i = N/2^3$	c
...		
k^{th}	$i = N/2^{k-1}$	c

$$c + c + c + \dots + c$$

$$= c \times k$$

$$T = c \times (\log_2 N + 1)$$