Time Complexity

1) for (i=1; i<n; i=$\boxed{i*2}$){

stmt 3

log(n)

② for(i=n; i>n; i=i/2){

stmt 3

$i \cancel{\;} * 2$

i=1/2 $\boxed{n=10}$ i= ...

$$\# \text{ for } (\boxed{i = n}\ ;\ \boxed{i \geq 1}\ ;\ i = i/2)\{$$

10

10 $\quad$ 10/2

stmt }

$n = 10$

2.5

2

1.25

i	
[redacted]	
5	$10/2$
5	$10/2^2$
2.5	$10/2^3$
1.25	$10/2^4$
	x

$\boxed{n = 20}$

i
20

o/p

$\boxed{n \rightarrow 20}$

10

$i = i * 2$

log(20)

Ceil

Floor

10   5

5   2.5

1.25 $\boxed{0.6}$ x

$i = i/2$

$O(\log(n))$

$n/2$

$n/2^2$

$n/2^3$

$\frac{n}{2^K} < 1$

$\boxed{n}$

$\frac{n}{2^K} = 1$

$n = 2^K$

$n/2^4$

$\vdots$

$n/2^k$

$\frac{n}{2^k} = 1$

$\log(n) = \log(2)^k$

$\log(n) = k \log(2)$

$k = \log(n)$

$i = i * 2$

1
2
4
6
8
$\vdots$

1
2
2^2
2^3
2^4
$\vdots$

2^K

$2^K = n$

$\log(n) = K$

$n/3$

$n/3^2$

$n/3^3$

$n/3^k$

$n/3^k = 1$

$n = 3^k$

$\log(n) = k \log(3)$

$\log(n) = 2k$

$k = \log(n)$

for(i=0 ; i * i ≤ n ; i++) {
Stmt }

$i^2 = n$

$i^2 = O(\sqrt{n})$

i^2 $\sqrt{i^2} = \sqrt{n}$

$i = \sqrt{n}$ $k^2 = n$ $i = \sqrt{n}$

$k = \sqrt{n}$

i		o/p	
0		0	0
1	1	1	1
	2		22

2
3
4
5
6

2
4
6
8
10

4
9
16
25
36

3^2
4^2
1
k^2

0 $O(n)$

$i++$
$i^2 < n$

$1 < n$ $O(\sqrt{n})$

$i^2 < n$

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

$3 < n$

0
1
2^2

i

0 $0 \, 1 \, P$

Stmnt 3

0
1
2
3
4

0
1
4
9
16

$k^2 = n$

$\sqrt{k^2} = \sqrt{n}$

$k = \sqrt{n}$

$2^1, 2^2, 2^k$

$O(\sqrt{n})$

3^2
4^2
5^2
$\vdots$
k^2

$\# 2^k \longrightarrow \log(n)$

$\# k^2 \longrightarrow \sqrt{n}$

$1, 2, 3 \dots k$

$k = n$

#

```
for(i=1; i<n; i++)          n
{stmnt 3                     n+2
for(j=1; j<n; j++)           n
stmnt 3
```

n^2 n^3 n^4 $O(n)$

$O(n)$

$m \rightarrow$ loops

$O(n^m)$

$\boxed{P=0}$

for(i=1; i<n; i=i*2) { — log n

p++ Start}

for(j=1; j<p; j=j*2) { — log(P)

log(n)

Start }

log(n) + log(p)

$O(p)$ $O(P)$

j++ log(n)

1 2 2

2 4 2^2 $2^k > p$

3 j++ 8 2^3 $2^k = p$

4 1 2 3 2^4 $k = \log(p)$

log(n) . log(p)

$O(\log(n))$

$k = p$ $O(p)$

2^k

$p = 1$

$for(\cancel{i=1};\ \cancel{i<p};\ i = i*2)\ \{$

$Stm^{n}1\ \}$

1
2
3
4

$\log(p)$

$\log(p)$

$k > p$

$O(p)$

$\boxed{k = p}$ $O(n)$

$\sqrt{n}$

$i * 2$
$i / 2$ $\left(O(\log(n)) \right)$

$i{+}{+}$
$j{+}{+}$
$p{+}{+}$ $\left(O(n) \right)$

for(i=1; i<=n; i++){ → O(n)

stmnt3

for(i=1; i<=P; i++){ → O(P)

stmnt3

for(i=1; i<=x; i++) → O(x)

{
stmt3

$for(i=1;\ i<n;\ \boxed{i=i*2})\{ \longrightarrow \log(n)$

$i=i/2$

Stmnt 3

$for(i=1;\ i<p;\ i=i*2) \longrightarrow \log(p)$

$for(i=1;\ i<m;\ i=i*2) \longrightarrow \log(m)$

for(i = 1 ; i * i <= n ; i++) $\longrightarrow O(\sqrt{n})$ $\boxed{\sqrt{n}}$

o/p

i	
1	1
2	4
3	9
4	16

1
2^2
3^2
4^2
$\vdots$
k^2

$k^2 = n$

$\boxed{k = \sqrt{n}}$

$k^2 \geq n$

for(i = 1 ; i^2 < n ; i = i * 2) {

$1 \longrightarrow 1$

$2 \longrightarrow$

$\boxed{i**2}$ stmnt 3

1 → i

2 → 4

4 → 16

8 → 64

→ $1, 2^2, 4^2, 8^2, \ldots k^2$

$k^2 = n$

$\boxed{k = \sqrt{n}}$

$O(n)$ $\boxed{3n + 2n + 6n}$

$\boxed{\log_2(\sqrt{n})}$

$\log(n)$

for(i=1; i^2 ≤ n; i=i*2){

$\log(\sqrt{n})$ $\log(n)$

$\boxed{i**2}$

$\boxed{\text{Stmnt}}$

$6n^2 + 8n^3 + 6n^3 \rightarrow O(n^3)$

$\log(n)$ $\log(n^2)$

$+\log(\sqrt{n})$

$\log(n+2)$

$$for(i=1;\ i^2<n;\ \underline{i=i/2})\{$$

Stmnt 3

i		o/p	
$i=1$	$1/2^0$	1	1
$i=1/2$	$1/2^2$	1/4	1/2
	$1/2^3$		

4

1

$1/2^2$

$1/4^2$

1

$1/2^2$

$1/2^k$

$1/2^k = n$

$\frac{1}{2^k} = n$

$i = 1/4 \quad 1/2 \quad 1/2^3 \quad 1/16 \quad 1/2^2$

$i = 1/8 \quad 1/64 \quad 1/2^3$

$i = 1$

$1/8^2$

$1/2^k = n \qquad \boxed{n \cdot 2^k = 1}$

$1/2^k = n$

$1 = n \cdot 2^k$

$$(n \cdot 2^k) = 1$$

$$\log(n \cdot 2^k) = \log(1)$$

$$0$$

$$\log(n) + \log(2^k) = \boxed{\cancel{\log}(1)}$$

$\log(n) = -\log(2)^{k}$

$k = \log(n)$

$\log n = k \cdot \log(2) \quad -1$

$n^2 + \cancel{k}$

$\log(n) = -k \cdot \log(2)$

$\log(n) = \cancel{(-1)} \cdot k \log(2)$

2 $\quad$ 2

4 $\quad$ 2

2

8 8

16

2^3

2^4

$h = \log(n)$

$1 \_ \_ 2^k = n$

$i = 1$, $i < n$; $\boxed{i = i/2} \longrightarrow \log(n)$

$i = 1$; $i < n$; $\boxed{i = i * 2} \longrightarrow \log(n)$

1/2 1/2

$i = 1;\ i^2 < n;\ i = i + 1 \rightarrow \sqrt{n}$

$1/3$

$1/4$

$\boxed{\cancel{i = 1}};\ \cancel{i^2 < n};\ \boxed{i = i + 1} \rightarrow \boxed{i = i/2}$

n

n

$1/2 \quad 1/3$

$1/2 - 1/3 - 1/4 - 1/5 - 1/6 \quad 1/4$

$1/2^k \qquad 1/2^3 \qquad 1/2^4 \qquad 2^2 \quad 2^3 \quad 2^4 \quad 2^k$