

## ASSIGNMENT - 1

### Apriori Analysis:

①

$i = n$

while  $i > 2$ :

$i = i^{1/25}$

print( $i$ )

$n^{1/25}$

$n^{1/25^2}$

$n^{1/25^3}$

$\vdots$  (k-times)

$\Rightarrow \underline{n^{1/25^k} = 2}$  (Stopping Condition)

$$n^{1/25^k} = 2$$

$$\log_2 n^{1/25^k} = \log_2 2$$

$$\frac{1}{25^k} \log_2 n = 1$$

$$\log_2 n = 25^k$$

$$\log_{25} (\log_2 n) = \log_{25} 25^k$$

$$\log_{25} (\log_2 n) = k \log_{25} 25$$

$$\Rightarrow \boxed{k = \log_{25} (\log_2 n)}$$

Time Complexity:  $O(\log \log n)$

②

$$i = 29$$

while  $i < n$ :

$$i = i^{23}$$

$$\begin{aligned} & (29)^{23^1} \\ & (29)^{23^2} \\ & (29)^{23^3} \\ & \vdots \\ & (29)^{23^k} \end{aligned}$$

$$\Rightarrow (29)^{23^k} = n \quad (\text{Stopping Condition})$$

$$(29)^{23^k} = n$$

$$\log_{29} (29)^{23^k} = \log_{29} n$$

$$23^k \cdot 1 = \log_{29} n$$

$$\log_{23} 23^k = \log_{23} (\log_{29} n)$$

$$k \cdot 1 = \log_{23} (\log_{29} n)$$

$$\Rightarrow \boxed{k = \log_{23} (\log_{29} n)}$$

Time Complexity:  $O(\log \log n)$

③

$i = 1$

while  $i \leq n$ :

$i = 2 * i \rightarrow ①$

$i = 3 * i \rightarrow ②$

From ① & ②;

$i = 6 * i$

Let  $n = 50$ ,

$i = 6 * 1 = 6$

$i = 6 * 6 = 36$

$i = 6 * 36 = 216$  }  $\times$  (Stop here since  $i > n$ )

$$\log_6 50 = \frac{\log_{10} 50}{\log_{10} 6} = 2.18 \approx \underline{\underline{2}}$$

Time Complexity:  $O(\log_6 n)$