

264. Ugly Number II - 18/08/24 - (Medium)

264. Ugly Number II

Medium

Topics

Companies

Hint

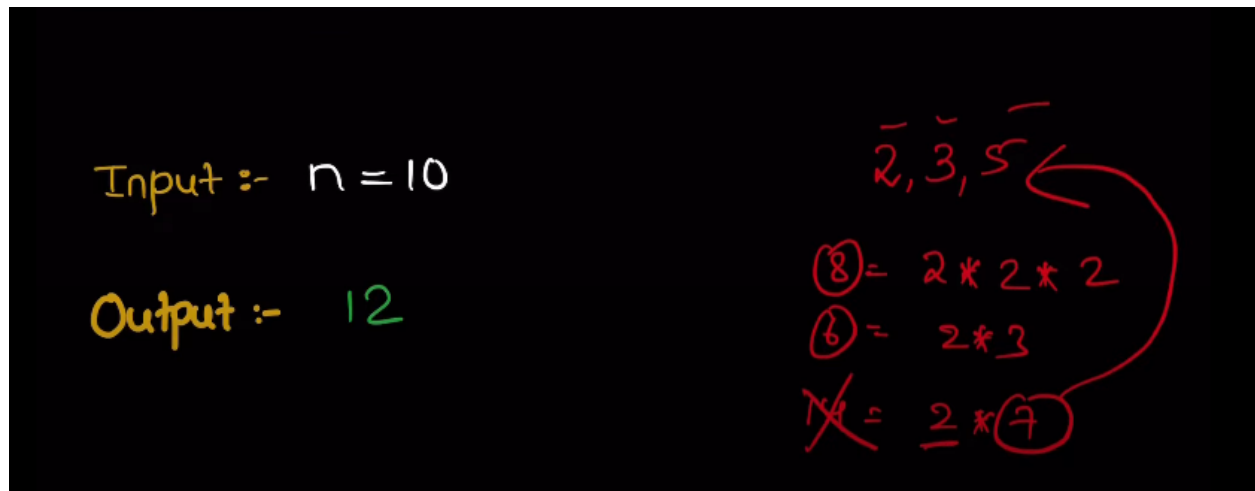
An **ugly number** is a positive integer whose prime factors are limited to 2, 3, and 5.

Given an integer n , return the n^{th} ugly number.

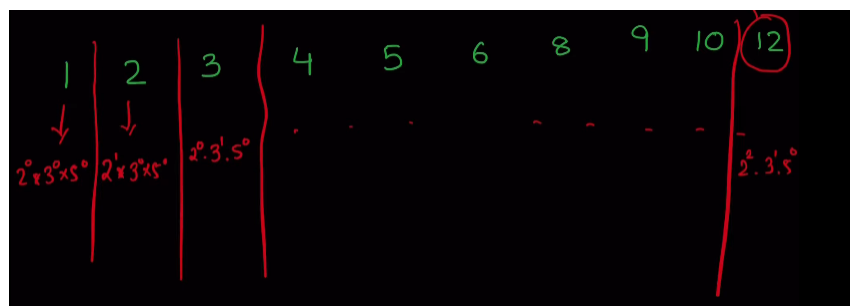


what is ugly number?

Jiska prime factor 2,3,or 5 ho



first 10 ugly number



Solve using Brute Force

divide the number till we get 1

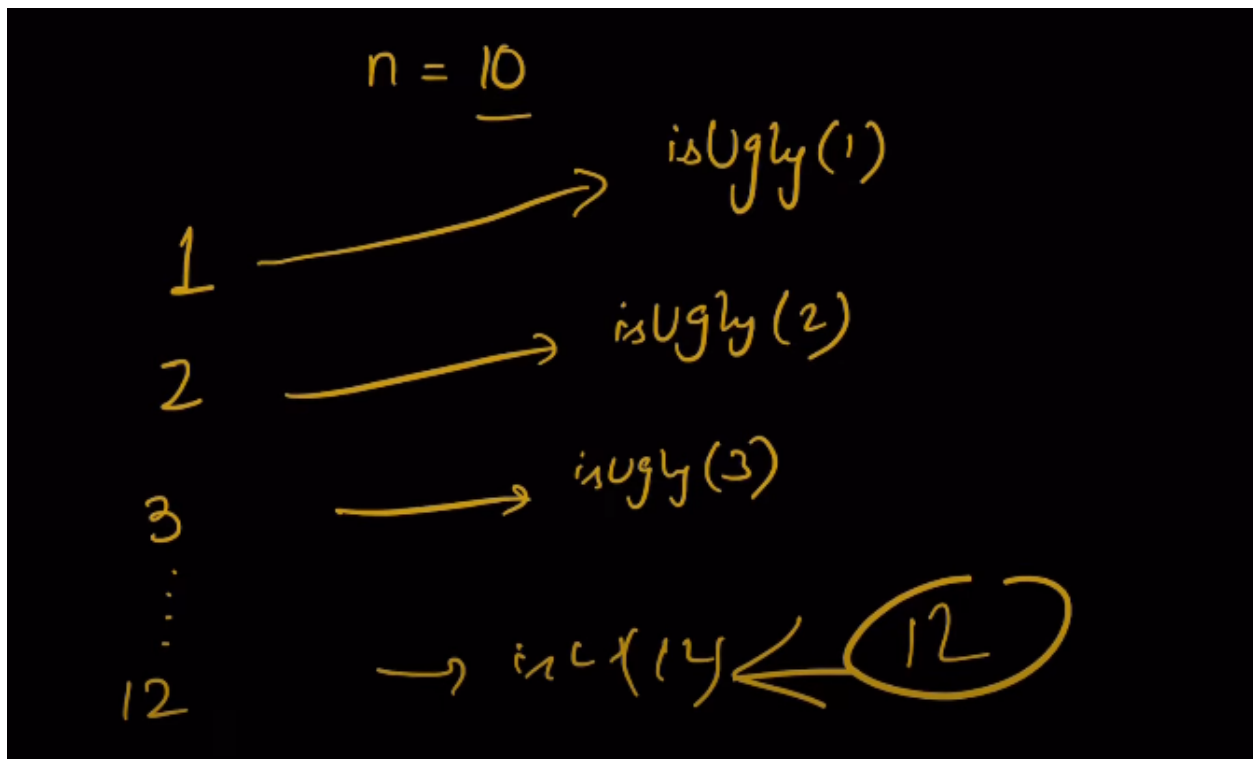
first by 2

then 3 and at last by 5

if still we don't get 1 in return then it is not ugly number

$$\begin{array}{l|l}
 n = 34 \text{ --- } \textcircled{2} \times \textcircled{17} & n = 12 \\
 34/2 = \textcircled{17} & \begin{array}{l} \textcircled{2} \rightarrow 12/2 = 6/2 = \underline{3} \\ \textcircled{3} \rightarrow 3/3 = \underline{1} \\ \textcircled{5} \rightarrow \textcircled{1} \end{array} \\
 & \text{ugly number}
 \end{array}$$

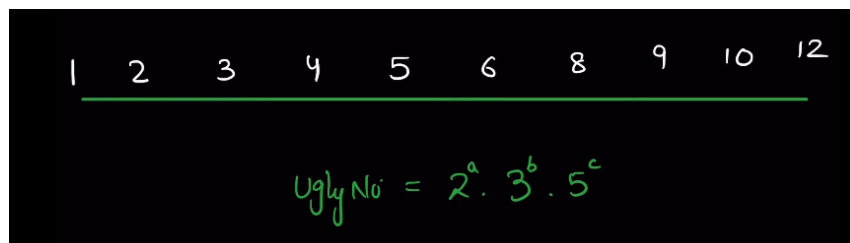
$$\begin{array}{l|l}
 n = 18 & n = 7 \\
 \textcircled{2} \text{ --- } 18/2 = \underline{9} & \textcircled{2} = 7 \\
 \textcircled{3} \rightarrow 9/3 = 3/3 = \underline{1} & \textcircled{3} = 7 \\
 \textcircled{5} \rightarrow \underline{1} & \textcircled{5} = \boxed{7} \\
 & \begin{array}{l} \hookrightarrow n=7 \\ \text{ugly no.} \end{array}
 \end{array}$$

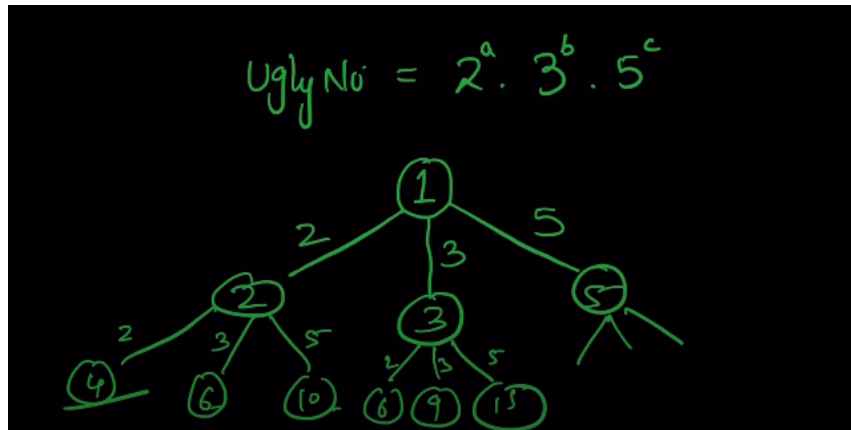


T.C = $O(n \cdot \log_{\text{base } 2}(n))$

→ $O(n \log(n))$

Optimal approach

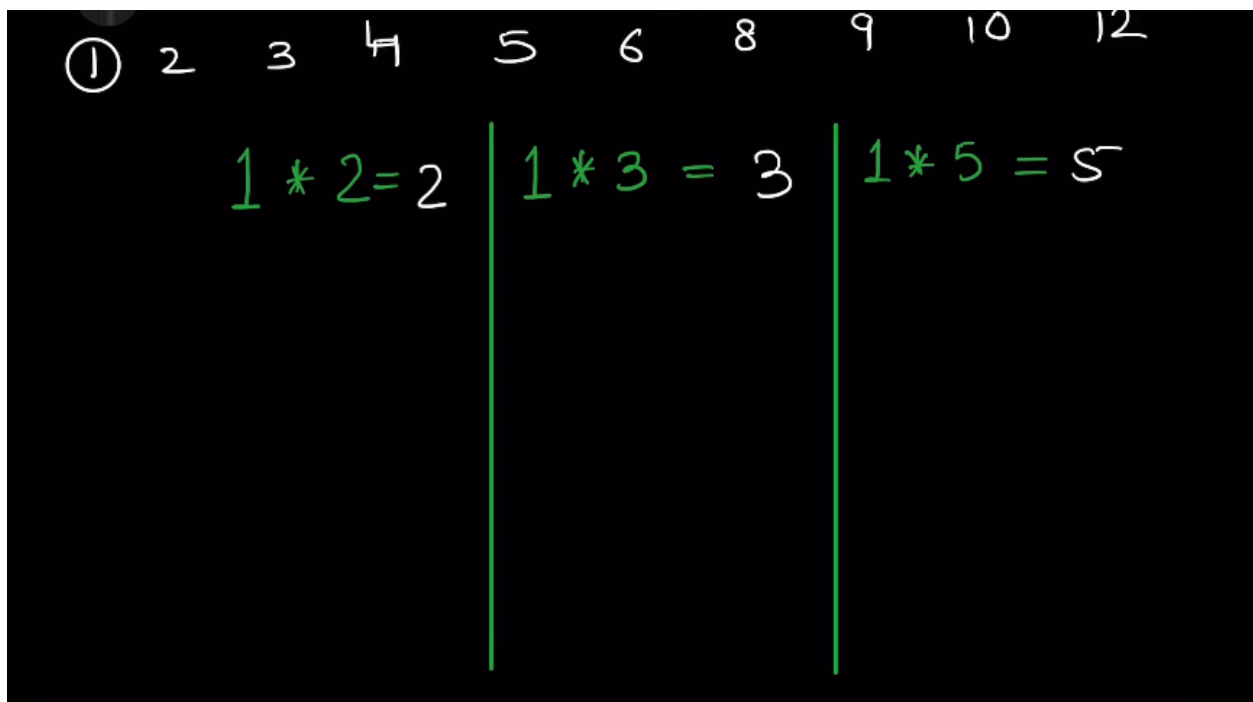




multiply 1 with 2,3,5 we will get 2,3,5 this are ugly numebr

so it is clear that muliply anything with 2,3,5 answer we get ugly number

(1)



(2)

① ② 3 4 5 6 8 9 10 12

→ $1 * 2 = \underline{2}$	→ $1 * 3 = \underline{3}$	→ $1 * 5 = \underline{5}$
→ $2 * 2 = \underline{4}$	→ $2 * 3 = \underline{6}$	→ $2 * 5 = \underline{10}$

(3)

① ② ③ 4 5 6 8 9 10 12

→ $1 * 2 = \underline{2}$	→ $1 * 3 = \underline{3}$	→ $1 * 5 = \underline{5}$
→ $2 * 2 = \underline{4}$	→ $2 * 3 = \underline{6}$	→ $2 * 5 = \underline{10}$
→ $3 * 2 = 6$	→ $3 * 3 = 9$	→ $3 * 5 = 15$

(4)

①	②	③	④	5	6	8	9	10	12
→	$1 * 2 = 2$			→	$1 * 3 = 3$		→	$1 * 5 = 5$	
→	$2 * 2 = 4$			→	$2 * 3 = 6$		→	$2 * 5 = 10$	
→	$3 * 2 = 6$			→	$3 * 3 = 9$		→	$3 * 5 = 15$	
→	$4 * 2 = 8$			→	$4 * 3 = 12$		→	$4 * 5 = 20$	

(5)

①	②	③	④	5	6	8	9	10	12
→	$1 * 2 = 2$			→	$1 * 3 = 3$		→	$1 * 5 = 5$	
→	$2 * 2 = 4$			→	$2 * 3 = 6$		→	$2 * 5 = 10$	
→	$3 * 2 = 6$			→	$3 * 3 = 9$		→	$3 * 5 = 15$	
→	$4 * 2 = 8$			→	$4 * 3 = 12$		→	$4 * 5 = 20$	

②	③	⑤
$1 * 2 = 2$	$1 * 3 = 3$	$1 * 5 = 5$
$2 * 2 = 4$	$2 * 3 = 6$	$2 * 5 = 10$
$3 * 2 = 6$	$3 * 3 = 9$	$3 * 5 = 15$
$4 * 2 = 8$	$4 * 3 = 12$	$4 * 5 = 20$
$5 * 2 = 10$	$5 * 3 = 15$	
$6 * 2 = 12$		

8th ugly number

We create an array that store all the ugly number

	0	1	2	3	4	5	6	7	8
arr	X	1							

we create 3 pointer

```

i2 = t[i]
i3 = t[i]
i5 = t[i]

```

we at 1

$$\begin{aligned} i2 &= t[1] = 1 * 2 = \textcircled{2} \\ i3 &= t[1] = 1 * 3 = 3 \\ i5 &= t[1] = 1 * 5 = 5 \end{aligned}$$

now smallest is 2 so $i2++$

no we at 2

$$\begin{aligned} i2 &= t[2] * 2 = 4 \\ i3 &= t[1] * 3 = 3 \\ i5 &= t[1] * 5 = 5 \end{aligned}$$

now smallest is 3 so $i3++$

$\begin{aligned} &\textcircled{2} \\ &\cancel{1 * 2 = 2} \leftarrow \\ i2 \quad &2 * 2 = \textcircled{4} \\ &3 * 2 = 6 \\ &4 * 2 = 8 \\ &5 * 2 = 10 \\ &6 * 2 = 12 \end{aligned}$	$\begin{aligned} &\textcircled{3} \\ &\cancel{1 * 3 = 3} \\ i2 \rightarrow &2 * 3 = 6 \\ &3 * 3 = 9 \\ &4 * 3 = 12 \\ &5 * 3 = 15 \end{aligned}$	$\begin{aligned} &\textcircled{5} \\ i \rightarrow &\cancel{1 * 5 = 5} \\ &2 * 5 = 10 \\ &3 * 5 = 15 \\ &4 * 5 = 20 \\ &i2 = t[2] * 2 = 4 \\ &i3 = t[1] * 3 = 3 \leftarrow \\ &i5 = t[1] * 5 = 5 \end{aligned}$
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now we at 3

$$\begin{aligned} i2 &= t[3] * 2 = 6 \\ i3 &= t[2] * 3 = 6 \\ i5 &= t[1] * 5 = 5 \end{aligned}$$

<p>(2)</p> $1 * 2 = 2$ ← $2 * 2 = 4$ → $3 * 2 = 6$ $4 * 2 = 8$ $5 * 2 = 10$ $6 * 2 = 12$	<p>(3)</p> $1 * 3 = 3$ $2 * 3 = 6$ → $3 * 3 = 9$ $4 * 3 = 12$ $5 * 3 = 15$	<p>(5)</p> $1 * 5 = 5$ $2 * 5 = 10$ ← $i5$ $3 * 5 = 15$ $4 * 5 = 20$ $i2 = t[3] * 2 = 6$ $i3 = t[2] * 3 = 6$ $i5 = t[2] * 5 = 10$
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0	1	2	3	4	5	6	7	8
×	1	2	3	4	5			

NOW increment i2 and i3 because both are 6

<p>(2)</p> $1 * 2 = 2$ ← $2 * 2 = 4$ → $3 * 2 = 6$ $4 * 2 = 8$ $5 * 2 = 10$ $6 * 2 = 12$	<p>(3)</p> $1 * 3 = 3$ $2 * 3 = 6$ → $3 * 3 = 9$ $i3 * 3 = 12$ $5 * 3 = 15$	<p>(5)</p> $1 * 5 = 5$ $2 * 5 = 10$ ← $i5$ $3 * 5 = 15$ $4 * 5 = 20$ <div style="text-align: center;">↓</div> $i2 = t[5] * 2 = 10$ $i3 = t[3] * 3 = 9$ $i5 = t[2] * 5 = 10$
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Solution

```
class Solution {
public:
    int nthUglyNumber(int n) {
        vector<int> arr(n+1);
        int i2;
        int i3;
        int i5;
        i2=i3=i5=1;
        arr[1] = 1;
        for(int i=2;i<=n;i++){
            int i2UglyNum = arr[i2]*2;
            int i3UglyNum = arr[i3]*3;
            int i5UglyNum = arr[i5]*5;

            int mini = min({i2UglyNum,i3UglyNum,i5UglyNum});
            arr[i] = mini;

            if(mini == i2UglyNum)
                i2++;
            if(mini == i3UglyNum)
                i3++;
            if(mini == i5UglyNum)
                i5++;
        }
        return arr[n];
    }
};
```