

Ques Subsequence of the given array whose gcd is 1. \rightarrow T or F

4 | 7 | 2 | 9 | 10 | 5

Brute Force \rightarrow find all subsequences and check the gcd of all the subsequences

$$O(2^n \times n \times \log_2(m))$$

- ② Find gcd of the complete array
- If $\text{gcd} == 1 \Rightarrow \text{True}$
else $\Rightarrow \text{False}$

$$TC \Rightarrow n \log_2(m)$$

$n \rightarrow$ number of elements
 $m \rightarrow$ second largest element

Ques Find all the factors of n

16

10

1, 2, 4, 8, 16

1, 2, 5, 10

① Brute Force $i \rightarrow n$ $TC \Rightarrow O(n)$

② go till $i \rightarrow \sqrt{n}$ $TC \Rightarrow O(\sqrt{n})$

③ \sqrt{n} $1, 2, 3, 4$

go till $i \rightarrow \sqrt{n}$ $TC \Rightarrow O(\sqrt{n})$

$i \leq \sqrt{n}$

for(`int i=1; i*i <= n; i++`) { $i * i \leq (\sqrt{n})^2$

`if(n/i == 0) {` $i * i \leq n$

`if(i * i == n) print(i);`

`else print(i, n/i);`

3

3

Ques Count the unique factors of n

```
Count = 0;  
for(int i=1; i*i <= n; i++) {  
    if(n % i == 0) {  
        if(i * i == n) Count += 1;  
        else Count += 2;  
    }  
}  
print(Count);
```

$T.C \Rightarrow O(\sqrt{n})$

Ques Number of factors are odd or even

Brute Force $\Rightarrow c = \text{getCount}()$ $T.C$
 $c \% 2 == 0 \Rightarrow \text{even}$ $O(\sqrt{n})$
 $c \% 2 != 0 \Rightarrow \text{odd}$

n is square \Rightarrow odd
else \Rightarrow even

$T.C \Rightarrow O(\log_2(n))$

$a = \text{Math.sqrt}(n)$
 $\text{if}(a * a == n)$
 $\quad \quad \quad \text{print}(\text{odd})$
 $\text{else print}(\text{even})$

$$n = 2^{20} \Rightarrow \sqrt{n} \Rightarrow 2^{10} \Rightarrow 1024 \approx 1000$$

$$\log_2 n \Rightarrow \log_2 2^{20} \Rightarrow 20$$

Prime Number

The number which is only divisible by 1 and the number itself.

1, 2, 3, 5, 7, 11, 13, 17, 19, ... -

Ques check if the given number is Prime

① Count factors

$$TC \Rightarrow O(\sqrt{n})$$

if count == 2

→ prime

else → not prime

② Check $2 \rightarrow \sqrt{n}$

$$TC \Rightarrow O(\sqrt{n})$$

if $n \mod i == 0$

→ not prime

→ prime





- ① generally if i is prime, $i+2$ is also prime
- ② generally next prime number is at $i+6$
starts from $i=5$

prime numbers are of the form $5 + 6i$
or $\underline{5+6i+2} \rightarrow \underline{6+6i+1} \Rightarrow 6(i+j) + 1$

where i and j are positive integers

$$6i + 1$$

$$6i + 5$$

```

boolean isPrime (int n) {
    if (n == 2 || n == 3) return true;
    if (n % 2 == 0 || n % 3 == 0)
        return false;
    for (i = 5; i * i <= n; i = i + 6) {
        if (n % i == 0 || n % (i + 2) == 0)
            return false;
    }
    return true;
}

```

$$TC \Rightarrow O(\sqrt{n})$$

no of iterations $\Rightarrow \frac{\sqrt{n} - 5}{6}$
 Operations

$i = 5$

$s \quad 7$

11

11 13

17

17 19

23

23 25

$$n = 10000$$

$$\sqrt{n} = 100$$

$$\textcircled{1} \frac{1}{\sqrt{n}-1} \rightarrow 99$$

$$\textcircled{2} \frac{\sqrt{n}-5}{6} \Rightarrow \frac{95}{6} = 15.83$$