Matter: Prime Numbers

Agenda

- Intro to Prime no.
- Erd all primes from 1 to N
- No. of factors
- Question

Prime Number : Numbers that have exactly 2 factors

er: 2,3,5,7....

Check if a given integer is prime?

M = 11 former for M = 21

Solution: wound # factors

wde

Scenario

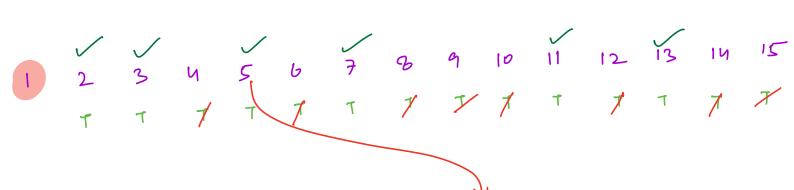
Sewx Prime wants to use random prime numbers from 1 to N.

$$N=10$$
 $\Rightarrow 2,3,5,7$
 $N=20$ $\Rightarrow 2,3,5,7,11,13,17,19$

Bouteforce

Sieve of Eratosthens

clan teacher -> Souil -> distribute choclates to prime roll no.



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code

Time complexity

i	j	iteration
2	4,6,8,10,	~ N/2
3	9,12,15,	~ N/3
Ч		0
5	25,30,	~ N/5

いろろう

$$\frac{N}{2} + \frac{N}{3} + \frac{N}{5} + \cdots + \frac{N}{\sqrt{N}}$$

$$< \frac{N}{2} + \frac{N}{3} + \frac{N}{9} + \frac{N}{5} + \cdots$$

$$N = 10^{12}$$
 $105N = 20$ $105 \log N = 4$
 $N = 10^{12}$ $105N = 40$ $105 \log N = 5$

Snation_

luner a rine integer N, wount # factors for all numbers from 1 to N.

$$N=6$$
#factions 1 2 3 4 5 6

Brukeforce: count factors for each no. from I to N

To to calculate factors: OCVN)

total TC = OCNJN)

Observation

factors of a number K is count of integers
from 1 to K which divides K.

we can also skip 1 & start factor count =1

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int factors (N+1)

***Yi, factors \( \mathbb{U} \) = I

for \( (i=2; i <= N; ++i) \) \( \frac{2}{3} \)

for \( (j=i; j <= N; j+=i) \) \( \frac{2}{3} \)

***Actors \( (j) \) ++ // i is a factor \( 4 \) \( \frac{2}{3} \)

***3
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iteration =
$$\frac{N}{2} + \frac{N}{3} + \frac{N}{4} + \cdots$$
 $T(= O(N10SN))$
 $S(= O(N))$ or $O(1)$ (if factors is output)

Sorted Permutation Rank

what is the rank of a given string wirt sorted order of its permutation.

eg "acb"

"bac" < "cab"

total promutation > N!

"date"

$$t \times - - = 3! = 6$$
 $t \times - - = 3! = 6$
 $t \times K = - = 3! = 6$
 $t \times K = - = 3! = 6$
 $t \times K = - = 3! = 2$
 $t \times M = - = 3! = 2$
 $t \times M = - = 3! = 2$
 $t \times M = - = 3! = 1! = 1$

cut =0
$$\Rightarrow$$
 # chan smaller than su)

for (j=i+1 to N-1) \(\frac{1}{2} \)

if (\(\frac{1}{2} \) \(\leq \) \(\leq \)

cut +++

3

aus = \(\text{am t} \) \(\text{cut * fact (N-i-1)} \) \(\text{/ m} \) \(\text{/ m} \)

7

return aus

 $TC = O(N^2)$