L54
Number Theory Final Problem Solving

Join Discord - https://bit.ly/ly-discord

RECAP

1. Modulo Inverse Intro & Need
2. Extended Euclid's Algorithm
3. Connected the dots
4. Number of distinct anagrams problem

Last day of Number Theory

Let’s get going

A N

1. Addition modulo m

$(a * b) \% m$

$X = ((a \% m) * (b \% m)) \% m$

$a = 10^{15} - 1$

$b = 10^{15} - 2$

$m = 10^{15}$

$10^{15}-1$ * $10^{15}-2$

Given a, b & m (where 1 <= a, b, m <= 10^15),

Find (a*b) % m

$a = 10$

$b = 7$

$m = 3$

$(10 \times 7) \% 3$

$70 \% 3 = 1$

$a = 10^{15}$, $b = 10^{15}$] a*b

6 X 8

6+6+6+6+6+6+6+6

Intuition

```
Sum = 0;
for(int i = 1; i <= b; i++)
{
    sum += a;
    sum %= m;
}
```

1015

$x^n \rightarrow x^{n/2} * x^{n/2}$ n is even

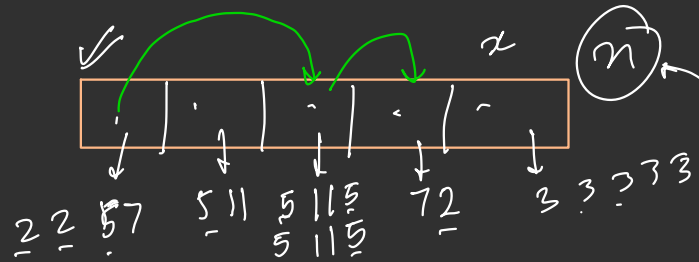
$\rightarrow x^{n/2} * x^{n/2} * x$ n is odd.

$a * b \rightarrow \left(\left(a * \frac{b}{2} \right) \% n + \left(a * \frac{b}{2} \right) \% n \right) \% n$ b is even

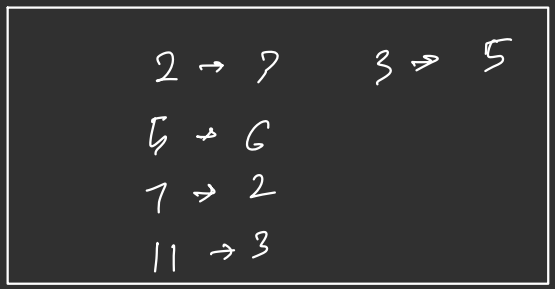
Solution

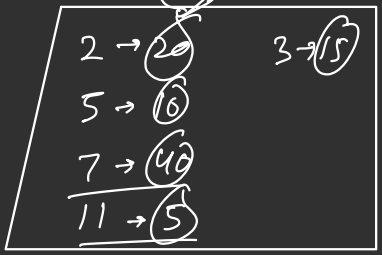
$a * \frac{b}{2} + a * \frac{b}{2} + a$ b is odd.

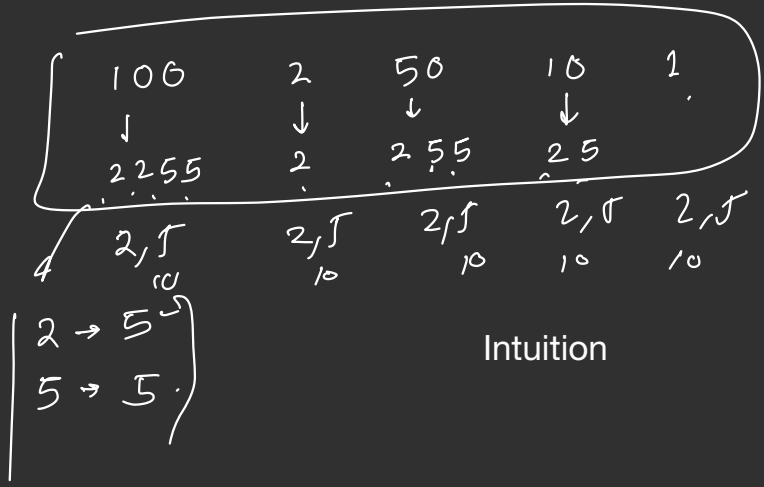
Let’s
implement



2. Divide & Equalise





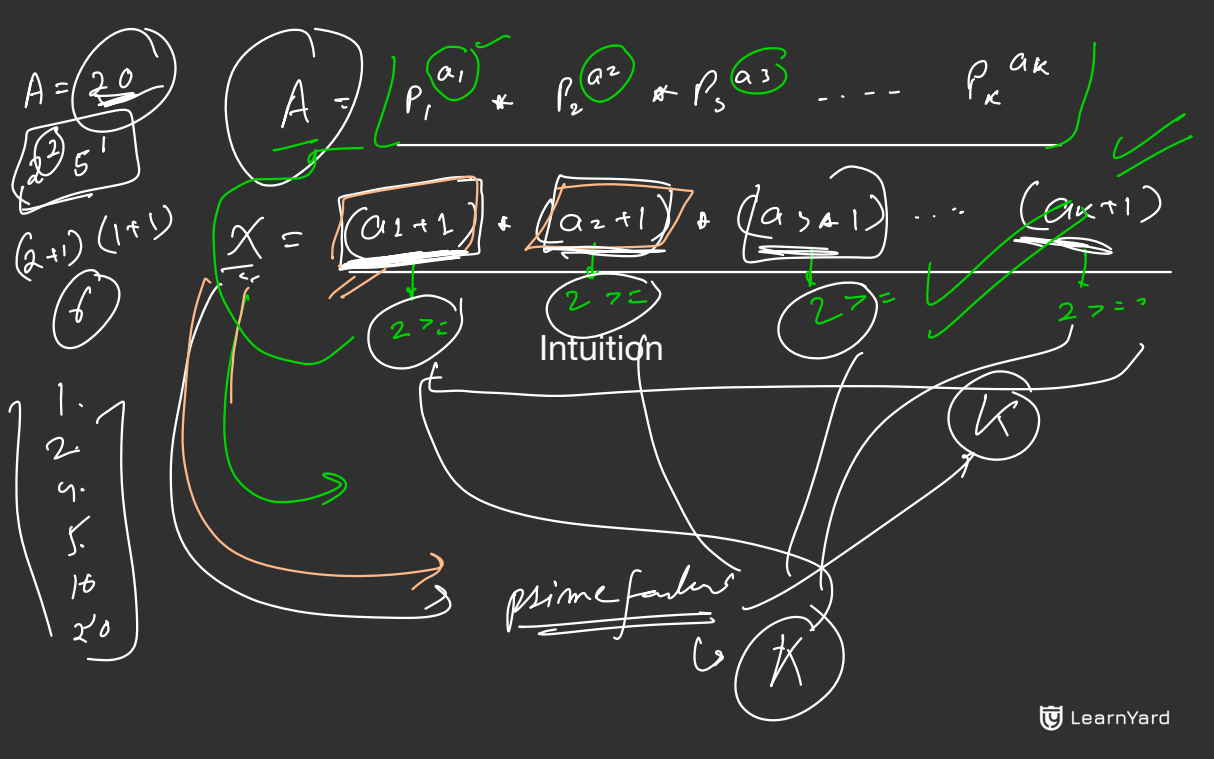


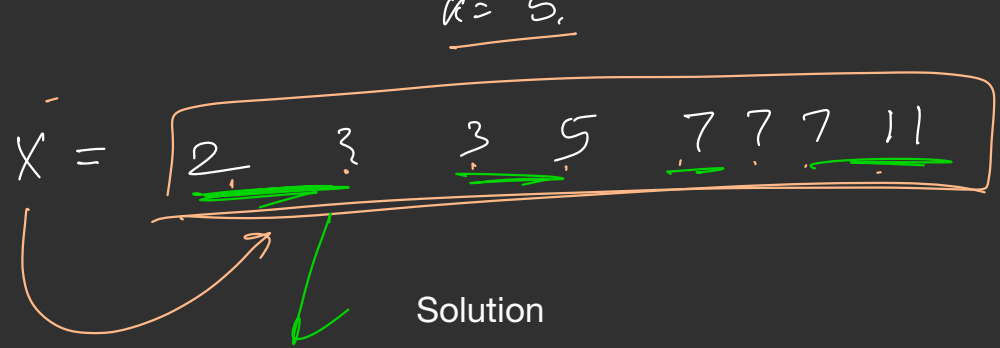
Intuition

Solution

Let’s
implement

3. Strange Number


A = 20
$2^2 \cdot 5^1$
(2+1)(1+1)
6
1.
2.
4.
5.
10
20
A =
$p_1^{a_1} * p_2^{a_2} * p_3^{a_3} \cdots p_k^{a_k}$
X =
$(a_1+1) * (a_2+1) * (a_3+1) \cdots (a_k+1)$
2 ways
2 ways
2 ways
2 ways
Intuition
K
K
prime factors
LearnYard



Let’s
implement

Thank You!

Reminder: Going to the gym & observing the trainer work out can help you know the right technique, but you'll muscle up only if you lift some weights yourself.

So, PRACTICE, PRACTICE, PRACTICE!