Modular Arithmetic

For CP

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The Modulo Operator

• For an integer a, and modulo (integer) m

• b = a % m, b is the remainder a when divided by m

• i.e repeatedly subtracting m from a until a < m

Modular Addition

• Int a, int b, int mod

• Find (a+b) % mod

• What if (a+b) overflows?

• (a+b) % mod = ((a%mod) + (b%mod)) % mod

Modular Multiplication

• Int a, int b, int mod

- Find (a * b) % mod
- But a * b may overflow

• (a * b) % mod = ((a % mod) * (b % mod)) % mod

Problem #1

• https://leetcode.com/problems/maximum-subarray-min-product/

https://leetcode.com/problems/sum-of-floored-pairs/

https://leetcode.com/problems/largest-palindrome-product/

Binary Exponentiation

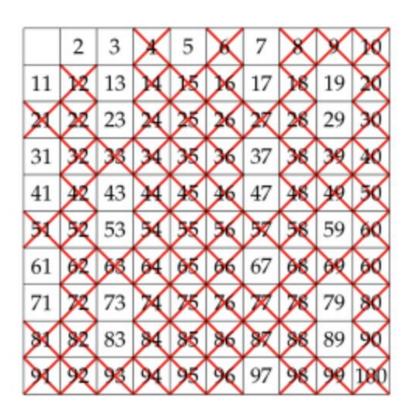
```
    public static long binpow(long a, long b, long m) {

• a %= m;
• long res = 1;
• while (b > 0) {
• if (b%2==1) {
res = res * a % m;
• a = a * a % m;
• b >>= 1;
return res;
```

Modular Division

```
public static long moddiv(long a, long b, long m) {
return (a%m * binpow(b,m-2,m)%m)%m;
```

Sieve of Eratosthenes



Problem Set

• https://codeforces.com/contest/1881/problem/D

• (difficult) https://codeforces.com/contest/1886/problem/D