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Given three integers n, a and b return $n^{th}$ magical number. Since the answer may be very large return $10^9+7$ %.

A positive integer is magical if the number is divisible by either a or b.

$a = 2, b = 3, n = 1$
ans = 2.

$n = 4, a = 2, b = 3$
ans = 6.

Sol$^n$. # Brute force Approach.

check numbers one by one and count magical numbers.

→ function nthMagical (n, a, b):

```
    c = 0
    num = 1
    while true:
        if num % a == 0 or num % b == 0:
            c++
        if c == n
            return num
        num++
```

T.C
⇓
$O(N \min(a,b))$

$\boxed{T.C = O(n \min(a,b)) \text{ for brute force.}}$

→ It fails as constraints go up to $10^9$.

# Optimal Approach.

↳ Instead of checking numbers one by one, binary search the answer.

- $count(x) = x/A + x/B - x/LCM(a,b)$.

- we want the smallest x such that:
  $count(x) \geq N$.

$L = 10^8$ $\approx 10^9$
$R = 10^9$

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⇒ Binary Search + LCM.

```
function nthmagical (n, a, b):
    MOD = 1e9 + 7
    l = 1
    r = n * min(a, b)
    lcm = (a * b) / gcd(a, b)
    while l < r:
        mid = (l + r) / 2
        c = mid/a + mid/b - mid/lcm
        if c < N
            l = mid + 1
        else :
            r = mid

    return l % MOD.
```

$\boxed{T.C = O(\log(n.\min(a,b)))}$

**Dry Run :-**

n = 1
a = 2
b = 3.

(1.) gcd(2,3) = 1
lcm(2,3) = 6.

(2.) l = 1
r = n * min(a,b) = 1×2 = 2.

then, (3.) 1/2 = 0
1/3 = 0  ∴ C = 0+0-0 = 0
1/6 = 0

then,

l = 2
mid = 2
r = 2
⇒ 2/2 = 1, 2/3 = 0, 2/6 = 0 , C = 1+0-0 = 1.

count ≥ N.

∴ Ans = 2.