

Problem 2939: Maximum Xor Product

Problem Information

Difficulty: Medium

Acceptance Rate: 28.84%

Paid Only: No

Tags: Math, Greedy, Bit Manipulation

Problem Description

Given three integers a , b , and n , return the **maximum value** of $(a \oplus x) * (b \oplus x)$ where $0 \leq x < 2^n$.

Since the answer may be too large, return it **modulo** $10^9 + 7$.

Note that \oplus is the bitwise XOR operation.

Example 1.

Input: $a = 12, b = 5, n = 4$ **Output:** 98 **Explanation:** For $x = 2$, $(a \oplus x) = 14$ and $(b \oplus x) = 7$. Hence, $(a \oplus x) * (b \oplus x) = 98$. It can be shown that 98 is the maximum value of $(a \oplus x) * (b \oplus x)$ for all $0 \leq x < 2^n$.

Example 2.

Input: $a = 6, b = 7, n = 5$ **Output:** 930 **Explanation:** For $x = 25$, $(a \oplus x) = 31$ and $(b \oplus x) = 30$. Hence, $(a \oplus x) * (b \oplus x) = 930$. It can be shown that 930 is the maximum value of $(a \oplus x) * (b \oplus x)$ for all $0 \leq x < 2^n$.

Example 3.

Input: $a = 1, b = 6, n = 3$ **Output:** 12 **Explanation:** For $x = 5$, $(a \oplus x) = 4$ and $(b \oplus x) = 3$. Hence, $(a \oplus x) * (b \oplus x) = 12$. It can be shown that 12 is the maximum value of $(a \oplus x) * (b \oplus x)$ for all $0 \leq x < 2^n$.

Constraints:

*`0 <= a, b < 250` *`0 <= n <= 50`

Code Snippets

C++:

```
class Solution {  
public:  
    int maximumXorProduct(long long a, long long b, int n) {  
  
    }  
};
```

Java:

```
class Solution {  
    public int maximumXorProduct(long a, long b, int n) {  
  
    }  
}
```

Python3:

```
class Solution:  
    def maximumXorProduct(self, a: int, b: int, n: int) -> int:
```