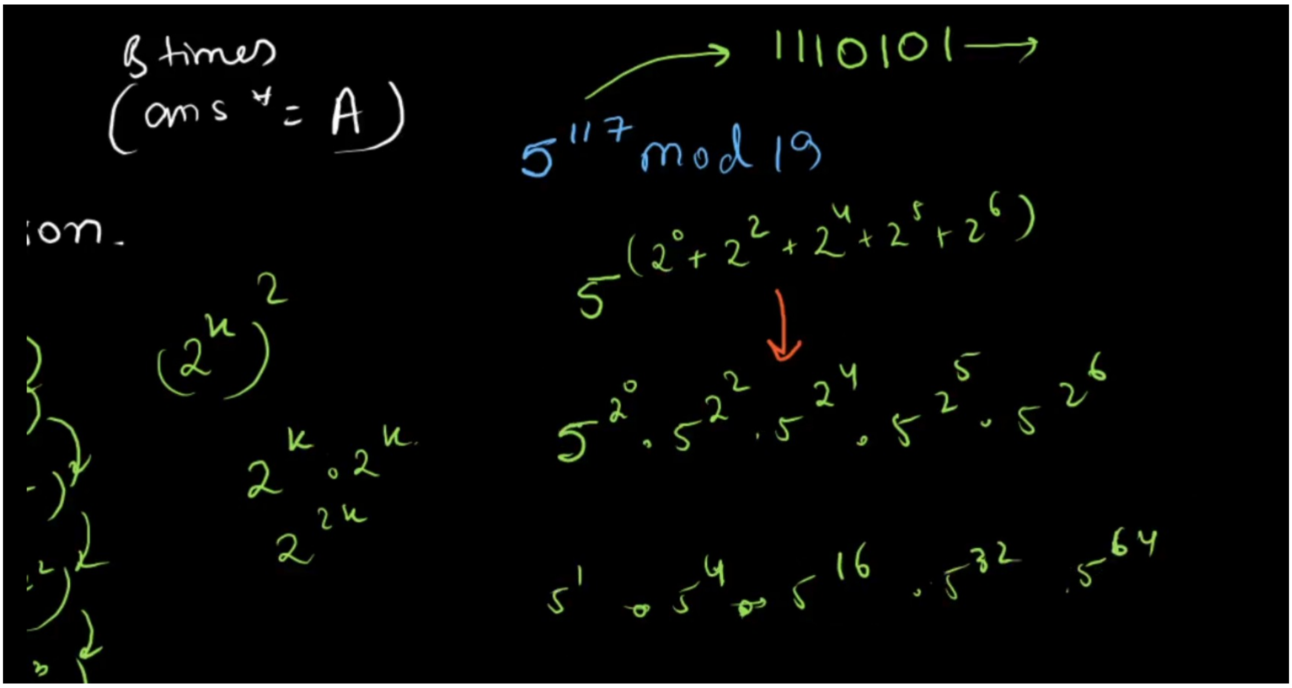
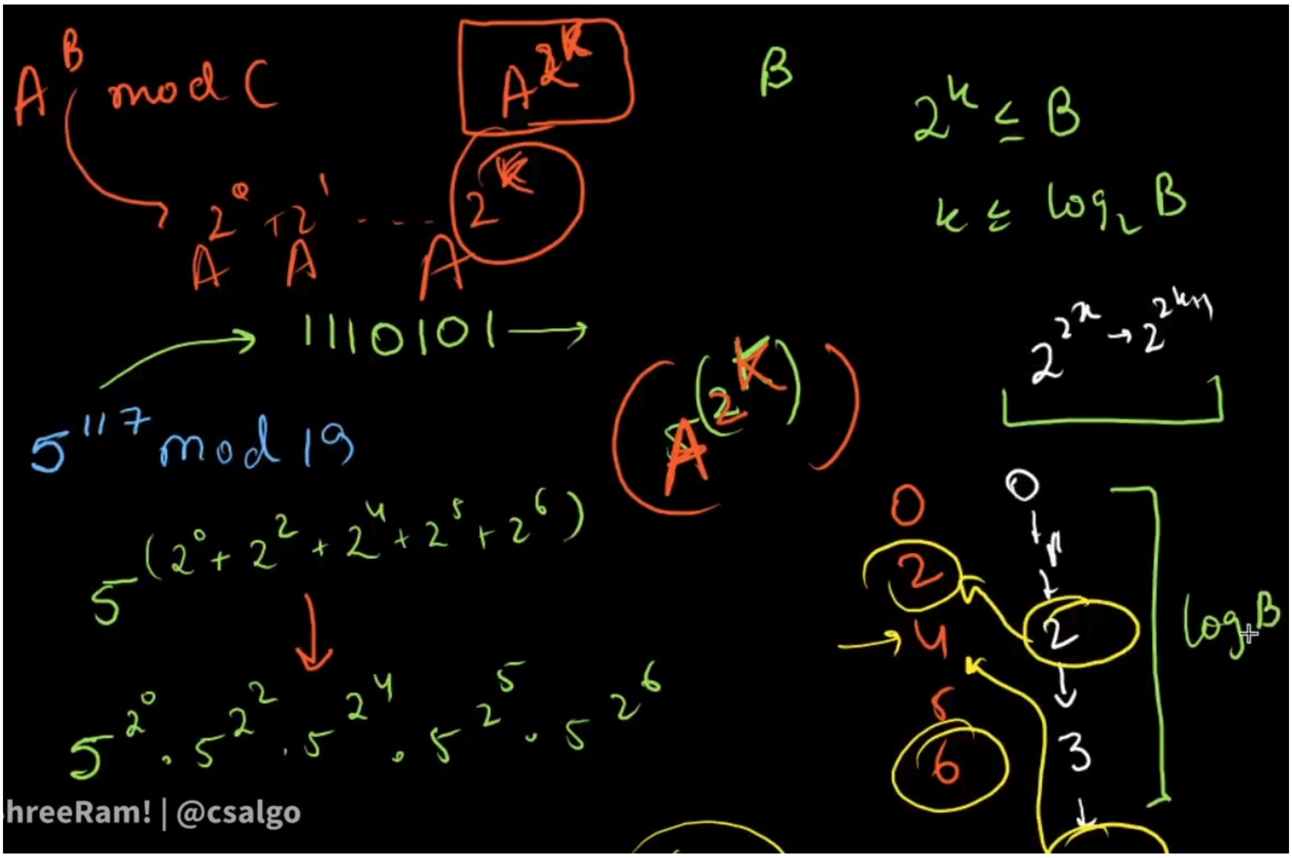
FAST EXPONENTIAION

(ITERATIVE)
(BINARY EXPONENTIATION)


B times
(ans *= A)
ion.
$(2^k)^2$
$2^k \cdot 2^k$
2^{2k}
1110101→
$5^{117} \bmod 19$
$5^{(2^0+2^2+2^4+2^5+2^6)}$
$5^{2^0} \cdot 5^{2^2} \cdot 5^{2^4} \cdot 5^{2^5} \cdot 5^{2^6}$
$5^1 \cdot 5^4 \cdot 5^{16} \cdot 5^{32} \cdot 5^{64}$



```
#include <iostream>
using namespace std;
int fastexpo(int a, int b, int mod)
{
    int ans = 1;
    while (b)
    {
        if (b % 2 == 1) // 1011 this is binary form eg then this is used to check weather the last bit is zero or 1 if 1 it means to multiply the ans with a
        {
            ans = (1LL * ans * a % mod);
        }
        a = 1LL * a * a % mod; //eg 1001 means 2^0*2^3 only
        b = b / 2;             //divide each time to go to next bit it can be done using bit manipulation
    }
    return ans;
}
int main()
{
    int a, b;
    cin >> a >> b;
    cout << fastexpo(a, b, 1e9 + 7) << "\n";
    //calculating mod inverse
    cout << fastexpo(a, 1e9 + 7 - 2, 1e9 + 7); //a^(p-2) by little theorem
}
```