Q. [Problem LCMSUM]

Summation (LCM (i, n)) = summation (i*n/ gcd(i,n))
= n summation(i/gcd(i,n))

6 1 , 2 , 3, 4, 5, 6,
1 , 2, 3, 2, 1, 6
1 , 1 , 2, 2 3, 6
{1} (1/1 + 5/1) , {2} (2/2+ 4/2) , {3}(3/3) , {6}(6/6)
= n summation for every k such k divides n (summation i/k such that gcd(i, n) =k)

$= n \sum_{k|n} \sum_{gcd(i,n)=k} \frac{i}{k}$

i = a *k where 1<= a <= n/k
gcd(a, n/k) = 1

$= n \sum_{k|n} \sum_{gcd(a,n/k)=1} a$

$= n \sum_{k|n} f(n/k)$

f(k) = sum of all numbers which are co prime to k and less than k if k != 1

$f(k) = \sum_{gcd(x,k)=1,\, x \le k} x$

$= \sum_{gcd(x,k)=1} k - x$

$= \sum_{gcd(x,k)=1} k - \sum_{gcd(x,k)=1} x$

$= \sum_{gcd(x,k)=1} k - f(k)$

⇒ 2*f(k) = $\sum_{gcd(x,k)=1}$ k

⇒ 2*f(k) = k * $\sum_{gcd(x,k)=1, 1 \le x \le k}$ 1

⇒ f(k) = (k * $\Phi(k)$)/2

if gcd(k-x, k) != 1 = d
k- x = dt1
k = dt2
x = dt2 -dt1 = d*(t2 -t1) gcd(x, k) = d contradiction

summation LCM(i, n) = n($\sum_{k|n,\, k\,!=1}$ k*$\Phi(k)$/2 + Add for 1 as k also)

code:

```
#include <bits/stdc++.h>

using namespace std;

const int maxN = 1000005;

int phi[maxN];
long long ans[maxN];

int32_t main(){
    for(int i=0;i< maxN;i++){
        phi[i] = i-1;
    }
    ans[1] = 1;
    for(int i=2;i<maxN;i++){
        ans[i] += (long long)phi[i]*i;

        for(int j=2*i;j< maxN;j+=i){
```

```
            phi[j] -= phi[i];
            ans[j] += (long long)phi[i]*i;
        }
        ans[i] /= 2;
        ans[i]++;
        ans[i] *= i;
    }

    int t;
    cin>>t;
    while(t--){
        int n;
        cin>>n;
        cout<<ans[n]<<"\n";
    }
    return 0;
}
```

11 1011 00000001011 2^0 + 2^1 + 2^3
9 1001
8 1000

AND 1001 9

OR 1011 11

XOR 0010 2

1 1 3 3 4

1 2 3 4 5
1 2 3 5

__builtin_popcount(n)
__builtin_ctz(n)
__builtin_clz(n)

31-__builtin_clz(11) ---> 3
63-__builtin_clzll(11) ---> 3

Q. You have an array of n elements you have to find the sum of xor of all pair of elements

n<=200000
0<=a[i]<=1e9
1 2 3 -> 1^2 + 1^3 + 2^3

00000001010100101 1
00000100010100101 0
00000101001100011 1
00000001010111111 1

4*0 =0
2*2 = 4*(2^1)

01
10
10

$1*2*2^0 = 2$ 1^2 + 2^3 + 3^1

$2*1*2^1 = 4$ 11 + 01 + 10 (binary)
3 + 1 + 2 =6 (decimal)

```
int n;
cin >> n;
vector<int> a(n);
for (auto &i : a)
    cin >> i;

int ans = 0;

for (int i = 30; i >= 0; i--){
    int zero = 0, one = 0;
    for (int j = 0; j < n; j++){
        if (a[j] & (1 << i))
            one++;
        else
            zero++;
    }

    ans += (zero * one) * (1 << i);
}
```

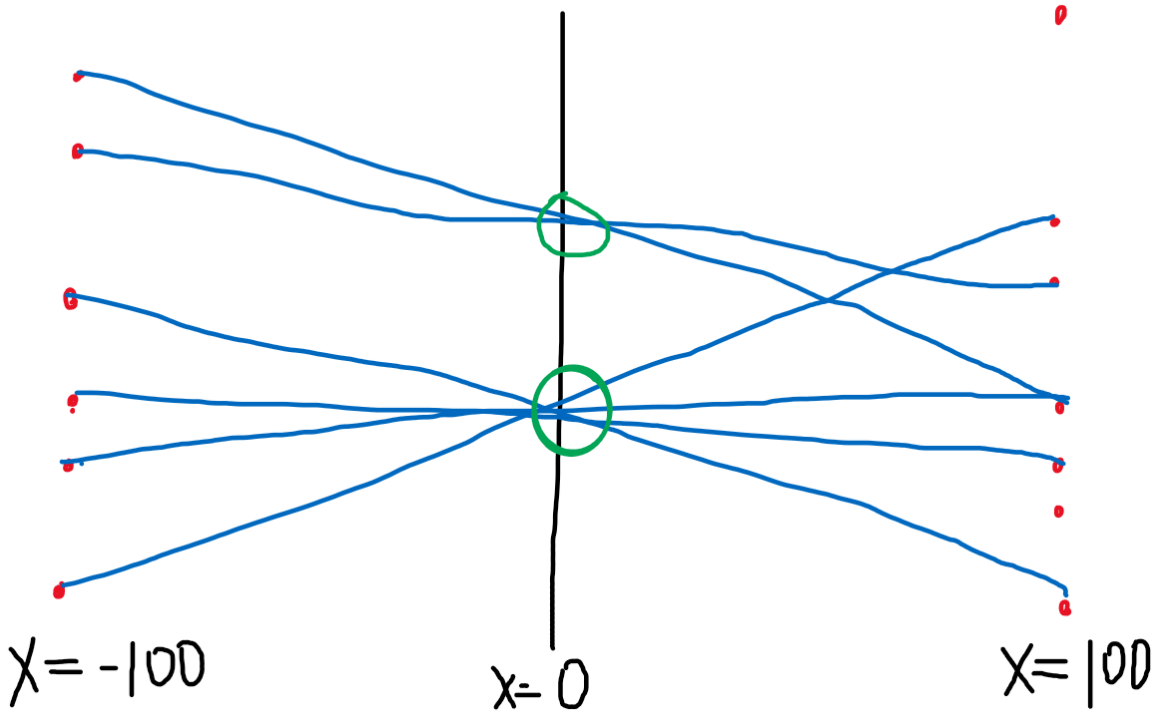
Q) You are given a string which is a representation of a number base 2 print a string which is the binary representation of this number base 6

|S| <= 200

(input) 10001 (17 -> decimal) ----> 25 (output)

Q. [Problem - 993C]

(Sum, count)	10 10 9 7 8 8	38	1,9	1,8	2,8	2,7




```
set <int> s;
   vi v;
   map<int, pair <long long, long long> > mask;
   rep(i,0,20005)
   mask[i]={0, 0};
   rep(i,0,n)
   {
        rep(j,0,m)
        {
             int sum=a[i]+b[j];
             if(s.find(sum)==s.end())
             v.pb(sum);
             mask[sum].ff|=(1ll << i);   10001100110 (i=2
-> unchanged)
             mask[sum].ss|=(1ll << j); 10000110 ->
10001110
(j=4 -> changed)
        }
   }
```

[Submission]

Errichto Blog 1: https://codeforces.com/blog/entry/73490

Errichto Blog 2: https://codeforces.com/blog/entry/73558