

MS | Amazon.

The gray code is a binary numeral system where two successive values differ in only one bit. Given a non-negative integer  $A$  representing the total number of bits in the code, print the sequence of gray code.

A gray code sequence must begin with 0.  $1 \leq A \leq 16$

No. of Bits

$[0, 1]$

$A=2 \Rightarrow [0, 1, 3, 2] \rightarrow$   
 $00 \quad 01 \quad 11 \quad 10$

$1 \leq A \leq 16 \rightarrow 16$  Bits

$A=1$   
 $0$   
 $1$

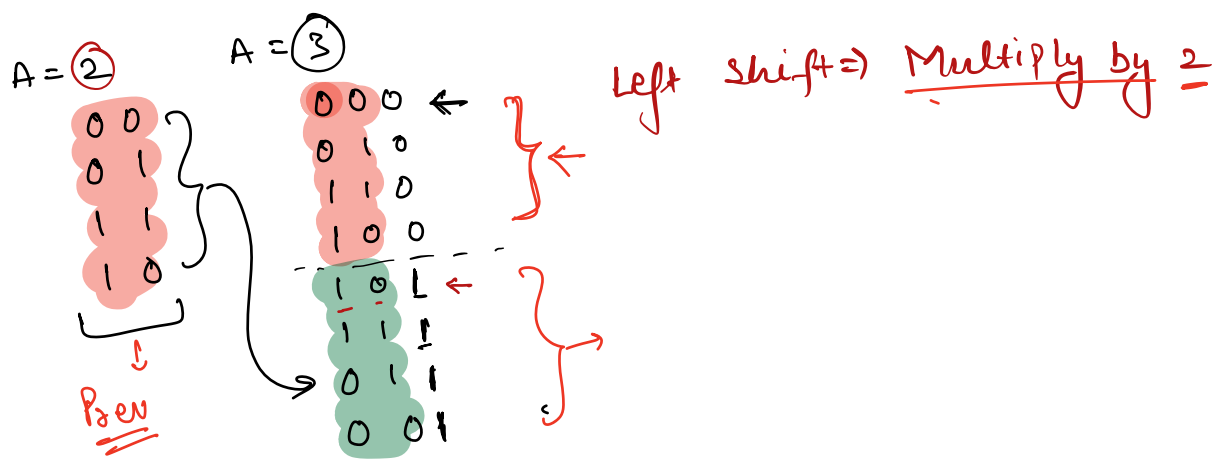
$A=2$   
 $00$   
 $01$   
 $11$   
 $10$

$A=3$   
 $000$   
 $010$   
 $110$   
 $100$   
 $101$   
 $111$   
 $011$   
 $001$

$A=4 \rightarrow 2^4$   
 $0000$   
 $0100$   
 $1100$   
 $1000$   
 $1010$   
 $1110$   
 $0110$   
 $0010$   
 $0001$   
 $0101$   
 $1101$   
 $1001$   
 $1101$   
 $0101$   
 $0001$

Observations :-

- We can use ans of  $A-1$ , to form the ans of  $A$ .
- for 1st half, append 0 to ans.  
for 2nd half, append 1 to the reversed order.



```

vector<int> grayCode(int A) {
    if (A == 1) return {0, 1};
    vector<int> prev = grayCode(A-1);
    vector<int> ans;
    vector<int> rev = reverse(prev);
    for (i = 0; i < prev.size(); i++) {
        ans.push_back(prev[i] * 2);
    }
    for (i = 0; i < rev.size(); i++) {
        ans.push_back(rev[i] * 2 + 1);
    }
    return ans;
}

```

T.C :  $O(2^A)$

$A$

$2^A + 2^{A-1} + 2^{A-1} + \dots + 1$

G.P

$A = 4 \rightarrow 16$

$3 \rightarrow 2^3$

$2 \rightarrow 2^2$

$1 \rightarrow 2^1$

HW :- Calculat sum of G.P

$a, ar, ar^2, ar^3, \dots ar^{n-1}$  ]

$$\boxed{\text{Sum} = \frac{a(r^n - 1)}{(r - 1).}}$$

$n$  is no. of  
terms.

## Q Largest Number

MMT/  
Amazon/  
Paytm/  
Zoho.

Given an array 'A' of non negative integers, arrange them s.t they form **Largest number**.

{ 3, 30, 34, 5, 9 }

→ "9534330"

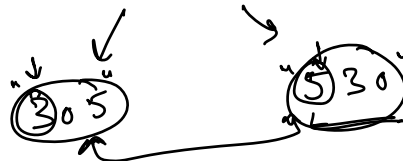
$n \leq 10^5$

$A[i] \leq 2 \times 10^9$

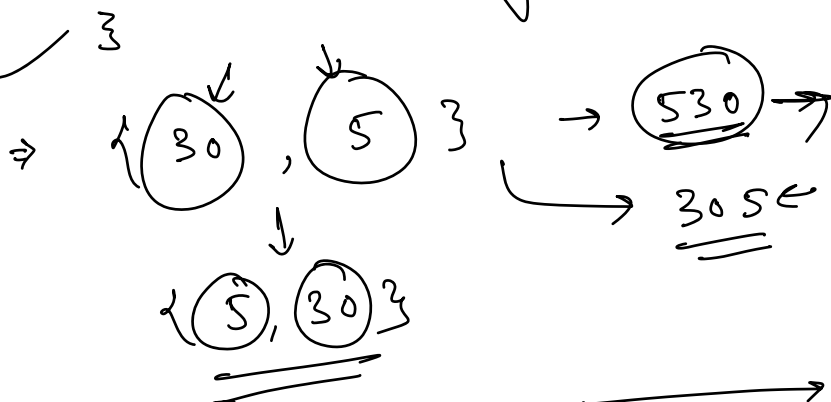
Return output as STRING.

A: { 30, 5 }  $\Rightarrow$  { "30", "5" }

S1 S2  
S2 S1



bool comp (string S1, string S2) {  
if ( S1+S2 > S2+S1 )  
return true;  
return false;  
}



(A) { 3, 30, 34, 5, 9 }  $\xRightarrow[\text{Array}]{\text{String}}$  (B) { "3", "30", "34", "5", "9" }

sort ( B, B+n, comp )

{ "30", "34" }  $\Rightarrow$  { 34, 30 }  
 $\swarrow \searrow$   
 "3034" < "3430"

Ans  $\Rightarrow$  { "9", "5", "34", "3", "30" }  $\rightarrow$  (n)

String s = " ";

for ( i=0; i < n; i++ )

s += Ans[i];

}

{ 30, 7, 34, 5, 7, (4), (9) }.

$\rightarrow$  "977543430"

"7", "5"  
 $\swarrow \searrow$   
 "57" < "75"

"9", "4"  
 $\swarrow \searrow$   
 "94" > "49"

Q Diff K II.

Given an Array of integers & a non negative integer 'K'. Find if there exists  $i \neq j$ , s.t

$$i \neq j \leftarrow a[i] - a[j] = K.$$

$$\{ 4, 3, 1, 9, 6, 1, 2 \}$$

0 1 2 3 4 5 6

$$K = 7.$$

$$a[3] - a[6] = 7.$$

$$9 - 2 = 7$$

Brute force :- Check for all the pairs.

$$a[i] - a[j] = K. \leftarrow$$

fixing  $a[i]$

$$\text{abs}(a[i] - a[j]) = K$$

$$a[i] - a[j] = K.$$

$$-(a[i] - a[j]) = K$$

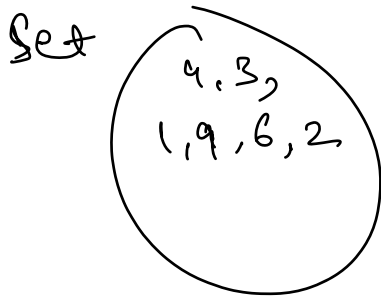
$$a[j] - a[i] = K.$$

Observation :- By fixing 'i', find  $a[j]$  s.t

$$a[j] = a[i] - K$$

$$\text{OR } a[j] = a[i] + K$$

# { 4, 3, 1, 9, 6, 1, 2 }  $k = 7$ .



1)  $4 + 7 \mid 4 - 7 \Rightarrow 11, -3$

2)  $3 + 7 \mid 3 - 7 \Rightarrow 10, -4$

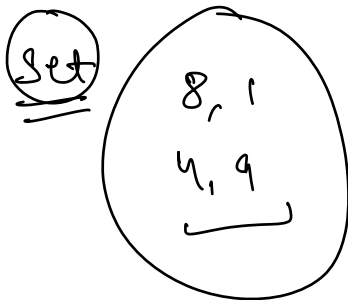
3)  $1 + 7 \mid 1 - 7 \Rightarrow 8, -6$

4)  $9 + 7 \mid 9 - 7 \Rightarrow 16, \textcircled{2}$

$a[i] = 9, a[j] = 2 \Rightarrow \text{Return True.}$

Edge case

# { 8, 1, 4, 9 }  $k = 0$ .



1)  $8 - 0 \mid 8 + 0 \Rightarrow \textcircled{8}$

$\Rightarrow$  HashMap

{ 4, 3, 1, 9, 6, 1, 2 }

0 1 2 3 4 5 6

→

map

4	0
3	1
1	5
9	3
6	4
2	6

if map contains  $a[i] + k$  (OR)  $a[i] - k$ .

```
for (i = 0; i < n; i++) {  
    map.put ( { a[i], i } );
```

```
}
```

```
for (i = 0; i < n; i++) {
```

```
    x1 = a[i] + k;
```

```
    x2 = a[i] - k;
```

```
    if ((map.containsKey(x1) && i != map.get(x1))
```

```
        || map.containsKey(x2) && i != map.get(x2))
```

```
        return true;
```

```
}
```

```
return false;
```

↓  
0 1 2 3 4 5 6 ✓  
4, 3, 1, 9, 6, 1, 2 }    k = 7  
↑    ↑    ↑  
map  
4 → 0  
3 → 1  
1 → 2 (5)  
9 → 3  
6 → 4  
2 → 6