



Subset Component

by [wanbo](#)

Problem

Submissions

Leaderboard

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You are given an array with n 64-bit integers: $d[0], d[1], \dots, d[n-1]$.

$\text{BIT}(x, i) = (x \gg i) \& 1$. (where $B(x, i)$ is the i^{th} lower bit of x in binary form.)

If we regard every bit as a vertex of a graph G , there exists one undirected edge between vertex i and vertex j if there exists at least one k such that $\text{BIT}(d[k], i) == 1 \&\& \text{BIT}(d[k], j) == 1$.

For every subset of the input array, how many [connected-components](#) are there in that graph?

The number of connected-components in a graph are the sets of nodes, which are accessible to each other, but not to/from the nodes in any other set.

For example if a graph has six nodes, labelled $\{1, 2, 3, 4, 5, 6\}$. And contains the edges $(1, 2)$, $(2, 4)$ and $(3, 5)$. There are three connected-components: $\{1, 2, 4\}$, $\{3, 5\}$ and $\{6\}$. Because $\{1, 2, 4\}$ can be accessed from each other through one or more edges, $\{3, 5\}$ can access each other and $\{6\}$ is isolated from everyone else.

You only need to output the sum of the number of connected-component(S) in every graph.

Input Format

```
n
d[0] d[1] ... d[n - 1]
```

Constraints

 $1 \leq n \leq 20$ $0 \leq d[i] \leq 2^{64} - 1$

Output Format

Print the value of S .

Sample Input

```
3
2 5 9
```

Sample Output

```
504
```

Explanation

There are 8 subset of $\{2, 5, 9\}$.

$\{\}$

=> We don't have any number in this subset => no edge in the graph => Every node is a component by itself => Number of connected-components = 64.

{2}

=> The Binary Representation of 2 is **00000010**. There is a bit at only one position. => So there is no edge in the graph, every node is a connected-component by itself => Number of connected-components = 64.

{5}

=> The Binary Representation of 5 is **00000101**. There is a bit at the 0th and 2nd position. => So there is an edge: (0, 2) in the graph => There is one component with a pair of nodes (0,2) in the graph. Apart from that, all remaining 62 vertices are independent components of one node each (1,3,4,5,6...63) => Number of connected-components = 63.

{9}

=> The Binary Representation of 9 is **00001001**. => There is a 1-bit at the 0th and 3rd position in this binary representation. => edge: (0, 3) in the graph
=> Number of components = 63

{2, 5}

=> This will contain the edge (0, 2) in the graph which will form one component

=> Other nodes are all independent components

=> Number of connected-component = 63

{2, 9}

=> This has edge (0,3) in the graph

=> Similar to examples above, this has 63 connected components

{5, 9}

=> This has edges (0, 2) and (0, 3) in the graph

=> Similar to examples above, this has 62 connected components

{2, 5, 9}

=> This has edges(0, 2) (0, 3) in the graph. All three vertices (0,2,3) make one component => Other 61 vertices are all independent components

=> Number of connected-components = 62

$$S = 64 + 64 + 63 + 63 + 63 + 63 + 63 + 62 + 62 = 504$$

[f](#) [t](#) [in](#)

 Submissions: [1389](#)

Max Score: 50

Difficulty: Hard

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Current Buffer (saved locally, editable)

Java 7

```

1 import java.io.*;
2 import java.util.*;
3 import java.text.*;
4 import java.math.*;
5 import java.util.regex.*;
6
7 public class Solution {
8
9     public static void main(String[] args) {
10         /* Enter your code here. Read input from STDIN. Print output to STDOUT. Your class should be named Solution. */
11     }
12 }

```

Line: 1 Col: 1

Upload Code as File

☐ Test against custom input

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