1. Server Selection

Some developers want to deploy their application on different servers with a load balancer in the front. There are *n* servers to choose from where the number of requests that can be handled by the i^{th} server is *server[i].* The number of requests served by any server is a power of 2 i.e. 1, 2, 4, 8, 16,...etc.

Given the array *server* and an integer *expected_load,* find the minimum number of servers that must be chosen such that the total sum of requests served by all the chosen servers is exactly equal to the *expected_load.* If there is no combination of servers that can serve exactly *expected_load* requests, report -1 as the answer.

Example
Suppose *n = 4, servers = [1, 1, 2, 4],* and *expected_load = 3.*

It is optimal to choose the first and the third or the second and the third servers serving a total of 1 + 2 = *expected_load* = 3 requests. Return the minimum number of servers needed, 2.

Function Description:
Complete the function *getMinServers* in the editor below.

The function *getMinServers* has the following parameter:
int expected_load: the number of requests to be served
int server[n]: the number of requests the servers can serve

Return
int: the minimum number of servers such that the sum of the total requests they can serve is exactly *expected_load*

Constraints:

- $1 \leq n \leq 10^5$
- $1 \leq server[i] \leq 10^9$
- It is guaranteed that *server[i]* is a power of 2.
- $1 \leq expected\_load \leq 10^9$

Input Format For Custom Testing

- The first line contains an integer, *expected_load*.
- The next line contains an integer, *n*, the total number of elements.
- The next *n* lines contain an integer, *server[i]*.

Sample Case 0

Sample Input For Custom Testing

```
STDIN       FUNCTION
-----       ----------
10      →   expected_load = 10
5       →   n = 5
1       →   server = [1, 1, 2, 4, 4]
1
2
4
4
```

Sample Output

```
3
```

Explanation

It is optimal to choose the last three servers to serve a total number of requests as 2 + 4 + 4 = 10.

Sample Case 1

Sample Input For Custom Testing

```
STDIN       FUNCTION
-----       ----------
4       →   expected_load = 4
3       →   n = 3
1       →   server = [1, 1, 1]
1
1
```

Sample Output

```
-1
```

Explanation

There is no selection of servers that can serve a total number of requests equal to 4.

```
package main
```

```go
import (
	"fmt"
	"sort"
)

func getMinServers(expectedLoad int, servers []int) int {
	n := len(servers)
	sort.Ints(servers)

	count := 0
	sum := 0
	for reza := n - 1; reza >= 0; reza-- {
		sum += servers[reza]
		count++
		if sum >= expectedLoad {
			return count
		}
	}

	return -1
}

func main() {
	var expectedLoad, n int
	fmt.Scan(&expectedLoad)

	fmt.Scan(&n)

	servers := make([]int, n)
	for i := 0; i < n; i++ {
		fmt.Scan(&servers[i])
	}

	minServers := getMinServers(expectedLoad, servers)
	if minServers == -1 {
		fmt.Println(-1)
	} else {
		fmt.Printf("%d\n", minServers)
	}
}
```

2. Maximize the Value

Rearrange an array of integers so that the calculated value U is maximized. Among the arrangements that satisfy that test, choose the array with minimal ordering. The value of U for an array with n elements is calculated as :

$U = arr[1] \times arr[2] \times (1 \div arr[3]) \times arr[4] \times \ldots \times arr[n-1] \times (1 \div arr[n])$ if n is odd
or
$U = arr[1] \times arr[2] \times (1 \div arr[3]) \times arr[4] \times \ldots \times (1 \div arr[n-1]) \times arr[n]$ if n is even

The sequence of operations is the same in either case, but the length of the array, n, determines whether the calculation ends on $arr[n]$ or $(1 \div arr[n])$.

Arrange the elements to maximize U so the items are in the numerically smallest possible order.

Example
$arr = [21, 34, 5, 7, 9]$

To maximize U and minimize the order, arrange the array as $[9, 21, 5, 34, 7]$ so $U = 9 \times 21 \times (1 \div 5) \times 34 \times (1 \div 7) = 183.6$. The same U can be achieved using several other orders, e.g. $[21, 9, 7, 34, 5] = 21 \times 9 \times (1 \div 7) \times 34 \times (1 \div 5) = 183.6$, but they are not in the minimum order.

Function Description
Complete the function *rearrange* in the editor.

rearrange has the following parameter(s):
int arr[n]: an array of integers

Returns
int[n]: the elements of *arr* rearranged as described

Constraints

- $1 \le n \le 10^5$
- $1 \le arr[i] \le 10^9$

input Format For Custom Testing
The first line contains an integer, n, the number of elements in *arr*.
Each line i of the n subsequent lines (*where* $1 \le i \le n$) contains an integer, $arr[i]$.

Sample Case 0

Sample Input For Custom Testing

```
STDIN    Function
-----    --------
4    →   arr[] size n = 4
1    →   arr = [1, 2, 3, 4]
2
3
4
```

Sample Output

```
2
3
1
4
```

Explanation

$U = 2\times3\times(1\div1)\times4 = 24$. All other arrangements where $U = 24$ are numerically higher than this array, e.g. *[2, 3, 1, 4] < [3, 4, 1, 2]*.

Sample Case 1

Sample Input For Custom Testing

```
STDIN    Function
-----    --------
2    →   arr[] size n = 2
4    →   arr = [4, 5]
5
```

Sample Output

```
4
5
```

Explanation

U is always $4\times5 = 20$, and *[4, 5] < [5, 4]*.

```go
package main

import (
    "bufio"
    "fmt"
    "os"
    "sort"
    "strconv"
    "strings"
)

func rearrange(arr []int) []int {
    n := len(arr)

    // Sort the array in ascending order
    sort.Ints(arr)

    // Rearrange the array by alternating the smallest and largest e
lements
    for i := 0; i < n/2; i++ {
        j := n - 1 - i*2
        arr[i], arr[j] = arr[j], arr[i]
    }

    return arr
}

func main() {
    // Read input from stdin
    reader := bufio.NewReader(os.Stdin)

    // Read the size of the array
    input, _ := reader.ReadString('\n')
    input = strings.TrimSpace(input)
    n, _ := strconv.Atoi(input)

    // Read the elements of the array
    arr := make([]int, n)
    for i := 0; i < n; i++ {
        input, _ := reader.ReadString('\n')
        input = strings.TrimSpace(input)
        arr[i], _ = strconv.Atoi(input)
    }

    // Rearrange the array
    arr = rearrange(arr)

    // Calculate U
```

```go
    u := float64(arr[0])
    for i := 1; i < n; i++ {
        if i%2 == 1 {
            u *= float64(arr[i])
        } else {
            u *= float64(arr[i]) / float64(arr[i-1])
        }
    }

    // Print the rearranged array
    for _, x := range arr {
        fmt.Println(x)
    }

    // Print the value of U
    fmt.Println(u)
}
```

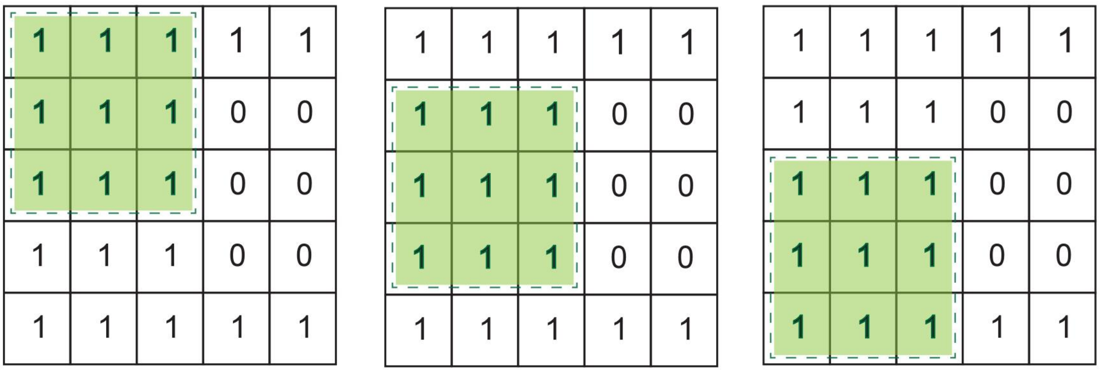
3. Product Defects

A quality agent is responsible for inspecting samples of the finished products in the production line. Each sample contains defective and non-defective products represented by 1 and 0 respectively. The product samples are placed sequentially in a two-dimensional square matrix. The goal is to determine the size of the largest square of defective products in the two-dimensional square matrix.

Example

n x n = 5 x 5 matrix of product samples

samples = [[1,1,1,1,1], [1,1,1,0,0], [1,1,1,0,0], [1,1,1,0,0], [1,1,1,1,1]]



- The first square of defective products is a sub-matrix *3 x 3* starting at (0,0) and ending at (3,3)
- The second square of defective products is also a sub-matrix *3 x 3* starting at (1,0) and ending at (4,3)
- The third square of defective products is also a sub-matrix *3 x 3* starting at (2,0) and ending at (5,3)
- The size of the largest square of defective products is 3

Function Description

Complete the function findLargestSquareSize in the editor below.

findLargestSquareSize has the following parameter:
  int samples[n][n]: a two-dimensional array of integers

Returns:
  int: an integer that represents the size of the largest square sub-matrix of defective products.

Constraints

- $0 \le n \le 500$
- samples[i][j] is in the set {0, 1} (0 denotes anon-defective products and 1 denotes a defective product)

Input Format For Custom Testing

The first line contains an integer, *n*, the number of *rows (the number of samples)*.
The second line contains the integer, *n*, the number of columns (the number of products in a sample).
Each line *i* of the *n* subsequent lines (where $0 \le i < n$) contains *n* space-separated integers that describe *samples[i]*.

Sample Case 0

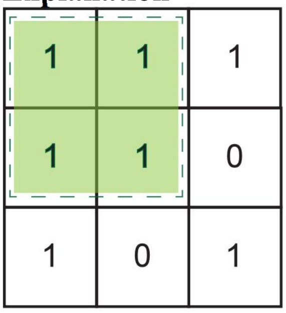
Sample Input For Custom Testing

```
STDIN       Function
-----       --------
3      →  samples[] size n = 3
3      →  samples[i][] size n = 3
1 1 1  →  samples=[[1,1,1],[1,1,0],[1,0,1]]
1 1 0
1 0 1
```

Sample Output

```
2
```

Explanation



- The first square of defective products is a sub-matrix *2 x 2* starting at (0,0) and ending at (1,1)
- The other square of defective products are a sub-matrix *1 x 1* at (2,0) , (0,2) and (2,2)
- The size of the largest square of defective products is 2

Sample Case 1

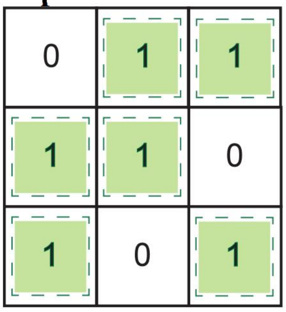
Sample Input For Custom Testing

```
STDIN     Function
-----     --------
3    →   samples[] size n = 3
3    →   samples[i][] size n = 3
0 1 1 →  samples=[[0,1,1],[1,1,0],[1,0,1]]
1 1 0
1 0 1
```

Sample Output

```
1
```

Explanation

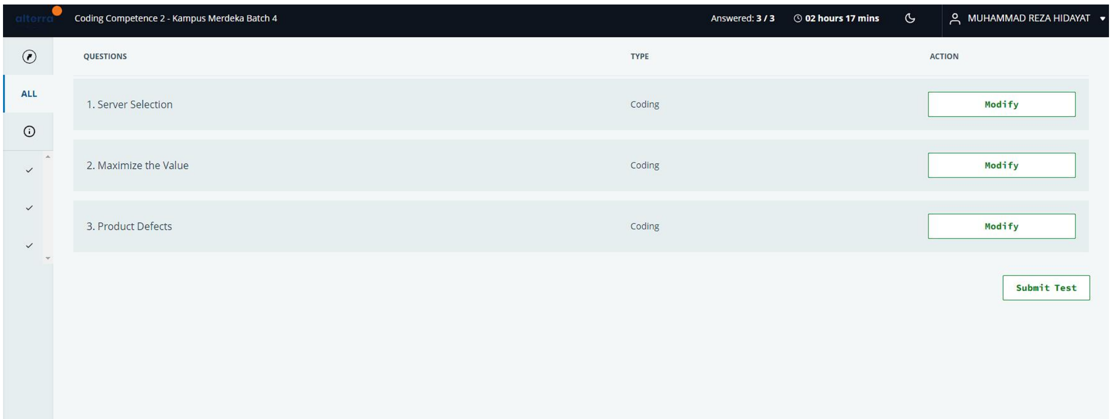


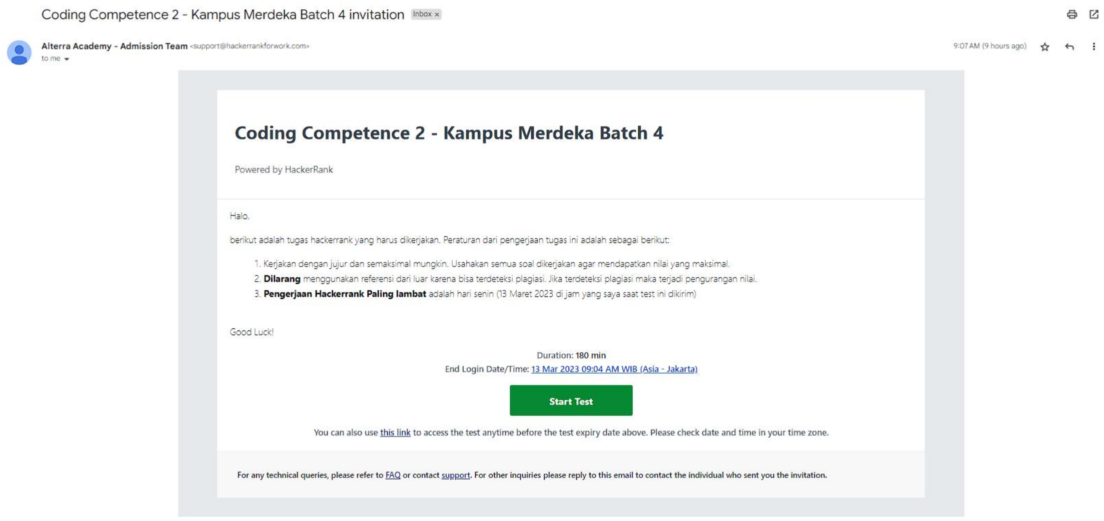
- All square of defective products are a sub-matrix *1 x 1* at (0,1) , (0,2) , (1,0), (1,1), (2,0) and (2,2).
- The size of the largest square of defective products is 1

```go
package main

import (
    "fmt"
)
func findLargestSquareSize(rezasamples [][]int) int {
    n := len(rezasamples)
    maxSize := 0
    // membuat tabel dp untuk menyimpan ukuran sub-
matriks persegi terbesar
    // produk cacat yang berakhir pada setiap posisi
(i,j) dalam matriks sampel
    dp := make([][]int, n)
    for p := range dp {
        dp[p] = make([]int, n)
    }
    // menginisialisasi baris pertama dan kolom pertama
dari tabel dp
    for p := 0; p < n; p++ {
        dp[p][0] = rezasamples[p][0]
        dp[0][p] = rezasamples[0][p]
    }
    // menghitung ukuran sub-matriks persegi terbesar
dari produk cacat
    // berakhir pada setiap posisi (i,j) dalam matriks
sampel
    for p := 1; p < n; p++ {
        for b := 1; b < n; b++ {
            if rezasamples[p][b] == 1 {
                dp[p][b] = 1 + min(dp[p-1][b-1],
min(dp[p-1][b], dp[p][b-1]))
                if dp[p][b] > maxSize {
                    maxSize = dp[p][b]
                }
            }
        }
    }
    return maxSize
```

```go
}
func min(a, b int) int {
    if a < b {
        return a
    }
    return b
}
func main() {
    // mendapatkan masukan
    var n int
    fmt.Scan(&n)
    rezasamples := make([][]int, n)
    for p := range rezasamples {
        rezasamples[p] = make([]int, n)
        for b := range rezasamples[p] {
            fmt.Scan(&rezasamples[p][b])
        }
    }
    //  menemukan ukuran sub-matriks persegi terbesar
dari produk cacat
    maxSize := findLargestSquareSize(rezasamples)
    // mencetak hasilnya
    fmt.Println(maxSize)
}
```





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Alterra Academy - Admission Team <support@hackerrankforwork.com>
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9:07 AM (9 hours ago)

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