

2025 Competitive Pizza Making Situated Online Contest

UNSW CPMSoc

5 April 2025

Contents

Guess how much [Maths]	2
Pizza is my F5VE [Maths]	3
FOC SUC Sum [Maths]	4
If then Otherwise [Maths]	5
$1 + 1 = 3$ [Maths]	7
Too Greedy? [Maths]	8
Wires [Programming]	9
Pizza Printing [Programming]	10
Circular Logic [Programming]	11
Zero [Programming]	13
Matching [Programming]	15
ruh-roh [Programming]	16

Guess how much [Maths]

In 2010, CPMSoc purchased 2 pizzas for “only” 10,000 BTC. If we assume 1 BTC is now worth \$135,000 AUD, and 1 pizza costs \$20 AUD, how much money did CPMSoc lose?

Pizza is my F5VE [Maths]

Stellini just added pizza to their roster of gourmet Italian food! You and your K-pop dance cover crew decided to buy a Margherita pizza (non-toxic) to share. You make X cuts (each cut is made from the center to the edge of the pizza) to divide the pizza evenly into delicious slices, making sure everyone gets a fair share.

But just as you're about to dig in, a few cute and friendly people from CPMSoc come up to you and compliment your dancing! You are so touched that you offer to share the pizza with them. Now, there are Y people, and to accommodate them, you decide to cut the pizza again, this time making Y evenly spaced cuts.

You decide to start with the first cut along the same line both times. When the old and the new cut are the same, they are counted as just one cut, so won't form a "zero slice".

Moving around the pizza, you realise that you have quite a few slices, which aren't necessarily of the same size. What is the average angle of all the slices? Express your answer in rounded to the nearest degree.

Subtask 1 (30% of points)

If the pizza was first sliced for $X = 5$ people and then sliced again for $Y = 8$ people?

Subtask 2 (30% of points)

If the pizza was first sliced for $X = 12$ people and then sliced again for $Y = 18$ people?

Subtask 3 (40% of points)

If the pizza was first sliced for $X = 36$ people and then sliced again for $Y = 64$ people?

Submission

Submit your answer to the subtasks as a comma-separated list of integers. For example, if your answers to the subtasks are 1, 3 and 4, you should submit `1,3,4`. Note that if you have not solved a subtask, you can submit a dummy answer for that subtask. For example, if your answer to the first subtask is 1, you could submit `1,0,0`.

FOC SUC Sum [Maths]

Some guy from the Republic of Pizza is claiming that they have invented a sequence that they are calling **FOC SUC!!!**

He says that the first term is 1^1 , the second term is 1^3 , and the final term is 1^{987} .

Subtask 1 (50% of points)

What is the FOC SUC sum?

Subtask 2 (50% of points)

What is the exponent of the third term in the sequence?

Submission

Submit your answer to the subtasks as a comma-separated list of integers. For example, if your answers to the subtasks are 3 and 4, you should submit **3,4**. Note that if you have not solved a subtask, you can submit a dummy answer for that subtask. For example, if your answer to the first subtask is 1, you could submit **1,0**.

If then Otherwise [Maths]

If there are 19,000 pizzerias in New York State then if dough-spinning is a professional-level sporting competition then if Domino's "World's Fastest Pizza Maker" needs 11 seconds to make a single large pizza then if Pizza Hut, Little Caesars, and Domino's all have their mozzarella cheese supplied by Leprino Foods then if the average pizza slice in New York City usually matches the price of a subway ride then if tomatoes or tomato sauce is required for pizza to be officially considered pizza then submit the term Gooey otherwise submit the term Pineapple otherwise if Pizza Hut has 19,000 locations across the globe then submit the term Crispy otherwise submit the term Cheese otherwise if World War I helped Bring Pizza to the Masses then if the most expensive pizza costs \$12,000 then submit the term Yum otherwise submit the term Wood-Fired otherwise if tomato sauce is bad for your immune system then submit the term Slice otherwise submit the term Mozzarella otherwise if the risk of certain cancers can be decreased by eating pizza once a week then if flatbread was invented around 5000 B.C.E. then if Peyton Manning owned 11 Papa John's franchises then submit the term Hand-Tossed otherwise submit the term Gluten-Free otherwise if 251,770,000 lbs of pepperoni are consumed every year then submit the term Detroit otherwise submit the term Brick Oven otherwise if a typical daily pizza serving accounts for more than half of the lycopene in your diet then if Pizza Hut, Little Caesars, and Domino's all have their mozzarella cheese supplied by Leprino Foods then submit the term Flour otherwise submit the term Deep Dish otherwise if NASA funded and tested a 3D printer that could make pizza for astronauts then submit the term Cheesy otherwise submit the term Oven otherwise if 997 C.E. features the first documented use of the word "pizza" then if the pizza chain Papa John's was started in the back of a broom closet then if Japanese people usually put mayonnaise on their pizza then if cheese is the most popular pizza topping then submit the term Bell Pepper otherwise submit the term Bacon otherwise if one of the first documented Internet purchases was a pizza then submit the term Hawaiian otherwise submit the term Foodie otherwise if there is an annual pizza expo in Las Vegas then if flour, milk, yeast, sugar, and oil are the five basic ingredients used to make pizza dough then submit the term Neapolitan otherwise submit the term Peel otherwise if there's a pizza museum in Europe then submit the term Sicilian otherwise submit the term Fold otherwise if North Korea opened their first pizzeria in 1998 then if pizza was first invented in Rome, Italy then if 34% of Americans prefer thin crust pizza then submit the term Gourmet otherwise submit the term Tomato otherwise if Spaceballs features a character made entirely of pizza called Pizza the Hut then submit the term Delivery otherwise submit the term Semolina otherwise if the technical term for the outer edge of a pizza's crust is cornicione then if bananas are berries but strawberries aren't then submit the term Pie otherwise submit the term Anchovy otherwise if the first frozen pizza hit the market in 1962 then submit the term Leftovers otherwise submit the term Mushroom otherwise if the largest pizza party had 7,353 participants then if tofu is the most popular pizza topping in China then if eggs are a common pizza topping in Australia then if pizza is a 73 billion dollar industry then if classic Hawaiian pizza originated from Hawaii then submit the term Pizza Stone otherwise submit the term Grandma otherwise if a pizza was delivered to an astronaut while he/she was in orbit then submit the term Calzone otherwise submit the term Pizzeria otherwise if the world's largest pizza is 19,660 feet squared then if Friday is the most popular day to eat pizza then submit the term Veggie otherwise submit the term Ricotta otherwise if Margherita pizza was named after Queen Margherita of Italy then submit the term Sourdough otherwise submit the term Yeast otherwise if someone ate 83 slices of pizza in ten minutes then if pizzas in Italy were originally square-shaped then if Americans eat 500 slices of pizza per second then submit the term Chicago otherwise submit the term Pan otherwise if more than 2 million Pizza Hut pizzas are sold during the Super Bowl then submit the term Margherita otherwise submit the term Delicious otherwise if Dominos deliver 2 million pizzas worldwide each day then if traditional flatbread originated from Egypt then submit the term Stuffed Crust otherwise submit the term New York otherwise if you can make 34 million pizza combinations with Domino's create-your-own-pizza then submit the term Pepperoni otherwise submit the term Parmesan otherwise if Bill Murray and Jean Claude Van Damme got their start making and delivering pizzas then if consumption of pizza has increased American's consumption of cheese by 79% since 1995 then if Domino's developed DVDs that smelled like pizza then if there's a pizza museum in Philadelphia then submit the term Za otherwise submit the term Jalapeño otherwise if one in six males aged 2 to 59 eat pizza for breakfast, lunch, or dinner on any given day then submit the term Sauce otherwise submit the term Olive otherwise if Domino's was the first pizzeria chain to offer online ordering then if tomatoes were first discovered in Africa then submit the term Spinach otherwise submit the term Ham otherwise if 25% of the

average slice of pizza is protein then submit the term Onion otherwise submit the term Basil otherwise if in Mongolia, deep-fried pizza is a common choice then if there is a mathematical theorem named after pizza then if the pizza ingredient tomatoes is 94% water then submit the term Sausage otherwise submit the term Artichoke otherwise if January is officially considered to be National Pizza Month then submit the term Bubbly otherwise submit the term Thin Crust otherwise if 560 kilocalories is contained in a slice of cheese pizza then if 56900 books about pizza are available on Amazon.com then submit the term Feast otherwise submit the term Garlic otherwise if one 18-inch pizza gives you more pizza than two 12-inch pizzas then submit the term White Pizza otherwise submit the term Takeout.

1 + 1 = 3 [Maths]

Lucy: “You know what would be a cool problem? We make them prove that $1 + 1 = 3$.”

Kyle: “Isn’t that impossible? No one is going to get marks.”

Lucy: “Yeah, we can just mark everyone as incorrect. I think we should mark one in every hundred solutions as correct though, to maximise confusion.”

Frank: “OMG, I have a program that does just that.”

Frank then write some beautiful python code to determine whether your proof is correct or not.

```
import random
from datetime import datetime
wrongfosho = input().strip()
def isCorrect(wrongfosho):
    random.seed(int(datetime.now().timestamp()) // 60)
    return random.randint(0, 99) == 0
```

Submission

What should you submit?

Too Greedy? [Maths]

A mysterious higher being has granted you the extraordinary power to alter the tastiness of your pizza slice. Each time you submit, you'll receive a "tastiness score", aka a random decimal value between 0 and 10. Your goal is to minimise this score.

However, you may only submit once per hour, and your final submission will determine your ultimate tastiness score.

May luck be with you!

Wires [Programming]

Program time limit: 1 second

Program memory limit: 512 MB

You are making pizzas for the CPMsoc party! However, at the kitchen, you received a warning letter saying the pizza is poisoned. For a pizza that you can model using a 2d board, you found interconnecting cheese strings on the pizza, and one of them is poisoned.

There are N cheese strings, the i th cheese string is a straight line between $(0, i)$ and $(100, A[i])$. $A[i]$ is a unique number between 1 and N (the array A forms a permutation).

When the cheese string x is poisoned, the venom will start at $(0, x)$ and continuously move to the right along the cheese strings. When it meets another cheese string, it will contaminate the other cheese string.

Given x , where does the contamination end? This will be a location at $(100, y)$ - output y .

Input

- The first line contains two integers N and x , the size of the array A and the location of the first poisoned cheese string.
- The next line contains N integers where the i^{th} integer is $A[i]$

Constraints

For all test cases:

- $1 \leq N \leq 1000$.
- $1 \leq x \leq N$.
- $1 \leq A[i] \leq N$ for all i .
- No three cheese strings intersections at the same location.

Output

Output one integer y , where $(100,y)$ is where the poison of the cheese string ends.

Sample Input 1

```
3 1
1 2 3
```

Sample Output 1

```
1
```

Explanation 1

The poison will start at $(0,1)$ and ends at $(100,1)$, with no other cheese strings connecting it, so the poison won't contaminate the other cheese strings.

Scoring

Your program will be run on multiple secret test cases one after another, and your program will lose points for each test case it solves proportionally. Recall that your final score on the task is the score of your lowest scoring submission.

Pizza Printing [Programming]

Program time limit: 1 second

Program memory limit: 512 MB

One day, while walking past a random pizza shop, you notice a competition with an incredible prize: 4.1 free pizzas! As the ultimate pizza lover, you decide to enter. The challenge? Write a program that simply outputs the word “pizza”.

Competition Constraints

Your code **cannot** contain the following characters:

- Letters: p, i, z, a, h
- Digits: 2 to 9

Additionally, since the waiters are so done with their work, they refuse to read any code longer than 200 characters.

Output

Output “pizza” :)

Circular Logic [Programming]

Program time limit: 1 second

Program memory limit: 512 MB

Sample Input 1

YES

Sample Output 1

NO

Sample Input 2

NO

Sample Output 2

YES

Sample Input 3

LEGIT

Sample Output 3

NO

Sample Input 4

UNTRUSTWORTHY

Sample Output 4

YES

Sample Input 5

GENUINE

Sample Output 5

NO

Sample Input 6

DISINGENUOUS

Sample Output 6

YES

Sample Input 7

truth

Sample Output 7

NO

Sample Input 8

falsehood

Sample Output 8

YES

Sample Input 9

1

Sample Output 9

NO

Sample Input 10

0

Sample Output 10

YES

Sample Input 11

$2 + 3 = 5$

Sample Output 11

NO

Sample Input 12

$2 + 3 = 4$

Sample Output 12

YES

Sample Input 13

TRUE

Sample Output 13

NO

Sample Input 14

FALSE

Sample Output 14

YES

Zero [Programming]

Program time limit: 2 seconds

Program memory limit: 512 MB

After his defeat by Prince Mozzarella De La Cheese, Noah has been locked in a white room. The tiles of this room can be modelled as a N by N grid.

To help alleviate his boredom, he has generated uniformly random numbers between 1 and $2^{40} - 1$ and placed one such number in each square. The number in the i th row and j th column is denoted as A_{ij} .

It has been a few days and Noah is convinced that if he finds a path of numbers whose XOR is 0, he can summon the one true pizza and escape. Please write a program to help Noah with this task.

Mathematically, you want to find a nonempty sequence of pairs $(x_1, y_1), (x_2, y_2), (x_3, y_3), \dots, (x_K, y_K)$ such that

- Every two consecutive locations share an edge — $|x_{i+1} - x_i| + |y_{i+1} - y_i| = 1$ for all $i \in [1, K - 1]$
- $(x_i, y_i) \neq (x_j, y_j)$ for all $i \neq j$
- $A_{x_1, y_1} \oplus A_{x_2, y_2} \oplus A_{x_3, y_3} \oplus \dots \oplus A_{x_K, y_K} = 0$

Input

- The first line of input contains the integers N .
- The next N lines of input contains N integers each. The j th integer in the i th row is $A_{i,j}$.

The indices for the rows and columns are 1-indexed. The top-leftmost square is $(1, 1)$.

Output

- The first line of output contains one integer K , the number of squares in this path.
- The next K lines of output contains two integers each, x_i and y_i .

If there are multiple correct outputs, any one of them will be accepted.

Constraints and scoring

For all test cases:

- $1 \leq A_{i,j} \leq 2^{40} - 1$.

There are 10 test cases:

- Test cases 1, 2, 3 has $N = 2000$.
- Test cases 4, 5 has $N = 200$.
- Test cases 6, 7 has $N = 100$.
- Test case 8 has $N = 60$.
- Test case 9 has $N = 50$.
- Test case 10 has $N = 40$.

Getting each test case correct will lose you 10% of the marks.

The values of the grid in the testcases will be randomly generated between 1 and $2^{40} - 1$.

The sample input below is just for your understanding and is not randomly generated, it will not be included in the test data.

Sample Input

```
3
1 2 3
4 5 6
7 8 9
```

Sample Output

```
4
2 1
2 2
3 2
3 3
```

Explanation

The output corresponds to the sequence $(2, 1), (2, 2), (3, 2), (3, 3)$. Note that no two pairs are equal and consecutive pairs share an edge.

The XOR of this path is $A_{2,1} \oplus A_{2,2} \oplus A_{3,2} \oplus A_{3,3} = 4 \oplus 5 \oplus 8 \oplus 9 = 0$.

Other solutions exist and will be accepted. For example, $(1, 1), (1, 2), (1, 3)$ is also a valid path.

Matching [Programming]

Program time limit: 2 second

Program memory limit: 512 MB

After a pizza making frenzy, Cindy found herself with a bit too much pizza. There are N pizzas left over, with the i th pizza having A_i slices.

She wants to give away this excess pizza to fans, and seems adamant that each fan receives exactly two pizza. Furthermore, she has promised that the number of slices a fan receives must be divisible by her favourite number K .

You don't know what her favourite number is. What is the maximum value of K so that she can give away all the pizza and keep her promise?

Input

- The first line of input contains a single integer N .
- The next line of input contains N integers describing the number of slices of each pizza. The i th of these is A_i .

You should read from standard input.

Output

- Your program must output a single integer: the maximum value of K so that the pizzas can be paired such the sum of slices in each pair is divisible by K .

Constraints

For all test cases:

- $2 \leq N \leq 10^5$.
- $1 \leq A_i \leq 10^5$.
- N is even.

Sample Input

```
6
1 4 2 6 3 9
```

Sample Output

```
5
```

Explanation

You can pair values (1, 4), (2, 3) and (6, 9). All three sums are divisible by 5. This is the largest value where such a pairing exists.

ruh-roh [Programming]

Program time limit: 1 second

Program memory limit: 512 MB

Ro rows her rose row boat up the rows of a roiling river flow. Ro rows no oars, only Ro's rose is known to Ro, which Ro rows Ro's rose row boat with, rosily. Ro's rose is rosy and old and has only a few rose petals holding on, denoted by rho. Of Ro's woes, not only is there old rose, but rolicking roe cultures in each row that Ro's river flows. Each row has a number of roe denoted by rho. Roused by rampant roes, Ro dons Ro's rose to row Ro's rose row boat from row i to row $i + \text{rho}$, in turn reducing Ro's rose rho by one and reducing row i 's roes rho by rho. Rho cannot exceed the current row's roe rho. Call the maximum roe rho of all rows, row roe rho. To put a close to Ro's roe woes, Ro began at the first row and rose up the flow rows with at most rose rho rows until she rowed to row n , the row after the final roe row. What is the minimum row roe rho of the roe rows that Ro's rose row boat rose?

Input

- The first line contains two integers n and r , the the number of rows and Ro's initial rose rho.
- The next line contains n integers where the i^{th} integer, $\text{row}[i]$ is the number of roe in the i^{th} row

Constraints

For all test cases:

- $1 \leq n \leq 10^6$.
- $1 \leq r \leq 10^6$.
- $1 \leq \text{row}[i] \leq 10^6$ for all i .

Output

- Output one integer, the minimum value of row roe rho after completing your journey.
- If the rows cannot be traversed in r rows then output -1

Sample Input 1

```
5 2
3 1 3 2 1
```

Sample Output 1

```
2
```

Explanation 1

The minimum row roe rho is 2 because after $r = 2$ optimal rows, which are from row 0 to row 2 to row n , we will have reduced the roe rho of row 0 to 1 and row 2 to 0. The maximum roe row is now 2.

Sample Input 2

```
5 2
3 1 2 1 1
```

Sample Output 2

```
-1
```


Explanation 2

It is not possible to get to row 6 in under 2 rows, hence the output is -1