## Problem : Identify time period bound by primes

Consider 24-hour times in the format HH:MM ranging from 00:00 (midnight) to 23:59 (1 minute before midnight) mapping to the "time numbers" between 0 (0000) and 2359. Note that there are 60*24 = 1440 such numbers only since times such as 0060 (actually 0100) or 1071 (actually 1111) are invalid.

Given an integer M, the objective is to identify a time interval M minutes apart in which both the starting time and ending time are "prime time numbers". Note that a time HH:MM is a prime time number if the four digit number HHMM is a prime. For example 00:02, 00:03, 00:07, 23:51 are prime time numbers, while 00:10 is not.

**Input**
One line giving a positive integer M.

**Output**
The earliest interval bounded by prime time numbers (starting and ending times in HH:MM format separated by a hyphen) that is separated by M minutes. If no such interval exists, the output should be “NONE”..

**Constraints**

0<M<2880

**Example 1**

Input:
30

Output:
00:07-00:37

Explanation:
From the input, M = 30
Scanning 30 minute time intervals, we observe:
0002 - 0032 (end time not prime)
0003 - 0033 (end time not prime)
0005 - 0035 (end time not prime)
0007 - 0037 (end time is prime!)
Hence the output is 00:07-00:37

**Example 2**

Input:
13

Output:
NONE

Explanation:
M is 13 as specified in the input. Considering possible values of start time,
0002 - 0015 (end time not prime)
...
2347 - 0000 (end time not prime)
2351 - 0004 (end time not prime)
2357 - 0010 (end time not prime)

Hence there are no 13 minute intervals bound by primes. The output is NONE.

## Problem : Inversions

Given a sequence of distinct numbers $a_1$, $a_2$, ….. $a_n$, an inversion occurs if there are indices i<j such that $a_i$ > $a_j$.
For example, in the sequence 2 1 4 3 there are 2 inversions (2 1) and (4 3).

The input will be a main sequence of N positive integers. From this sequence, a derived sequence will be obtained using the following rule. The output is the number of inversions in the derived sequence.

**Rule for forming derived sequence**

A factor of a positive integer is a positive integer that divides it completely without leaving a remainder. For example, for the number 12, there are 6 factors 1, 2, 3, 4, 6, 12.
For each number in the original sequence, the derived sequence gives the number of factors of the corresponding number in the original sequence.

**Input**

The first line of the input will have a single integer, which will give N.

The next line will consist of a comma separated string of N integers, which is the main sequence

**Output**

The number of inversions in the derived sequence formed from the main sequence.

**Constraints**

N <= 50
Integers in sequence <= $10^6$

**Example 1**

Input:
5
55, 53, 88, 27, 33

Output:
3

Explanation:
The number of integers is 5, as specified in the first line. The given sequence is 55, 53, 88, 27, 33, the derived sequence is 4, 2, 8, 4, 4 (corresponding to the number of factors of each of these numbers). The number of inversions in this are 3, namely (4 2), (8 4), (8 4).

**Example 2**

Input:
7
12,27,48,55,47,63,20

Output:
9

Explanation:
The number of integers is 7, as specified in the first line. The given sequence is 12, 27, 48, 55, 47, 63, 20, and the derived sequence is 6, 4, 10, 4, 2, 6, 6. There are 9 inversions (6,4), (6,4), (6,2), (4,2), (10,4), (10,2),(10,6), ( 10,6), (4,2). Hence the output is 9

## Problem : Weighted Maze

In the amusement park at Looney's amusement, there is a "Weighted Maze" challenge. This consists of a set of East West roads (referred to as left to right roads) and North South roads (referred to as up down roads). Each intersection has a set of identical iron bars whose weight is given. You enter the maze at the top left corner with 1 kg in a cart. The exit from the maze is at the bottom right corner. Movement at any intersection is to the right or down provided a road exists in that direction.

At each intersection you pass through, you must exchange the weight in your cart with the weight of the bar at the intersection if it is heavier than the weight you have in the cart.

The objective is to determine a path through the maze along the roads so that one can exit the maze with the minimum weight in the cart. For example, in the maze shown, the least weight one can exit the maze is 22 kg.

| | | | | | |
|---|---|---|---|---|---|
| -> | 1 | 8 | 21 | 7 | |
| | 19 | 17 | 10 | 20 | |
| | 2 | 18 | 23 | 22 | |
| | 14 | 25 | 4 | 13 | -> |

**Input**

The first line consists of a positive integer n, which is the number of intersection in any up-down or left-right road.

The next n lines each consist of n positive integers representing the weights at the intersections in the corresponding left-right road

**Output**

A positive integer that represents the minimum weight possible in the cart when exiting the maze.

**Constraints**

Weight of iron bars ≤100, n≤50

**Example 1**

Input:
4
1,8,21,7
19,17,10,20
2,18,23,22
14,25,4,13

Output:
22

Explanation:
One possible path through the maze is through the intersections with coordinates (1,1),(1,2),(2,2),(2,3)(2,4)(3,4),(4,4). This would result in the cart having a weight of 22 kg ( at the intersections on this path,, the weight in the cart after the exchange are 1,8,17,18,18,20,22,22

**Example 2**

Input:
5
1,29,40,24,12
13,31,40,31,33
29,40,17,35,32
15,39,28,3,31
15,21,31,38,24

Output:
38

Explanation:
One path through the maze is (1,1),(2,1), (3,1),(4,1),(5,1),(5,2), (5,3), (5,4) (5,5). The maximum weight in this path is 38, which is the weight in the cart when leaving the maze.

As there is no other path in the maze which has a lower weight in the cart when exiting it, the output is 38

## Problem : Longest increasing sequence

Given a sequence $a_1$, $a_2$, ... $a_n$, of positive integers, a strictly increasing subsequence is such that each term of the subsequence is strictly less than the next. For example, in the sequence 1, 2, 10, 3, 7 , 4, two strictly increasing sequences are 1, 10 and 2, 3, 4

The Input consists of N sets of five integers each. From these sets, a derived sequence is formed by one of the five numbers in each set.

The objective is to pick the numbers from each set so that the corresponding derived sequence has the longest possible strictly increasing subsequence.

**Input**

The first line of the input has a positive integer which is the number of sets of the numbers in the input. Each of the next N lines consists of a set of five (not necessarily distinct) comma separated positive integers.

**Output**

The length of the longest strictly increasing subsequence in all possible derived sequences

**Constraints**

N≤50
Integers in sets≤10000

**Example 1**

Input:
5
3000,400,1500,4350,2700
2050,3650,650,2750,4300
2000,700,2100,700,1650
300,200,500,600,200
3000,3100,3200,1100,1400

Output:
4

Explanation:
A possible derived sequence the input which gives the longest possible strictly increasing subsequence is 400,650,2000,500,3000 (one from each row), and the longest strictly increasing subsequence from this is 400,650,2000,3000. As the length of this subsequence is 4, the output is 4.

**Example 2**

Input:
6
800,3000,600,3600,800
1400,5200,1600,6000,2600
3200,3800,3200,1600,2400
800,2800,4800,600,1400
5200,1400,4800,3800,800
5000,4200,4800,1800,2000

Output:

6

Explanation:
There are 6 input sets. One possible derived sequence from the input that gives the longest possible strictly increasing subsequence is 800, 1400, 1600, 2800, 4800, 5000 which has a strictly increasing subsequence of length 6. Hence the output is 6

## Problem : Round Vaults in Bank

In the strong room of ABC bank there are N vaults arranged in a circle. The amount of money inside each vault displayed on the door. You can empty any number of vaults as long as you do not empty more than 2 out of any 5 adjacent vaults. If you attempt to break more than 2 of any 5 adjacent vaults, an alarm sounds and the sentry a sharp shooter will kill you instantly with his laser gun! Note that as the vaults are arranged in a circle, the last vault is adjacent to the first one.

The output is the maximum amount of money that can be emptied without sounding the alarm

**Input**

The first line contains an integer N which is the number of vaults. The next line has a sequence of positive integers of length N, giving the amount of cash in its vaults in order

**Output**

The maximum amount of money that can be looted without sounding the alarm.

**Constraints**

N<=50, Amount in each vault <=50000

**Example 1**

Input:
9
1000, 2000, 1000, 5000, 9000, 5000, 3000, 4000, 1000

Output:
15000

Explanation:
The vaults 1, 5, 6 are looted, giving a total loot of (1000+5000+9000)=15000

**Example 2**

Input:
10
1000,2000,3000,5000,9000,7000,6000,4000,7000,5000

Output:
26000

Explanation:
There are 10 vaults arranged in a circle. The amounts in the vaults are 1000, 2000, … 5000.

One way of getting the maximum is to loot vaults 4, 5, 9 and 10 giving a total of 26000. Hence the output is 26000. Note that no 5 adjacent vaults have more than 2 looted.

## Problem : Distinct Partitions

Among the several path breaking contributions to Number theory by the famous Indian mathematician Srinivasa Ramanujan, his contribution to partitions is extensive and deep. A partition of a positive integer n, also called an integer partition, is a way of writing n as a sum of positive integers. Two sums that differ only in the order of their summands are considered the same partition. For example, 4 can be expressed as a sum of positive integers in the following ways,: 1+1+1+1, 1+1+2, 1+3, 2+2, 4. Of these, only 1+3 and 4 use non repeating summands. Partitions using non repeating summands are called distinct partitions of n. There is no general formula for the number of partitions of an integer n and it is known that the partitions grow rapidly with n.

A k-distinct-partition of a number n is a set of k distinct positive integers that add up to n. Hence, if we look at 3-distict partitions of 10, they are the partitions 1+2+7, 1+3+6,1+4+5 and 2+3+5

The objective is to count all k-distinct partitions of a number that have at least two prime numbers in the elements of the partition

**Input**

The input consists of one line containing of N and k separated by a comma

**Output**

One number denoting the number of k-distinct partitions of N that have at least two prime numbers in the elements of the partition.

**Constraints**

$k<N<200$, so that at least one k-distinct partition exists

**Example 1**

Input:
10,3

Output:
2

Explanation:
The input asks for 3-distinct-partitions of 10. There are 4 of them (1+2+7, 1+3+6, 1+4+5 and 2+3+5). Of these, only 2 have at least two primes in the partition (1+2+7, 2+3+5)

**Example 2**

Input:
12,3

Output:
2

Explanation:
The input asks for 3-distinct partitions of 12. There are 7 of them (1+2+9, 1+3+8, 1+4+7, 2+3+7, 1+5+6, 2+4+6 , 3+4+5). Of these 2 (2+3+7 and 3+4+5) have at least 2 primes. Hence the output is 2.