Problem A. Ladder

Input filename:	`ladder.in`
Output filename:	`ladder.out`
Time limit:	2 seconds
Memory limit:	256 Mb

The ladder has n stairs, indexed by numbers $1, 2, \ldots, n$ from bottom to top. There is a number written on each stair. You want to climb from the bottom (stair with index 0) to the very top (stair with index n) of the ladder. In one step, you can step up either one or two stairs. As you climb, you add up the numbers on the stairs you step on. You want to maximize this sum.

Input file format

The first line contains a single integer $1 \le n \le 100$. The second line contains n space-separated integers $-10\,000 \le a_1, a_2, \ldots, a_n \le 10\,000$ written on the stairs.

Output file format

On the first and only line print a single integer—the maximum possible climb sum on the given ladder.

Sample tests

ladder.in	ladder.out
2 1 2	3
2 2 -1	1
3 -1 2 1	3

Problem B. Rabbit

Input filename:	`lepus.in`
Output filename:	`lepus.out`
Time limit:	2 seconds
Memory limit:	256 Mb

The rabbit jumps along the line. There are n cells on this line, indexed by numbers from 1 to n. Some cells are swamps, and the rabbit cannot land into them. Other cells contain tasty grass, a rabbits' beloved snack.

The rabbit starts at the cell with index 1 and wants to get to the cell with index n. It wants to eat as much grass along the way as possible, without landing into the swamp. The rabbit's design features mean that it can only jump 1, 3, and 5 cells to the right.

Determine what is the maximum number of cells with grass that a rabbit can visit.

Input file format

The first line contains a single integer $2 \le n \le 1000$. The second line has a string w of length n. `'w'` corresponds to a swamp, `'"'` corresponds to grass, and `'.'` corresponds to an empty cell. You may assume that the first and the last cell do no contain neither grass nor swamps.

Output file format

On the first and only line print a single integer—the maximum possible number of cells with grass that a rabbit can visit on his path. Print -1 if it cannot reach the destination print -1.

Sample tests

ladder.in	ladder.out
4 ."".	2
5 .w"..	0
9 .www.www.	-1

Problem C. Knight's move

Input filename:	`knight.in`
Output filename:	`knight.out`
Time limit:	1 second
Memory limit:	256 Mb

You are given a rectangular board $N \times M$, with a chess knight in the top left corner. The knight can only move downwards, and to the right, that's it:

- two squares down and one to the right;
- one square down and two to the right.

Find the number of different ways the knight can take to reach the bottom-right corner of the board.

Input file format

The first line contains two space-separated integers $1 \leq N, M \leq 50$.

Output file format

On the first and only line print the number of different knight paths.

Sample tests

knight.in	knight.out
3 2	1
31 34	293930

Problem D. Path Cost

Input filename:	king2.in
Output filename:	king2.out
Time limit:	1 seconds
Memory limit:	256 Mb

Every square of an 8×8 chessboard has a non-negative number written on it. The king wants to move from the lower-left corner of the board to the upper right corner, but it can only walk upwards, to the right, and diagonally to the upper right. The cost of visiting a square is equal to the number written on it.

Move the knight from the lower-left corner of the board to the upper right corner with minimum path cost.

Input file format

Eight lines of the input contain eight non-negative integers up to 1000 each. Lower left corner is guaranteed to be 0.

Output file format

On the first and only line print a single integer—the minimum path cost.

Sample tests

king2.in	king2.out
9 9 9 9 9 9 1 9 9 9 9 9 9 1 9 2 9 9 9 9 9 9 1 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 0 9 9 9 9 9 9 9	56

Problem E. Slalom

Input filename:	`slalom.in`
Output filename:	`slalom.out`
Time limit:	2 seconds
Memory limit:	256 Mb

One of the popular ski resorts in Italy hosts a slalom competition. Every participant will go down the mountain on the skis. On every path of the path, the participant will get some number of points. As the participant goes down, we add these points together. The participant with the maximum number of points wins. The mountain is a triangle of integers, representing points for parts of the path. Participants may choose whether to go left or right on every layer as they go down to the next layer. The participants start in the highest number and may finish in any of the lowest.

For example, the mountain can look like this:

```
   1
  4 3
 5 6 7
8 9 0 9
```

Find the maximum number of points that one can score.

Input file format

The first line of the input file contains one positive integer $1 \le n \le 100$, representing the number of layers. The following n lines contain the description of layers, with i numbers $-100 \le a_{i,1}, a_{i,2}, \ldots, a_{i,i} \le 100$ in the i-th row.

Output file format

On the first and only line print the maximum score possible.

Sample tests

slalom.in	slalom.out
4 1 4 3 5 6 7 8 9 0 9	20

Problem F. Cannonballs

Input filename:	balls.in
Output filename:	balls.out
Time limit:	2 seconds
Memory limit:	256 Mb

Captain Vasya always keeps some cannonballs on his ship if he ever needs to fight with the pirates. He stores the cannonballs in the pyramids. Each layer of the pyramid is an equilateral triangle of side k filled with cannonballs. The lowest layer of the pyramid has side n, the next layer has $n-1$, ..., and the last layer is a single cannonball, i.e. the triangle of side 1.

For example, a pyramid of size 3 consists of the following layers (from top to bottom):

```
  X

  X
 X X

  X
 X X
X X X
```

Clearly, a single pyramid can contain only $1, 4, 10, 20, \ldots$ cannonballs.

However, Vasya wants to take exactly m cannonballs. What is the minimum number of pyramids he will need?

Input file format

The first line contains the number of test cases $1 \le T \le 20$. The following m lines have one number each, the number $1 \le m_i \le 300\,000$ of cannonballs in the i-th test.

Output file format

For every test case print the minimum number of pyramids on the separate line.

Sample tests

balls.in	balls.out
5 1 5 9 15 91	1 2 3 3 2

Problem G. Longest Path

Input filename:	`longpath.in`
Output filename:	`longpath.out`
Time limit:	2 seconds
Memory limit:	256 Mb

Find the longest path in a given directed acyclic graph.

Input file format

The first line contains two integers: the number of vertices $n \leq 10\ 000$ and number of edges $m \leq 100\ 000$. The following m lines contain edges' descriptions in the form $1 \leq b_i, e_i \leq n$, where b_i is the beginning, and e_i is the end of the i-th edge.

It s guaranteed that the input graph has neither cycles nor loops.

Output file format

On the first and only line print the maximum possible path length in the given graph.

Sample tests

longpath.in	longpath.out
5 5 1 2 2 3 3 4 3 5 1 5	3

Problem H. Peaceful Sets

Input filename:	`peacefulsets.in`
Output filename:	`peacefulsets.out`
Time limit:	2 seconds
Memory limit:	256 Mb

We call a set of positive integers *peaceful*, if any two of its elements differ at least two times. We call the sum of the elements of the set its *strength*. Find the number of peaceful sets of a given strength.

Input file format

The first line contains a single integer $1 \leq n \leq 2000$.

Output file format

On the first and only line print a single integer—the number of peaceful sets of strength n.

Sample tests

peacefulsets.in	peacefulsets.out
2	1
5	2

Problem I. Knapsack

Input filename:	`knapsack.in`
Output filename:	`knapsack.out`
Time limit:	1 seconds
Memory limit:	64 Mb

You came across a buried treasure, consisting of N golden ingots with given weights. Find the maximum total mass of gold that you can take if you only have a knapsack of capacity S.

Input file format

The first line contains two integers $1 \le S \le 10\ 000$ and $1 \le N \le 300$. The second line contains N space-separated integers $0 \le w_1, w_2, \ldots, w_n \le 100\ 000$, representing the ingots' weights.

Output file format

On the first and only line print a single integer—the maximum possible total mass of gold you can put in your knapsack.

Sample tests

knapsack.in	knapsack.out
10 3 1 4 8	9
20 4 5 7 12 18	19

Problem J. Bad Substring

Input filename:	`badsubs.in`
Output filename:	`badsubs.out`
Time limit:	2 seconds
Memory limit:	256 Mb

Find the number of strings consisting of letters `'a'`, `'b'`, `'c'` of the given length n and without a substring `"ab"`.

Input file format

The first line contains a single integer $1 \le n \le 22$.

Output file format

On the first and only line print the number of such strings.

Sample tests

ladder.in	ladder.out
0	1
3	21
11	46368

Problem K. Josephus Problem

Input filename:	`joseph.in`
Output filename:	`joseph.out`
Time limit:	2 seconds
Memory limit:	64 Mb

N children are standing in the circle. They start counting clockwise. Whenever someone gets number P, they leave the circle, the counter is reset, and counting contains from their right neighbour.

The last man standing wins.

Find the winning number (children are indexed 1 to N, starting from the same child that the count begins from).

Input file format

The first line contains two integers $1 \leq N, P \leq 10^6$.

Output file format

Print the winning number on the first and only line.

Sample tests

joseph.in	joseph.out
3 4	2