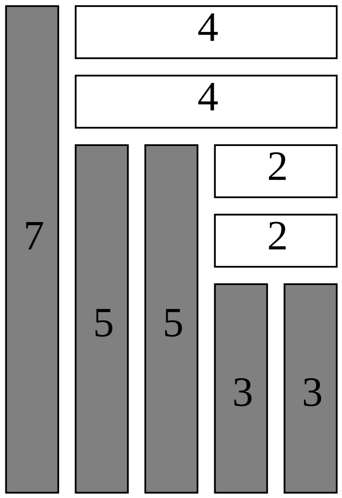
Problem A- Orthogonal Bar Graphs



Some bar graphs fill the plane such that the empty space (also referred to as the *negative space*) can be filled by an orthogonal bar graph. Some cannot, but would if you permuted its columns.

The problem is this: given a bar graph, find its orthogonal bar graph.

Input Specification:

The input begins with an integer t denoting the number of test cases that follow. Each test case will be a positive integer n, the number of bars, and then n positive integers denoting the lengths of each bar. In all cases, $n \leq 100000$, and the lengths of the bars will not exceed 1000000.

Output Specification:

Your program will output a sequence of integer pairs, N L, one per line, separated by a single space. The pair will represent N bars of length L in the orthogonal bar graph. Present them in order of increasing lengths. Terminate the output of each test case (even the last test case) by a single blank line.

Sample Input:

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

Sample Output:

```
3 1
4 2

2 2
2 4
```

Problem B- Binary Conversions

0110111001011110111
10001001101010111100
1101111011111100001000110
010100111010010101101101
0111110001100111010110111100
11101111101111110000010000 1......

It is well known that the decimal expansion of 1/3 is never-ending. Eventually, you have to chop the number, losing some precision.

Binary numbers experience the same problem. Even the decimal number 0.2 gives a repeating decimal that looks like 0.0011001100110011... which must be chopped or rounded at some point.

Input Specification:

Each line of input presents a single test case: a string of decimal digits, no longer than 120 characters long. There will be no extraneous spaces in the input.

The input ends on EOF.

Output Specification:

For each test case, determine if its binary representation is exact or loses some precision. Output "`Exact.`" or "`Some precision lost.`" as appropriate.

Sample Input:

```
0.75
0.2
0.625
```

Sample Output:

```
Exact.
Some precision lost.
Exact.
```

Problem C- Campsite

You are going camping in a local forest! But first, you need to find an appropriate clearing for the campsite. You have obtained a map that shows precise locations of all the trees in the forest. To find a campsite, you will pick three trees such that

- no other tree is inside the resulting triangle; and
- the triangle has the largest possible area.

Input Specification:

The first line of the input contains the positive integer $T \leq 20$, the number of test cases to follow. Each test case starts with an integer N, the number of trees ($3 \leq N \leq 200$). N lines giving the tree coordinates follow. Each line will contain two integers X_i and Y_i. The absolute value of each coordinate will be at most 10000. No two trees in a test case will have the same coordinates.

Output Specification:

For each test case, print "`Case #k: A`", where k is the 1 or 2-digit test case number (starting from 1) and A is the area of the largest empty triangle of trees in the forest. Print the area to one decimal place.

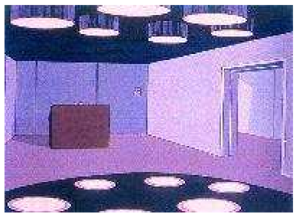
Sample Input:

```
2
3
0 0
1 1
-1 0
4
0 0
0 1
0 2
0 3
```

Sample Output:

```
Case #1: 0.5
Case #2: 0.0
```

Problem D- Quantum teleporters



It's the future, and all public transit has been replaced with a network of Quantum Teleporters^{tm}! Unfortunately they have a peculiar feature- each teleporter can be in one of two states (let's call them A and B), and you won't know what the states are until you take the entire trip (just like quantum states!).

The states affect the time it takes to be teleported from one place to another. The travel time between two connected teleporters depends on the states they ended up in: AA, AB, BA or BB. Four possible states mean four possible travel times. You need to get to a programming contest and since you absolutely cannot be late, you need to find the path with the smallest guaranteed total time. (That is, once you choose the path, you should assume the states will be in the worst possible configuration.)

Input Specification:

The first line of the input contains a nonnegative integer $T \leq 20$, the number of test cases to follow. Each test case starts with a line containing two integers: N, the number of teleporters, themselves numbered from 0 to $N-1$ ($2 \leq N \leq 50$), and M, the number of teleporter connections. M lines follow, each containing six integers: U, V, $A_U A_V$, $A_U B_V$, $B_U A_V$, $B_U B_V$; which describe a two-way connection between teleporters U and V, with travel times that depend on the states of U and V. Travel times are integers in the range 0 to 10 inclusive.

In the data, there will be at most one connection between each pair of teleporters and no teleporter will be connected to itself. You start at teleporter 0 and the programming contest is at teleporter 1. There will always be a route from 0 to 1.

Output Specification:

For each test case, output the smallest time you can guarantee the trip will take. Output one case per line.

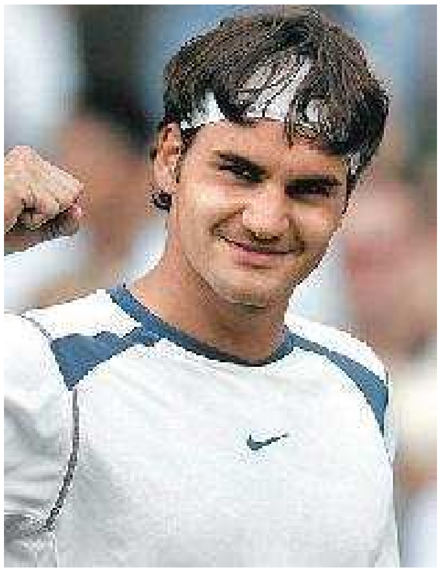
Sample Input:

```
1
3 2
0 2 1 10 1 10
2 1 9 9 1 1
```

Sample Output:

```
11
```

Problem E- Tennis probability



You know how a *game* is scored in tennis? A game consists of *points*. A point is started with a serve and continues until one of the players fails to return the ball properly. The first player to score four or more points, while leading by at least two, wins the game. (As an aside, a tennis match consists of sets, which consist of games, but we are only concerned with games in this problem).

Suppose you are watching a tennis match and you know the probability that your favorite player will win a point against his current opponent. You assume that all points are independent (the player does not get discouraged after a long losing streak and vice versa). What is the probability that the player will win a game?

Input Specification:

The first line of the input contains a nonnegative integer $T \leq 200$, the number of test cases to follow. Each of the next T lines contains a single floating point number p the probability that the player will win a point ($0 \leq p \leq 1$).

Output Specification:

For each test case, print one line: the probability that the player will win a game, rounded to 5 decimals.

Sample Input:

```
2
0
1.0
```

Sample Output:

```
0.00000
1.00000
```

Problem F- Trophy Case

Igor has won so many ACM trophies that he wants to put them on display for his equally many girlfriends to swoon over. They will appear, side-by-side, on his mantle.

To display the trophies properly, the tallest one must be in the middle somewhere (duh). The trophies that appear on either side must be successively shorter. Put another way, a *proper display* of trophies will be a sequence of trophies of increasing heights, until the tallest trophy, followed by a sequence of trophies of decreasing heights.

Naturally, there are many proper displays, but not all are as *attractive* as others. Measure the attractiveness by the differences in width of adjacent trophies. The lower the total differences are, the more attractive is the display.

Input Specification:

The input will be a series of test cases, presented one line at a time, and terminated by EOF. Each line will be a series of positive integers, the first of which is $n \leq 450$, the number of trophies. Then there will be n pairs of positive integers h_i w_i, which describe the height and width of each trophy. The trophies will be input by increasing heights. All heights are distinct.

Output Specification:

For each test case, output the best attractiveness score for Igor's trophies.

Sample Input:

```
3 5 1 6 4 7 2
5 5 1 6 4 7 8 8 2 10 5
```

Sample Output:

```
3
11
```