1a. Counting primes

Standard Bank

Introduction

A prime number is an integer greater than 1 that is only divisible by 1 and itself.

Task

Write a program to count the number of primes there are between 1 and N inclusive, for various N.

Example

If N is 15, then there are six primes between 1 and N inclusive: 2, 3, 5, 7, 11 and 13.

Input

The first line of input contains the integer T, the number of test cases. Each test case consists of a single line containing the integer N for that test case.

Sample input

```
3
15
5
100
```

Output

For each test case, output a line of the form

```
Case #X: P
```

where X is the test case number, starting from 1, and P is the number of primes between 1 and N inclusive.

Sample output

```
Case #1: 6
Case #2: 3
Case #3: 25
```

Constraints

- $1 \leq T \leq 20$
- $1 \leq N \leq 10\,000$

2. Stock trading

Standard Bank

Introduction

For reasons understood only by stock-brokers, one of the signs of a good stock trading strategy is to always buy a stock for less than one previously bought it for.

Task

You've been asked to help measure the performance of some stock-brokers by looking at the history of prices for a stock. You will be provided with a list of prices, and must determine the maximum number of times this stock could have been bought while paying strictly less for it each time.

Example

Suppose that a stock has had historical prices of R10, R5, R30, R25, R23, R25, R20, R24 and R22. Then the maximum number of times it could be bought would be 4, buying it for R30, R25, R24 and R22. Notice that the price must *strictly* decrease each time, so it cannot be bought twice for R25.

Input

The first line of input contains an integer T, the number of test cases. T test cases follow.

The first line of each test case is an integer N, the number of prices that will be provided. The next N lines will each contain an integer stock price P_i, in the order that the prices occurred.

Sample input

```
2
9
10
5
30
25
23
25
20
24
22
2
1
5
```

Output

For each test case, output a line of the form

```
Case #X: M
```

where X is the test case number, starting from 1, and M is the maximum number of times at which the stock could have been bought while paying strictly less for it each time.

Sample output

```
Case #1: 4
Case #2: 1
```

Constraints

- $1 \leq T \leq 20$
- $1 \leq N \leq 1\,000$
- $1 \leq P_i \leq 10\,000$

3. Average profit

Standard Bank

Introduction

Banks always like to tell customers how much money they are making for them, in the hope that they will invest more. One way this could be described is to indicate the average daily profit made over some period of time.

Task

The bank would obviously like to make the most favourable such statement it can (i.e., find the period for which the average daily profit is the highest). However, it will only consider periods of at least a M days, since the customers will be suspicious if they indicate the profit over too short a period to be meaningful.

Example

Suppose that the bank made the following amounts for the customer over a number of days: R15, −R10, R10, R11, R10, R2, R10, R9, R11, R1; and that it wants to tell the customers about a period of at least 4 days. Then it can announce that from the 3rd to the 9th day (inclusive), it made an average of R9 a day.

Input

The first line of input contains an integer T, the number of test cases. T test cases follow.

The first line of each test case contains two integers, N and M, separated by a space. The next N lines each contain an integer P_i, the profit (or loss, if negative) that the bank made on day i. Days are numbered from 1 to N.

Sample input

```
1
10 4
20
-50
10
11
10
2
10
9
11
1
```

Output

For each test case, output a line of the form

```
Case #X: A B
```

where X is the test case number, starting from 1, and the maximum average daily profit was made in the period starting on day A and ending on day B (both inclusive). If there is a tie, output the longest period (maximum value of $B - A$). If there is still a tie, output the most recent period (maximum value of A).

Sample output

```
Case #1: 3 9
```

Constraints

- $1 \leq T \leq 10$
- $1 \leq M \leq N \leq 1\,000$
- $-10\,000 \leq P_i \leq 10\,000$