Nomura Algo Trading Developer Quiz

Instructions

1. You agree not to disclose the quiz.

2. You are not allowed to discuss the questions with anyone.

3. Each problem specifies an input format to read different test cases, and an output format to provide the solutions for the given test cases. The input should be read from the standard input and results written to standard output.

4. Please provide a C/C++ implementation for each problem. Submissions without an implementation for all problems will not be considered.

5. The performance of each solution matters: consider how to minimise both the execution time and memory usage.

6. Provide any documentation, test cases, or any other material that you consider relevant to support the correctness of your solutions. Please do not submit binaries.

7. Where possible submit all materials in a single zip file. Please do not use any other archive format.

Problem 1 - What is the Median?

Median plays an important role in the world of statistics. By definition, it is a value which divides an array into two equal parts. In this problem you are to determine the current median of some long integers.

Suppose we have five numbers {1, 3, 6, 2, 7}. In this case, 3 is the median as it has exactly two numbers on its each side. {1, 2} and {6, 7}.

If there are even number of values like {1, 3, 6, 2, 7, 8}, only one value cannot split this array into equal two parts, so we consider the average of the middle values {3,6}. Thus, the median will be (3+6)/2 = 4.5.

In this problem, you have to print only the integer part, not the fractional. As a result, according to this problem, the median will be 4!

Input

The input consists of series of integers X (0 <= X < 2^31) and total number of integers N is less than 10000. The numbers may have leading or trailing spaces.

Output

For each input print the current value of the median.

Sample Input	Sample Output
1 3 4 60 70 50 2	1 2 3 3 4 27 4

Problem 2 - Squares

A square is a 4-sided polygon whose sides have equal length and adjacent sides form 90-degree angles. It is also a polygon such that rotating about its centre by 90 degrees gives the same polygon. It is not the only polygon with the latter property, however, as a regular octagon also has this property.

So we all know what a square looks like, but can we find all possible squares that can be formed from a set of stars in a night sky? To make the problem easier, we will assume that the night sky is a 2-dimensional plane, and each star is specified by its x and y coordinates.

Input

The input consists of a number of test cases. Each test case starts with the integer n (1 <= n <= 1000) indicating the number of points to follow. Each of the next n lines specify the x and y coordinates (two integers) of each point. You may assume that the points are distinct and the magnitudes of the coordinates are less than 20000. The input is terminated when n = 0.

Output

For each test case, print on a line the number of squares one can form from the given stars.

Sample Input	Sample Output
4 1 0 0 1 1 1 0 0 9 0 0 1 0 2 0 0 2 1 2 2 2 0 1 1 1 2 1 4 -2 5 3 7 0 0 5 2 0	1 6 1

Problem 3 - Gold Coins

The king pays his loyal knight in gold coins. On the first day of his service, the knight receives one gold coin. On each of the next two days (the second and third days of service), the knight receives two gold coins. On each of the next three days (the fourth, fifth, and sixth days of service), the knight receives three gold coins. On each of the next four days (the seventh, eighth, ninth, and tenth days of service), the knight receives four gold coins. This pattern of payments will continue indefinitely: after receiving N gold coins on each of N consecutive days, the knight will receive N+1 gold coins on each of the next N+1 consecutive days, where N is any positive integer.

Your program will determine the total number of gold coins paid to the knight in any given number of days (starting from Day 1).

Input

Each line of the input (except the last one) contains data for one test case of the problem, consisting of exactly one integer (in the range 1..10000), representing the number of days. The end of the input is signaled by a line containing the number 0.

Output

There is exactly one line of output for each test case. This line contains the number of days from the corresponding line of input, followed by one blank space and the total number of gold coins paid to the knight in the given number of days, starting with Day 1.

Sample Input	Sample Output
10 6 7 11 15 16 100 10000 1000 21 22 0	10 30 6 14 7 18 11 35 15 55 16 61 100 945 10000 942820 1000 29820 21 91 22 98

Problem 4 – SuperSale

There is a SuperSale in a SuperHiperMarket. Every person can take only one object of each kind, i.e. one TV, one carrot, but for an extra low price. We are going with a whole family to the SuperHiperMarket. Every person can take as many objects as he/she can carry from the SuperSale. We are given a list of objects with their respective price and weight. We also know the maximum weight that every person can stand. What is the maximal value of objects we can buy at SuperSale?

Input

The input consists of T test cases. The number of them (1<=T<=1000) is given on the first line of the input file. Each test case begins with a line containing a single integer number N that indicates the number of objects (1 <= N <= 1000). Then follows N lines, each containing two integers: P and W. The first integer (1<=P<=100) corresponds to the price of object. The second integer (1<=W<=30) corresponds to the weight of object. Next line contains one integer (1<=G<=100) it's the number of people in our group. Next G lines contains maximal weight (1<=MW<=30) that can stand this i-th person from our family (1<=i<=G).

Output

For every test case your program has to determine one integer. Print out the maximal value of goods which we can buy with that family.

Sample Input	Sample Output
2 3 72 17 44 23 31 24 1 26 3 72 17 44 23 31 24 3 26 16 24	72 144