E - Partition

The process of learning an art can be conveniently divided into two parts: one, the domain of theory; the other, the domain of practice.
Erich Fromm

The Problem

In a short time, we will have vaccines for Covid-19. Every day, queues will form at the outpatient clinics for people to get vaccinated.

In each clinic, there will be several medical vaccination teams. Patients will be divided into as many groups as medical teams there are. The people in the queue will be distributed as follows: the first *x* patients will be vaccinated by the first team, the second *y* patients will be vaccinated by the second team, and so on. For example, if there are *p*=3 medical teams, the initial queue will be divided as follows:

$\{p_1\ p_2 \cdots p_x\}\ \{p_{x+1}\ p_{x+2} \cdots p_{x+y}\}\ \{p_{x+y+1}\ p_{x+y+2} \cdots p_{x+y+z}\} \cdots$

where each p_i is the weight of each patient, in kilograms.

The attention time of the patients will be directly proportional to their weight.

The queue must be divided into *p* parts, to minimize the maximum sum of weights of the different ranges, without reordering any of the numbers.

For example, if the initial queue is 10 20 30 40 50 60 70 80 90, and the number of partitions *p*=3, the three partitions will be: {10 20 30 40 50}, {60 70}, {80 90}. The value associated with that partition is the maximum between 150, 130 and 170, that is, 170. Any other partition would make the previous solution worse.

The Input

The first line of the input contains an integer, *t*, indicating the number of test cases.

For each test case, there is a line with one number, *n*, indicating the number of patients, where $2 \leq n \leq 20$. Then, there is a new line with *n* numbers indicating the weights of the patients. Finally, there is another line with one number, *p*, $p < n$, indicating the number of partitions or medical vaccination teams.

The Output

For each test case, the output should consist of a line with an integer number, *T*, indicating sum of weights of the maximum partition in the optimal solution, i.e. the total time to vaccinate all the people.

Sample Input

```
4
9
10 20 30 40 50 60 70 80 90
3
9
10 20 30 40 50 60 70 80 90
```

```
4
9
1 2 3 4 5 6 7 8 9
2
9
9 8 3 9 3 8 4 2 5
2
```

Sample Output

```
170
150
24
29
```