Problem A. Hack a Contest

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Fish just participated in a programming contest. Before the final standing being public, he hacks the database and wants to change his result!

The database he accessed records the number of times he submitted for each problem and the result (AC or not) for each submission. Soon he finds out that even thought the time for each submission is stored in random order, he can not change it at all (neither the number of submissions for each problem). What he can modify is problem id and result for each submission. In order not to make things too strange, there should not be any submissions for a problem after he has already got an AC in this problem in the end.

You must have known that participants are ranked according to the most problems solved and then ranked by least penalty for those in the same place. The penalty is the sum of the time consumed for each problem solved. The time consumed for a solved problem is the time for its first AC submission, plus 20 for every previously not AC submissions for that problem.

Please help Fish find the best result he can get.

Input

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

Then for each test case:

The first line contains two integers N, M, the number of submissions and number of problems.

The second line contains N integers t_i, the time of each submission.

The third line contains M integers c_i, the number of submissions on each problem.

Output

For each test cases, you should output Case x: y, where x indicates the case number starting from 1, and y is the penalty for his best result.

Example

standard input	standard output
2 4 2 10 20 30 40 2 2 4 3 10 20 30 40 1 1 2	Case 1: 100 Case 2: 90

Note

$1 \leq T \leq 100$

$1 \leq N \leq 10^5$

$1 \leq M \leq min(N, 13)$

$1 \leq t_i \leq 300$

$\sum c_i = N$

For 90% test cases: $N \leq 100$

Problem B. Cycle Function

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	256 megabytes

Fish is learning functions! He has a linear function $f(x) = Ax + B$ and N numbers $x_1, x_2, \cdots, x_N$. Now he is curious about for each function $g(x)$ in

$$\left\{\begin{array}{c} g_1(x) = c_1 x + d_1 \\ g_2(x) = c_2 x + d_2 \\ \vdots \\ g_M(x) = c_M x + d_M \end{array}\right\}$$

how to calculate the difference between $f(g(x))$ and $g(f(x))$.

As smart as Fish is, he soon comes up with a function $D(x) = |f(g(x)) - x| + |g(f(x)) - x|$ and uses the sum over $x_1, x_2, \cdots, x_N$ as the difference.

Can you tell him all the differences immediately?

Input

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

Then for each test case:

The first line contains two integers N, M as mentioned above and then two real numbers A, B indicating the given function $f(x) = Ax + B$.

The second line contains N real numbers $x_1, x_2, \cdots, x_N$.

Then M lines follow, each line containing two real numbers c_i, d_i indicating a function $g_i(x) = c_i x + d_i$ mentioned above.

All numbers in the same line are separated by one space.

Output

For each test case, you should output Case x: in the first line, where x indicates the case number starting from 1.

Then M lines follow, the i-th line of which contains a real number representing the difference for given function $g_i(x)$.

Your answers will be considered correct if its absolute error does not exceed 10^{-6}.

Example

standard input	standard output
2 3 2 2.0 3.0 1.0 2.0 3.0 0.4 -2.0 0.6 -5.0 3 2 2.5 2.0 1.0 2.0 3.0 0.4 -2.0 0.6 -5.0	Case 1: 7.800000 28.200000 Case 2: 12.600000 36.900000

Note

$1 \leq T \leq 100$

$1 \leq N, M \leq 10^5$

$-100 \leq A, B, x_i, c_i, d_i \leq 100$

For 90% test cases: $\max(N, M) \leq 1000$

Problem C. Edge, Path, Number

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Fish has a directed graph and there is a label attached to each edge. A label is an integer ranging from $[0, 9]$. If he chooses a vertex as start point, moves along K edges in the graph, and writes down the labels in the edges walking through as $l_1, l_2, \cdots, l_K$, he can easily concatenate them to get a decimal integer $l = \overline{l_1 l_2 \cdots l_K}$.

Now he wonders, given P and X, how many ways he can move so as to get a number l satisfying $l \equiv X \pmod{P}$. Two ways are considered different if the order of edges walking through is different.

Input

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

Then for each test case:

The first line contains five integers N, M, K, P, X as mentioned above, separated by one space .

Then M lines follow, each line containing three integers u, v, w which means that there exists an edge from node u to node v with label w.

Output

For each test case, you should output Case x: y, where x indicates the case number starting from 1 and y is the number of ways.

Since y can be very large, you should output $y \bmod (10^9 + 7)$ instead.

Example

standard input	standard output
3 4 4 3 3 0 1 2 1 2 3 1 3 4 1 4 1 1 4 4 3 2 1 1 2 1 2 3 1 3 4 2 4 1 1 4 4 4 1111 0 1 2 1 2 3 1 3 4 1 4 1 1	Case 1: 4 Case 2: 3 Case 3: 4

Note

$1 \leq T \leq 100$

$1 \leq N \leq 100$

$1 \leq M \leq 1000$

$1 \leq K \leq 8$

$1 \leq P < 10^K$

$0 \leq X < P$

For 90% test cases: $N \leq 20$, $M \leq 100$, $K \leq 6$

Problem D. Farm

Input file:	`standard input`
Output file:	`standard output`
Time limit:	14 seconds
Memory limit:	512 megabytes

Fish is retired from programming, so he goes back home and becomes a farmer.

It is important to know the total sunshine time for a specific position in a day. If we assume that his farm is a segment from $(0, 0)$ to $(W, 0)$, the sun above can be seen to move from $(0, H)$ to (W, H) at a constant speed. Whatever the precise value for the speed is, what we care is just the relevant sunshine time in a day, which is the ratio of actual sunshine time to the total time for the sun moving from the start to the end.

At the same time, there are N stationary clouds on the sky in a day, and each cloud can be regarded as a segment paralleling to the farm. You should know that the light moves straightly, so the clouds may block the sunshine in some time for some places.

Please help Fish figure out the relevant sunshine time in a day for some positions.

Input

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

Then for each test case:

The first line contains four integers N, W, H, Q, the number of clouds, and range of the farm, the height of the sun and the number of queries.

Then N lines follow, each line containing three integers x_1, x_2, y, which means that there is a cloud from (x_1, y) to (x_2, y).

Then Q lines follow, each line containing one integer x, which means that Fish wants to know the answer for position $(x, 0)$.

Output

For each test case, you should output Case x: first, where x indicates the case number starting from 1. Then Q lines follow, each line containing a real number representing the answer.

Your answer will be consider correct if its absolute error does not exceed 10^{-6}.

Example

standard input	standard output
2 1 4 4 5 1 3 2 0 1 2 3 4 2 4 4 5 1 2 2 2 3 3 0 1 2 3 4	Case 1: 0.50000000 0.25000000 0.00000000 0.25000000 0.50000000 Case 2: 0.50000000 0.33333333 0.16666667 0.41666667 0.66666667

Note

$1 \le T \le 100$

$1 \le N \le 1000$

$1 \le W, H \le 10^6$

$1 \le Q \le 10^5$

$0 \le x_1 < x_2 \le W$

$1 \le y < H$

For 90% test cases: $N \le 100$, $Q \le 1000$