ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Exercise – *India*

Twenty days after their departure from London, Phileas Fogg and his travel companion Jean Passepartout reach Bombay and set foot on Indian soil. To arrive in India a bit early, Fogg did pay some large amount of money to accelerate their steamboat and thus Fogg's former fortune is slowly shrinking. But traveling through India should be quick and cheap thanks to a new railway section straight to Calcutta. Or at least so they thought...

Unfortunately, the train tracks from Bombay to Calcutta are still incomplete. A fifty mile long segment in the middle from Kholby to Allahabad is missing. Fifty miles are too far for Fogg and Passepartout to just walk, because they brought many more suitcases with them than they can possibly carry themselves. So Fogg asked around and found some guides that are willing to transport his luggage using elephants, at least for parts of their missing journey.

For each guide, Fogg learned in which city the guide lives. Each guide trained all his elephants to bring goods to a single other city. Elephants are very clever, hence each elephant knows how to walk to this other city on his own. Unfortunately, the elephants can not find the way back to their guide though and therefore can only be used to walk their route at most once. Fogg also learned how much each guide charges per elephant and how many elephants each guide owns. Each elephant can carry at most one suitcase.

The guides and their elephants are very reliable. Hence, Phileas Fogg is confident that his belongings will arrive safely and quickly even if he sends different suitcases using different routes and using multiple elephants. Fogg computed how much of his remaining money he is willing to spend on elephant transportation and is now wondering how many of his countless suitcases he can possibly have delivered to Allahabad without exceeding his budget.

Input The first line of the input contains the number $t \leqslant 30$ of test cases. Each of the t test cases is described as follows.

- It starts with a line that contains five integers `c g b k a`, separated by a space. They denote
    - c, the number of cities $p_0, \ldots, p_{c-1}$ in India ($2 \leqslant c \leqslant 10^3$);
    - g, the number of guides in India ($0 \leqslant g \leqslant 5 \cdot 10^3$);
    - b, the total budget that Fogg is willing to spend on luggage transportation by elephants ($0 \leqslant b \leqslant 10^9$);
    - k, the number of the city p_k where Kholby is located ($0 \leqslant k \leqslant c - 1$);
    - a, the number of the city p_a where Allahabad is located ($0 \leqslant a \leqslant c - 1$ and $k \neq a$).
- The following g lines define the guides in India. Each line contains four integers `x y d e`, separated by a space and such that $0 \leqslant x \leqslant c - 1$, $0 \leqslant y \leqslant c - 1$, $1 \leqslant d \leqslant 10^3$, and $1 \leqslant e \leqslant 10^3$. Such a line describes a guide that owns e elephants and is willing to send them with one suitcase per elephant from city p_x to city p_y at a cost of d per elephant.

Note: Several guides may be willing to transport suitcases between the same pair of cities.

Output For each test case output one line with a single integer that denotes the maximum number of suitcases that Phileas Fogg can afford to have transported from Kholby to Allahabad without exceeding his budget.

Points There are four groups of test sets, each of which is worth 20 points. For each group there is also a corresponding hidden test set that is worth 5 points. So, there are $4\cdot20+4\cdot5 = 100$ points in total.

1. For the first group of test sets, you may assume that the budget is sufficient to transport either zero or at most one suitcase.

2. For the second group of test sets, you may assume that the budget is large enough to pay what all guides collectively ask for (to use all elephants available altogether for transporting suitcases).

3. For the third group of test sets, you may assume that the budget is sufficent to transport at most ten suitcases.

4. For the forth group of test sets, there are no additional assumptions.

Corresponding sample test sets are contained in `testi.in/out`, for $i \in \{1, 2, 3, 4\}$.

Sample Input

```
3
3 3 3 0 2
0 1 2 3
0 2 4 1
1 2 1 2
3 3 9 0 2
0 1 2 3
0 2 4 1
1 2 1 2
3 3 10 0 2
0 1 2 3
0 2 4 1
1 2 1 2
```

Sample Output

```
1
2
3
```