SIENAcollege
Computer Science

34th Annual High School Programming Contest

Sponsored by transfinder

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Gold Problem #6: The Transfinder Problem

Background Information: You are in control of a busing system, where you have $n <= 10$ bus routes that you can use to travel to stations numbered from 1 to $p <= 1000$. You are always starting at station number 1. You are given the bus schedule for the day, which is a list of station numbers that the buses on each route will stop to pick up and drop off passengers, and the ordering which they do so. Your task is to determine the number of different ways you can travel from station 1 to station p.

For example, on a trip to from station 1 to station 10, you have

- One bus route that stops at every station
- One bus route that stops at stations 1, 4, and 10

There are 4 ways to do this. The first two are simple: you can travel on the first or second bus route from 1 all the way to 10. The other two involve transfers. You could start on the first bus route, take it to station 4, then transfer from the first bus route to the second bus route at station 4, and take the second bus route to station 10. You could start on the second bus route, take it to station 4, then transfer from the second bus route to the first bus route at station 4, and take the first bus route to station 10.

Note that each bus route does not have to stop at station 1, nor does each bus route have to stop at station p. If we were to have one bus route that stops only at 1, 5, and 10, and another that had stops only at station 6 and station 9, the second route would not be useful for our travels, since we must start on the route that has a stop at 1, and we have no way to get to station 6 to switch to the the other bus route.

Programming Problem:

Input: The destination station number p, followed by the number of bus routes n, on separate lines. Then, you will read in n pairs of lines, the first in each pair being the number of stops k, and the next line being k increasing numbers on the interval [1, p] representing the stations at which this bus route has stops.

Output: The number of different ways you can travel from station 1 to station p.

Example 1: Input:

```
10
2
10
1 2 3 4 5 6 7 8 9 10
3
1 4 10
```

Output:

```
4
```

Example 2: Input:

```
10
2
3
```

```
1 5 10
2
6 9
```

Output:
```
1
```

Example 3: Input:
```
13
3
13
1 2 3 4 5 6 7 8 9 10 11 12 13
7
1 3 5 7 9 11 13
4
1 5 9 13
```

Output:
```
125
```

Example 4: Input:
```
8
2
3
1 4 7
3
2 5 8
```

Output:
```
0
```

Some hints on reading the input for this problem are below.

Hints on reading this input:

As you can see, you will need to read a line with several numbers that are on the same line of input into variables (likely an array). In case this is not something you have done before, we give some tips below.

In Python, this function will read a line of input known to contain 1 or more space-separated integer values and will return an array of those values as integers:

```
def input_to_intarray():
    arr = input().split()
    for i in range(len(arr)):
        arr[i] = int(arr[i])
    return arr
```

Using this, if you would like to read the next line of input into a variable `a`, you could write:

```
a = input_to_intarray()
```

In Java, we are more likely to take advantage of the previous line, which tells us how many numbers to expect on the line of station numbers. Say we read the number of stations into a variable `n`, we could then use the following to read in the numbers from a Scanner `s`, into an array `a`:

```
int a[] = new int[n];
for (int i = 0; i < n; i++) {
    a[i] = s.nextInt();
}
```