ACM-ICPC Live Archive

6472 Powers of Pascal

The *Pascal matrix* is the (infinite) matrix defined by (zero based row and column):

$$Pascal[row, column] = Comb(row, column) \quad \text{for} \quad 0 \le column \le row$$

and zero otherwise, where $Comb(n, k)$ is the number of combinations of n things taken k at a time (the binomial coefficient).

```
1    0    0    0    0    0    0    0    0    0   . . .
1    1    0    0    0    0    0    0    0    0   . . .
1    2    1    0    0    0    0    0    0    0   . . .
1    3    3    1    0    0    0    0    0    0   . . .
1    4    6    4    1    0    0    0    0    0   . . .
1    5   10   10    5    1    0    0    0    0   . . .
1    6   15   20   15    6    1    0    0    0   . . .
1    7   21   35   35   21    7    1    0    0   . . .
1    8   28   56   70   56   28    8    1    0   . . .
1    9   36   84  126  126   84   36    9    1   . . .
.    .    .    .    .    .    .    .    .    .   . . .
.    .    .    .    .    .    .    .    .    .   . . .
.    .    .    .    .    .    .    .    .    .   . . .
```

For this problem, you will write a program to compute entries in powers of the Pascal matrix:

$$Pascal^P = Pascal \times Pascal \times \ldots \times Pascal \ (P \text{ factors})$$

Since the matrix is lower triangular, all powers are lower triangular and only the upper left N by N corner is used in computing coefficients in the upper left N by N corner of the power.

Input

The first line of input contains a single integer K, $(1 \le K \le 1000)$, which is the number of data sets that follow. Each data set should be processed identically and independently.

Each data set consists of a single line of input containing four space-separated decimal integers. The first integer is the data set number. The second integer is the power, P $(1 \le P \le 100,000)$, to which to raise the Pascal matrix. The third and fourth integers give the row number, R, and the column number, C, of the desired entry $(0 \le C \le R \le 100,000)$.

Output

For each data set there is a single line of output. The line consists of the data set number, a single space, which is then followed by the requested entry of the requested *Powers of the Pascal* matrix. Input values will be restricted so results will not overflow a 64-bit integer value.

Sample Input

```
3
1 1 8 3
2 9 21 13
3 200 100000 99998
```

Sample Output

```
1 56
2 8759577256290
3 199998000000000
```