Transpose X37157_en

Write a function `transpose` that returns the transpose of a given non-empty integer matrix M. You will also need to define a procedure `print_matrix` to write the contents of a non-empty matrix in the output.
Recall that transposing a matrix converts rows into columns, and columns into rows. For example, the following matrix:

```
1 2 3
4 5 6
```

is transposed into:

```
1 4
2 5
3 6
```

Use the C++ code below so that your functions will be called with several input cases. You must add code only in the parts marked with ..., respecting the rest and making an adequate use of it with the appropriate calls and declarations.

```
#include <iostream>
#include <vector>
using namespace std;

typedef vector<int> Row;
typedef vector<Row> Matrix;

// Reads a matrix  with n rows and m columns
// from the input and returns it. Assumes
// that the input format is
// a00 ... a0(m-1) a10 ... a1(m-1) ... a(n-1)0 ... a(n-1)(m-1)
Matrix read_matrix(int n, int m)
{
   Matrix M(n, Row(m));
   for (int i = 0; i < n; ++i)
      for (int j = 0; j < m; ++j)
          cin >> M[i][j];
   return M;
}

// prints the given non-empty matrix into the cout; the first line
// gives the number of rows followed by the number
// of columns, then each successive row is printed in
// a different line, with each element of the row
// separated from the next by a blank space,
// and an end-of-line is printed at the end, after the
// last row of the matrix
```

```
void print_matrix(const Matrix& M) {
   ...
}

// returns the transpose of the given non-empty matrix
Matrix transpose(const Matrix& M) {
     ...
}

int main() {
    int n,m;
    while (cin >> n >> m)
        print_matrix(transpose(read_matrix(n, m)));
}
```

Exam score: 2.5 **Automatic part:** 100%

Input

The input consists in a sequence of matrices. For every matrix we have its dimensions $n, m \geq 1$, followed by its elements in row order. Every integer is separated by the next one by a blank space and each row is ended with a line break. Two consecutive matrices are separated by a blank line.

Output

For each matrix in the input sequence, the program prints its transpose. The function print_matrix (to be defined in this problem) must print a first line with the number of rows and columns, then each successive row in a different line, the elements of a row are separated by blank spaces; an end-of-line is also printed after the last line of the matrix.

Sample input 1

```
2 2
1 -1
0 1

1 2
1 -1

2 1
1
-1

2 2
1 -1
0 -1

2 2
1 -1
0 1

2 2
-1 1
0 1
```

```
3 2
1 -1
0 1
1 -1

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

Sample output 1

```
2 2
1 0
-1 1

2 1
1
-1

1 2
1 -1

2 2
1 0
-1 -1

2 2
1 0
-1 1

2 2
-1 0
1 1

2 3
1 0 1
-1 1 -1

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

Sample input 2

```
2 2
1 0
-1 1

2 1
1
-1

1 2
1 -1

2 2
1 0
-1 -1

2 2
1 0
-1 1

2 2
-1 0
1 1

2 3
1 0 1
-1 1 -1

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

Sample output 2

```
2 2
1 -1
0 1

1 2
1 -1

2 1
1
-1

2 2
1 -1
0 -1

2 2
1 -1
0 1

2 2
-1 1
0 1

3 2
1 -1
0 1
1 -1

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

Problem information

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