2.5.3 Transposing a Matrix

- To transpose a matrix we must interchange the rows and columns. This means that each element a[i][j] in the original matrix becomes element b[j][i] in the transpose matrix.

First algorithm

```
for each row i
    take element <i,j,value>
and store it as element <j,i,value>
of the transpose;
```

Problem: If we process the original matrix by the row indices we will not know exactly where to place element <j,i,value> in the transpose matrix until we have processed all the elements that precede it.

	row	col	value
b[0]	6	6	8
[1]	0	0	15
[2]	0	4	91
[3]	1	1	11
[4]	2	1	3
[5]	2	5	28
[6]	3	0	22
[7]	3	2	-6
[8]	5	0	-15

Transpose of example matrix

Eg: (0,0,15) becomes (0,0,15); (0,3,22) becomes (3,0,22); (0,5,-15) becomes (5,0,-15).

- If we place these triples consecutively in the transpose matrix, then, as we insert new triples, we must move elements to maintain the correct order.
- We can avoid this data movement by using the column indices to determine the placement of elements in the transpose matrix.

Second algorithm

```
for all elements in column j
    place element <i,j,value> in element <j,i,value>
```