The most efficient way to store a band matrix is to use **Diagonal-major form,** also known as **Band storage**.

The storage scheme for the given *NxN* band matrix, or more generally for any *MxN* band matrix, is given by the following storage function:

where

…

This storage scheme is only efficient when and are both much less than the size *N* of the original matrix, (i.e. on a very sparse matrix).

**Example:**

With

would be mapped to

NOTE: Matrix entry ‘ \* ‘ signifies a “DONT\_CARE” value that should never be interpreted, and is merely in place to preserve the symmetry of the array

**Size comparison**:

* 5x5 band matrix X of bandwidth 3:
* 3x5 dense matrix A

In this case, storing the sparse banded matrix **X** as a 2D array **A** in band storage form allows for **a 40% reduction in space**. This advantage grows even larger as the scarcity of the matrix increases (i.e. as the number of elements grows larger and larger than the bandwidth. This is because less and less of a proportion of the matrix must actually be stored, so it is the bandwidth that ultimately is most related related to storage space for sparse matrices.