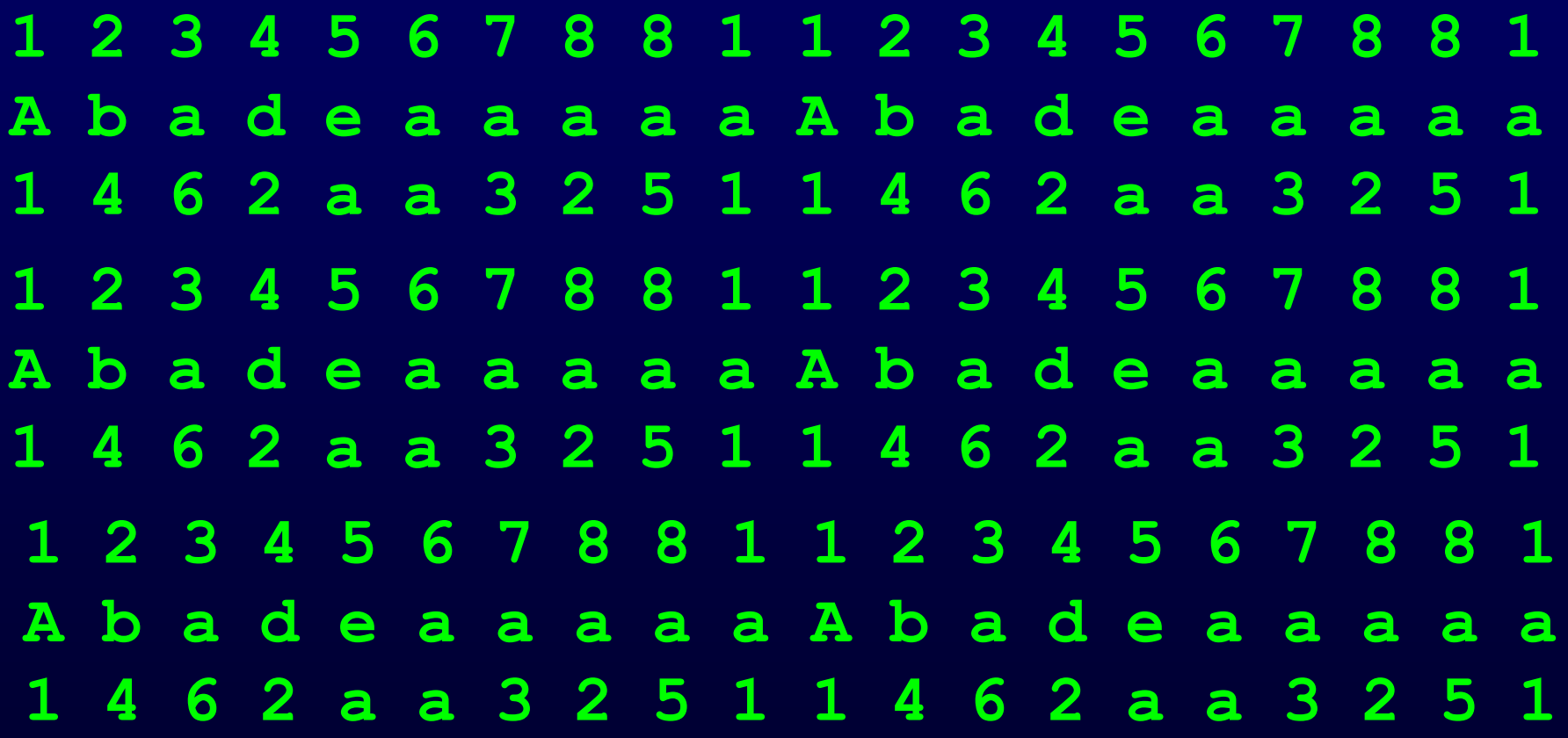
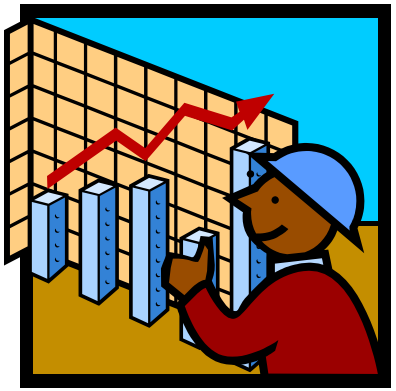
The Matrix



Lab 01

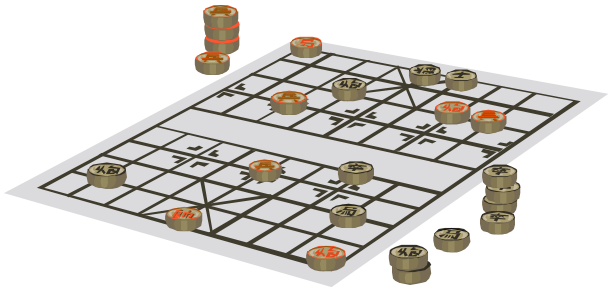
Two-D arrays
Matrices

A two-dimensional array is a one-dimensional array of one-dimensional arrays.



A spreadsheet is a matrix.

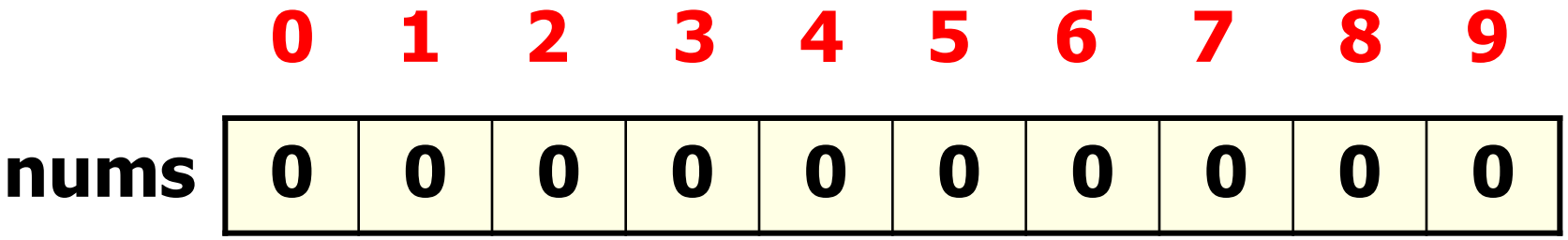
A matrix has rows and columns.



What is an array?

An array is a group of items all of the same type which are accessed through a single identifier.

```
int[] nums = new int[10];
```



Matrices

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

A matrix is filled with 0 values when instantiated. The exact value in the matrix depends on the specified type.

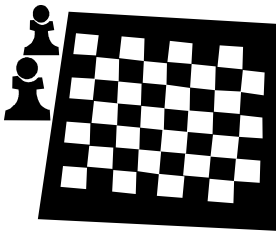
Matrices

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

Each row is a one-dimensional array.

Matrices

	0	1	2	3	4
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

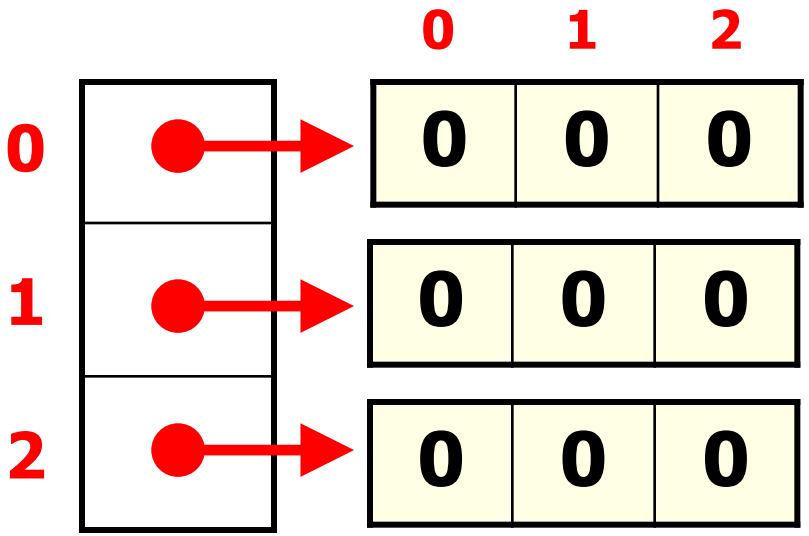


```
int[][] mat = new int[5][5];
```

What is a matrix?

A matrix is an array of arrays.

```
int[][] mat = new int[3][3];
```



open matrixone.java

Matrix Variables

Matrix Variables

```
int size = 40;

int[][] mat = {{5,7,9,2},
               {5,3,4,6},
               {7,0,8,9}};

int[][] intMat = new int[size][size];
      //intMat is filled with zeros - 0s
```

Matrix Variables

```
String[][] words = new String[4][4];
        //words is filled with null

double[][] dMat = new double[3][3];
        //dMat is filled with 0.0
```

Printing Matrix Spots

Printing Spots

```
int[][] mat = {{5,7,9,2},
               {5,3,4,6},
               {7,0,8,9}};

out.println(mat[2][1]);
out.println(mat[1][2]);
out.println(mat.length);
out.println(mat[0].length);
```

OUTPUT

```
0
4
3
4
```

open matrixtwo.java

Printing Matrices

Printing an Array

```
int[] nums = {1,2,3,4,5,6,7};
for(int r=0; r<nums.length; r++)
{
    out.println(nums[r]);
}
```

length returns the # of elements/items/spots in the array!!!

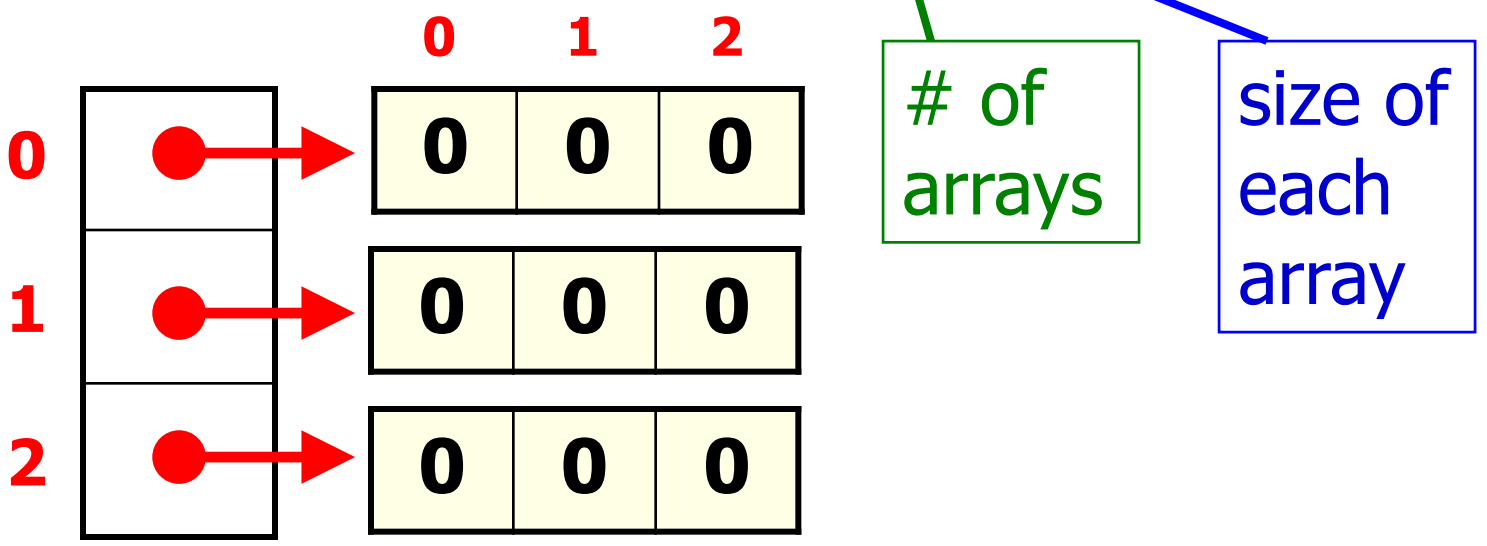
OUTPUT

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

What is a matrix?

A matrix is an array of arrays.

```
int[][] mat = new int[3][3];
```



Printing an Array

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};

out.println(Arrays.toString(mat[0]));

out.println(Arrays.toString(mat[1]));
```

OUTPUT

```
[5, 7]
[5, 3, 4, 6]
```

open matrixoutone.java

Nested Loop Review

```
int outer=1;
      //start      //stop      //increment
for(outer=1;  outer<=2;     outer++)
{
        //start      //stop    //increment
   for(int inner=1;  inner<=2;   inner++)
     out.println(outer + " " + inner);
   out.println();
}
```

OUTPUT

```
1 1
1 2

2 1
2 2
```

open nestedfor.java

Printing a Matrix

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};

for(int r=0; r<mat.length; r++)
{
    for(int c=0; c<mat[r].length; c++)
    {
        out.print(mat[r][c]);
    }
    out.println();
}
```

OUTPUT

```
5 7
5 3 4 6
0 8 9
```

open matrixouttwo.java matrixoutthree.java

open matrixoutfour.java

Setting Matrix Spots

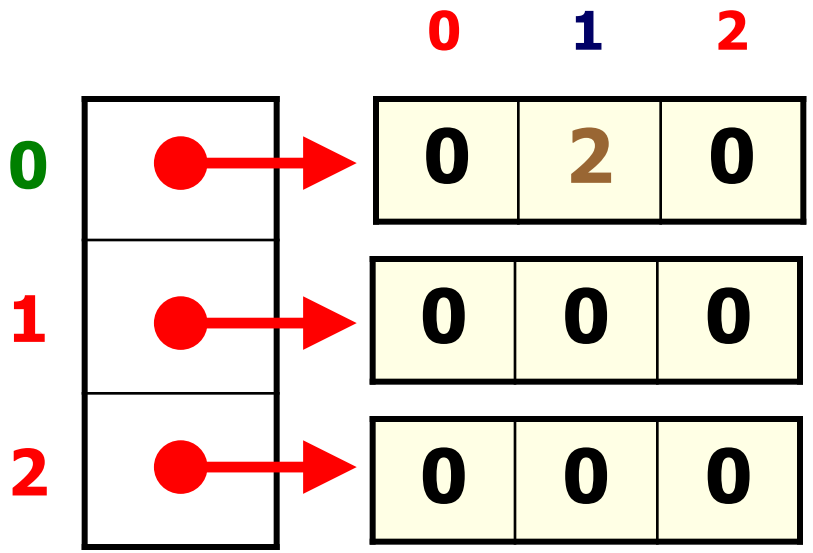
What is a matrix?

A matrix is an array of arrays.

```
int[][] mat = new int[3][3];
mat[0][1]=2;
```

Which array?

Which spot?



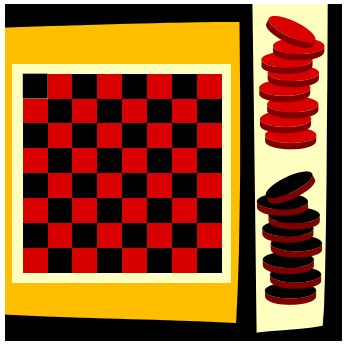
Setting Spots in a Matrix

	0	1	2	3	4
0	0	0	0	5	0
1	0	0	0	0	0
2	0	0	7	0	0
3	0	0	0	0	0
4	0	3	0	0	0

mat[2][2]=7;

mat[0][3]=5;

mat[4][1]=3



Setting Spots in a Matrix

```
for( int r = 0; r < mat.length; r++)
{
  for( int c = 0; c < mat[r].length; c++)
  {
       mat[r][c] = r*c;
  }
}
```

if mat was 3x3

0	0	0
0	1	2
0	2	4

open matrixsetone.java matrixsettwo.java

Matrices As Instance Vars

Matrix Instance Vars

```
class MatrixFun
{
  int[][] mat;          //instance var / data field

  public MatrixFun(int numRows, int numCols)
  {
    mat=new int[numRows][numCols];
  }

  //other methods not shown
}
```

open matrixinstancevars.java

Matrix Extras

matrixinout.java

A complete matrix program.

matrixtotal.java

A matrix program that totals a matrix.

matrixfilereaderfor.java

A matrix program that reads a matrix from a file.

Helpful Hint

2D Matrices like RC.

Rows first - - Columns second

Start work on Lab 01