

A+ Computer Science

MATRICES



Array of 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.



Array of Arrays - Matrices

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

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

0 1 2 3 4 5 6 7 8 9

nums

0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

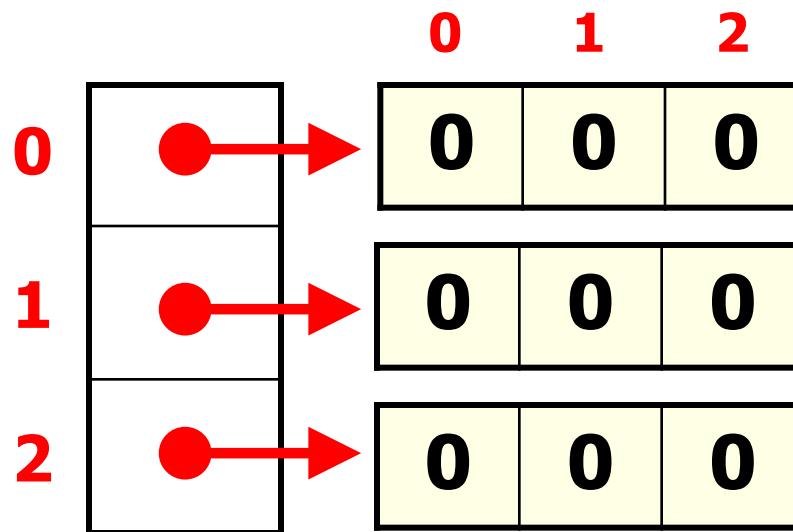
Matrix Variables



Array of Arrays - Matrices

A matrix is an array of arrays.

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

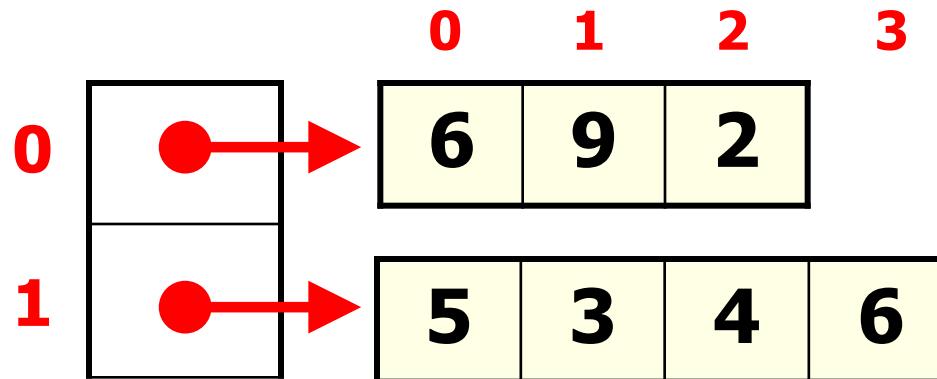




Array of Arrays - Matrices

A matrix is an array of arrays.

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



Array of Arrays - Matrices

```
String[][] words = new String[4][4];  
//words is filled with 16 nulls
```

```
double[][] dMat = new double[3][3];  
//dMat is filled with 9 0.0s
```

```
int[][] mat = new int[5][5];  
//mat is filled with 25 0s
```

matrixone.java

Printing Matrix Values



Array of Arrays - Matrices

```
int[][] mat = {{5,7,9,2,1,9},  
               {5,3,4},  
               {3,7,0,8,9}};
```

```
out.println(mat[2][1]);  
out.println(mat[1][2]);  
out.println(mat[0][3]);  
out.println(mat[2][4]);
```

OUTPUT

```
7  
4  
2  
9
```



Array of Arrays - Matrices

```
int[][] mat = {{5,7,9,2,1,9},  
               {5,3,4},  
               {3,7,0,8,9}};
```

```
out.println(mat[7/4][0]);  
out.println(mat[1*2][2]);  
out.println(mat.length);  
out.println(mat[0].length);
```

OUTPUT

5
0
3
6

matrixtwo.java

Setting Matrix Values



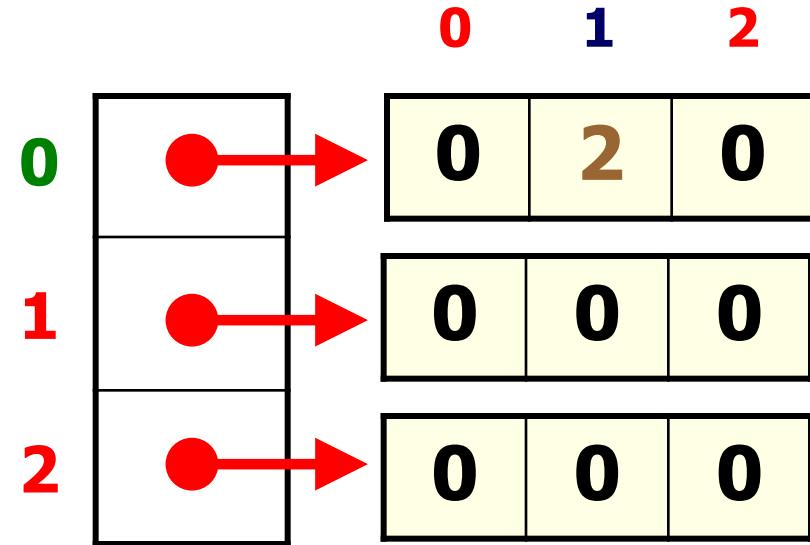
Array of Arrays - Matrices

A matrix is an array of arrays.

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

Which array?

Which spot?





Array of Arrays - Matrices

	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

matrixsetone.java
matrixsettwo.java

Nested Loops



Nested Loops

```
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

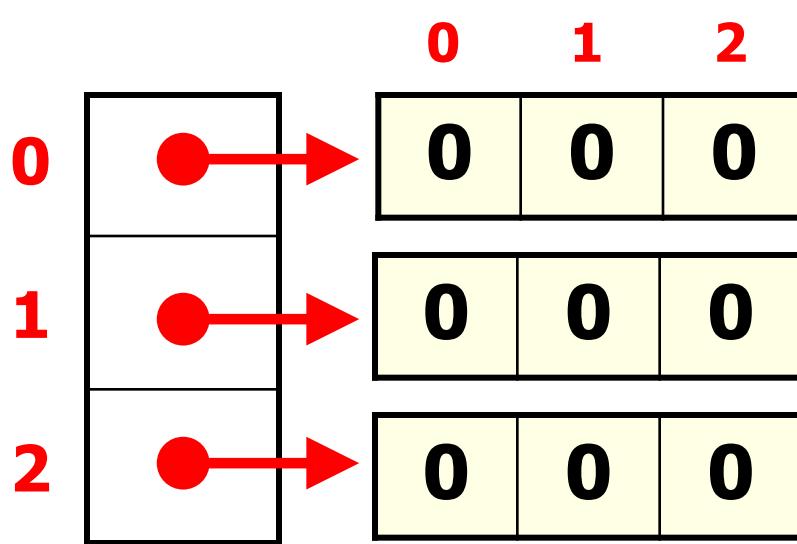
nestedfor.java

Traversing With Loops

Array of Arrays - Matrices

A matrix is an array of arrays.

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



of arrays

size of each array



Array of Arrays - Matrices

```
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]
```



Array of Arrays - Matrices

```
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



Array of Arrays - Matrices

```
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[1].length; c++)  
    {  
        out.print(mat[1][c]);  
    }  
    out.println();  
}
```

<u>OUTPUT</u>
5 3 4 6
5 3 4 6
0 8 9



Array of Arrays - Matrices

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

```
for( int[] row : mat )
{
    for( int num : row )
    {
        System.out.print( num + " ");
    }
    System.out.println();
}
```

OUTPUT

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

matrixoutone.java

matrixouttwo.java

matrixouthree.java
matrixoutfour.java

Searching For Values



Array of Arrays - Matrices

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};  
int count = 0;  
for( int r = 0; r < mat.length; r++ )  
{  
    for( int c = 0; c < mat[r].length; c++ )  
    {  
        if( mat[r][c] == 5 )  
            count++;  
    }  
}  
System.out.println("5 count = " + count);
```

OUTPUT

5 count = 2



Array of Arrays - Matrices

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};  
int count = 0;  
for( int[] row : mat )  
{  
    for( int num : row )  
    {  
        if( num == 5 )  
            count++;  
    }  
}  
System.out.println("5 count = " + count);
```

OUTPUT
5 count = 2

matrixsearch.java



Array of Arrays - Matrices

```
int[][] mat = {{5,7},{5,3,4,6},{0,8,9}};  
int sum = 0;  
for( int[] row : mat )  
{  
    for( int num : row )  
    {  
        sum += num;  
    }  
}  
System.out.println( sum );
```

OUTPUT
47

matrixsum.java

Matrix Of References

```
public class Dog
{
    private int age;
    private String name;

    public Dog( String n, int a ) {
        age = a;
        name = n;
    }

    public int getAge()  {
        return age;
    }

    public String getName()  {
        return name;
    }

    public String toString()  {
        return "Dog - " + name + " " + age;
    }
}
```

Basic Dog Class





Array of Arrays - Matrices

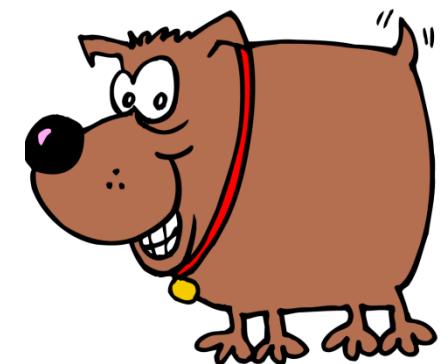
```
Dog[][] herd;  
herd = new Dog[3][3];
```

OUTPUT

```
null  
Dog - fred 11
```

```
herd[0][0] = new Dog( "fred", 11 ) ;  
herd[1][2] = new Dog( "ann", 21 ) ;
```

```
System.out.println( herd[2][2] );  
System.out.println( herd[0][0] );
```



dog.java
doggies.java

Matrix Instance Variables



Array of Arrays - Matrices

```
public class MatrixFun
{
    private int[][] mat;      //instance variable

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

    //other methods not shown
}
```

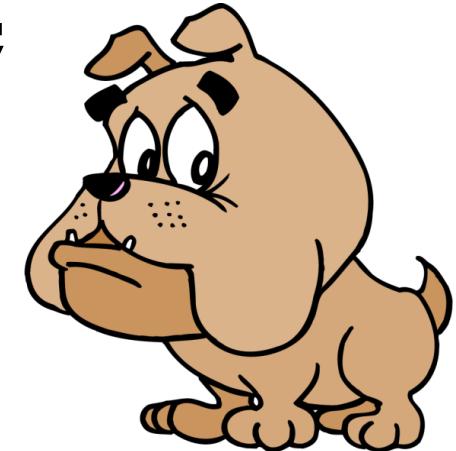


Array of Arrays - Matrices

```
public class Doggies
{
    private Dog[][] mat; //instance variable

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

    //other methods not shown
}
```



matrixinstancevars.java

Matrix

Extras

matrixinout.java
matrixtotal.java
matrixfilereader.java

Work on Programs!

Crank Some Code!

A+ Computer Science

MATRICES