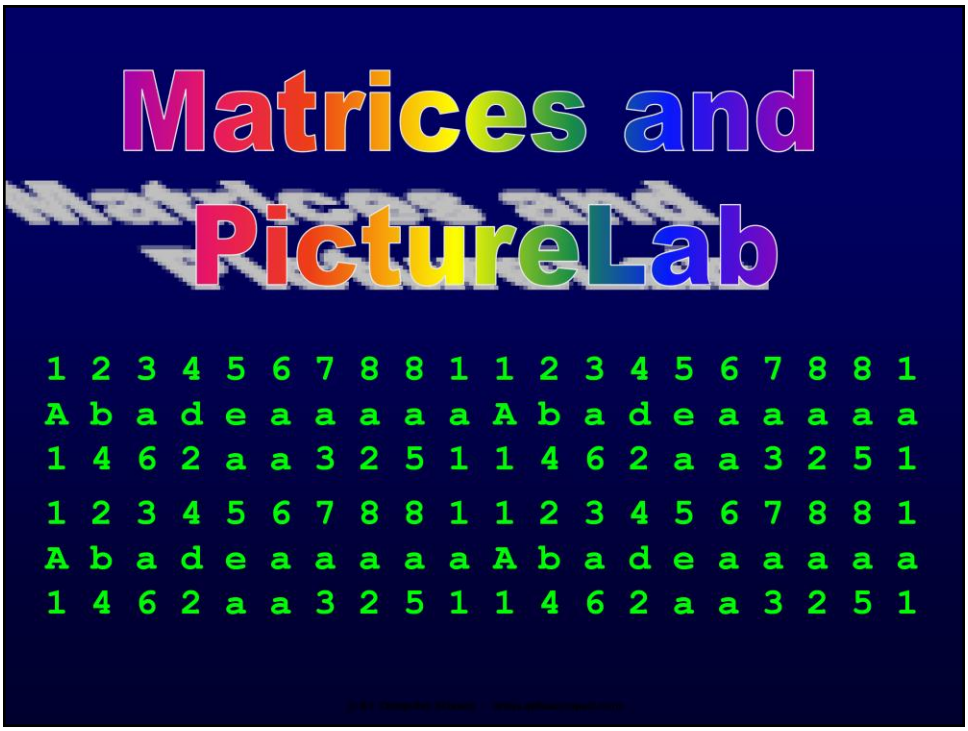
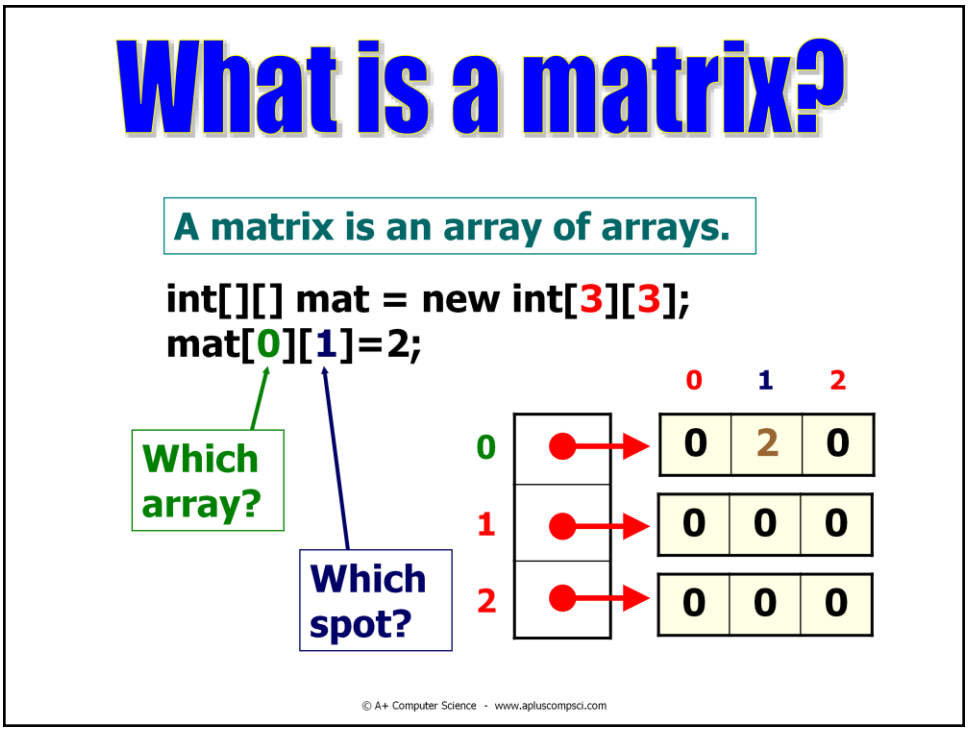

Matrices and
PictureLab
1 2 3 4 5 6 7 8 8 1 1 2 3 4 5 6 7 8 8 1
A b a d e a a a a a A b a d e a a a a a
1 4 6 2 a a 3 2 5 1 1 4 6 2 a a 3 2 5 1
1 2 3 4 5 6 7 8 8 1 1 2 3 4 5 6 7 8 8 1
A b a d e a a a a a A b a d e a a a a a
1 4 6 2 a a 3 2 5 1 1 4 6 2 a a 3 2 5 1



Each spot in an matrix stores the location/address of an array.

`mat[0]` stores the location / address of a one-dimensional array.

```
mat[0][1]=2;
```

This line sets `mat[0]` spot 1 to 2.

Common Matrix Algorithms

Searching for a specific value

Summing up all or some section of the matrix

Rotating all of the values

Reversing all of the values

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Summing a Matrix

```
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

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Summing up a matrix involves visiting each value going row by row and adding each value to a variable.

open matrixsum.java

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Searching a Matrix

```
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
```

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Searching for values in an array or matrix is a common process often tested on the AP exam.

open matrixsearch.java

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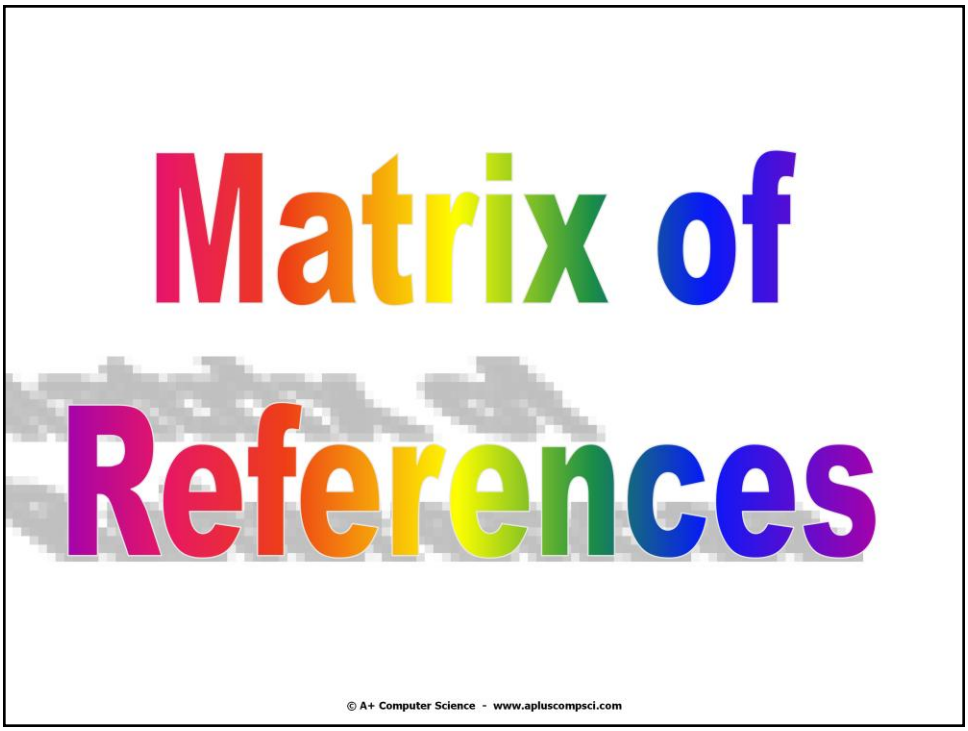
Matrix of
References
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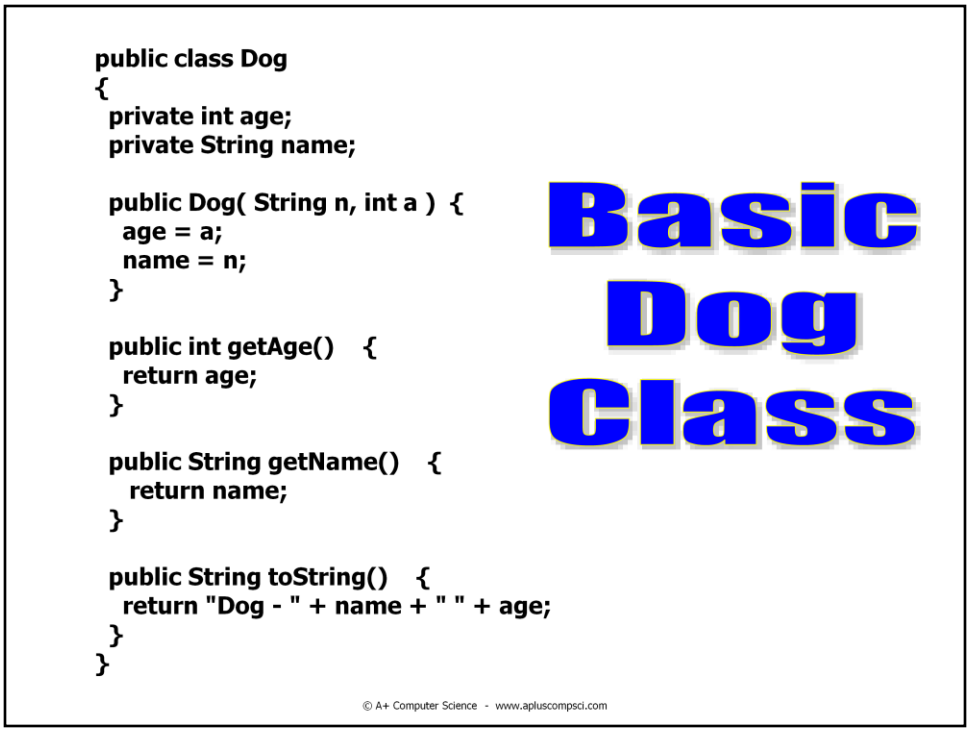
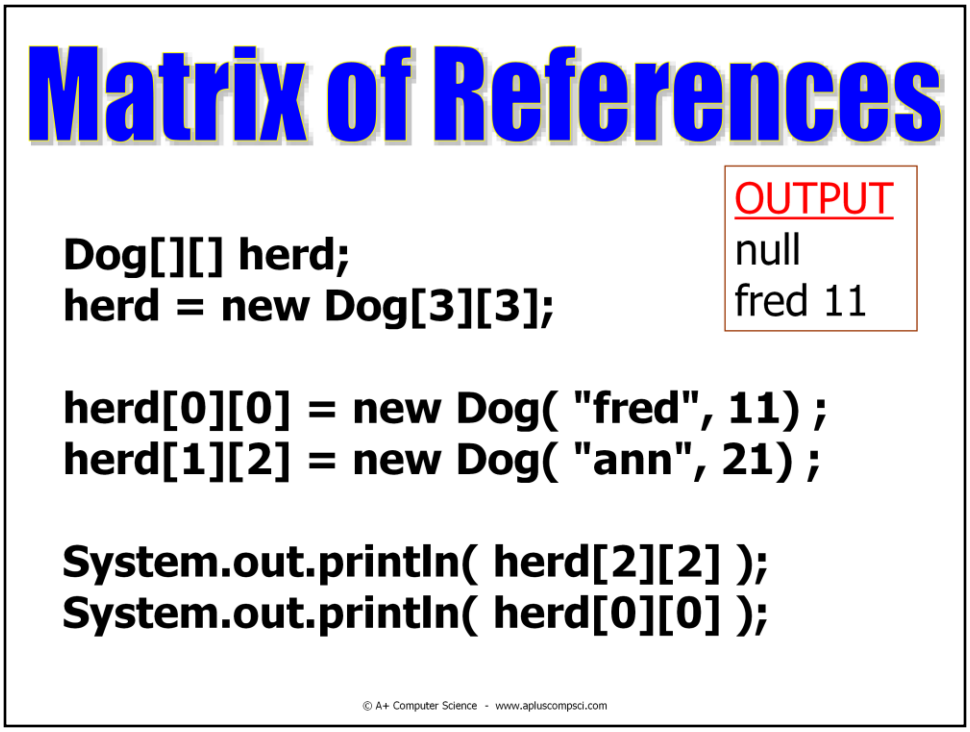


Classes are used to store related methods and variables.



Matrices can store references to objects. This enables each spot in the matrices to house more than just a single value. Each spot can house multiple variables and methods all of which would be contained in a class.

Open
Dog.java
Doggies.java

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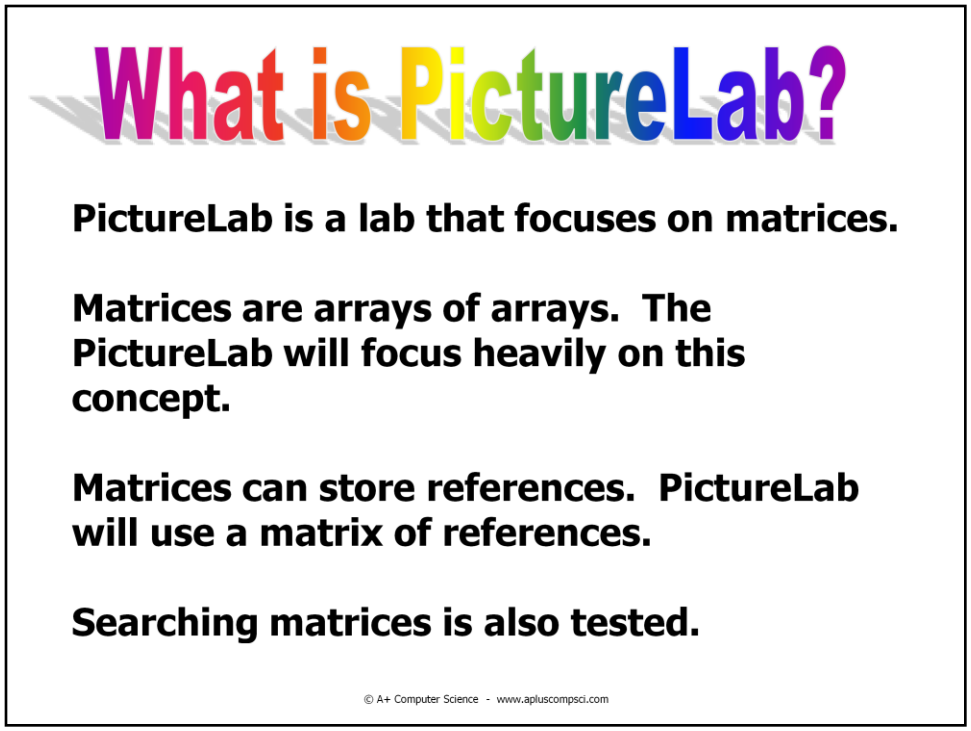
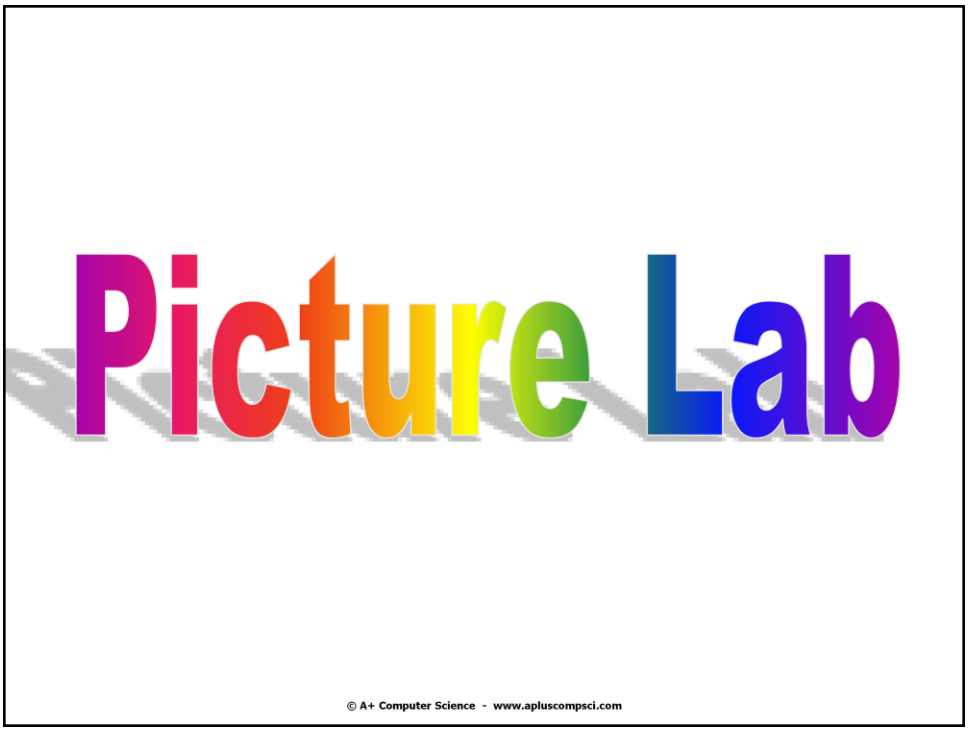


PictureLab is a lab that focuses on matrices.

Matrices are arrays of arrays.
The PictureLab will focus heavily on this concept.

Matrices can store references.
PictureLab will use a matrix of references.

Searching matrices is also tested.


Picture Lab
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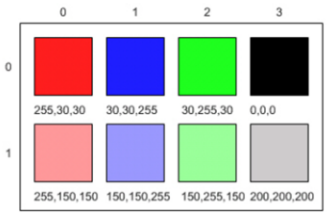
What is a Color?

Colors consist of 3 integer values that range in value from 0 to 255.

```
Color c = new Color( 255, 30, 30);
```

red green blue



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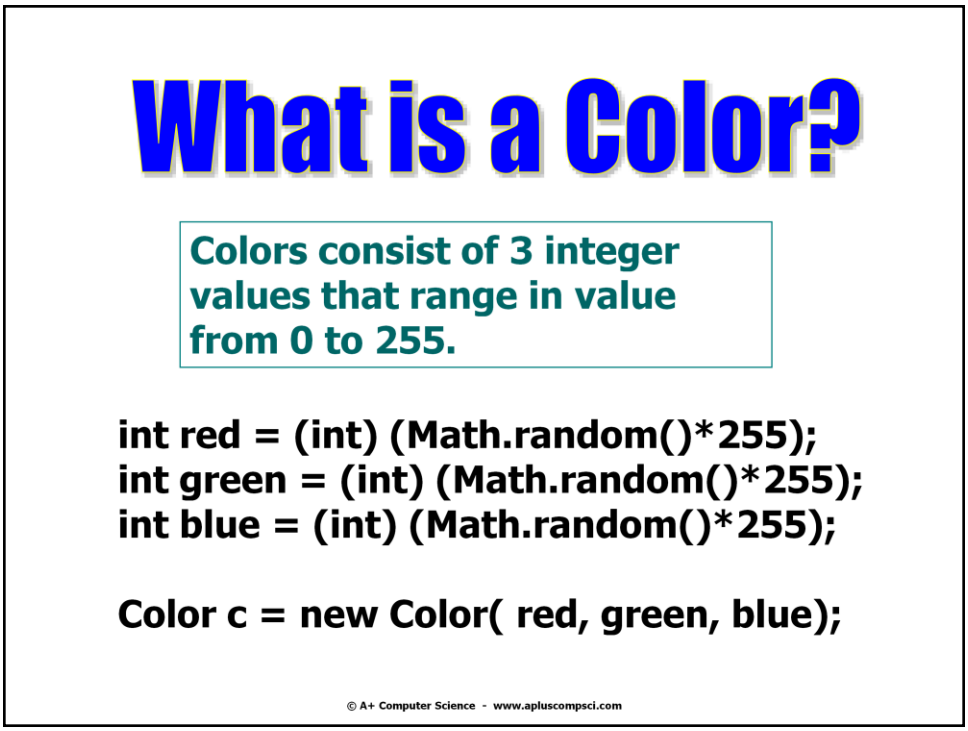

Colors consist of 3 integer values that range in value from 0 to 255.

Open Picture Lab Code\ pixLab\ classes \ ColorChooser.java

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What is a Picture?

```
public static void main( String args[])
{
  Picture pix = new Picture("aplus.jpg");
  pix.explore();
}
```

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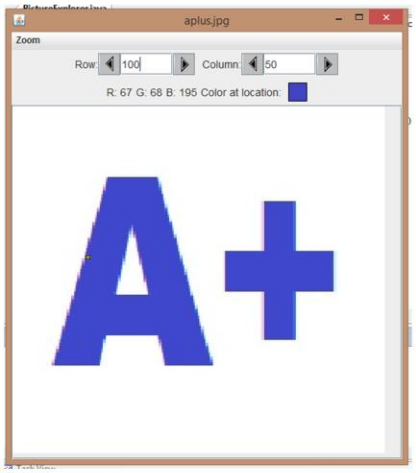
```
public static void main( String args[])
{
  Picture pix = new Picture("aplus.jpg");
  pix.explore();
}
```

What is a Picture?



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What is a Picture?

```
Picture p = new Picture("aplus.jpg");
Picture smallP = p.scale(0.5,0.5);
smallP.write("halfaplus.jpg");
```

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open
Picture Lab Code\
pixLab\classes \
PictureExplorer.java

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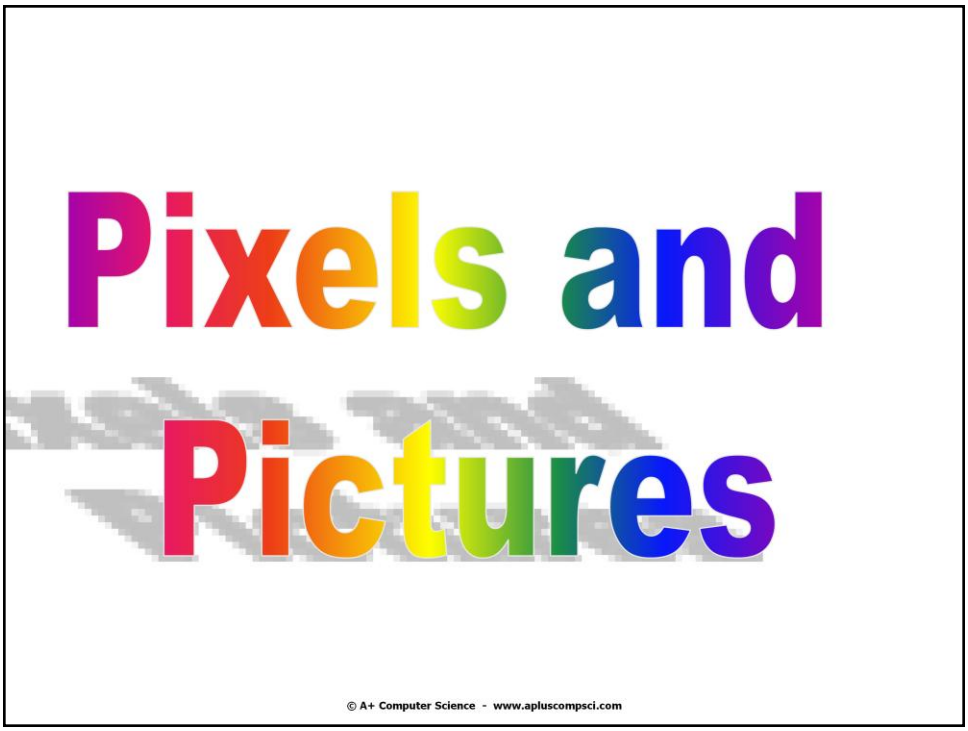
Pixels and
Pictures
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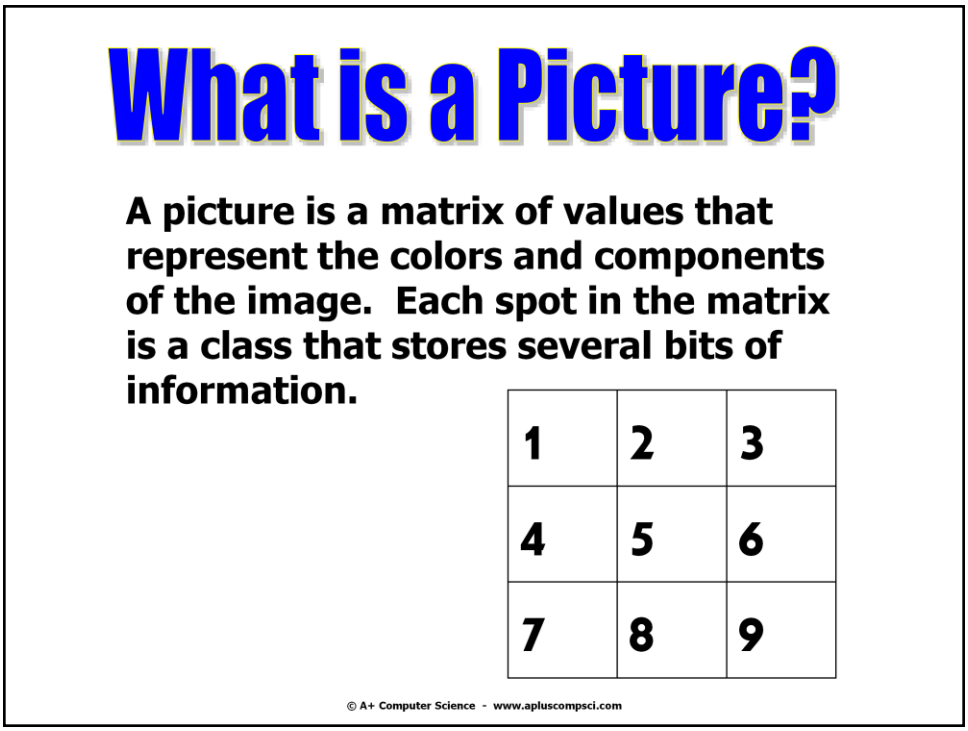

A picture is a matrix of values that represent the colors and components of the image. Each spot in the matrix is a class that stores several bits of information.

Basic Pixel Class

```
public class Pixel
{

  //the digital picture this pixel belongs to
  //this ends up as a BufferedImage
  private DigitalPicture picture;

  //the x (column) location of this
  //pixel in the picture; (0,0) is top left */
  private int x;

  //the y (row) location of this pixel in the picture;
  //(0,0) is top left
  private int y;

  //lots of methods not shown

  //toString not shown

}
```

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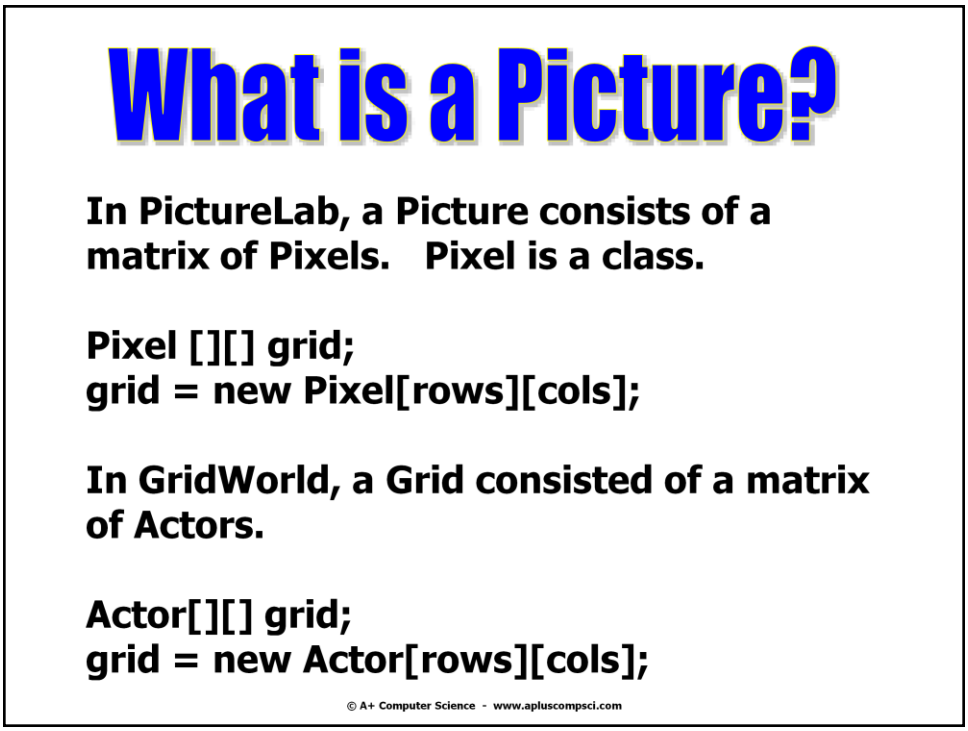
Classes are used to store related methods and variables.



In PictureLab, a Picture consists of a matrix of Pixels. Pixel is a class.

Pixel [][] grid;

grid = new Pixel[rows][cols];

What is a Picture?

```
public static void main(String[] args)
{
  Picture aplusPic;
  aplusPic = new Picture("aplus.jpg");
  aplusPic.explore();
  aplusPic.zeroBlue();
  aplusPic.explore();
}
```

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What is a Picture?

```
public static void main(String[] args)
{
  Picture aplusPic = new Picture("aplus.jpg");
  aplusPic.explore();
  aplusPic.zeroBlue();
  aplusPic.explore();
}
```

After the call to the zeroBlue() method.

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open
Picture Lab Code\
pixLab\classes \
Picture.java

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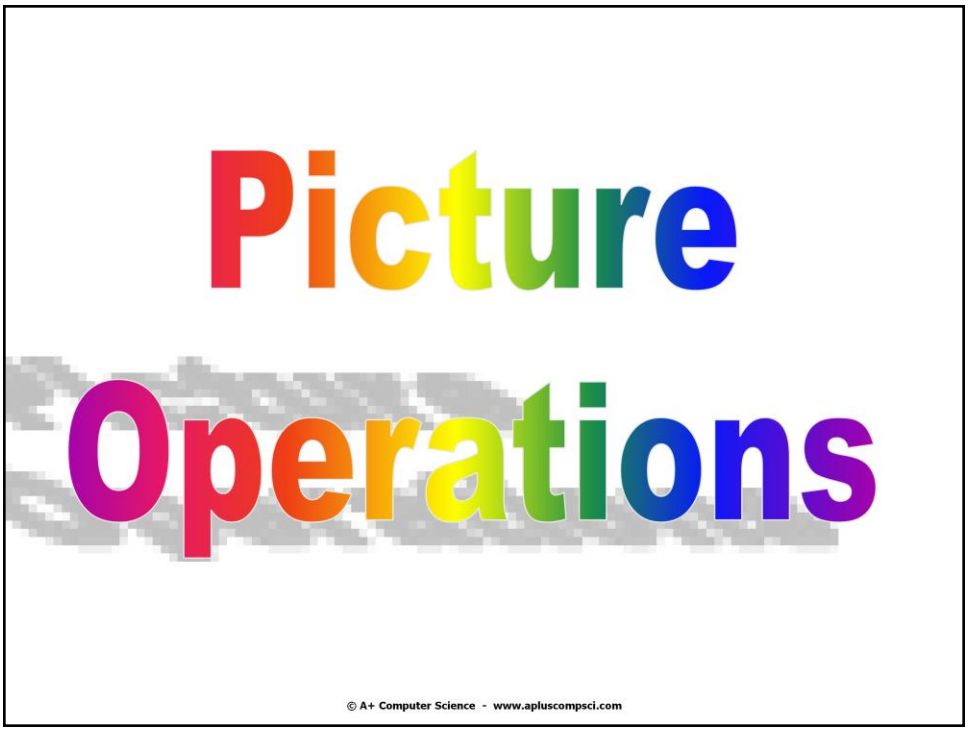
Picture
Operations
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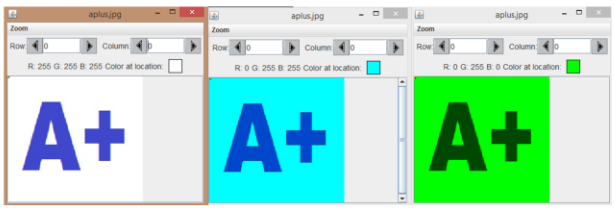
What is a Picture?

```
public void zeroRed()
{
   // what code would you need to
   // make a zeroRed( ) method
   // look at the zeroBlue() method
}
```



Original no Red no Blue

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pixLab\classes \
Picture.java

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Add in a zeroRed( ) method

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What is a Picture?

Pictures sometimes need to be mirrored. Mirroring sometimes involves copying pixels from one side of the row to the other.

A	P	L	U	S
R	O	C	K	S
G	R	I	D	S

A	P	L	P	A
R	O	C	O	R
G	R	I	R	G

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What is a Picture?

Pictures sometimes need to be mirrored. Mirroring sometimes involves copying pixels from one side of the column to the other.

A	P	L	U	S
R	O	C	K	S
G	R	I	D	S

A	P	L	U	S
R	O	C	K	S
A	P	L	U	S

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pixLab\classes \
Picture.java

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Check out
the mirror
methods
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Add in a new mirror method

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Start work
on the labs
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