This lab uses the pixLab folder. Be sure to down load and unzip this file first.

Objective: In this lab you will practice making different colors using combinations of red, green, and blue light. This activity introduces the java.awt.Color class.

Background:

If you look at an advertisement for a digital camera, it will tell you how many megapixels the camera can record. A digital camera has sensors that record color at millions of points arranged in rows and columns. Each point is a **pixel**, an abbreviation for *pic*ture *el*ement ("pix" is an abbreviation of "picture"). A pixel is the smallest controllable element in a digital picture.

A megapixel is one million pixels. A 16.2 megapixel camera can store the color at over 16 million pixels. That's a lot of pixels! Do you really need all of them? If you are sending a small version of your picture to a friend's phone, then just a few megapixels will be plenty. But, if you are printing a huge poster from a picture or you want to zoom in on part of the picture, then more pixels will give you more detail.

How is the color of a pixel recorded? It can be represented using the RGB (Red, Green, Blue) color model, which stores values for red, green, and blue, each ranging from 0 to 255. You can make yellow by combining red and green. Combining pixels is not the same as mixing paint to make a color. The computer uses light to display color, not paint. The RGB color model sometimes also stores an alpha value as well as the red, green, and blue values. The alpha value indicates how transparent or opaque the color is. A color that is transparent will let you see some of the color beneath it.

The computer stores color numbers as binary numbers in memory. A **bit** is a binary digit, which can be either a 1 or a 0. A **byte** is a group of 8 bits.

Questions:

1) How many bits does it take to represent the values from 0 to 255?

2) How many bytes does it take to represent a color in the RGB color model?

3) How many pixels are in a picture that is 640 pixels wide and 480 high?

Activity:

Compile all of the .java files in the pixLab folder. Run the main method in ColorChooser.java. This will pop up a window asking you to pick a color. Click on the RGB tab and move the sliders to make different colors.
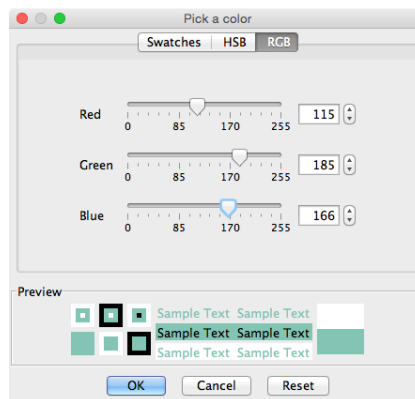
When you click the OK button, the red, green, and blue values for the color you picked will be displayed as shown below.

```
java.awt.Color[r=115,g=185,b=166]
```

Java represents color using the java.awt.Color class. This is the full name for the Color class, which includes the package name of java.awt followed by a period and then the class name Color. Java groups related classes into packages. The awt stands for Abstract Windowing Toolkit, which is the package that contains the original Graphical User Interface (GUI) classes developed for Java. You can use just the short name for a class, like Color, as long as you include an import statement at the beginning of a class source file, as shown below. The Picture class contains the following import statement.

```
import java.awt.Color;
```

Use the ColorChooser class (run the main method) to answer the following questions.

Questions:

4) How can you make yellow?

5) How can you make purple?

6) How can you make white?

7) How can you make pink?

8) How can you make dark gray?

Picture Lab 1: Introduction to Colors

Pixel Questions

1)   8 bits = 1 byte

2)   1 byte for Alpha, Red, Green, Blue = 4 bytes total

3)   640 x 480 = 307200 pixels

Color Questions

1)   Yellow Example: R = 255, G = 255, B = 51

2)   Purple Example: R = 255, G = 51, B = 255

3)   White: R = G = B = 255

4)   Pink Example: R = 255, G = 157, B = 246 (very subjective)

5)   Dark Gray Example: R = G = B = 102