# PIXELS AND RESOLUTION

Understanding pixel dimensions, resolution, and output will help you create works that are sized properly, and will look excellent when printed.
First, we need to understand a few things:

Any image has pixel dimensions attached to it. These dimensions are not the actual physical size of the image, as this will depend on output (printer, screen, etc.)
Below is an image from Google:
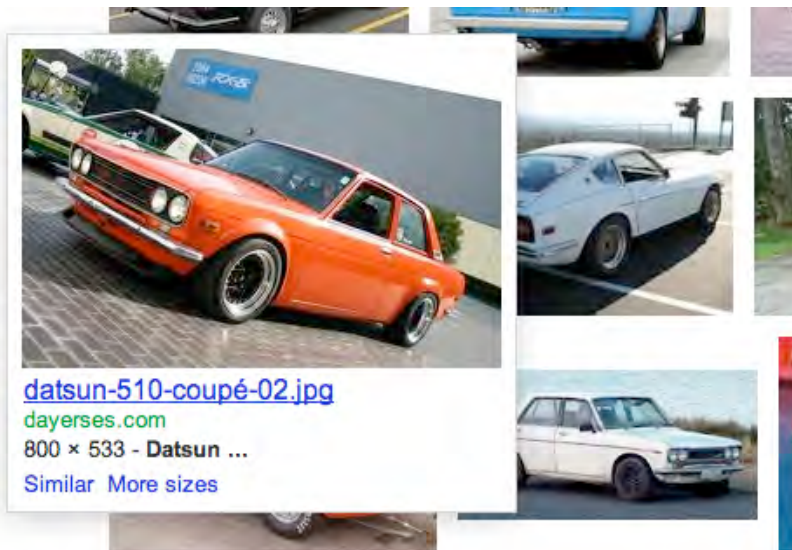
The pixel dimensions are very important to the educated designer or photographer, and that is why they are so prominently displayed.

The pixel dimensions for this photo are 800 pixels wide, by 533 pixels high.

A pixel is simply a unit of currency; it depends on _what_ you want are buying as to how _much_ you can buy.

In digital photography, you will be using your recorded pixels to buy space in two places: on a screen, or on a sheet of photo paper.

Screen space is relatively cheap. You can "buy" an inch of screen for between 72 and 100 Pixels. For ease of calculation, assume a resolution of 100 pixels per inch.

Resolution is simply a measure of pixels per inch (also known as "PPI".) Think of it as analogous to how speed is measured in Km/h.

To figure out approximate size of an image, just divide each pixel dimension by the required resolution. For the above image, 800 pixels divided by 100 is 8, and 533/100 = 5.33.
Using this calculation, we can assume that the above image will appear about 8" by 5.33" on a computer screen.

As a photographer, you are probably interested in printing your image out via a printer.

This is where understanding resolution is critical! To buy one inch of photo paper, it will cost you 300 pixels! All of a sudden, the image above will be only 2.67" x 1.8"! Tiny!
I arrived at these dimensions by dividing 800/300=2.67, and 533/300=1.8

NOW, many students are confused at this point and say "I'm terrible at math!"
There are two easy ways around this. One is to do the math in your head. simply subtract the last two digits from the pixel dimension (instead of 800, it is now 8)
Now divide this number by "3" (300ppi with the last two digits removed).

8/3= a little less than 3"

The other way is of course to use a calculator.

IN PHOTOSHOP...
Photoshop is powerful…really powerful. There are at least two different ways to alter your image size.
Before we go on, we need to remember that your image has certain pixel dimensions, and these are similar to an article of clothing that is a certain size. You can always "stretch" the pixel dimensions, just as you can always fit into a t-shirt a few sizes too small, but at a certain point the t-shirt will rip!
The equivalent to the shirt ripping in Photoshop is that you will begin to see "noise", or pixilation. Below is an extreme example:
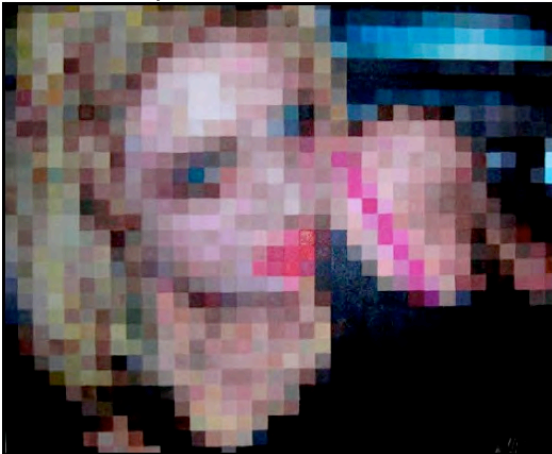
One way to alter the size of your image is through the "Crop" command. In your toolbar you will see the
following:
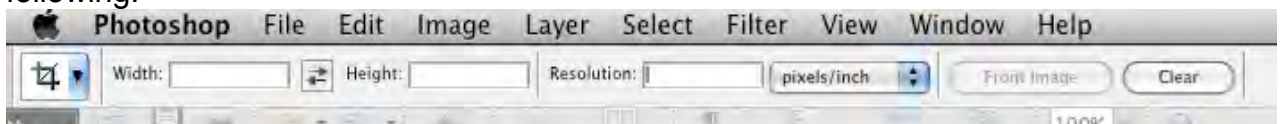
Now, what you can do is enter the width in pixels *or* inches. If you were to have a large number of your photos printed at a lab, you would enter in the inch dimensions, let's say 4"x6", and in resolution, enter in 300, because we are printing these images.

Let's assume that our original image size is 2400x 3600 pixels. We are just going to crop a picture that will end up having pixel dimensions of 1200x1800, so we have ample pixels for this crop.

I can make this crop 16"x 20" @300ppi as well, and Photoshop will have to "interpolate."
Interpolation is where there are not enough pixels to crop to the size we want, so Photoshop creates more. This is OK, and Photoshop does a good job of this, but again, it is like stretching a t-shirt. Eventually you are going to notice something is wrong!
You cannot take an image that is 300 x 400 pixels, and make it 16" x20" @ 300ppi and expect it to look good. Photoshop CAN do this, but it will look very bad.

If you want to make an image with lots of pixels smaller, this is no problem, as this is the same as effectively "shrinking" the t-shirt by placing it in really warm water.

The second way to resize images is by going to "Image" in the Photoshop toolbar and selecting "Image size" You will get a dialogue box that looks like following:
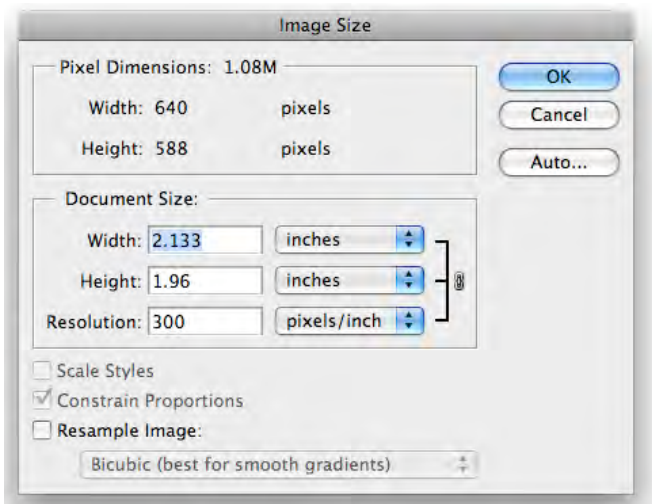
This makes a great calculator to figure out approximately what size you can print your image. It also gives you your pixel dimensions.

Note that the "Resample Image" checkbox has been left unchecked. This button is essentially an Interpolation "On/Off" switch. If it is unchecked, Photoshop will not create any new pixels, and vice-versa.

RESOLUTION IN YOUR CAMERA/SCANNER

OK, the last thing is that you are also in charge of how many pixels your camera captures. Nikons have "S", "M" and "L" sizes. (small, medium and large). These can either be accessed through shortcut buttons on the back of your camera, or through the menu.

When Photoshop interpolates an image, it accentuates noise associated with high ISO, so be aware of this. It is easier to interpolate an image taken at a low ISO number.

When you are using a scanner, you will be telling the scanner what resolution (how many pixels per inch) you want to capture.

Please use the previous tools to answer the following questions. Please save this document as a .pdf and hand in to the appropriate drop box. It should be titled "YourNameResolution.pdf"

1. What are the pixel dimensions for the image recorded on your camera when it is set to "Medium." Please record what camera model it is as well.

2. What are some instances when you would want to resize an image smaller than the camera has recorded it?

3. An image has the following pixel dimensions 1568 x 1820. *Approximately* what sizes will this print out (in inches)?

4. Approximately what size will the above image be on a computer screen?

5. Photoshop can "create" pixels. True or false?

6. What is this "creation" technique called?

7. What is one thing you can change in your camera settings to reduce pixilation and noise when you are shooting?

8. Is it possible to take an image with the dimensions 600 x 800 and print it out 12" x16"? How will it look?