

Resolution & Resizing Photographs



Resolution:

Resolution, also known as DPI (Dots Per Inch) or PPI (Pixels Per Inch), can be described as the **number of dots** that fit horizontally and vertically into a one-inch space. Generally, the more dots per inch, the more detail captured and the sharper the resulting image.



High-resolution
image,
printed at
300ppi



Low-resolution
image,
printed at
72 ppi

Resolution:

Resolution, also known as **DPI (Dots Per Inch)** or **PPI (Pixels Per Inch)**, can be described as the **number of dots** that fit horizontally and vertically into a one-inch space. Generally, the more dots per inch, the more detail captured and the sharper the resulting image.

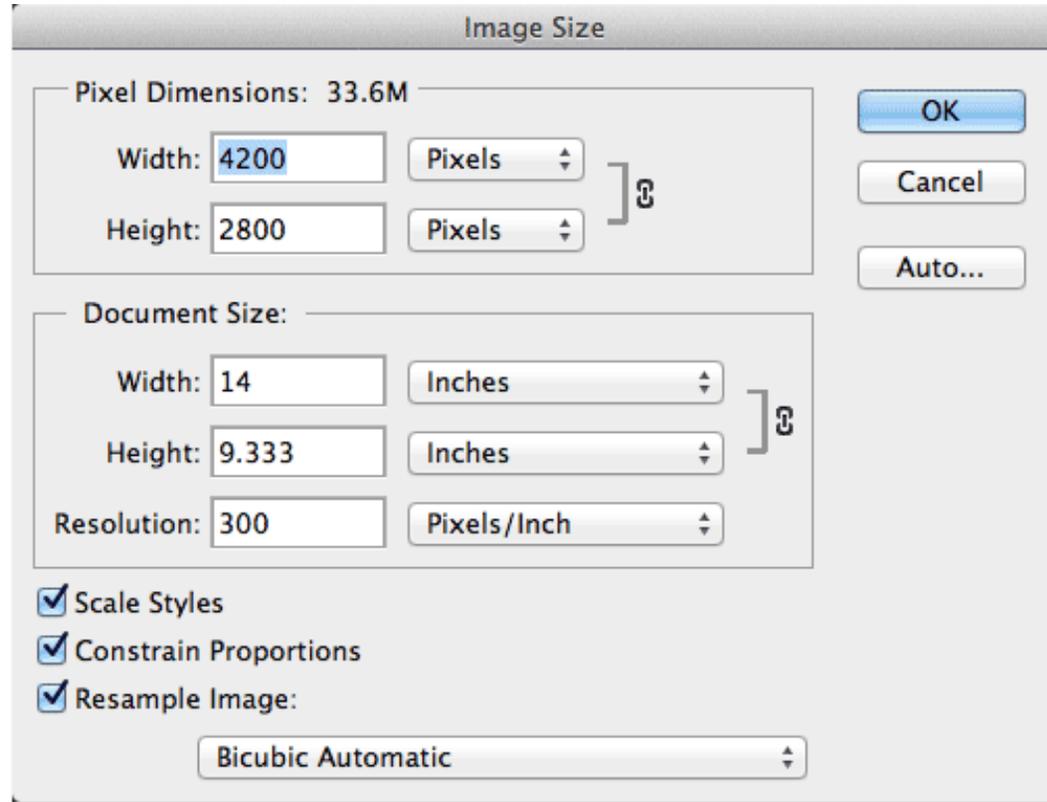


Image resolution and associated abbreviations such as **ppi** and **dpi** confuse a lot of people. This lecture will explain what **resolution** is and how it needs to be taken into account when creating layouts or printing pictures. We will cover the following topics:

- Pixels, the basis for talking about resolution
- Resolution as the definition of the number of pixels
- Resolution as the definition of the intended size of an image
- Resolution requirements for various printing processes
- Resolution and print quality

Pixels

Since resolution has to do with digital images, let's first look at such an image.....



If an electronic (or digital) image is enlarged a lot, you can see that it consists of a matrix of picture elements. Such picture elements are called pixels. Below are the pixels that make up the eye of the bird.



Resolution as the definition of the number of pixels

In the below image each row contains contains 3000 pixels and there are 2000 rows. **Resolution describes the image size as the number of pixels it contains**, typically as '**width x height**'.

That means the (entire) image of the bird has a resolution of 3000 x 2000 pixels. Sometimes users are only interested in the total number of pixels. Those 6 million pixels equal a resolution of 6 megapixel. The habit of using the term **resolution** to refer to the number of pixels in an image is typical for the photography world.



Resolution = the definition of the absolute size of an image

The above definition is pretty straightforward. The term resolution can however also be used to describe the actual or assumed size of pixels. That is typically the case in the printing industry (which we know is a different “city” than the “screen industry.”)



So, how large is a pixel? Since a digital image is not physical, the pixels in it don't really have a size. When you print the image or display it on some physical device, then those pixels do get actual dimensions. Maybe they become very small or maybe they become big enough to fill a soccer field. It's up to you, your camera capability and essentially, your RAW files.

Resolution as the definition of the intended size of an image

There is still a **third definition** of resolution that you need to be aware of. **Resolution can be used to describe the intended number of pixels that fit in one inch.**

Before an image gets printed, its pixels don't really have dimensions. They are just bits in an electronic file. People discovered that it can be practical if you could also define within that file how big you intend the image to be.

RECOMMENDED RESOLUTION SETTINGS				
Print Size	150ppi(Good)	MegaPixels	300ppi(Best)	MegaPixels
4 x 6	600 x 900	< 1	1200 x 1800	2
5 x 7	750 x 1050	1	1500 x 2100	3
8 x 10	1200 x 1500	< 2	2400 x 3000	7
11 x 14	1650 x 2100	3	3300 x 4200	14

RECOMMENDED RESOLUTION SETTINGS

Print Size	150ppi(Good) MegaPixels	300ppi(Best) MegaPixels
4 x 6	600 x 900 < 1	1200 x 1800 2
5 x 7	750 x 1050 1	1500 x 2100 3
8 x 10	1200 x 1500 < 2	2400 x 3000 7
11 x 14	1650 x 2100 3	3300 x 4200 14

RECOMMENDED RESOLUTION SETTINGS

Print Size	150ppi(Good) MegaPixels	300ppi(Best) MegaPixels
4 x 6	600 x 900 < 1	1200 x 1800 2
5 x 7	750 x 1050 1	1500 x 2100 3
8 x 10	1200 x 1500 < 2	2400 x 3000 7
11 x 14	1650 x 2100 3	3300 x 4200 14

Here are two practical examples:

You scan or photograph an advertisement in an old newspaper. It needs to appear in a book with the exact same dimensions. Instead of writing in a notepad how big the image is, why not store that information in the image itself?

Any school-boy or girl can make good pictures with one of the Eastman Kodak Co.'s **Brownie Cameras** **\$1.00**



\$1.00

Brownies load in daylight with film cartridges for 6 exposures, have fine monocus lenses, the Eastman Rotary Shutters for snap shots or time exposures and make pictures 2 1/4 x 2 1/4 inches.

Brownie Camera, for 2 1/4 x 2 1/4 pictures.	\$1.00
Transparenc Film Cartridge, 6 exposures, 2 1/4 x 2 1/4.	.15
Paper Film Cartridge, 6 exposures, 2 1/4 x 2 1/4.	.15
Brownie Developing and Printing Outfit.	.75
Brownie Removable Finder.	.25

Take a Brownie Home for Christmas.

Brownie circulars and Kodak catalogues free at the dealers or by mail.

EASTMAN KODAK CO.
Rochester, New York.

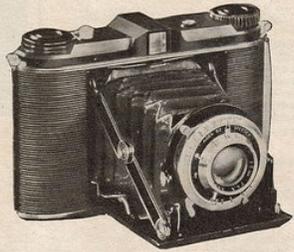
When you write, please mention "The Compollan."

SENSATIONAL CAMERA VALUE!

Agfa Speedex: \$29⁰⁰

- 1. Brilliant, eye-level view finder.
- 2. Highly-corrected f4.5 anastigmat lens.
- 3. Precision shutter speeds of 1/2 to 1/250th of a second, Time and Bulb.
- 4. Focuses 3 1/2 ft. to infinity. Focusing ring in lens mount.
- 5. Built-in shutter release on camera top!

Your dealer will let you see and handle this fine camera. Ask him!



SPEEDX JUNIOR: Same features as above, but with less elaborate lens and shutter for fixed-focus operation. Only \$11.00! Agfa Ansco, Binghamton, New York.

AGFA  CAMERAS
MADE IN U. S. A.



Nothing more suitable for a **HOLIDAY GIFT** than a **RAY Camera**

They have stood the test of time.

15 styles from **\$2.⁵⁰** up.

We guarantee every camera.
Our handsomely illustrated catalogue free.

MUTSCHLER, ROBERTSON & CO.,
183 West Main St., Rochester, N. Y.

When a designer places an image on a page in a layout application like Adobe InDesign, that application needs to display the image at 'some size'. What better size than the one that the image itself claims to be the intended size? That can save the designer a lot of time because there is less need to change the size of the image after importing it.

An image file does not only contain all of the image data of the pixels. It can also contain **metadata**, which are data about the data. The name of the photographer is metadata, as is the brand of digital camera that was used to capture an image. All this information can be found in Photoshop.

As you may have guessed, the image resolution can also be part of the **metadata**. You can configure your digital cameras so that they embed in images that their intended resolution is 300 ppi, however, anyone who gets hold of your images (for example a screen shot off your website) can still do whatever he or she pleases and use a completely different resolution.

Any school-boy or girl can make good pictures with one of the **Eastman Kodak Co.'s Brownie Cameras** **\$1.00**



\$1.00

Brownies load in daylight with film cartridges for 6 exposures, have fine meniscus lenses, the Eastman Rotary Shutters for snap shots or time exposures and make pictures 2 1/4 x 2 1/4 inches.

Brownie Camera, for 2 1/4 x 2 1/4 pictures.	.....	\$1.00
Transparent-Film Cartridge, 6 exposures, 2 1/4 x 2 1/4.	.....	.15
Paper-Film Cartridge, 6 exposures, 2 1/4 x 2 1/4.	.....	.15
Brownie Developing and Printing Outfit.	.....	.25
Brownie Removable Finder.	.....	.25

Take a Brownie Home for Christmas.

Brownie circulars and Kodak catalogues free at the dealers or by mail.

EASTMAN KODAK CO.
Rochester, New York.

When you write, please mention "The Cosmopolitan."

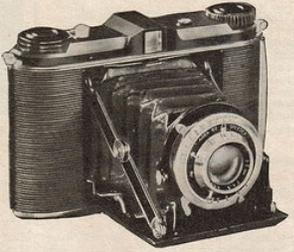
SENSATIONAL CAMERA VALUE!

Agfa Speedex: \$29.00

- This beautifully compact Agfa Speedex takes twelve 2 1/4 x 2 1/4" pictures! Here are its All-American features!

1. Brilliant, eye-level view finder.
2. Highly-corrected f4.5 anastigmat lens.
3. Precision shutter speeds of 1/2 to 1/250th of a second, Time and Bulb.
4. Focuses 3 1/2 ft. to infinity. Focusing ring in lens mount.
5. Built-in shutter release on camera top!

Your dealer will let you see and handle this fine camera. Ask him!



SPEDEX JUNIOR: Same features as above, but with less elaborate lens and shutter for fixed-focus operation. Only \$11.00! *Agfa Ansco, Binghamton, New York.*

AGFA CAMERAS
MADE IN U. S. A.



Nothing more suitable for a **HOLIDAY GIFT** than a **RAY Camera**

They have stood the test of time.

15 styles from **\$2.50** up.

We guarantee every camera. Our handsomely illustrated catalogue free.

MUTSCHLER, ROBERTSON & CO.,
183 West Main St., Rochester, N. Y.

Resolution requirements for printing

When an image is sent to a certain output device, such as a printer or a monitor, its **resolution** becomes important because each device or medium needs a certain base resolution to reproduce the image with the best possible quality. There are many ways you might want to use your images after you make them:

- ✓ Printing
- ✓ Magazines
- ✓ Newspaper
- ✓ Billboards

Printing

Usually 300 dpi is considered the optimum resolution for printing high quality photos.

Magazines

For images printed on good quality paper using an offset press, the general rule is that the image resolution needs to be twice the screen ruling used to print the job. Magazines are typically printed using a 150 or 175 lpi screen ruling. This means images need to be 300 dpi.

Newspaper

Newspaper are printed at a higher speed on lower quality paper. This means the resolution requirements are not as high as those for magazines. Typically a resolution of 200 to 250 dpi is considered sufficient. For line art images, 400 to 600 dpi is recommended.

Billboards

The larger a picture gets printed, the lower its resolution needs to be. The main reason behind this is that the viewing distance also increases. For large billboards, 30 dpi is often sufficient – which means that a lot of digital cameras are perfectly capable of generating such files.

Resolution and Print Quality

If you are not sure what resolution images need to have for a certain project, consult your printer/printing source.

- If the resolution of an image is too low, this results in
- a loss of sharpness.
- Images also get a 'pixelated' look.
- Too much information may sound as if it is harmless but that is not true: Your file will be bloated, taking up more storage space, time to print or time to transmit
- Images can lose a bit of sharpness.



High Resolution = High Quality
300 DPI at Size needed for Ad



Low Resolution = Low Quality
Under 300 DPI. Image will print blurry.

HIGH
vs.
LOW
RESOLUTION

As we have learned, the **resolution** of an image or picture describes the detail (or information) an image holds.

The higher the resolution, the more detail the image has, because there is more information. Information translates to “pixels,” which are the different colored “dots” that make up an image.

The more pixels there are makes the image more vivid and detailed to the naked eye. If an image has very few pixels the image will appear to be “pixelated”—the pixels look like squares all joined together—but you know exactly what I’m talking about if you’ve ever printed something off the internet for example, and it looked like this pixelated duck.



When dealing with print media, you will always hear the term “high resolution” or “low resolution” when it comes to images or photos. You may ask yourself, “Why am I having to do this? My picture is very good quality and very clear!” After all, it looks GREAT on your computer monitor, right? But digital media works completely differently than print media. And one of the big differences is how each medium (screen vs. print) handles resolution.



High-resolution
image,
printed at
300ppi



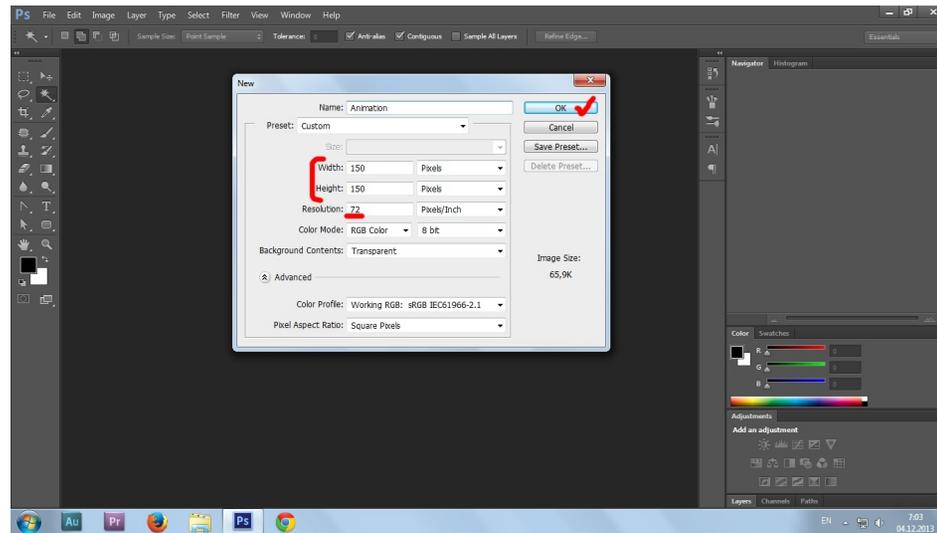
Low-resolution
image,
printed at
72 ppi

With regard to resolution, there are some important things to remember:

DPI: Dot's per inch. The number of dots in a printed inch. The more dot's the higher the quality of the print (more sharpness and detail).

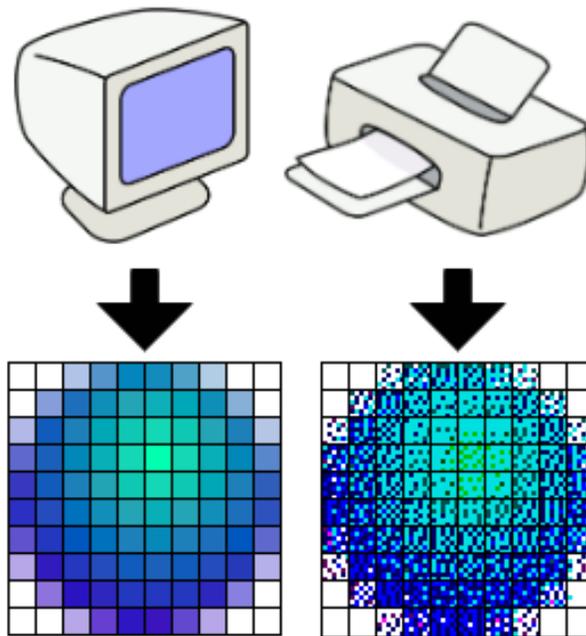
PPI: Pixels per inch. Most commonly used to describe the pixel density of a screen (computer monitor, smart phone, etc...) but can also refer to the pixel density of a digital image.

Resolution: Resolution is the measure of pixels in the display, usually expressed in measurements of width x height.



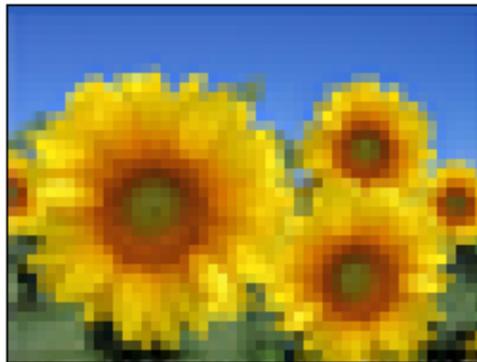
Photos or images used for online or web graphics can be at low resolution (72 DPI) and will look FABULOUS on a computer screen. But try to print those same pictures and they'll look horribly pixelated.

For printing purposes images should be 300 DPI or better. In this class, and from here on out, 300 DPI is the way to go!





Supplying Low-Resolution Graphics for Print
will result in loss of image quality.



Low-Resolution



High-Resolution

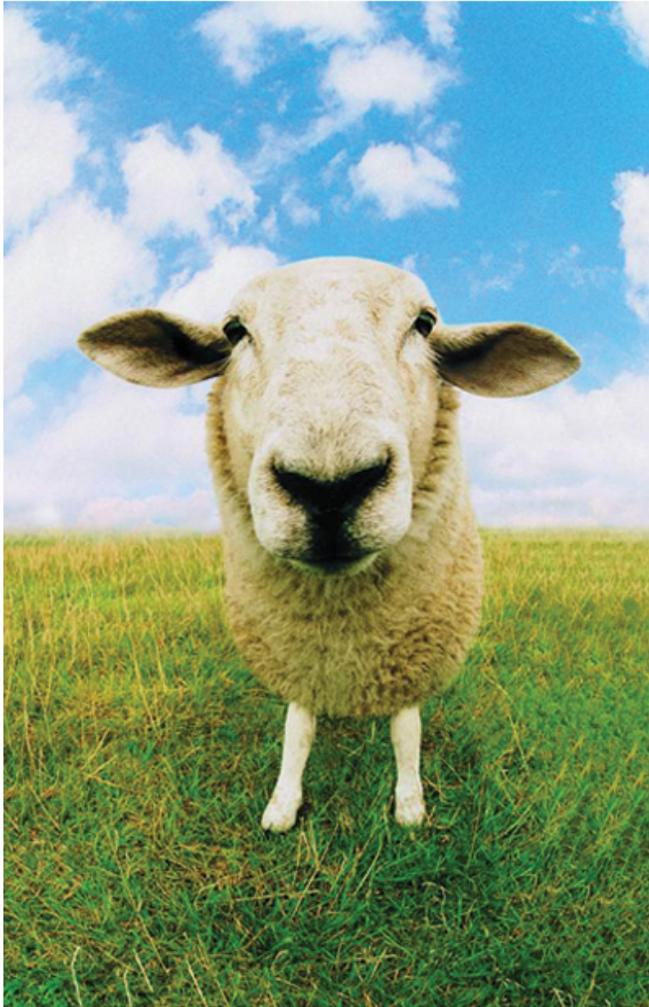


HIGH RESOLUTION



LOW RESOLUTION





High Resolution



Low Resolution



Picture created and printed at a high resolution of 350 dpi.



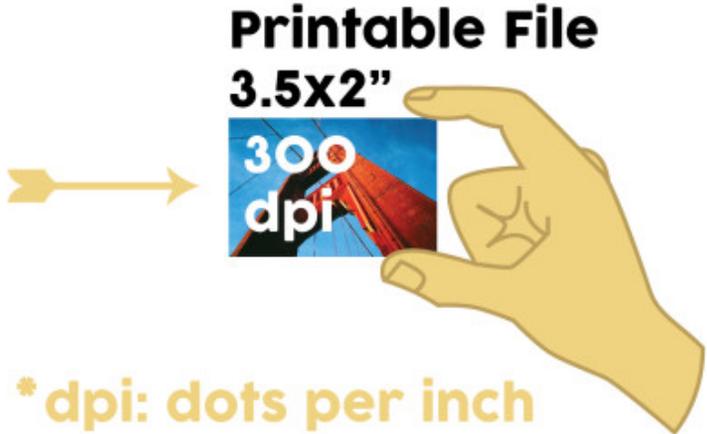
Picture created at a low resolution of 72 dpi will cause the image to be jaggy and not crisp.

72 DPI LOW RES IMAGE

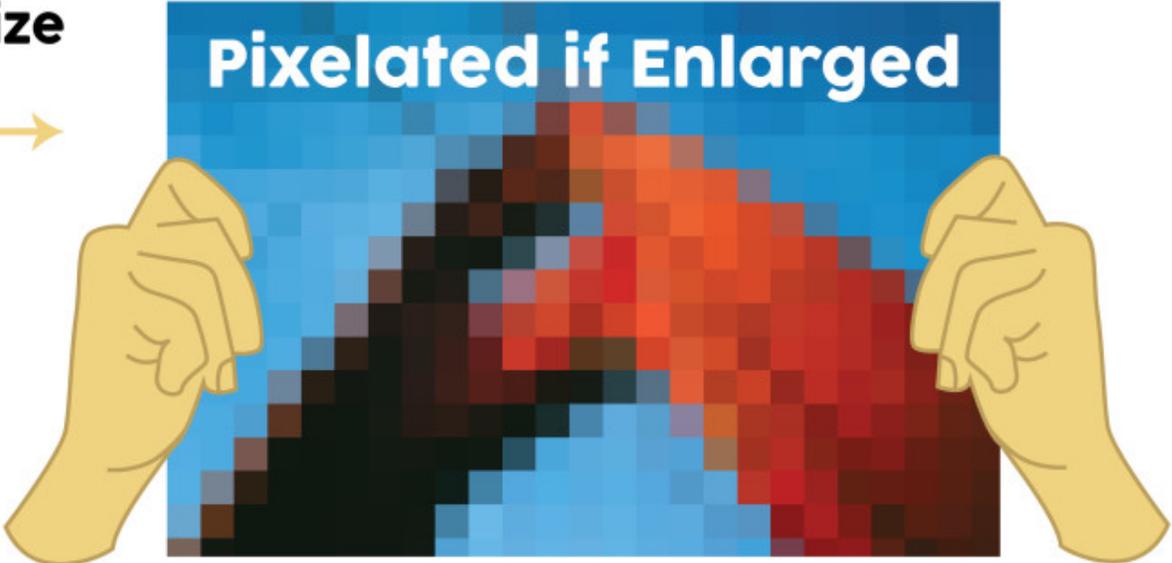


SAME IMAGE 300 DPI HIGH RES





Small Image Size



If you've ever looked at a print ad or even a photo online that was blurry and undefined, that means it is low resolution. Images that are clear and detailed are high.

Low is best for online, due to the fact that a lot of web graphics and online photos are normally created at 72dpi. 72 dpi is suited best for the web because it makes file sizes smaller, therefore pages load quicker.

Computers generally capture images at 72dpi, but then once someone tries to print the same picture, though it may be clear on the screen, it will print out jagged and hazy.

300dpi is used for print publications or commercial printing. This is the resolution you see when pictures are clear, glossy, and detailed.



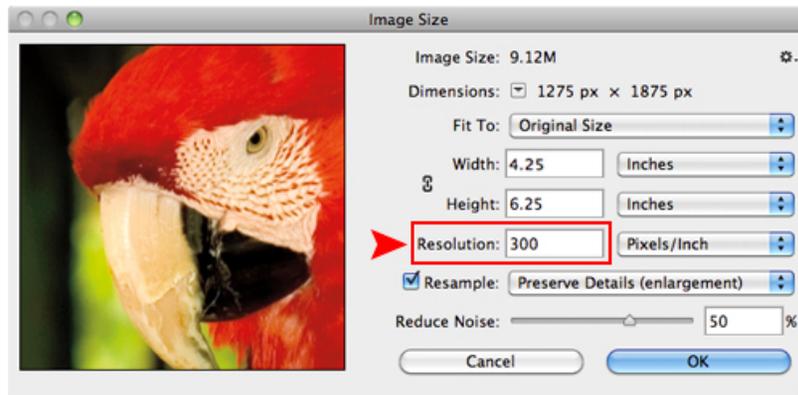
High resolution 300 dpi



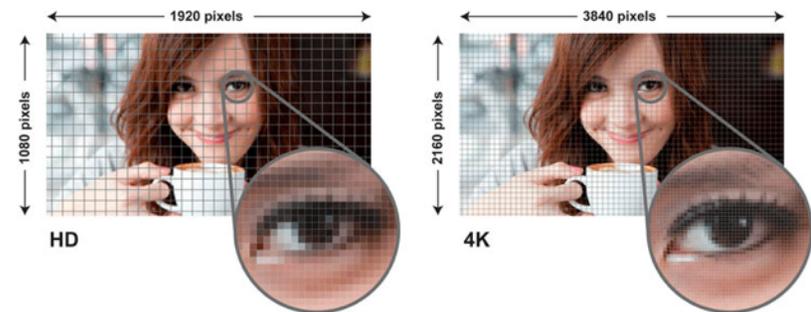
Low resolution 72 dpi

Photoshop:

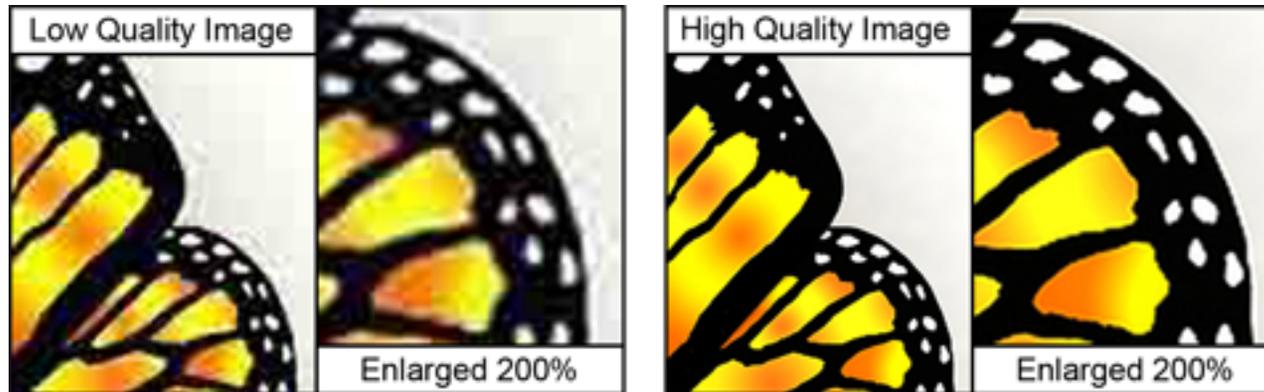
To see if your file has the proper resolution for printing in Photoshop, click on Image>Image Size. View the resolution section. The resolution should be set to 300 dpi.



For printing, the resolution should be 300 dpi. Notice the detail as being sharp and crisp.



It is important to know that trying to expand or stretch an image (in Photoshop) that is low resolution will not suddenly make it high resolution. It will only make it larger, while still retaining the blurriness.





The first example has a lot of detail – 300 ppi

The second example is at 72dpi but scaled up to the same size so you can see the difference in detail.

Photography ain't easy: anyone that says it is, is sorely mistaken.

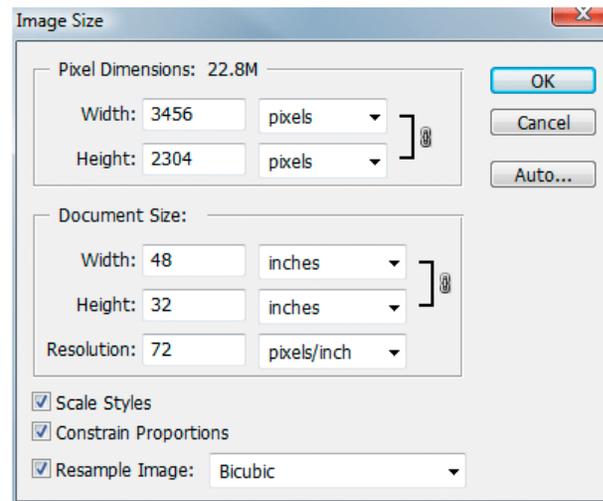


Resizing an Image

Resizing an image is one of the most commonly used skills in all of Photoshop.

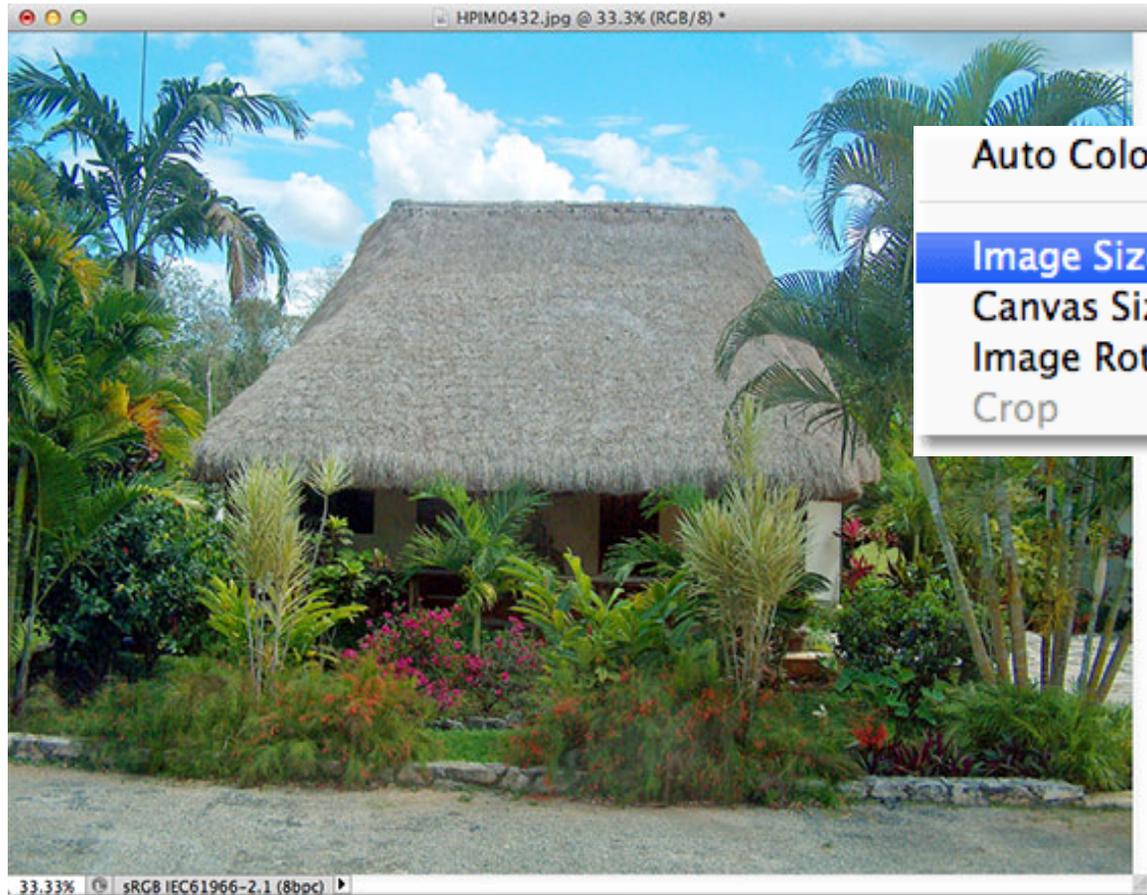
It's so common, in fact, that even people who know virtually nothing about Photoshop still manage to use it to resize their images, which should give you an idea of how easy it is to do.

In this tutorial, we'll learn how to resize images, as well as a general rule to keep in mind so your resized photos remain crisp and sharp.





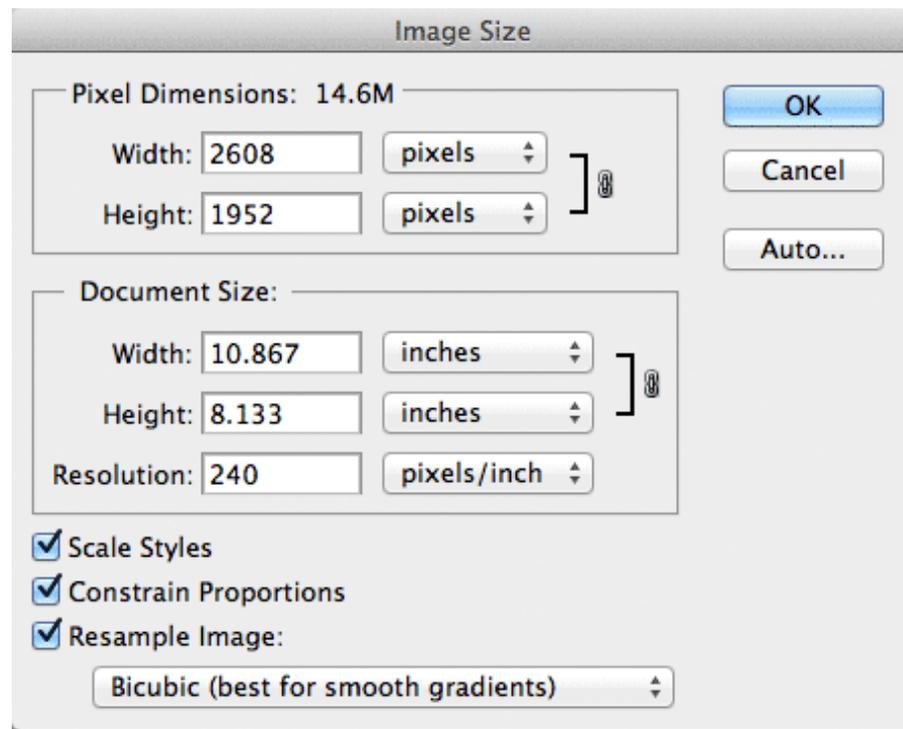
To resize an image in Photoshop, we use the **Image Size** command which we can get to by going up to the **Image menu** in the **Menu Bar** along the top of the screen and choosing **Image Size**



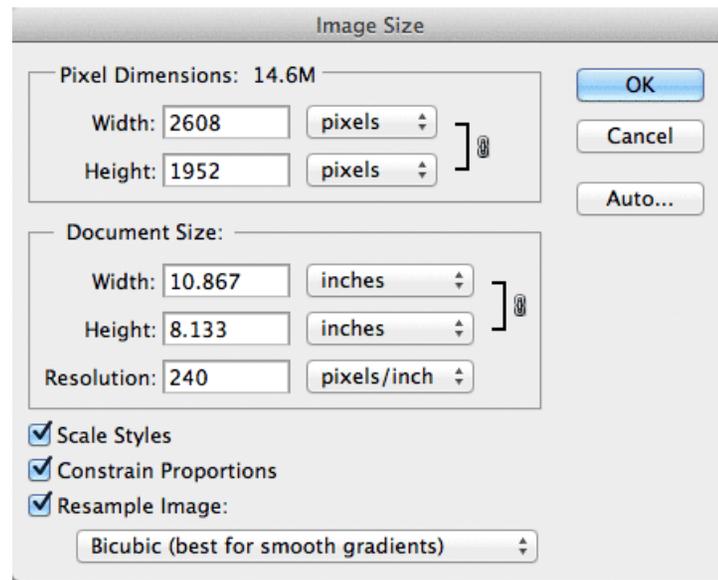
- Auto Color ⌘ B
- Image Size... ⌘ I**
- Canvas Size... ⌘ C
- Image Rotation ▶
- Crop

This will bring up the Image Size dialog box, as shown below:

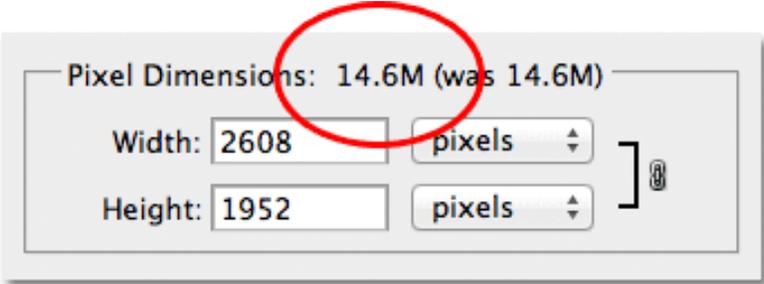
The dialog box has a few options:



If you look closely, you'll notice that the dialog box is divided into two main sections - **Pixel Dimensions** and **Document Size** - each showing different measurements.

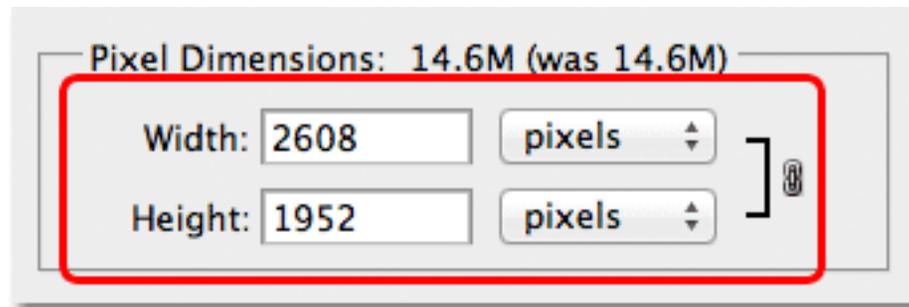


Let's look more closely, then, at the Pixel Dimensions section, which tells us two things about our image. First, if we look directly to the right of the words "Pixel Dimensions", we can see the current file size of the image. In my case, it's telling me that my photo is 14.6 M (the "M" stands for megabytes, or "millions of bytes"):



Knowing the file size of the image can be useful if you want to compare the size of the original version with the resized version, but it doesn't help us actually resize our image.

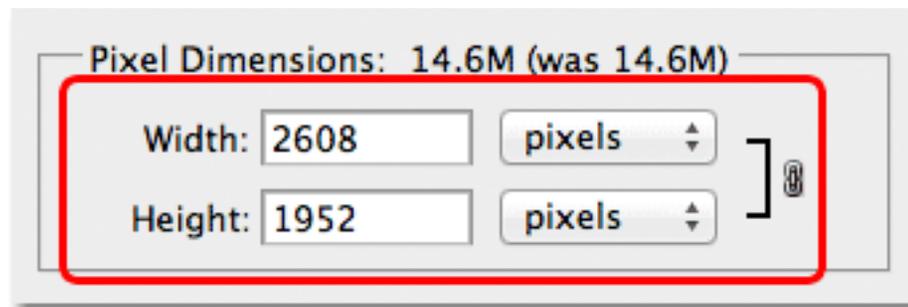
For that, we need the other bit of information that the Pixel Dimensions section is telling us - the current Width and Height of our image:



Here, we see that my original photo was 2608 pixels wide by 1952 pixels high. At that size, I'd have no problem printing a great looking 8x10, but I needed a smaller version, one that would fit better on these pages.

So how do we make it smaller?

I simply changed the numbers in the Width and Height boxes to what I needed! I'll set the new width for my image to 900 pixels and the height to 647 pixels (of course this is just an example, you can enter whatever size you need):

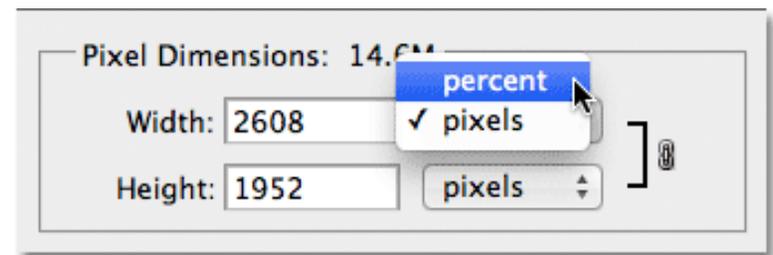


To change the Width and Height values, **simply double-click inside one of the two boxes** (either Width or Height), which will highlight the number currently showing in the box, and then type a new value.

When you're done, click the **OK button** and Photoshop will resize your image to the new dimensions you've specified.

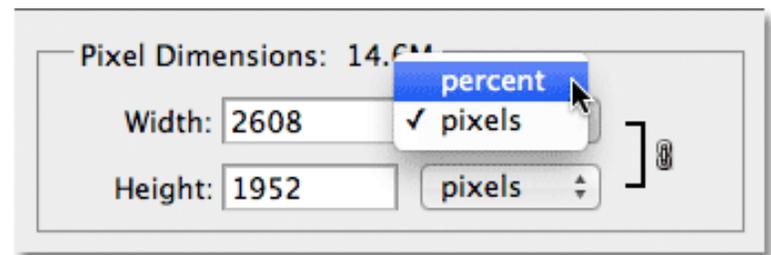
You can also resize your image by a percentage of the original image size rather than typing in a specific pixel value.

If you look to the right of the Width and Height value boxes, you'll notice that the measurement type is currently set to pixels, but if you click on either the word "pixels" or the arrow to the right of the word, a drop-down menu will appear which lets you change the measurement type to percent:



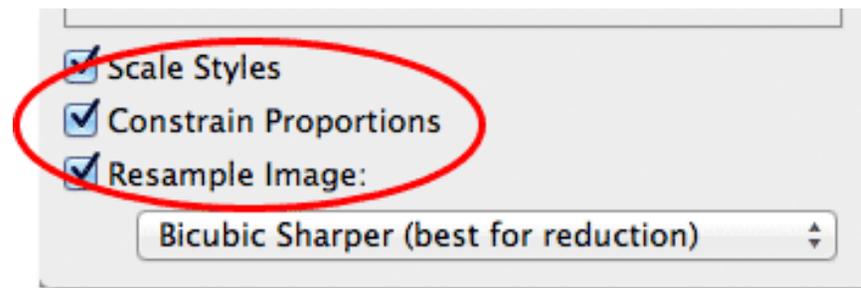
Once you've chosen percent as your measurement type, the **Pixel Dimensions** section will display the width and height of your image as a percentage rather than a pixel value. Resizing the image using a percentage is done the same way as if you were using pixel values.

Just **double-click inside the Width or Height** value box and type in a new percentage. When you're done, click the **OK button** and Photoshop will resize the image to whatever percent value you entered.



If you look near the bottom of the Image Size dialog box, you'll see the Constrain Proportions option which controls whether the width and height are linked.

By default, the option is selected, but **if you need to change the width and height separately**, simply uncheck this option:



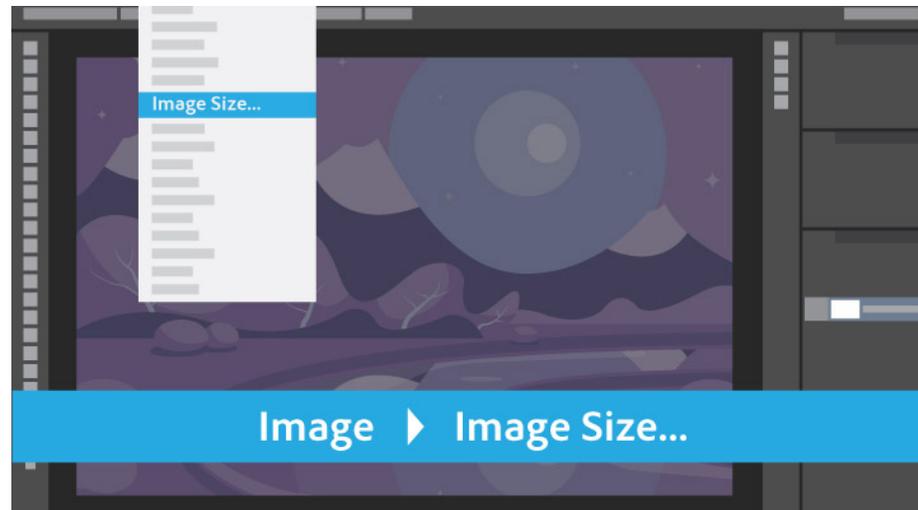
Breaking Down Resolution

[https://helpx.adobe.com/photoshop/how-to/
image-resolution-explained.html](https://helpx.adobe.com/photoshop/how-to/image-resolution-explained.html)

Breaking Down Resolution

[https://www.youtube.com/watch?
v=Wfnvf8zU648](https://www.youtube.com/watch?v=Wfnvf8zU648)

A review:
Open an image in Photoshop. Select Image > Image Size...



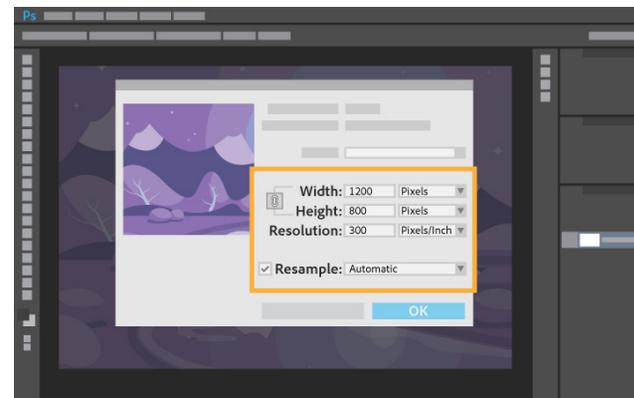
Do any of the following:

To change image size, enter values for Width and Height. To maintain the original ratio of width and height, select the Constrain Proportions () option. Deselect this option to adjust the width or height independently.

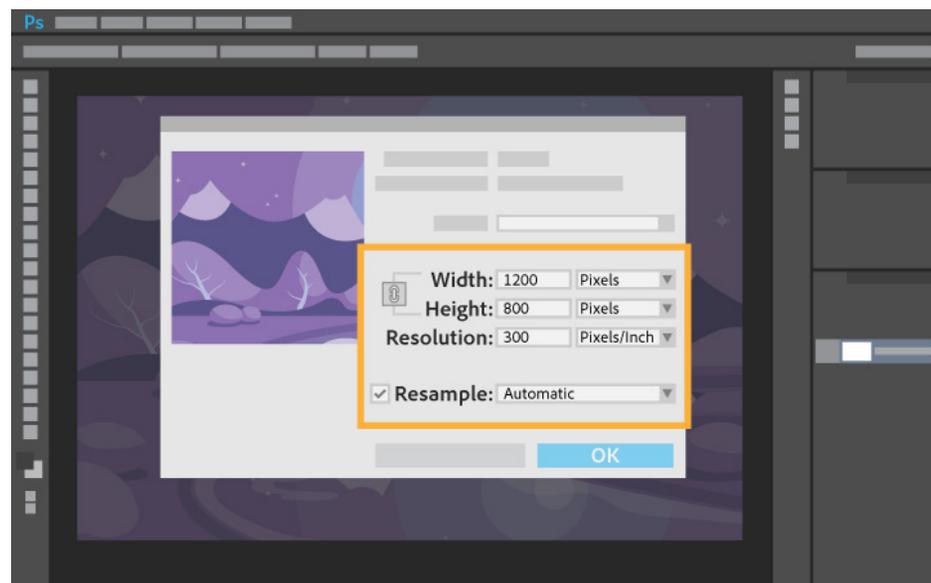
To change the Resolution, enter a new value.

To change the image size or resolution while allowing the total number of pixels to adjust proportionately, make sure that you select **Resample**.

To change the image size or resolution without changing the total number of pixels, **deselect Resample**.



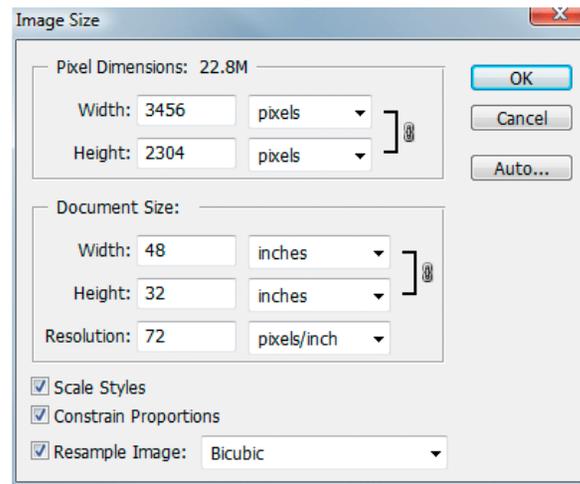
Click OK. Photoshop resizes the image based on the values you entered.



RESAMPLING VS. RESAMPLING

Resizing an image by reducing or increasing its number of pixels. An image can also be resized for printing without resampling and altering its physical structure.

The term resampling is used to describe the process of reducing or increasing the number of pixels in an image. Resampling can change the image file size as well as the image resolution. Resampling changes the original image.



RESIZING vs. RESAMPLING

<https://www.youtube.com/watch?v=EA2G8ND2Xs>

<http://tv.adobe.com/watch/learn-photoshop-cs6/understanding-resize-vs-resample/>



Don't forget that resolution is only **one** of the MANY parameters that determine the quality of images in a printed job! Image sharpness, noise, color accuracy and the composition of a picture are as important as its number of pixels.

Using a lossy format like JPEG (instead of shooting RAW) can make images blurry. The choice of printing paper and the settings of the press also have a huge impact.



REMEMBER:

The holy grail for good digital photography printing is 300ppi. With 300 pixels crammed into every inch of your image the naked eye cannot make out the individual pixels.

The image appears beautifully crisp!



72ppi



300ppi





300ppi



72ppi



High resolution image at 300 dpi (dots per inch), suitable for book printing.



Low resolution image at 72 dpi, which will look crisp on a monitor, but look choppy when printed in a book.



300 PPI



72 PPI



**USE
300 PPI
FOR PRINT**