



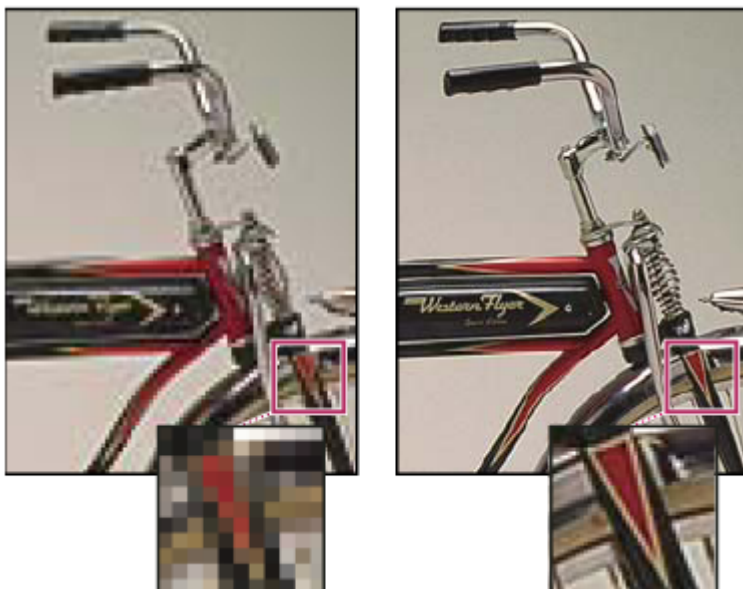
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Note:

Photoshop has an updated Image Size dialog box. See [Resizing images](#) for more information.

About pixel dimensions and printed image resolution

Pixel dimensions measure the total number of pixels along an image's width and height. Resolution is the fineness of detail in a bitmap image and is measured in pixels per inch (ppi). The more pixels per inch, the greater the resolution. Generally, an image with a higher resolution produces a better printed image quality.



Same image at 72-ppi and 300-ppi; inset zoom 200%

Unless an image is *resampled* (see [Resampling](#)), the amount of image data remains constant as you change either the print





same amount of image data.

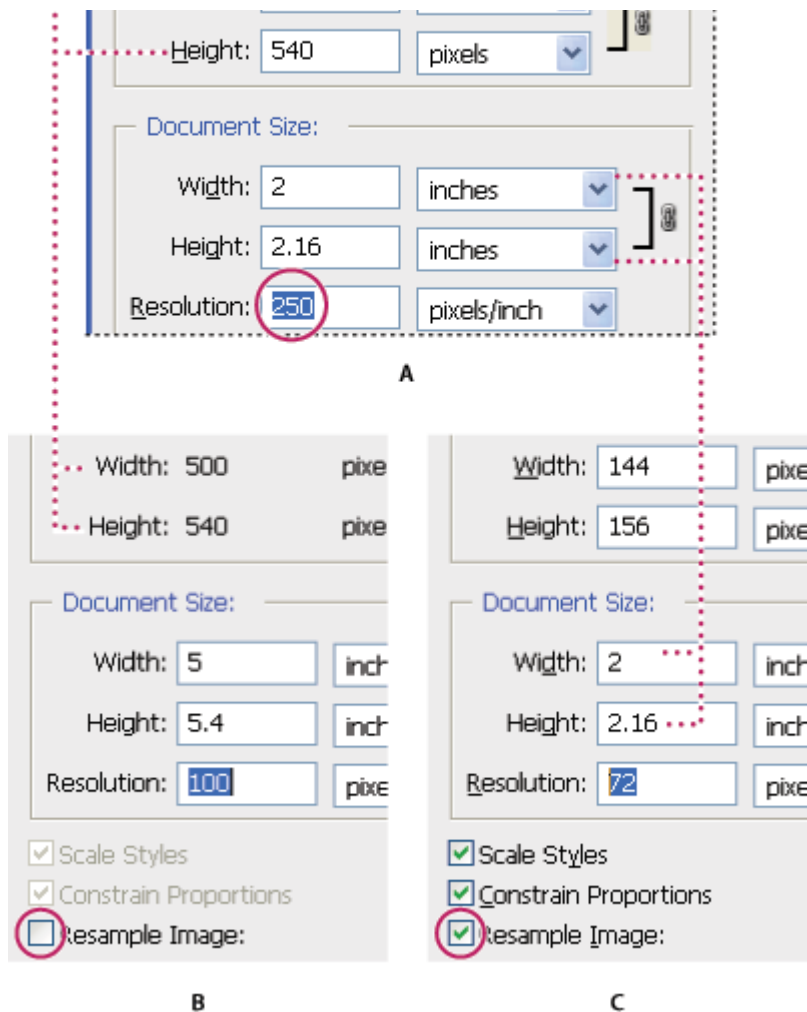
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Size). Deselect Resample Image, because you don't want to change the amount of image data in your photo. Then change width, height, or resolution. As you change one value, the other two values change accordingly. With the Resample Image option selected, you can change the resolution, width, and height of the image to suit your printing or onscreen needs.





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Pixel dimensions equal document (output) size times resolution.

A. Original dimensions and resolution **B.** Decreasing the resolution without changing pixel dimensions (no resampling) **C.** Decreasing the resolution at same document size decreases pixel dimensions (resampling).

Quickly display the current image size

If you want to quickly display a document's current image size, use the information box at the bottom of the document window.

- 1 Position the pointer over the file information box, and hold down the mouse button.





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Size is proportional to the pixel dimensions of the image. Images with more pixels may produce more detail at a given printed size, but they require more disk space to store and may be slower to edit and print. Image resolution thus becomes a compromise between image quality (capturing all the data you need) and file size.

Another factor that affects file size is file format. Because of the varying compression methods used by GIF, JPEG, PNG, and TIFF file formats, file sizes can vary considerably for the same pixel dimensions. Similarly, color bit-depth and the number of layers and channels in an image affect file size.

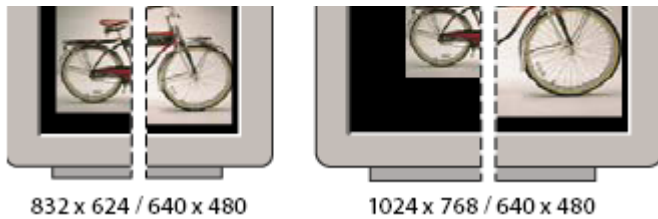
Photoshop supports a maximum pixel dimension of 300,000 by 300,000 pixels per image. This restriction places limits on the print size and resolution available to an image.

About monitor resolution

Your monitor's resolution is described in pixel dimensions. For example, if your monitor resolution and your photo's pixel dimensions are the same size, the photo will fill the screen when viewed at 100%. How large an image appears on-screen depends on a combination of factors—the pixel dimensions of the image, the monitor size, and the monitor resolution setting. In Photoshop, you can change the image magnification on-screen, so you can easily work with images of any pixel dimensions.



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A 620- by 400-pixel image displayed on monitors of various sizes and resolutions.

When preparing images for viewing on-screen, you should consider the lowest monitor resolution that your photo is likely to be viewed on.

About printer resolution

Printer resolution is measured in ink dots per inch, also known as dpi. Generally, the more dots per inch, the finer the printed output you'll get. Most inkjet printers have a resolution of approximately 720 to 2880 dpi. (Technically, inkjet printers produce a microscopic spray of ink, not actual dots like imagesetters or laser printers.)

Printer resolution is different from, but related to image resolution. To print a high quality photo on an inkjet printer, an image resolution of at least 220 ppi should provide good results.

Screen frequency is the number of printer dots or halftone cells per inch used to print grayscale images or color separations. Also known as *screen ruling* or *line screen*, screen frequency is measured in lines per inch (lpi)—or lines of cells per inch in a halftone screen. The higher the resolution of the output device, the finer (higher) a screen ruling you can use.

The relationship between image resolution and screen frequency determines the quality of detail in the printed image. To produce a halftone image of the highest quality, you generally use an image resolution that is from 1.5 to at most 2 times the screen frequency. But with some images and output devices, a lower resolution can





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Some imagesetters and 600-dpi laser printers use screening technologies other than halftoning. If you are printing an image on a nonhalftone printer, consult your service provider or your printer documentation for the recommended image resolutions.



Screen frequency examples

A. 65 lpi: Coarse screen typically used to print newsletters and grocery coupons **B.** 85 lpi: Average screen typically used to print newspapers **C.** 133 lpi: High-quality screen typically used to print four-color magazines **D.** 177 lpi: Very fine screen typically used for annual reports and images in art books

Determine a suggested resolution for an image

If you plan to print your image using a halftone screen, the range of suitable image resolutions depends on the screen frequency of your output device. Photoshop can determine a recommended image resolution based on the screen frequency of your output device.





If your image resolution is more than 2.5 times the screen ruling, an

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a copy of the file, and then reduce the resolution.

- 1 Choose Image > **Image Size**.
- 2 Click Auto.
- 3 For Screen, enter the screen frequency for the output device. If necessary, choose a different unit of measurement. Note that the screen value is used only to calculate the image resolution, not to set the screen for printing.
- 4 For Quality, select an option:

Draft Produces a resolution that is the same as the screen frequency (no lower than 72 pixels per inch).

Good Produces a resolution 1.5 times the screen frequency.

Best Produces a resolution 2 times the screen frequency.

View the print size onscreen

- 1 Do one of the following:
 - Choose View > Print Size.
 - Select the Hand tool or Zoom tool, and click Print Size in the options bar.

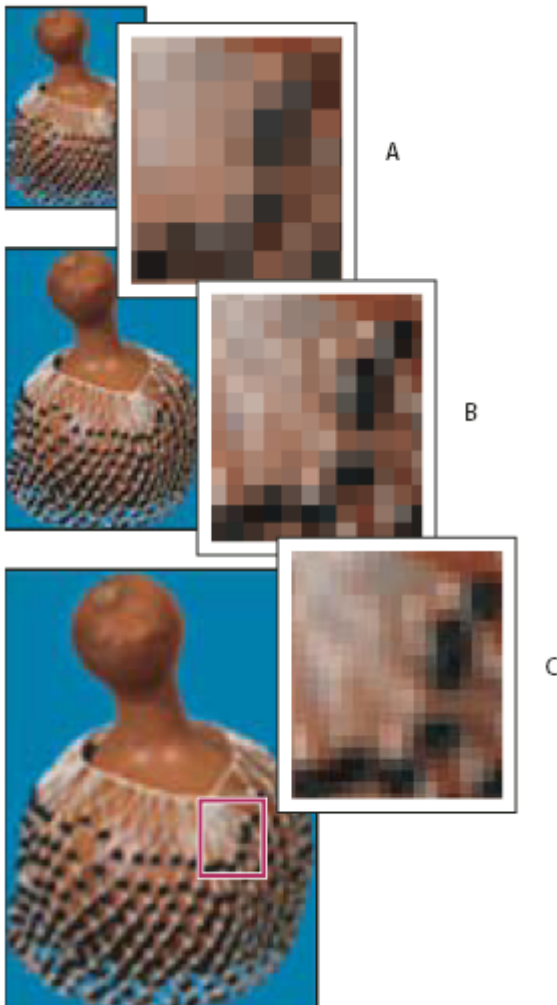
The image is redisplayed in its approximate printed size, as specified in the Document Size area of the **Image Size** dialog box. The size and resolution of your monitor affect the on-screen print size.

Note:



Resampling

Resampling is changing the amount of image data as you change either the pixel dimensions or the resolution of an image. When you *downsample* (decrease the number of pixels), information is deleted from the image. When you *resample up* (increase the number of pixels, or *upsample*), new pixels are added. You specify an *interpolation* method to determine how pixels are added or deleted.



Resampling pixels

A. Downsampled **B.** Original **C.** Resampled up (selected pixels displayed for each set of images)





dimensions, the image loses some detail and sharpness. Applying

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You can avoid the need for resampling by scanning or creating the image at a sufficiently high resolution. If you want to preview the effects of changing pixel dimensions on-screen or to print proofs at different resolutions, resample a duplicate of your file.

Photoshop resamples images using an *interpolation method* to assign color values to any new pixels based on the color values of existing pixels. You can choose which method to use in the **Image Size** dialog box.

Nearest Neighbor A fast but less precise method that replicates the pixels in an image. This method is for use with illustrations containing edges that are not anti-aliased, to preserve hard edges and produce a smaller file. However, this method can produce jagged effects, which become apparent when you distort or scale an image or perform multiple manipulations on a selection.

Bilinear A method that adds pixels by averaging the color values of surrounding pixels. It produces medium-quality results.

Bicubic A slower but more precise method based on an examination of the values of surrounding pixels. Using more complex calculations, Bicubic produces smoother tonal gradations than Nearest Neighbor or Bilinear.

Bicubic Smoother A good method for enlarging images based on Bicubic interpolation but designed to produce smoother results.

Bicubic Sharper A good method for reducing the size of an image based on Bicubic interpolation with enhanced sharpening. This method maintains the detail in a resampled image. If Bicubic Sharper oversharpen some areas of an image, try using Bicubic.

Note:

You can specify a default interpolation method to use whenever Photoshop resamples image data. Choose Edit > Preferences > General (Windows) or Photoshop > Preferences > General (Mac OS),





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Change pixel dimensions of an image

Changing an image's pixel dimensions affects not only its onscreen size but also its image quality and its printed characteristics—either its printed dimensions or its image resolution.

- 1 Choose Image > **Image Size**.
- 2 To maintain the current ratio of pixel width to pixel height, select Constrain Proportions. This option automatically updates the width as you change the height, and vice versa.
- 3 Under Pixel Dimensions, enter values for Width and Height. To enter values as percentages of the current dimensions, choose Percent as the unit of measurement. The new file size for the image appears at the top of the **Image Size** dialog box, with the old file size in parentheses.
- 4 Make sure that Resample Image is selected, and choose an interpolation method.
- 5 If your image has layers with styles applied to them, select Scale Styles to scale the effects in the resized image. This option is available only if you selected Constrain Proportions.
- 6 When you finish setting options, click OK.

Note:

For best results when you produce a smaller image, downsample and apply the Unsharp Mask filter. To produce a larger image, rescan the image at a higher resolution.

Change the print dimensions and resolution

When creating an image for print media, it's useful to specify image size in terms of the printed dimensions and the image resolution. These two measurements, referred to as the *document size*,





image is placed into another application. You can further

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affect only the printed image, not the document size of the image file.

If you turn on resampling for the image, you can change print dimensions and resolution independently (and change the total number of pixels in the image). If you turn off resampling, you can change either the dimensions or the resolution—Photoshop adjusts the other value automatically to preserve the total pixel count. For the highest print quality, it's generally best to change the dimensions and resolution first, without resampling. Then resample only as necessary.

- 1 Choose Image > **Image Size**.
- 2 Change the print dimensions, image resolution, or both:
 - To change only the print dimensions or only the resolution and adjust the total number of pixels in the image proportionately, select Resample Image and then choose an interpolation method.
 - To change the print dimensions and resolution without changing the total number of pixels in the image, deselect Resample Image.
- 3 To maintain the current ratio of image width to image height, select Constrain Proportions. This option automatically changes the width as you change the height, and vice versa.
- 4 Under Document Size, enter new values for the height and width. If desired, choose a new unit of measurement. Note that for Width, the Columns option uses the width and gutter sizes specified in the Units & Rulers preferences.
- 5 For Resolution, enter a new value. If desired, choose a new unit of measurement.

Note:

To restore the initial values displayed in the **Image Size** dialog box, hold down Alt (Windows) or Option (Mac OS), and click Reset.





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File size depends on the pixel dimensions of an image and the number of layers it contains. Images with more pixels may produce more detail when printed, but they require more disk space to store and may be slower to edit and print. You should keep track of your file sizes to make sure the files are not becoming too large for your purposes. If the file is becoming too large, reduce the number of layers in the image or change the image size.

You can view the file size information for an image at the bottom of the application window.

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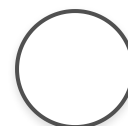
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