

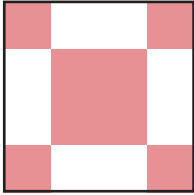
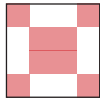
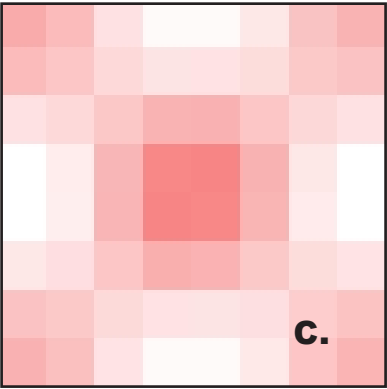


PIXELS: RESIZING vs RESAMPLING

The examples below are to demonstrate the relationship and difference between changing the size of a Photoshop Document by resizing or resampling. These small resolutions are nothing you would use in the real world of web design or print design but are set only as a relative examples to show the pixel squares.

Resizing does not change the original number of pixels, the quality of the image, or the file size; it only changes the size of the pixel and hence the Document Size. To Resize a document go to **Image>Image Size and uncheck the Resample box**. Changing any one of the Width, Height, or Resolution fields will automatically change the other fields. Like a see-saw, if one side goes up, the other must come down. Increasing the Resolution will decrease the Width and Height of the Document Size and visa versa.

Resampling involves either adding pixels to a document (upsampling) or subtracting pixels from a document (downsampling). Resampling always changes the original number of pixels, the file size, and affects the quality of the image. In the Upsampling example, see how Photoshop made up pixels of average colors to put in between the original pixels. In the Downsampling example, see how it threw out pixels and averaged the remaining colors. Neither upsampling or downsampling retained the original number of pixels, so the actual quality and clarity of the graphic is disguised by Photoshop's interpolation. If the original image has enough pixels (1200 x1800 pixels or greater) to begin with, then most often the degradation of quality may not even be visible to the eye when resampling. Photoshop gives you a choice of several interpolation methods to choose from if you have to resample. The general rule is to choose a Bicubic method for continuous tone images. If you are downsampling choose Bicubic Sharper; if you are upsampling choose Bicubic Smoother. To Resample a document go to **Image>Image Size and check the Resample, Scale Styles, and Constrain Proportions boxes**. You

can change the size of your document by changing any of the open fields, Pixel Width or Height, Document Size, and/or the Resolution. The before and after File Sizes will be notated at the top of the Image Size Dialog box.[ex. Pixel Dimensions: 192 bytes (was 48 bytes)]. It is important to understand what the results are given the choices of resampling vs. resizing a document. Using the original pink checkerboard image, pretend your printer prints at its best, when the document's resolution is between 1 and 2 pixels per inch. Your original file is 4 x 4 inches, but you want to print the document at 2 x 2 inches. Both the A & D examples are 2 x 2 inches. One has been resized and the other has been downsampled to be 2 x 2 inches. Which method would be the better choice in this scenario? Obviously "A." Now, pretend you need a 2 x 2 inch document for the Web. Pretend the resolution for the Web is 1 pixel per inch. Which method would be the better choice in this scenario? You would have to choose "D" in this instance. Even though "A" is a 2 x 2 inch document, it's resolution is 2 pixels per inch. If you put that on your web page it would appear as a 4 x 4 inch document because it has 4 pixels across and 4 pixels down.

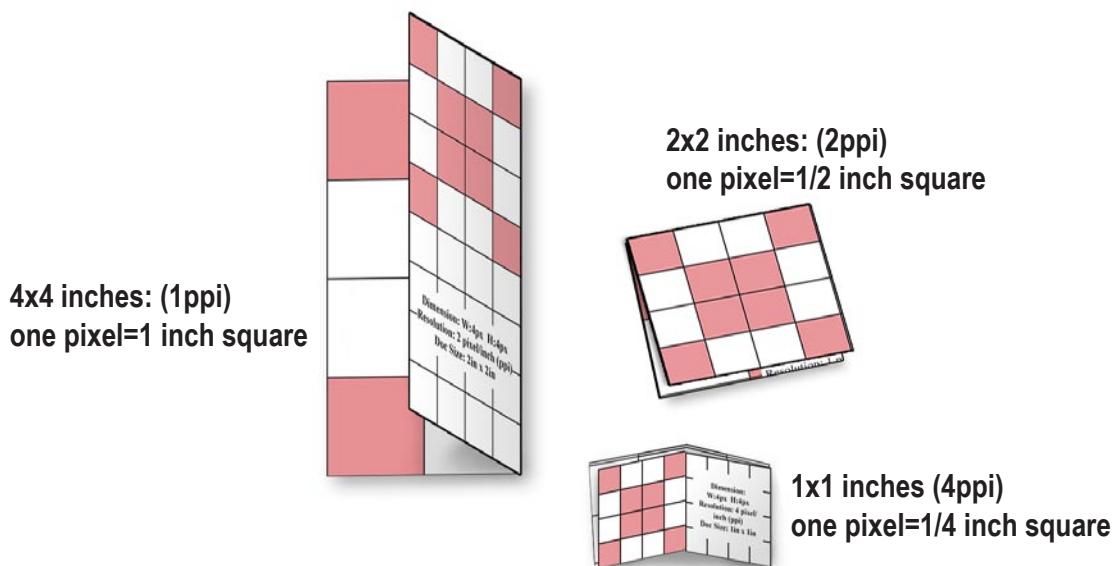
<p>ORIGINAL</p> <p>Pixel Dimension: W: 4 pixels x H: 4 pixels Resolution: 1 pixel/inch (ppi) Document Size: W: 4 inches x 4 inches File Size: 48 bytes</p> 	<p>RESIZE</p> <p>Pixel Dimension: W: 4 pixels x H: 4 pixels Resolution: 2 pixel/inch (ppi) Document Size: W: 2 inches x 2 inches File Size: 48 bytes</p> 
<p>UPSAMPLING</p> <p>Pixel Dimension: W: 8 pixels x H: 8 pixels Resolution: 2 pixel/inch (ppi) Document Size: W: 4 inches x 4 inches File Size: 196 bytes</p> 	<p>RESIZE</p> <p>Pixel Dimension: W: 4 pixels x H: 4 pixels Resolution: 4 pixel/inch (ppi) Document Size: W: 1 inches x 1 inches File Size: 48 bytes</p> 
	<p>DOWNSAMPLING</p> <p>Pixel Dimension: W: 2 pixels x H: 2 pixels Resolution: 1 pixel/inch (ppi) Document Size: W: 2 inches x 2 inches File Size: 12 bytes</p> 

PRINTING INSTRUCTIONS FOR INSTRUCTORS: 4 Pixel Square Resizing Guides per 8x5x11 inch page.

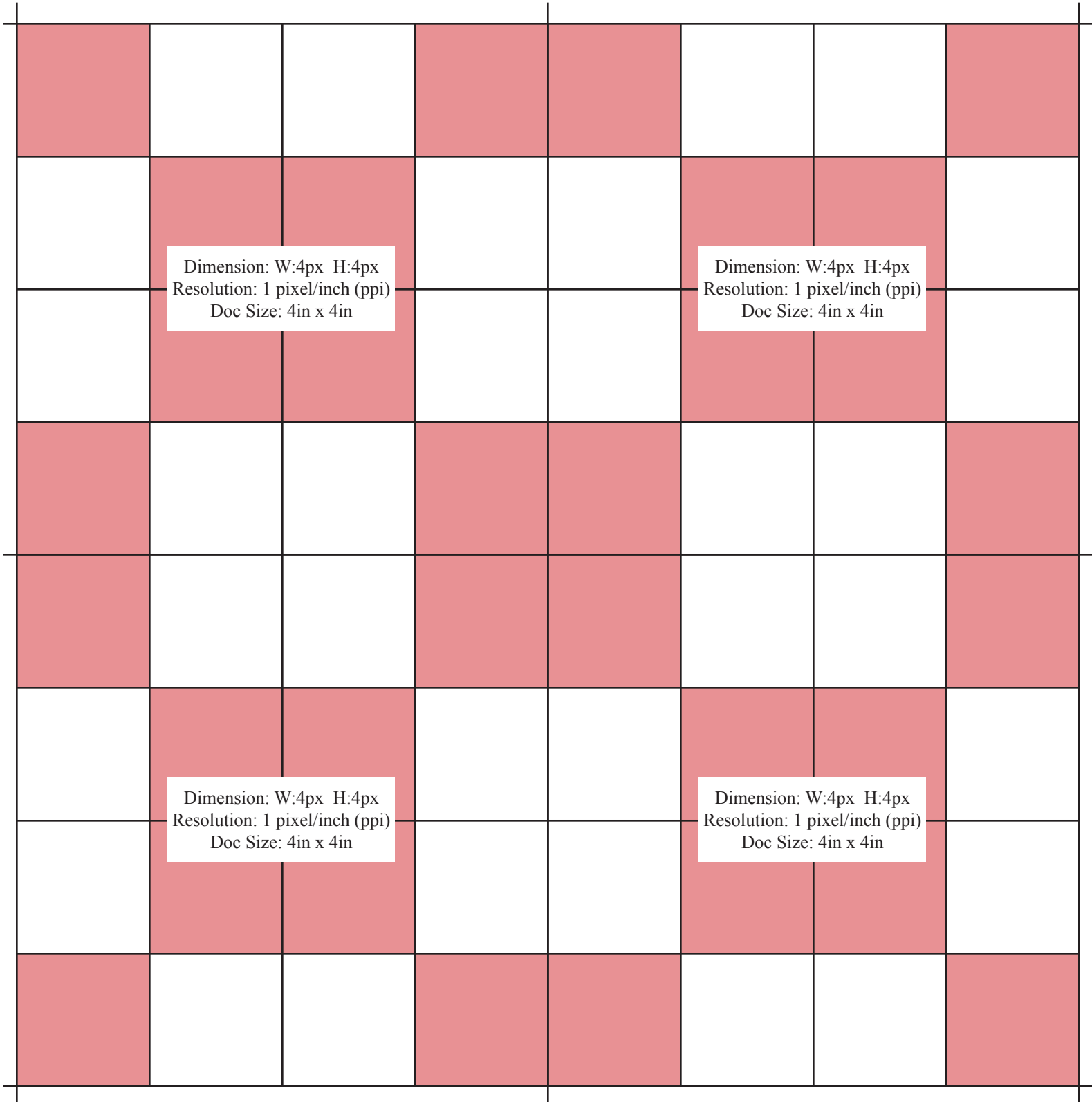
1. The last 2 pages contain the 4-up 2 page layout for my Pixel Square Resizing Guide.
2. Print on 8.5 x 11 inch paper. Set Print Page Range 3-3, Set # copies.
3. Print Centered Horizontally and Vertically.
4. When first side is printed, flip pages, reload in printer and Set Print Page Range 4-4, Set # copies.
5. Cut on guides that extend beyond the graphic so that you end up with four 4-inch squares; front side has page 3; W: 4-1 inch pixels; H: 4-1 inch pixels; back side has page 4 with the 2ppi, 4 ppi, and the Terms and Resolution Ranges.

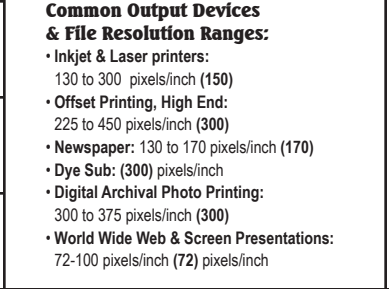
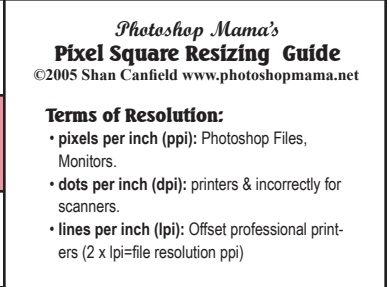
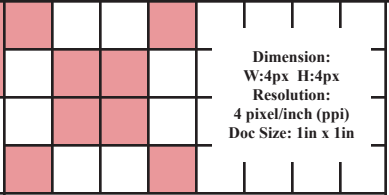
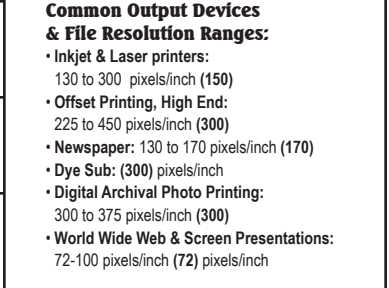
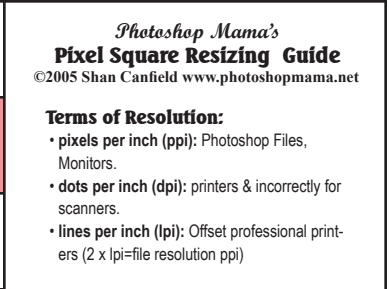
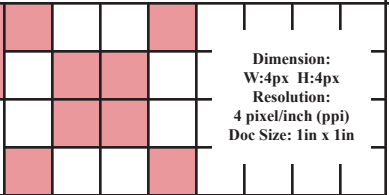
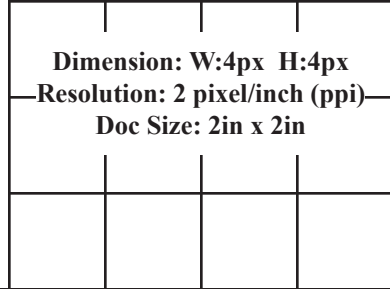
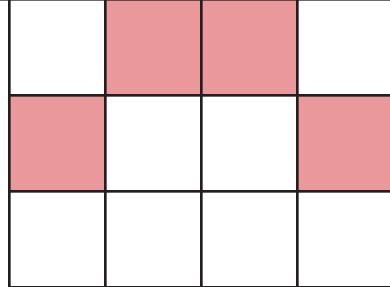
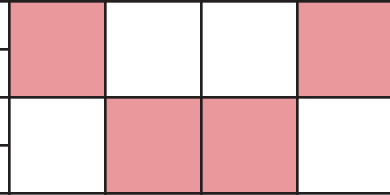
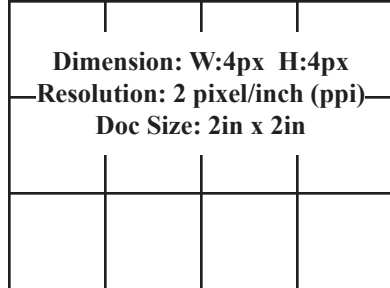
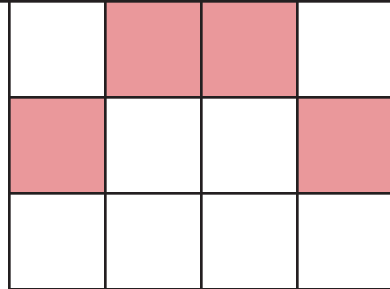
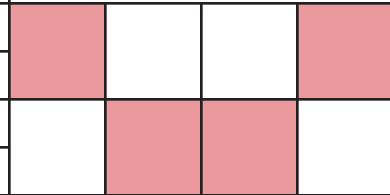
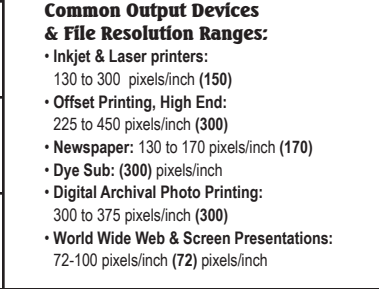
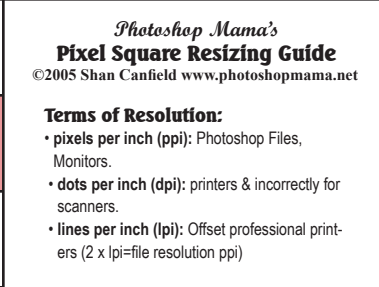
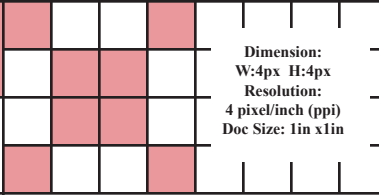
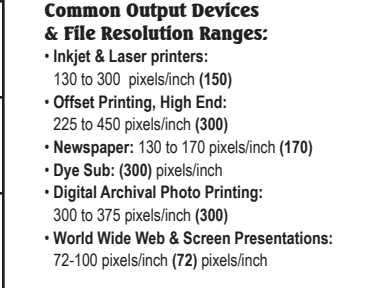
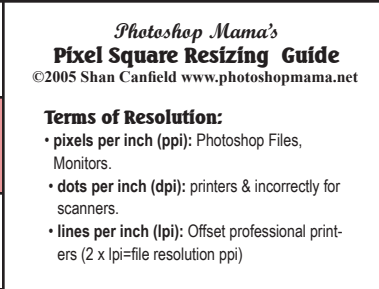
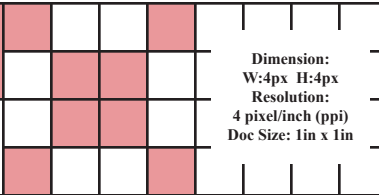
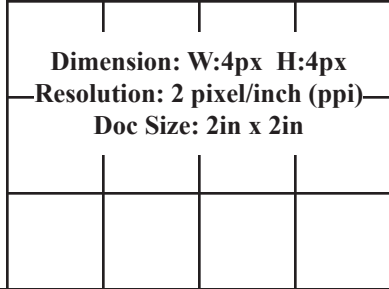
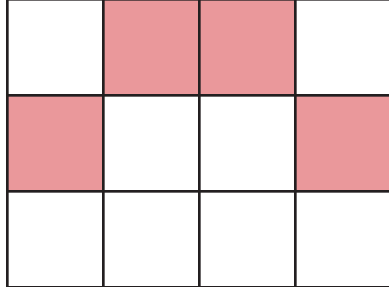
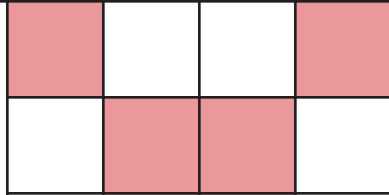
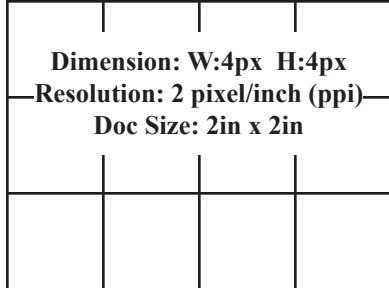
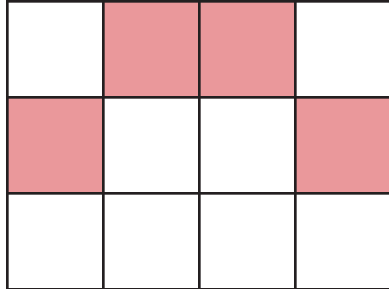
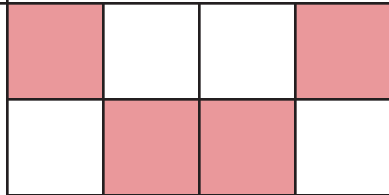
PIXEL SQUARE RESIZING INSTRUCTIONS

1. Give a cut pixel guide to student. The Common Output Devices and File Resolutions printed on the guide have the most common resolution listed in boldface.
2. With guide expanded, view the side with the large 1 inch pixels—Dimension W: 4px H: 4px; Resolution: 1 pixel/inch (ppi); Doc Size 4" x 4". Explain that each square represents 1 pixel and on this side, is actually 1 inch.
3. Flip over the guide—fold vertically along the 2 pixel/inch line; then fold horizontally so both visible sides show the same size pixels. Explain that the number of pixels have not changed but the resolution has been changed to 2 pixels per inch; therefore the Document size is now 2" x 2"; one fourth the original size. This is an example of Resizing, not Resampling--the document still has a W: 4 pixels and H: 4 pixels and still has the same File Size in terms of Bytes, Kilobytes or Megabytes but now there are 2 pixels that fit in 1 inch.
4. Open the first fold and flip the fold so that the 4ppi grid is up; fold over again twice so that the 4ppi grid is visible and the folded Document size is now a 1" x 1" square. Explain that the number of pixels from the original 4" x 4" document still has not changed but since the resolution has increased 4 times that of the original that the document size had decreased 1/16th of the original. And as you can see, there are now 4 pixels in a 1 inch square.
5. Summarize Resizing by pointing out the inverse relationship between Resolution and Document Size: If the Resolution (ppi) increases then the Document Size decreases or if the Document Size increases then the Resolution (ppi) decreases but the original number of pixels always remains the same, as does the file size. While the inherent shape of a pixel is always a square in a Photoshop Document, for print or web, stress that a pixel has no inherent size—other than what is designated for the Resolution. The Resolution is the "key." The Pixel Square Resizing Guide makes it easy to prove this abstraction, since it is designed based on a 1 inch grid. When you fold to where the resolution is changed to 2 pixels/inch, you can see that a single pixel has changed its size from a 1 inch square to a 1/2 inch square; fold again to where the resolution is changed to 4 pixels/inch and you can see that a single pixel has changed its size to a 1/4 inch square. To show how the pixel gets larger, reverse the process, starting the with the 4 ppi folded guide and unfold to the smaller resolutions which yield larger pixels!



After printing this page (page 3 of this document), flip over and reload the printed sheet(s) in your printer. Print the next page (page 4 of this document) so it is on the back side of this one. Cut into fours. You will have four separate Pixels Resizing guides, printed front and back.





Dimension:
W:4px H:4px
Resolution:
4 pixel/inch (ppi)
Doc Size: 1in x 1in

Dimension:
W:4px H:4px
Resolution:
4 pixel/inch (ppi)
Doc Size: 1in x 1in

Photoshop Mama's
Pixel Square Resizing Guide
©2005 Shan Canfield www.photoshopmama.net

Terms of Resolution:

- **pixels per inch (ppi):** Photoshop Files, Monitors.
- **dots per inch (dpi):** printers & incorrectly for scanners.
- **lines per inch (lpi):** Offset professional printers (2 x lpi=file resolution ppi)

Common Output Devices & File Resolution Ranges:

- **Inkjet & Laser printers:** 130 to 300 pixels/inch (150)
- **Offset Printing, High End:** 225 to 450 pixels/inch (300)
- **Newspaper:** 130 to 170 pixels/inch (170)
- **Dye Sub: (300)** pixels/inch
- **Digital Archival Photo Printing:** 300 to 375 pixels/inch (300)
- **World Wide Web & Screen Presentations:** 72-100 pixels/inch (72) pixels/inch

Dimension: W:4px H:4px
Resolution: 2 pixel/inch (ppi)
Doc Size: 2in x 2in

Dimension: W:4px H:4px
Resolution: 2 pixel/inch (ppi)
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