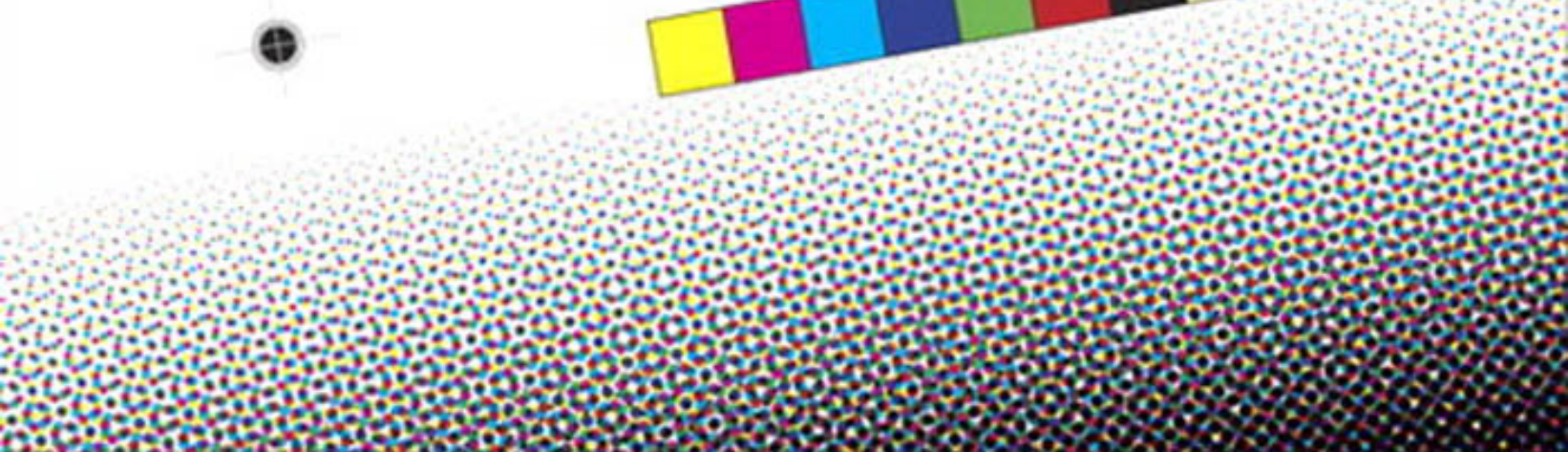
FROM **DESIGN** ▸ ◂ INTO **PRINT**

Preparing Graphics and Text for Professional Printing

SANDEE COHEN



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by Sandee Cohen

Peachpit Press

Color mode and depth chart

Use the following chart as a quick recap of the different color modes. And remember, the deeper the bit depth, the greater the file size.

COLOR MODE	BIT DEPTH	# OF CHANNELS	# OF COLORS
Bitmap	1-bit	1	2
Grayscale	8-bit	1	256 shades of gray
RGB	24-bit	3	16.7 million
CMYK	32-bit	4	16.7 million
Index	8-bit	1	2 to 256 colors

Raster Images and Resolutions

Pixels and resolution are the heart and soul of working with digital photographs, art, and scanned images. It's somewhat similar to buying bed linens. At higher thread counts the sheets feel good; at lower counts they feel rough. With the proper resolution, images look good; with the wrong resolution, images look blurry or jagged.

There are two ways to determine the correct resolution. One is to memorize a set of numbers and rules and follow them by rote. That's okay until a project comes up that has slightly different requirements—then you're lost.

The other way is to understand *why* the numbers and rules were set. Then if a project comes up that's different, you'll know what to do.

This chapter covers the details of resolution for scanning and printing images. The goal is that by the end of this chapter you'll understand how to determine the correct resolution for any type of image for any project. (Of course, I'll also give you some numbers and rules to follow.)

Monitor resolution

Before we get into how to set the resolution for printing images, it's important to understand what the monitor is doing with pixels. After all, you're looking at the computer screen that holds the image for printing.

First, you need to understand the concept of **pixels**. Pixels are the "picture elements," or rectangles that create the images on a computer screen. If you hold a strong magnifying glass up to the monitor, you can actually see the rectangles and how a single color pixel fills up each rectangle.

If you look at the display preferences for your monitor, you can choose from the list of the recommended monitor resolutions. You can change the number of pixels the monitor displays. Now here's where it gets tricky. A *low* monitor resolution such as 800 pixels across and 600 pixels down gives you a total of 480,000 pixels (800 times 600). These pixels are rather *big* which is why it's hard to fit lots of windows and documents on the screen. The *lower* the resolution, the *larger* the pixels.

But if you choose a *high* monitor resolution, such as 1600 by 1200, the pixels get *smaller*. This means everything on your screen is smaller but you can fit more stuff on the screen. It also means

Raster (Dots) vs. Vector (Lines)

Raster refers to images, monitor displays, and computer graphics that use dots (on paper) or pixels (on the monitor). You'll also hear them referred to as bitmap images. In Chapter 4 you read that image editing programs such as Photoshop, Paint Shop Pro, or PhotoDeluxe create and work with images using the pixels on the screen, so those graphics are raster images.

You also read in Chapter 4 that vector drawing programs such as Illustrator or CorelDraw create and work with images as collections of independent lines and shapes, or objects, that are each defined by mathematical formulas. Those graphics are vector images.

As you read this chapter about resolution, this is the important difference to understand about raster and vector images: *vector images don't give a hoot about all this resolution stuff; it doesn't apply to them*. Vector images carry their resolution around in their math formulas—they will resolve to the resolution of the output device. For all the details about vector graphics, see Chapter 7.

So this chapter only applies to raster images, which is any image you have scanned, taken with a digital camera, or created in an image editing program.

that old-timers such as me can't read the type on the controls and menus. The pixels are just too damn small!

A low monitor resolution (left) displays larger pixels and larger screen items.

A high monitor resolution (right) displays smaller pixels and small screen items.

This is similar to the resolutions for high-definition flat panel televisions. An HD television screen with a resolution of 720p (pixels) has fewer pixels and less details than an HD television with a resolution of 1080p.

Image resolution

If you understand monitor resolution, you're well on your way to understanding image resolution. The same principles apply.

- The lower the resolution, the larger the pixels.
- The higher the resolution, the smaller the pixels.

Remember the kitchen floor analogy from the previous chapter? Imagine you're laying out a kitchen floor and you want to have the most beautiful, most detailed design. Which would you use: big, clunky tiles that are 1 square foot or smaller tiles that are only 1 square inch?

Obviously you'd choose the smaller tiles—the smaller the tile, the better the detail in the art. Now consider each of the tiles as the resolution of the floor. But instead of pixels per inch you have tiles per foot. Some tiles are larger at 1 tile per foot. Other tiles are smaller at 12 tiles per foot—the higher the resolution the smaller the tile.

That's the situation with pixels. Each pixel is a tile—the smaller the pixel the better the detail of your image. In the early days of computer graphics it was very easy to find artwork that had been created at the wrong resolution. Artwork—especially hand drawings—looked blocky or jagged. Designers would complain that their images had the "jaggies." Those jaggies were simply the large pixels on the edges of the art.

Common image resolution can be as low as 72 pixels per inch (**ppi**) to as high as 300 pixels per inch. Most Web graphics are created at 72 PPI. Most print graphics are created at 300 PPI. But, as with all good rules there are exceptions to these numbers.

The "cost" of pixels

So why would anyone ever worry about pixel resolution? Why not take photos with the highest resolution the camera can provide? Why not scan images at insanely high quality?

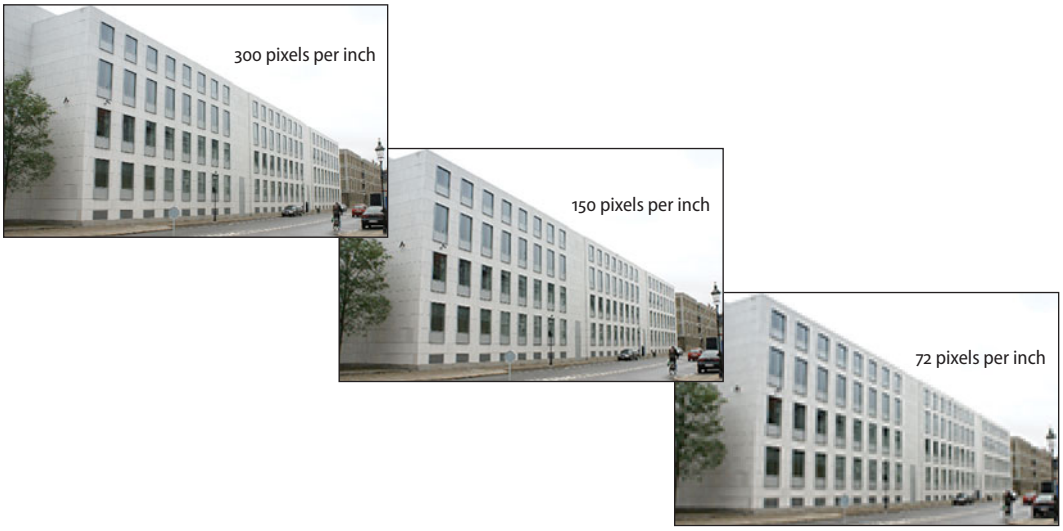
Well, consider the floor tiles. What if each tile costs a dollar (or a yen or pound or euro)? It doesn't matter how big or small the tiles are, they all cost 1 unit each.

If you're rich and don't care about the cost of the tiles, you can buy as many as you want at the floor care center. But reality says you need to worry about the cost of each pixel. And in terms of resolution, the cost of each pixel is an increase in file size.

Now, I'm not going to get into the mathematics of resolution as it pertains to file size. But suffice it to say, the only thing you need to know is **the more pixels in a raster image, the higher "cost" (file size)**.

Back when designers first started using computers, file size was a very important constraint. We constantly needed to keep the file size low to fit on the small hard drives. But today hard drive space is huge.

So is there any good reason to still worry about the size of print graphics? Large file sizes could slow down a desktop printer that processes your files if they've got more resolution than necessary. I'll cover that later in this chapter.



An example of how higher resolution creates smaller pixels and more details. The 300 pixels per inch image has more details around the bicycle rider and the lamp post. However, the same area is just a bit of a blur in the 72 pixels per inch image.

Output resolution

Just as there's a resolution for images there's also a resolution for your printer (technically called an **output device**). The resolution for an output device is similar to image resolution: The higher the resolution, the greater the detail.

However, unlike the resolution for images, an ordinary office ink-jet or laser printer has an output resolution of anywhere from 600 dots per inch (**DPI**) to 1200 dots per inch. Obviously the higher the resolution, the better the quality. (The first laser printer I ever owned had a resolution of 300 DPI which I thought was a humongous amount!)

You may notice that image resolution is expressed as pixels per inch (PPI) whereas output resolution is expressed as dots per inch (DPI). The distinction comes from the fact that pixels are electronic elements whereas dots are little bits of printing such as laser toner or inks.