Images intended to be viewed on a computer screen are best measured directly in pixels, because the output devices, monitors and projectors are generally thought of in terms of the number of pixels they display, 600 x 800 for example.

Determining the resolution of images intended for print must take into account several additional criteria. First of all, an image on paper is more commonly thought of by it’s physical size.

Also the output devices, printers, are measured in two ways. The more common measure is the size of the smallest dot of a single color that the printer can make, generally described by how many can fit in an inch, hence dots per inch or dpi.

This describes how sharp the printer can make a single color image in the color inks available. This is appropriate for images referred to as line copy where there are no intermediate tones, only the white of the paper and the solid application of one of the colors of the ink available, generally cyan, magenta, yellow and black.

Images of this type should be scanned at the full resolution of the printer. In actual practice, it is difficult for the human eye to tell the difference of anything over 400 dots per inch, so no matter what the resolution of the printer, scanning line copy over 400 dots per inch yields diminishing returns.

In order to simulate grey tones, printers use a scheme known as halftoning, where clusters of the dots the printer is capable of are used to simulate shades of grey. In color printing the image is divided into its cyan, magenta, yellow and black component and each is printed in a halftone pattern, which the eye and brain reconstruct into the full spectrum of colors.

These halftone patterns are measured in lines per inch. It is this halftone frequency that determines how sharp an image a given printer can produce.

It is quite rare for this measure to be published in printer manuals, and modern color printers especially use variants of the scheme for which this halftone frequency is not as obvious as with a traditional printed halftone.

The best scheme is to make an assumption of what the halftone frequency is based on the full resolution of the printer.

New laser printers will have a halftone frequency about 85.

Color inkjet printers printing at 720 dpi have a halftone frequency about 90 lines per inch and at 1440 dpi, about 130 lines per inch.

The general recommendation for the correct resolution for an image is one and a half to two times the halftone frequency, depending on how critical you are.

So for a black and white laser printer, you would have to have between 120 and 170 dots per inch.

As with any application, you want to have enough data to get a sharp image, but no more.

The images on the accompanying page demonstrates the practical implications of this.

The top row of images range from the top end of the range, 180 dpi, a little more than twice the halftone frequency, to 105 dpi, only about 125% of the halftone frequency.

It's rather difficult to tell the difference between these images. On close inspection the higher resolution images seem sharper, but it's hard to identify specific details that contribute to that difference, and without the 180 dpi image to compare it to, it would be easy to assume the 105 dpi image was as good as it could be.

The 80 dpi image at first glance looks pretty good, but on careful inspection, the curves of the lamp base and the outer edge of the cat's eye reveal the stair step pattern of the square pixels that make up the image. The points of the tufts of fur on her chest are not as sharp and well defined.

In the 60 dpi image the pixels can be seen throughout the image to a careful viewer, and at 40 dpi, they dominate the image.

The images on the accompanying page demonstrate the practical implications of this.