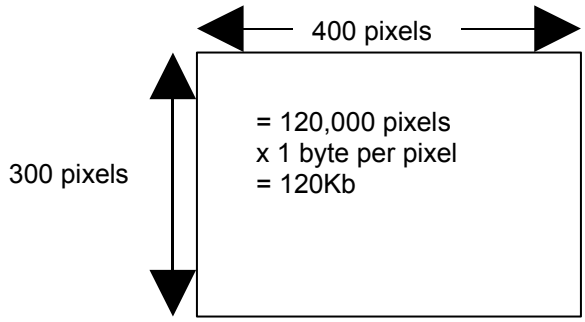
Bitmap Image File Size
And File Formats

The most common image file formats have the extensions **.GIF, .JPG,** and **.PNG**. All of these file formats are types of *bitmaps*, as opposed to *vector graphics*. Bitmapped images are made of tiny dots called pixels (short for *picture element*). The number of dots that make up the image does not change when the image is enlarged, hence the individual dots become visible, and the image becomes grainy.

For an image on a computer screen to look as good as a photograph, it has to contain a lot of different colours. A sort of basic "minimum" required is about 256 different colours. The unit of computer memory required to store 256 possible values is 8 *bits.* A bit is either a one or a zero. Computers run on electricity, which is either on or off, and so they count in *binary* (as opposed to base 10, like people). So, the values 00000000 to 11111111 represent (in binary) the numbers 0 to 255, or 256 different possible values. Bits are usually referred to in groups of eight, which is the same as 1 *byte*. *Each pixel* in an image is assigned 8 bits (=one byte), and therefore may be any one of 256 different colours.

The number of bits assigned per pixel is called **colour depth**. An image containing 256 different colours has a colour depth of 8 bits per pixel, or 8bpp.

Suppose an image is 400 x 300 pixels; that is, 120,000 pixels (dots). Each one of those pixels can have any one of 256 different values (which correspond to the 256 different colours). That means 120,000 bytes are required to store and display that image, or 120 kilobytes.



Here is a table of standard bits-per-pixel colour depths, and the number of colours produced on-screen:

Bits per pixel	**Number of colours**
1bpp	2 (e.g. black and white)
4bpp	16
8bpp	256
16bpp	65,536
24bpp	16,777,216
32bpp	16,777,216 (24bpp plus 8bpp for "special effects")

For most purposes, 16bpp is sufficient colour depth; however, serious graphics work may require 24bpp. This might seem absurd, considering the fact that the human eye cannot distinguish more than a few thousand distinct colours. However, because of quirks in software and hardware, as well as the human eye, some images may look fine at 8bpp, and others may look grainy and primitive at 16bpp.

Computer screens are also measured in pixels.

Screen Resolution, Colour Depth, and RAM

Computer screens run at certain resolutions, measured in pixels, such as 640x480, 800x600, 1024x768, and higher. A certain number of bits is assigned to each pixel, exactly like an image. How good images will look on-screen depends on three things: 1) the image itself 2) the monitor 3) the video card.

The video card is the device that produces the signal that is displayed on the screen. In order to produce a given *colour depth*, at a given *resolution*, the video card has to have enough memory (RAM). A really basic, boring example, is a monitor running at 640x480, and 1bpp colour depth:

640 x 480 = 307,200 pixels, so 307,200 bits are required; divide 307,200 by 8 to get bytes = 38,400 bytes, so 38.4Kb of video RAM are required to display a monochrome 640x480 image.

That is normally what you are looking at while a machine boots up: white text on a black background. The combination of *screen resolution* and *colour depth* is called a *video mode* or *colour mode.* If someone asked me what my video mode was, I might answer, " Eight hundred by six hundred at 24 bits per pixel". When written down, you may see that video mode as 800x600@24, or 800x600x24. That mode, incidentally, requires a great deal more RAM than 640x480@1:

800 x 600 = 480,000 pixels; we can take a shortcut here: 24 bits = 3 bytes, so:

480,000 pixels x 3 bytes per pixel = 1,440,000 bytes, or call it 1.4 Megabytes (1.4Mb)

You need a video card with at least 1.4 Mb of RAM to produce 800x600x24bpp.

RAM chips are not made in such odd amounts, but rather in multiples which correspond to powers of two, like 256Kb, 512Kb, 1Mb, 2Mb, 4Mb, 8Mb, 16Mb, 32Mb, 64Mb, etc. In order to get 800x600x24bpp, you need 1) a video card with 2Mb of RAM or more, 2) a monitor capable of running at 800x600.

Table of Video Modes

Resolution (pixels)	ColourD(bpp)	RAM(Kb)	# Colours	actual RAM (Kb, Mb)	
640x480	1	38.5	2	128	1/8 Mb
800x600	1	60	2	128	
1024x768	1	98.3	2	128	
640x480	4	153	16	256	1/4 Mb
800x600	4	240	16	256	
1024x768	4	394	16	512	1/2 Mb
640x480	8	307.2	256	512	
800x600	8	480	256	512	
1024x768	8	786.4	256	1024	1 Mb
640x480	16	614.4	65536	1024	
800x600	16	960	65536	1024	
1024x768	16	1208	65536	2048	2 Mb
640x480	24	921.6	16.7 mil	1024	1 Mb
800x600	24	1440	16.7 mil	2048	2 Mb
1024x768	24	2360	16.7 mil	4096	4 Mb