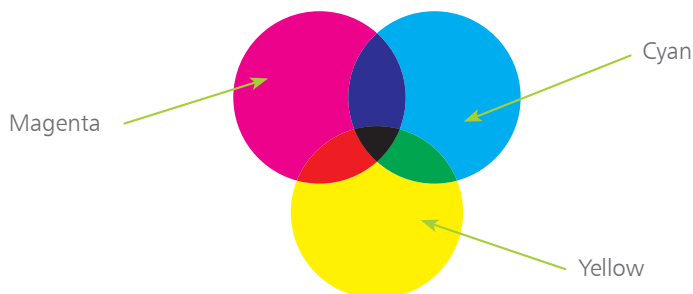# RGB and CMYK Color Models

You need to be aware of two color models, as you start working with Adobe Photoshop. These are the RGB (Red, Green, Blue) and CMYK (Cyan, Magenta, Yellow and blacK) color models.

RGB is important, because it mirrors the way the human eye perceives color. It is the model used by scanners and digital cameras to capture color information in digital format, and it is the way that your computer monitor describes color.
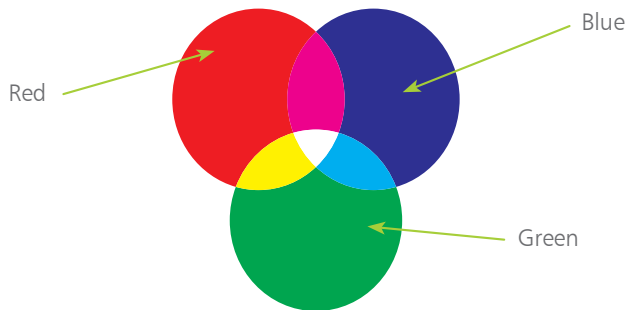
Red, green and blue are referred to as the "additive primaries". You can add varying proportions of the three colors, to produce millions of different colors – but still a more limited range (or "gamut") than in nature, due to the limitations of the monitor. If you add 100% of red, green and blue light together, you get white. You produce the "secondary" colors when you add red and blue to get magenta; green and blue to get cyan; red and green to get yellow.

The CMYK color model is referred to as the "subtractive" color model. It is important because this is the color model used by printing presses. If you subtract all cyan, magenta and yellow when printing, you end up with a complete absence of color – white.
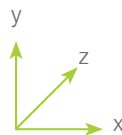
Beware

When you convert from RGB to CMYK mode, Photoshop converts out-of-gamut colors (in this case, colors that can be seen on screen, but not printed) into their nearest printable equivalent.
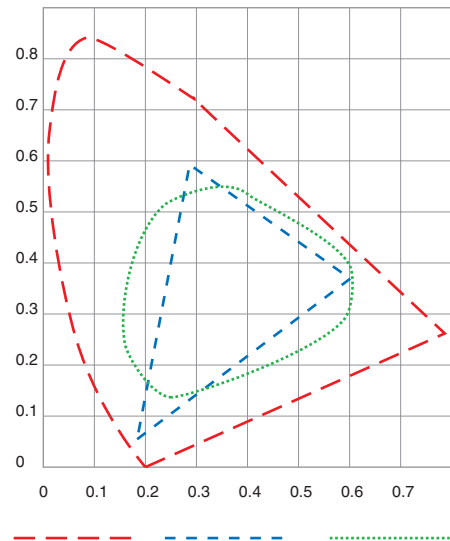
Hot tip

The CIE (Commission Internationale de l'Eclairage) XYZ color model is a model that defines the visible spectrum that can be seen by a "standard" observer.

Colors with the same lightness value fall within an approximately triangular flat plane (the Visible Spectrum area in the diagram opposite). The x axis represents the amount of red in colors, and the y axis indicates the amount of green. The z axis represents the lightness of colors.

...cont'd

Color gamuts

Color gamut refers to the range of colors a specific device is capable of producing. There are millions of colors the eye can discern in the visible spectrum. Scanners, monitors, and printing presses cannot reproduce every color in the visible spectrum – the range of colors they are capable of producing is their gamut.

From the desktop publishing point of view, the process of capturing digital color information, viewing and manipulating this on-screen, and then finally printing the image using colored inks, is complicated, because the gamut of a color monitor is different to the gamut of CMYK and PANTONE inks. There are colors (especially vibrant yellows and deep blues) that can be displayed on a monitor, but cannot be printed using traditional CMYK inks.

Typically, you will work in RGB mode if the image is intended for use on the World Wide Web or in a multimedia presentation. You can work in CMYK or RGB mode if the image is intended for print, but you must remember to convert to CMYK mode before saving/exporting in EPS or TIFF file format, in order to use the image in a page layout application. Adobe InDesign can import CMYK or RGB images in native Photoshop (.PSD) file format.

CIE XYZ color model

Visible Spectrum   Monitor   SWOP-CMYK