# CMYK versus RGB Color Spectrum

Computer monitors emit color as RGB (red, green, blue) light. Although all colors of the visible spectrum can be produced by merging red, green and blue light, monitors are capable of displaying only a limited gamut (i.e., range) of the visible spectrum.

Whereas monitors emit light, inked paper absorbs or reflects specific wavelengths. Cyan, magenta and yellow pigments serve as filters, subtracting varying degrees of red, green and blue from white light to produce a selective gamut of spectral colors. Like monitors, printing inks also produce a color gamut that is only a subset of the visible spectrum, although the range is not the same for both. Consequently, the same art displayed on a computer monitor may not match to that printed in a publication. Also, because printing processes such as offset lithography use CMYK (cyan, magenta, yellow, black) inks, digital art must be created as CMYK color or must be converted from RGB color to enable use.
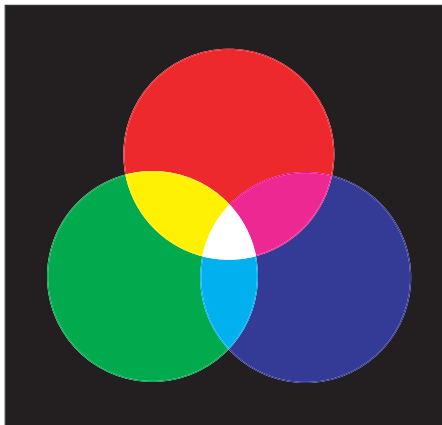
Red, Green, Blue
Additive color space
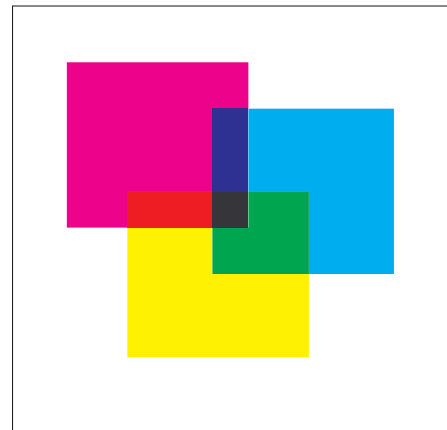
Cyan, Magenta, Yellow
Subtractive color space

All work should be in the CMYK (Cyan/Magenta/Yellow/Black) mode, as this is the mode required for the printing process. If an RGB (Red/Green/Blue) file is submitted, it must be converted to CMYK. When the conversion takes place, color shifts can occur, so it is important that you do the conversion so you can monitor and correct any color shifts that may take place.

It can sometimes be difficult to visualize the reason for color shift in color space conversion. The best way to see the color differences between the CMYK and RGB color spaces is to look at a color gamut comparison chart. The chart to the left plots the visible color spectrum as the large "horse shoe" area, and within this is a plot of the CMYK colors, and the RGB colors. You can see that in some areas the RGB color space is "outside" that of the CMYK space. It is these colors that will be affected by a conversion from RGB to CMYK