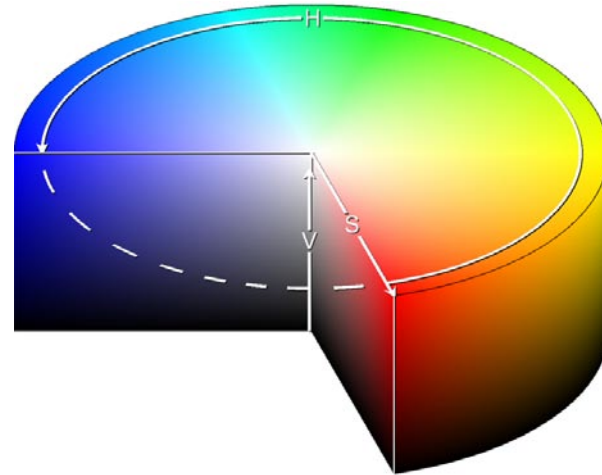


# Color Models

There are several models of color reproduction. Each one has a separate function, but all are related. The subtractive color model is used to describe color that exists in pigment form and is applied to a physical surface, such as ink on paper, or paint on a wall. The additive color model is used to describe color that exists in light form and is emitted from a source, such as a flame, television or computer monitor. Each model is limited by its reproduction technology, be it a desktop printer, commercial press, computer monitor.

## HUE, SATURATION, BRIGHTNESS (HSB OR HSV)

Based on the human perception of color, this model uses three characteristics: hue, saturation, and brightness (or value). This model defines colors as points in a cylinder whose central axis ranges from black at the bottom to white at the top with neutral colors between them. The angle around the axis represents the hue, distance from the axis represents saturation, and distance along the axis represents brightness, or value.

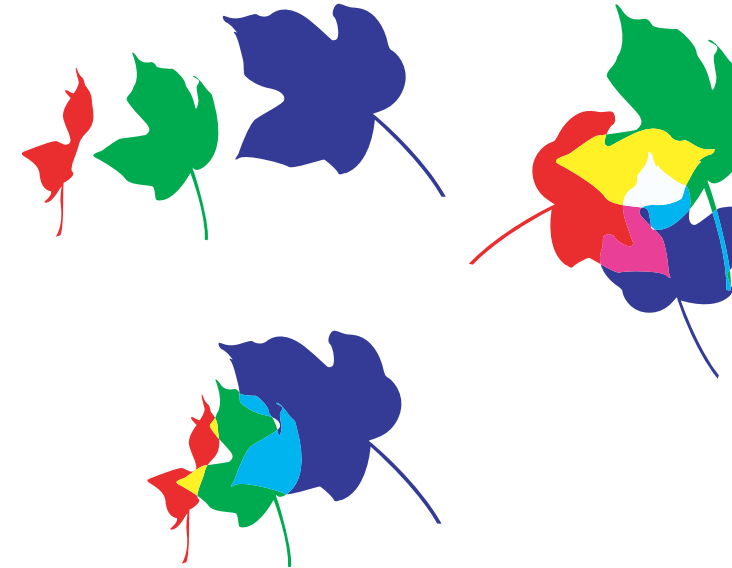
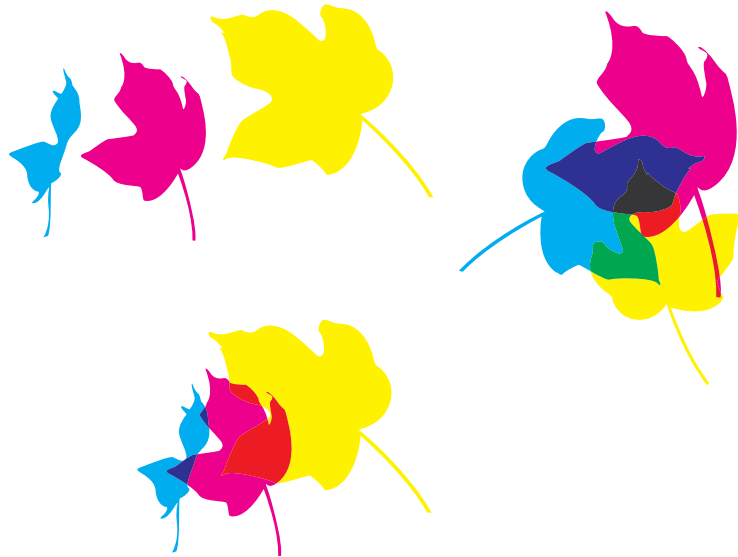


## SUBTRACTIVE:

### CYAN, MAGENTA, YELLOW, BLACK (CMYK)

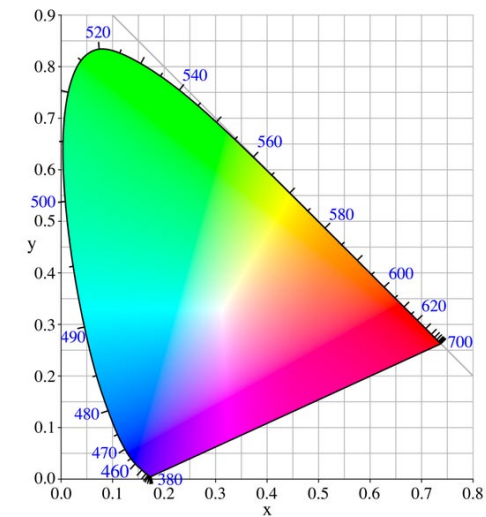
The second model is based on the primary hues of cyan, magenta, and yellow (CMY), with black (K) added as a control, and commonly used by printers. The complementary hues are red, blue, and green. In the subtractive system, a mixture of the three primary hues, of equal intensity, will form black, and subtract towards white. The subtractive system works through the reflection and absorption of light. This is how we see color on a surface, such as paper.

The surface of the paper reflects certain wavelengths and absorbs others; the color we see is from the wavelength that is reflected.



## ADDITIVE: RED, GREEN, BLUE

The third system is the additive system, based on the primary hues of red, green, and blue (RGB), which are the primary hues in light. The complementary hues are cyan, magenta, and yellow. In this system, mixtures of the three primary hues, of equal intensity, combine to form white, while the absence of all three produces no color (black). The additive system works through direct projected light, light that is visible from the source, such as light bulbs, the sun, and video and computer monitors.



## CIE L\*a\*b\*

This widely used model was developed by the Commission Internationale de l'Éclairage (CIE; International Commission on Illumination) as an international standard for color measurement in 1931, and refined in 1976. This model is device independent which means that color is description is consistent across multiple peripherals such as scanners, computers, monitors, and printers, including computer languages such as PostScript.

Color is defined by a luminance or lightness characteristic (L) and two chromatic characteristics: a (green to red) and b (blue to yellow). The outer curved boundary is the spectral (or monochromatic) locus, with wavelengths shown in nanometers.