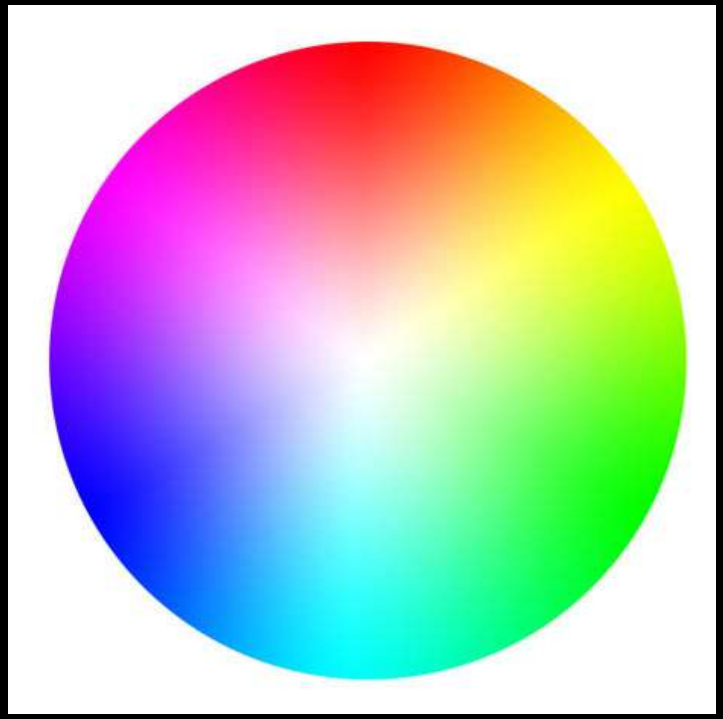
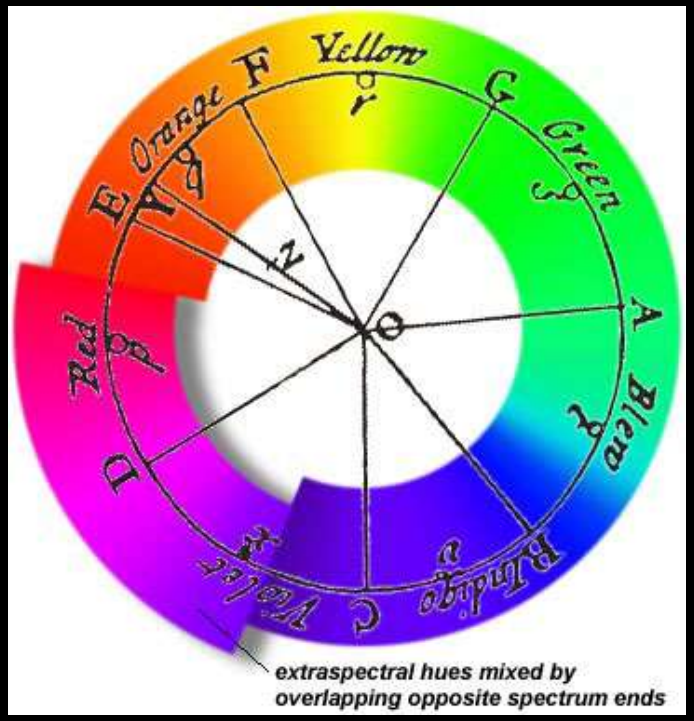
Color Theory



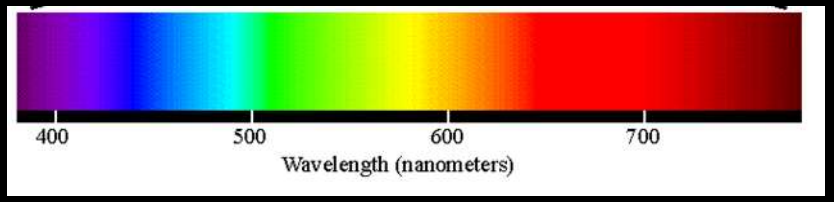


Color Theory

Color is light.

Light is electromagnetic radiation and over a range of wavelengths it makes an impression on the human eye.

This range of wavelengths is the visual spectrum.



Color Theory

When light hits an object some wavelengths are absorbed and others are reflected.

We see the reflected wavelengths of light as color.

When all the wavelengths in the visual spectrum are **absorbed** we see **black** and when all are **reflected** we see **white**.

When some are absorbed and some are reflected we see different colors of the spectrum.

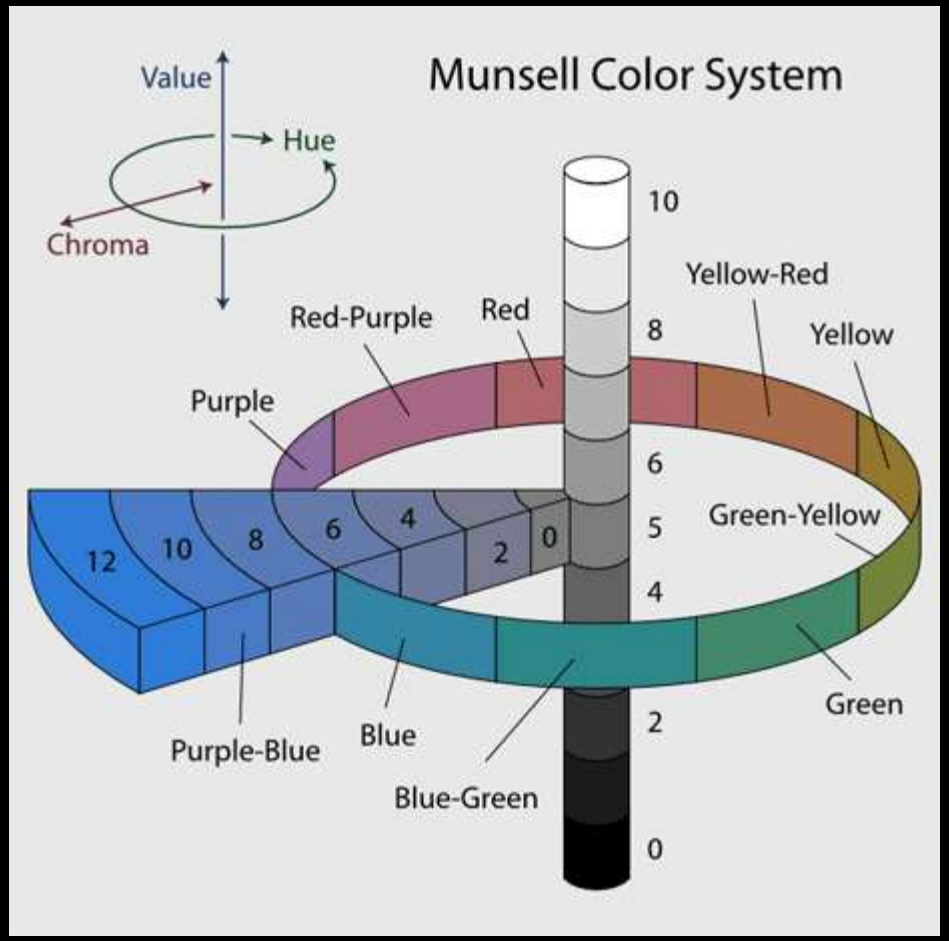
Munsell Color System

Color can be described in three ways.

By name (hue),
By purity (chroma),
and by value or lightness.

We have several terms to help us describe colors in those three ways.

As you read the terms below glance back at the image at right.

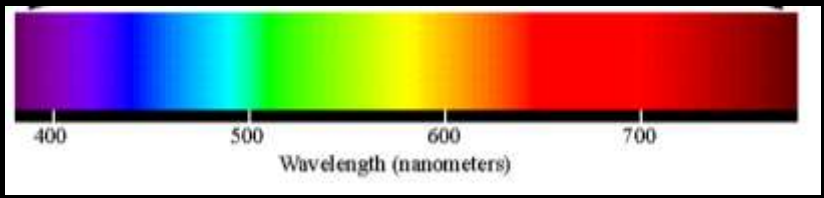


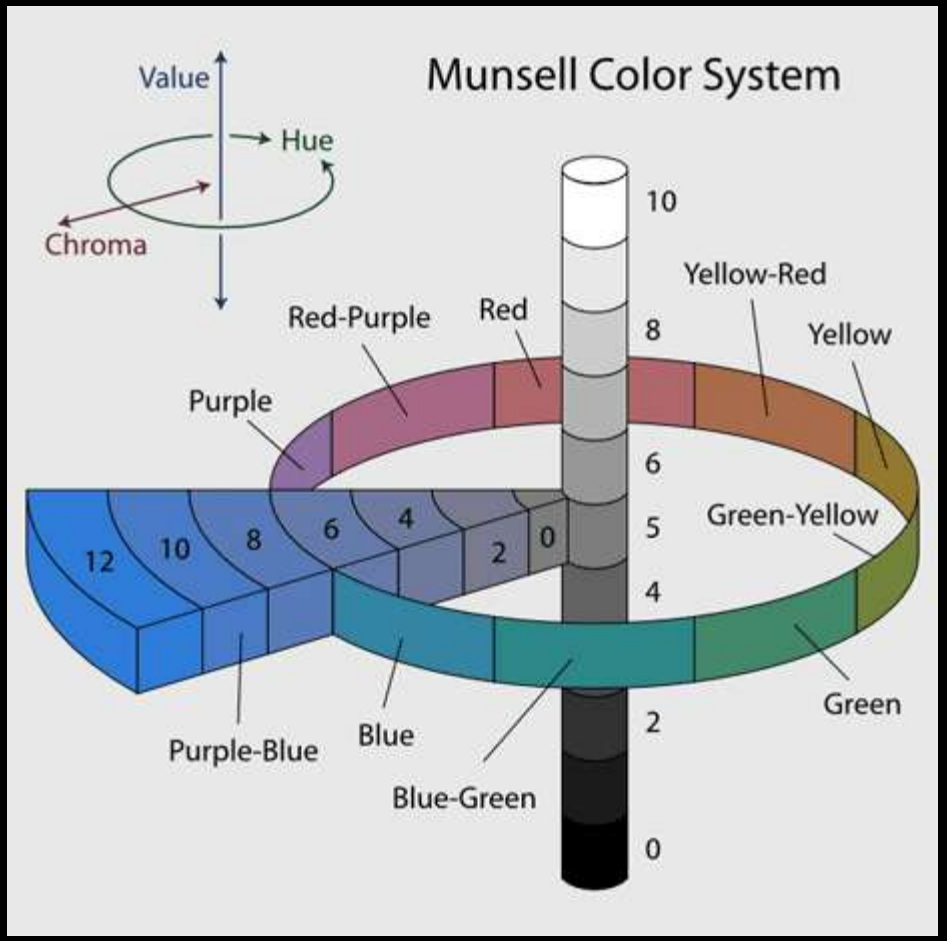
Munsell Color System

Hue:

When someone is talking about hue they are talking about the actual color of an object.

Green is a hue as are red, yellow, blue, purple, etc





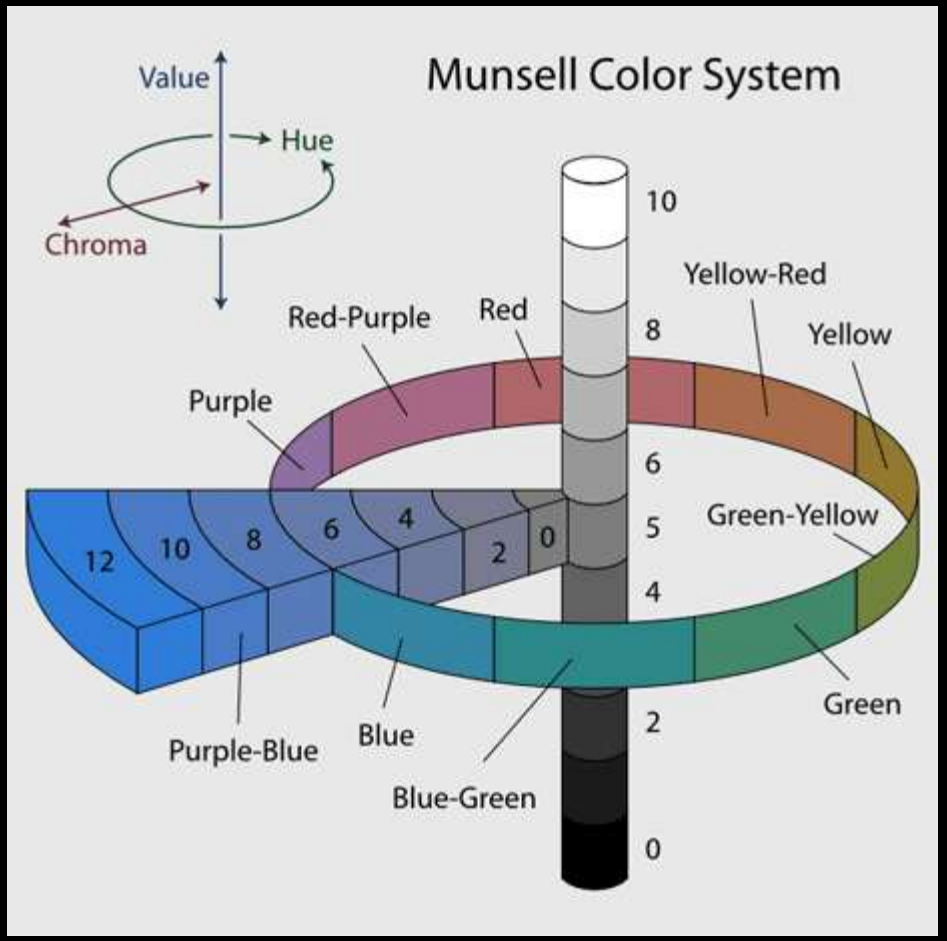
Munsell Color System

Chroma:

Refers to the purity of a hue in relation to gray.

When there is no shade of gray in a color that color has a high chroma.

Adding shades of gray to a hue reduces it's chroma.



Munsell Color System

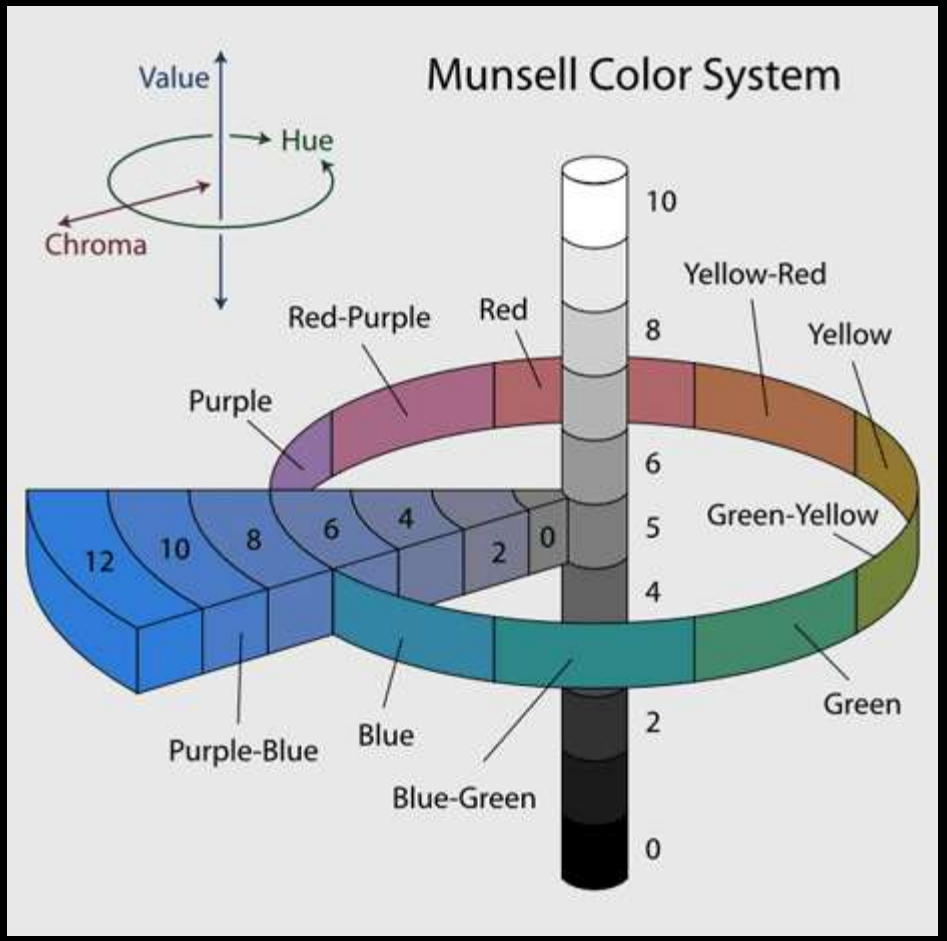
Saturation:

is the degree of purity of a hue.

It's similar to chroma, though not quite the same thing.

Pure hues are highly saturated.

When gray is added the color becomes desaturated



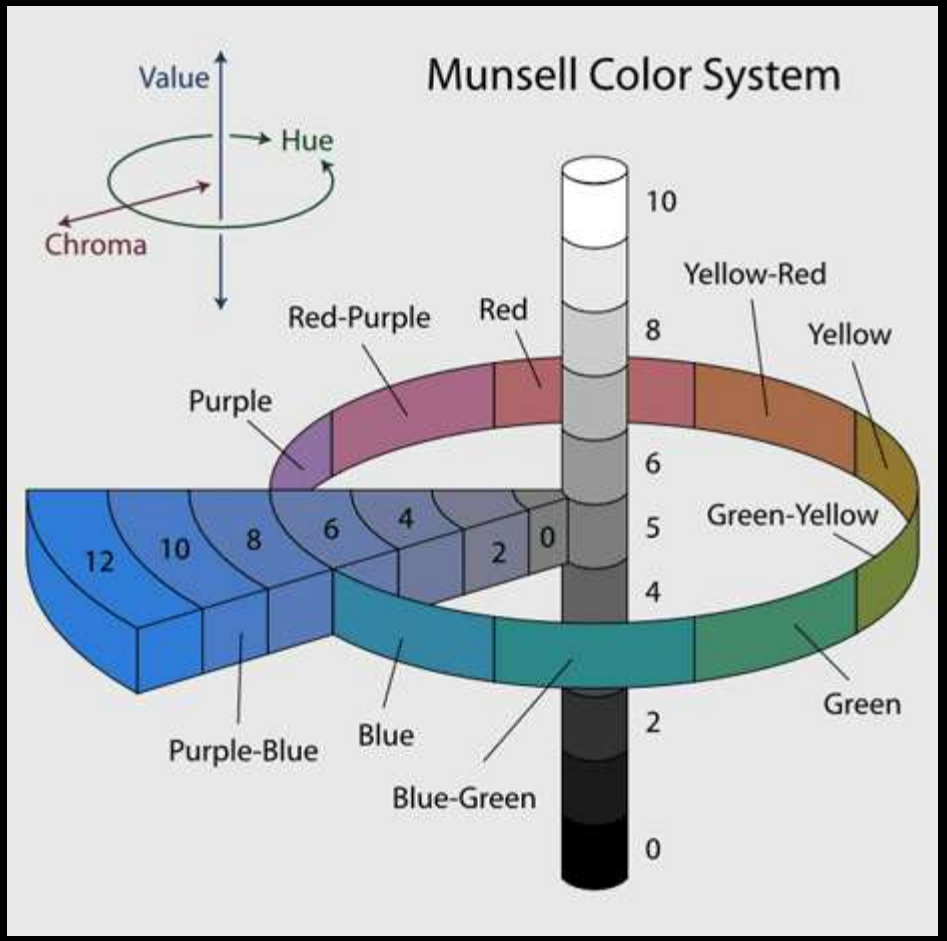
Munsell Color System

Intensity:

Refers to the brightness or dullness of a color.

Adding white or black to a color lowers it's intensity.

An intense and highly saturated color has a high chroma.



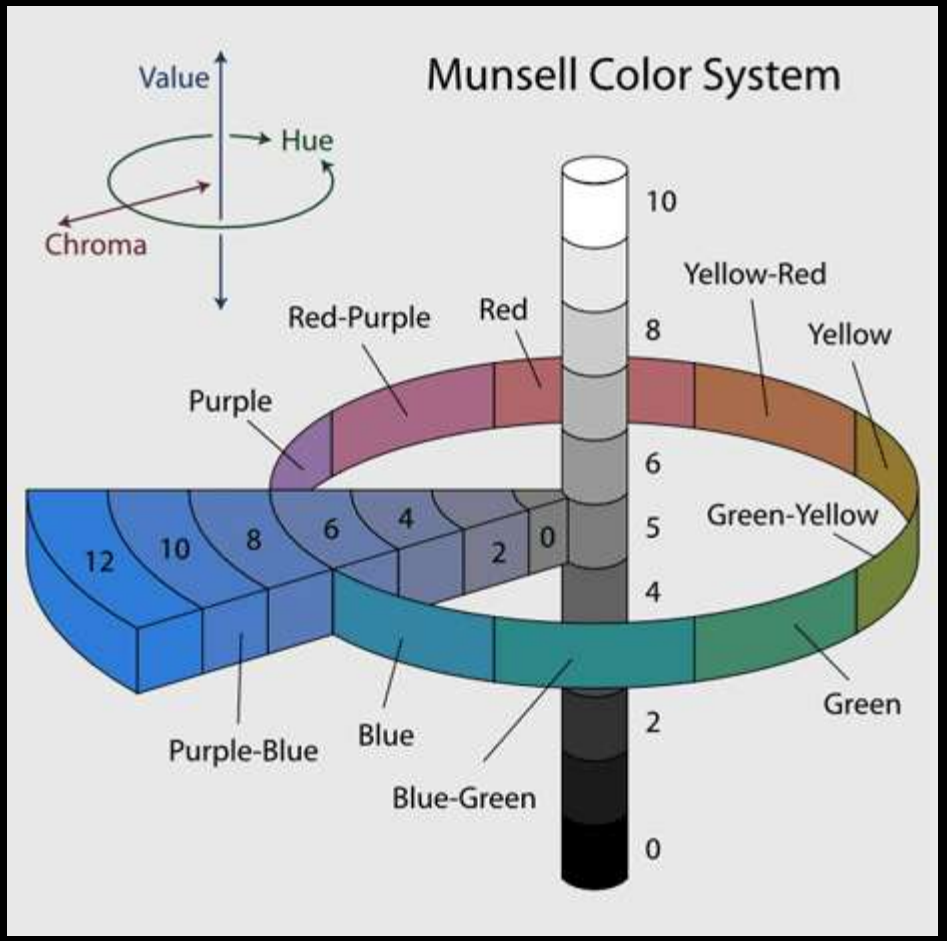
Munsell Color System

Value/luminance:

Is a measure of the amount of light reflected from a color and is basically how light or dark a hue is.

Adding white to a hue makes it lighter and increases its value or luminance.

Consequently adding black makes it darker and lowers the value or luminance.



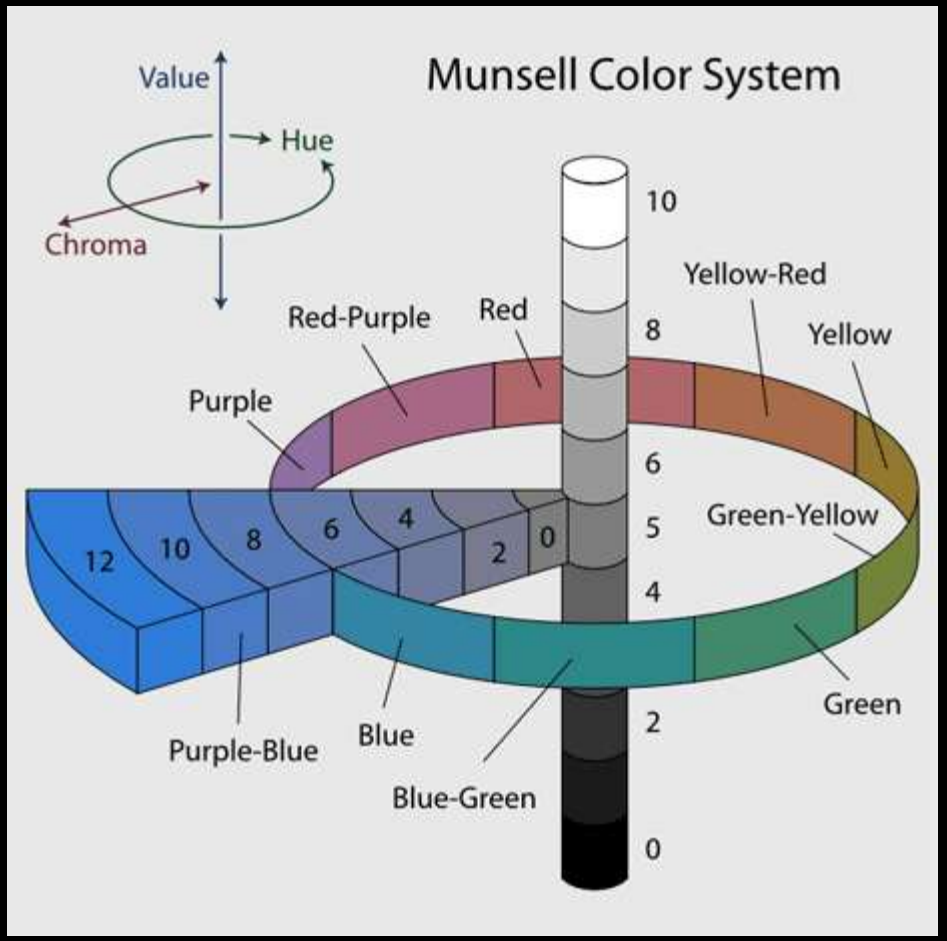
Shade-tint-tone

- **Shade:** The result of adding black to a hue to produce a darker hue

- **Tint:** The result of adding white to a hue to produce a lighter hue

- **Tone:** In between black and white we have gray. A color tone is the result of adding gray to a hue.

Shades and tints are tones at the extremes.



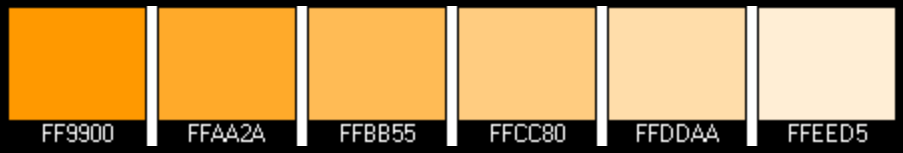
Tints-shades-tones

These terms are often used incorrectly, although they describe fairly simple color concepts.

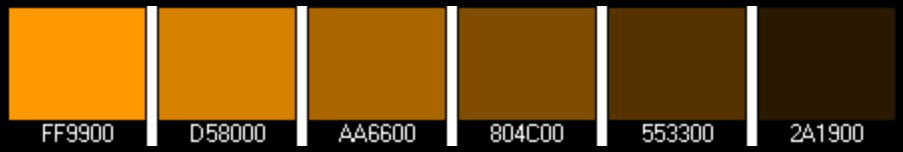
If a color is made lighter by adding white, the result is called a tint.

If black is added, the darker version is called a shade.

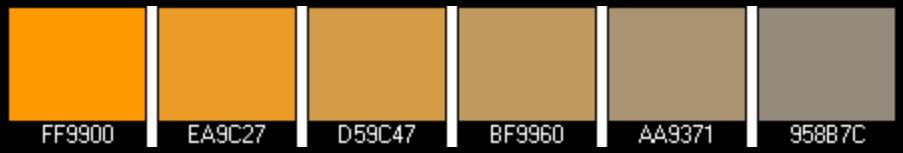
And if gray is added, the result is a different tone



Tints- adding white to a pure hue



Shades- adding black to a pure hue



Tones – adding gray to a pure hue

Color Systems

Color systems refer to how we produce colors.

When producing physical colors as in paint a subtractive system is used.

When producing colors digitally (with light) as on a computer an additive system is used.

CMYK - Subtractive Color

RGB - Additive Color

Color Systems

The colors you see on your computer screen may not end up being the same colors other see on their computer screens.

The differences may be even more pronounced if your images end up in print.

Color management can help make things more consistent, but understand there will likely always be some differences.

CMYK - Subtractive Color

RGB - Additive Color

Subtractive Colors

Subtractive Colors (CMYK)

When we see colors in physical objects we're seeing reflective light.

When we see **red** it's because all the other wavelengths of light have been absorbed and only the red is reflected.

This is a subtractive system, because to produce color we're removing all the wavelengths of light who's color we don't want to see. We subtract the other colors.

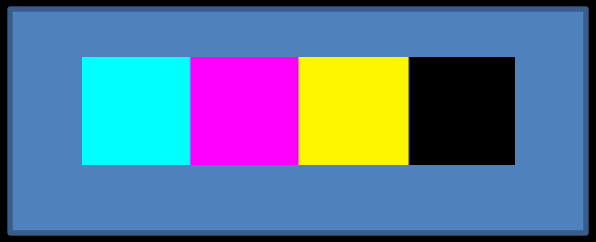
CMYK - Subtractive Color

Subtractive Colors

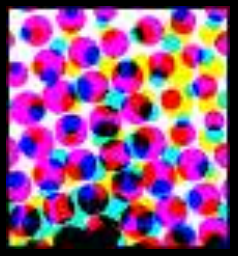
Subtractive Colors (CMYK)

In the print industry, cyan, magenta, yellow and black are used as the primary colors.

When you mix all the colors, the result is gray.



If you look at a printed page with a magnifying glass you might see something like the illustration below



Subtractive Colors

Subtractive Colors (CMYK)

As we add more colors to the system more light is absorbed and the overall color gets darker.

Subtractive systems start with white and continue to add color until the result is black.

CMYK (Cyan, Magenta, Yellow, Black) is a subtractive system used to create colors for print

CMYK - Subtractive Color

Additive Colors

Additive Colors (RGB)

To create colors on a computer screen we have to use light since the light source comes from within instead of reflecting the light coming from outside the system.

When there is no light we see black and as we add more color (more wavelengths of light) we move toward white.

Additive Colors

Additive Colors (RGB)

RGB (Red, Green, Blue) is an additive system used to create colors in digital media whenever light is used as a medium.

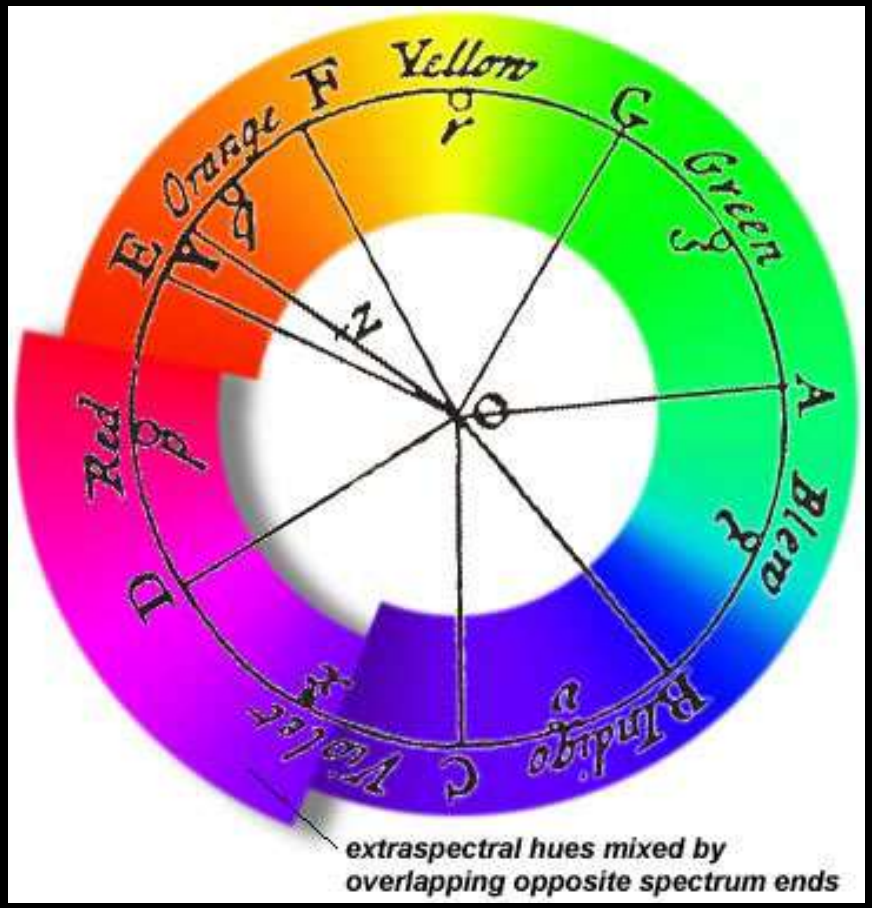
Because **additive systems** are different from how we perceive color in nature, our primary colors have changed.

Green (and not yellow) is now primary to the system instead of being a secondary product of blue and yellow. Yellow is produced by adding red to green.

The Color Wheel

The **color wheel** is a visual representation of most everything we've talked about above.

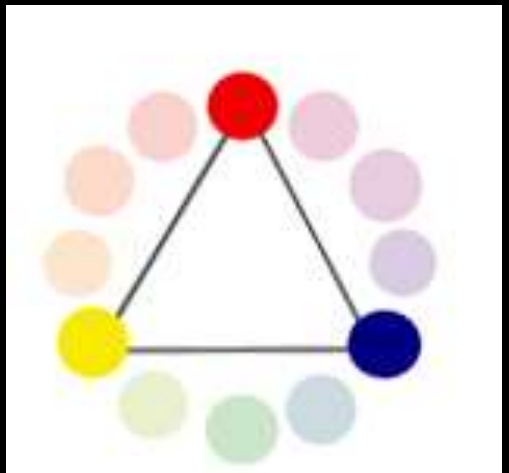
The original color wheel is credited to Sir Isaac Newton who joined the red and violet ends of the visual spectrum into a circle.



The Color Wheel

In the adjacent images you can see how a color wheel is created.

You start with the **primary colors** located at the corners of an equilateral triangle and then set a similar triangles rotated 180 degrees to create the **secondary colors.**



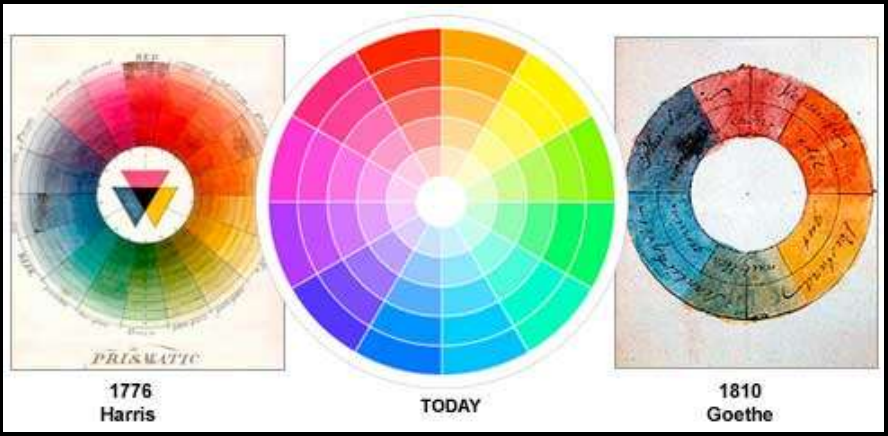
Primary Colors

Seconday Colors

The Color Wheel

In between these colors will be the **tertiary colors.**

Notice in the images shown that the three primary colors here are red, yellow, and blue.

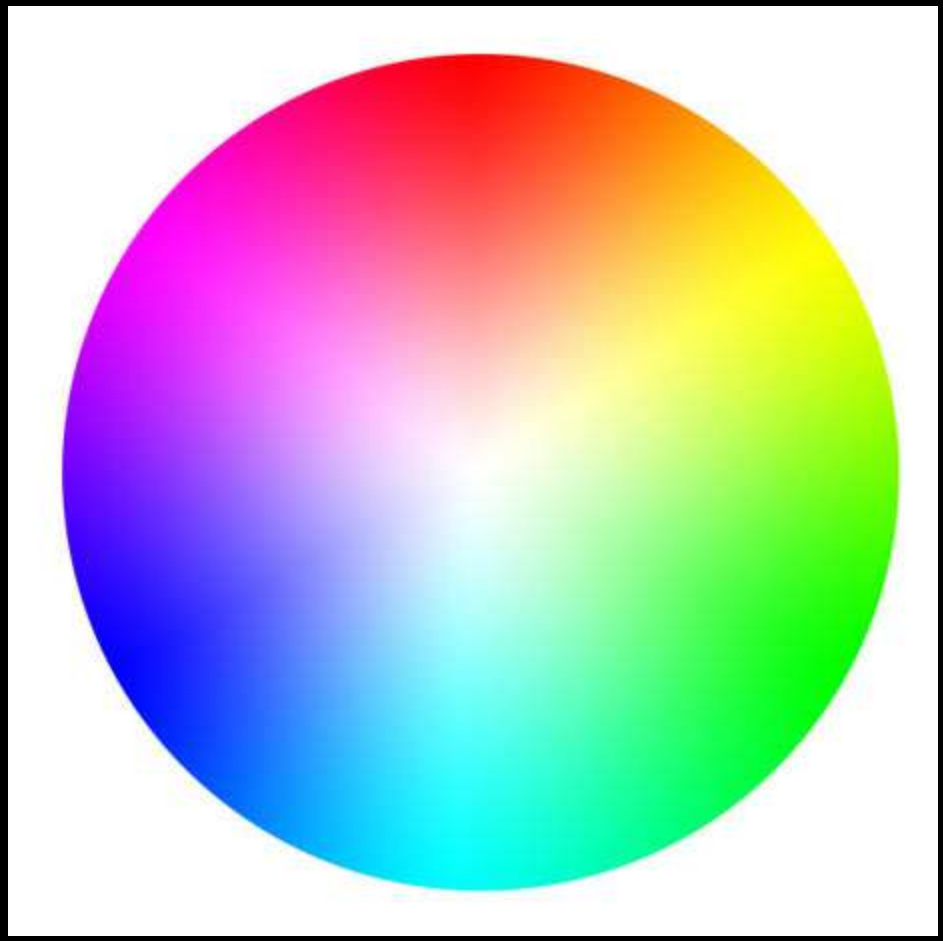


RGB Color Wheel

Now look at the color wheel shown. You'll notice it looks different than the one previous.

The primary colors here are red, green, and blue and you'll also notice it shows various tints of colors until it reaches white in the center.

This is an RGB color wheel of tints.

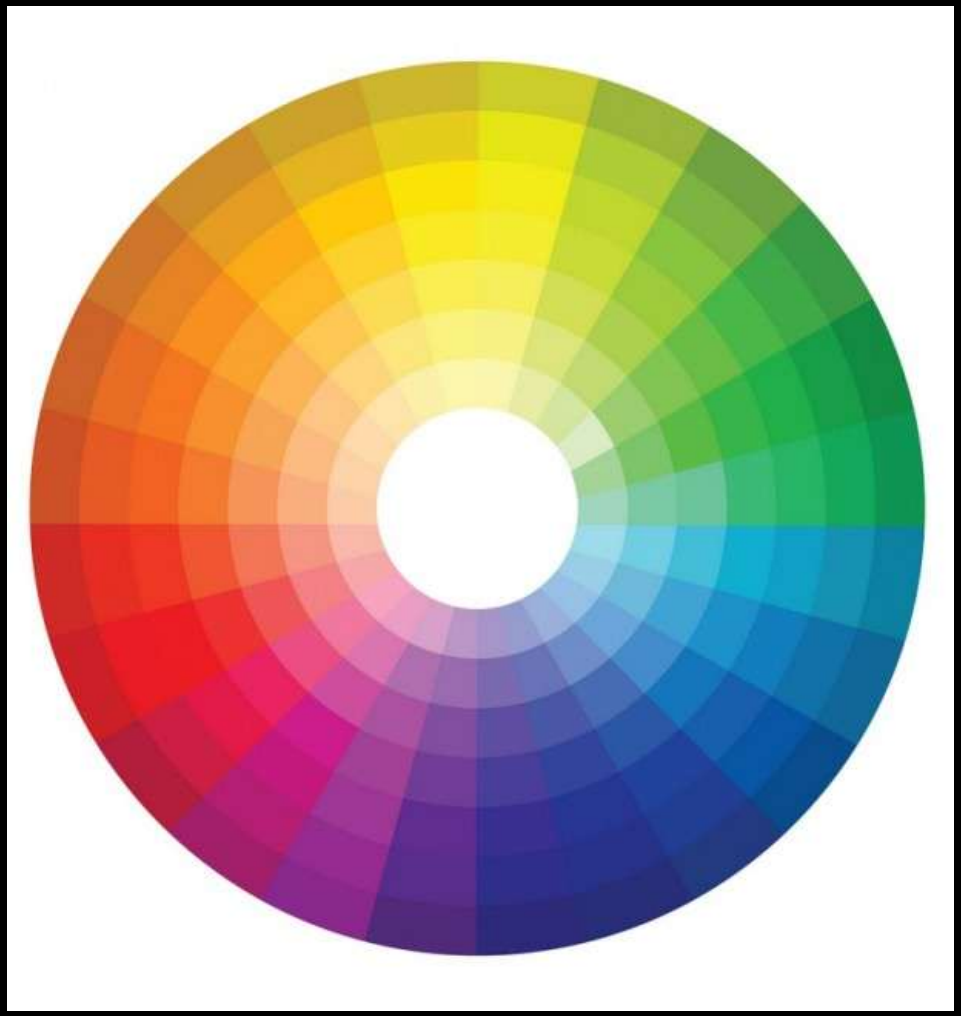


Color Wheel

You can also find color wheels that show shades and tones.

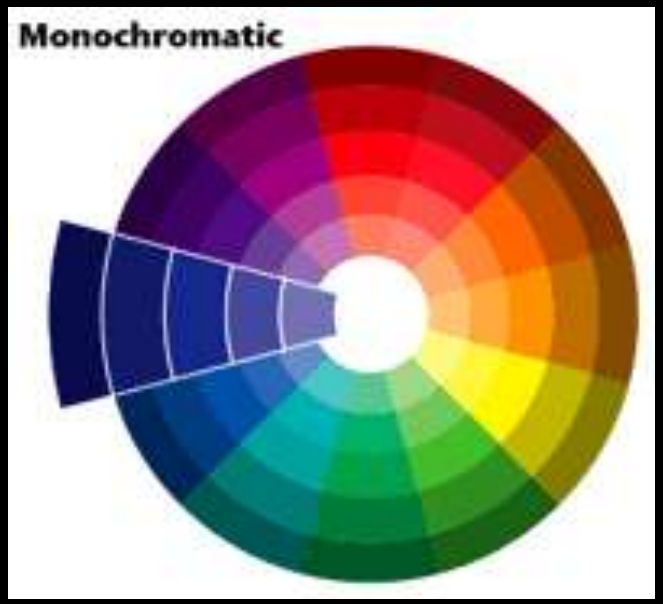
In fact there are a variety of color wheels and color triangles.

Remember a color wheel is just a representation of color and there are different ways to express color relationships.



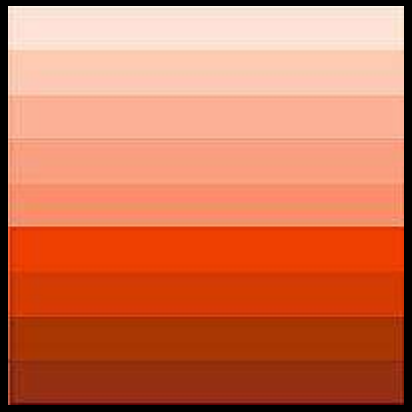
Color Schemes

Color schemes come out of the color wheel and the different color schemes are different combinations of colors based on their relationship to each other.



Monochromatic color schemes are based on different tones of the same color.

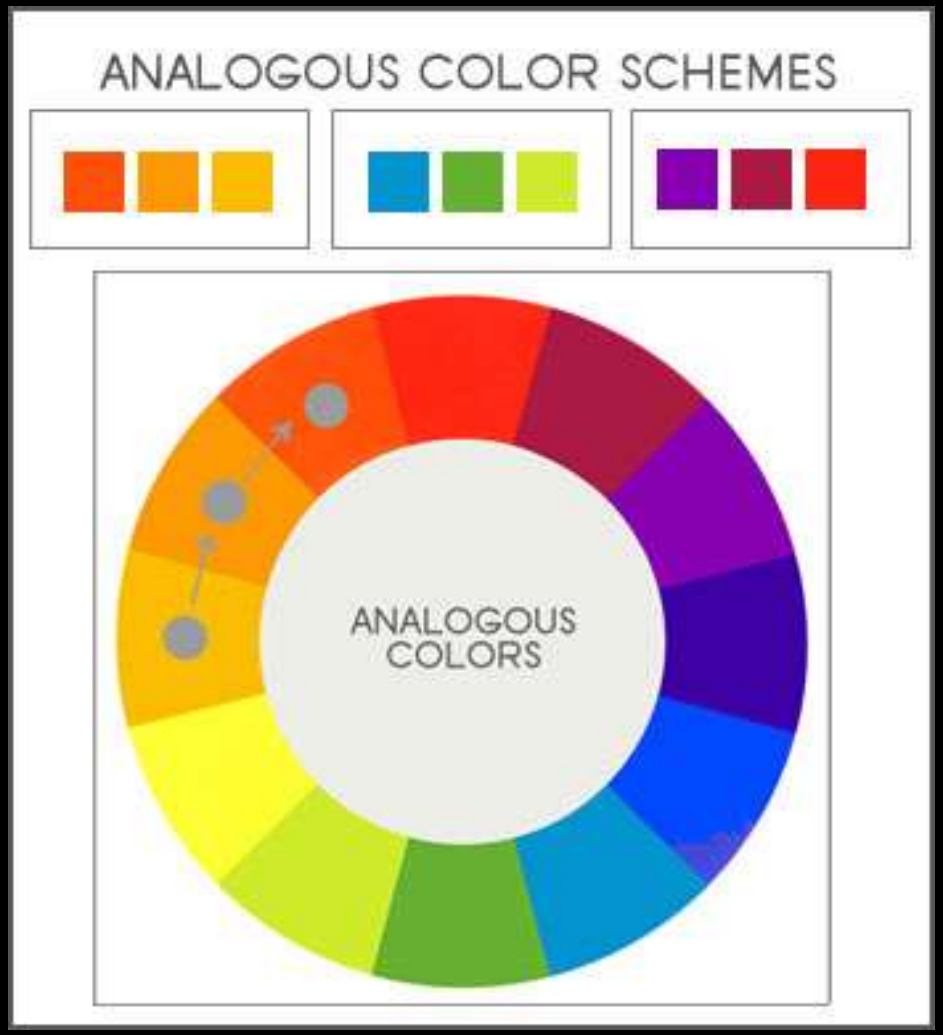
Here tints of red of shown.



Color Schemes

Analogous color schemes are based on colors adjacent to each other on the color wheel.

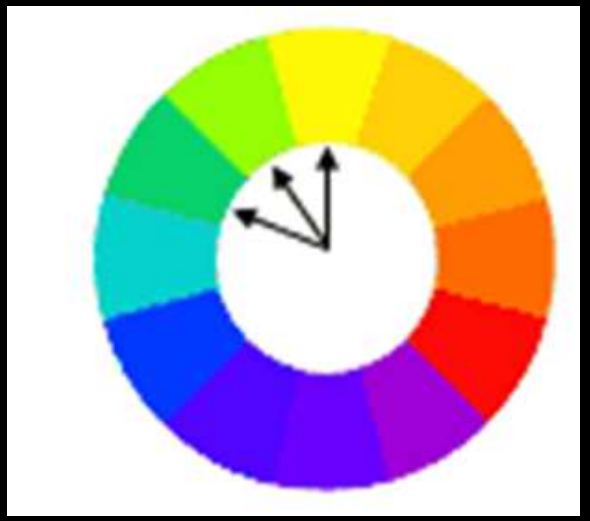
Here, red is the primary color- yellow is the analogous color on one of it's sides and violet-purple the analogous color on it's other side.



Analogous Colors

Analogous colors are any three colors which are side by side on a 12 part color wheel, such as yellow-green, yellow, and yellow-orange.

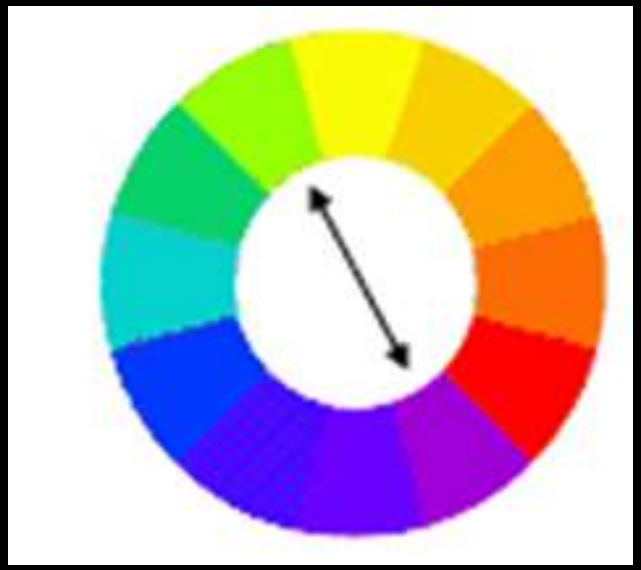
Usually one of the three colors predominates.



Complementary Colors

Complementary colors are any two colors which are directly opposite each other, such as red and green and red-purple and yellow-green.

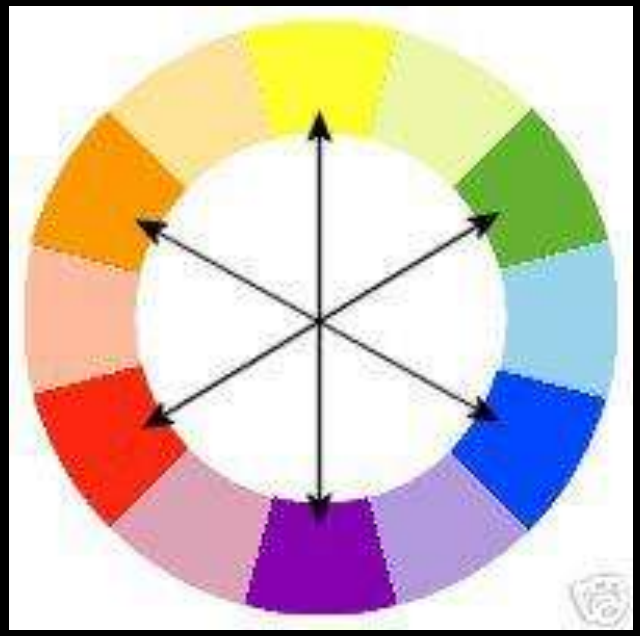
In the illustration shown, there are several variations of yellow-green in the leaves and several variations of red-purple in the orchid.

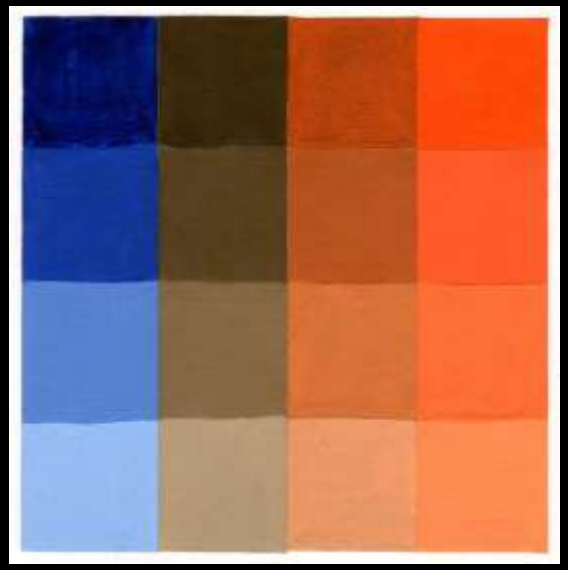


These opposing colors create maximum contrast and maximum stability.

Complementary Colors

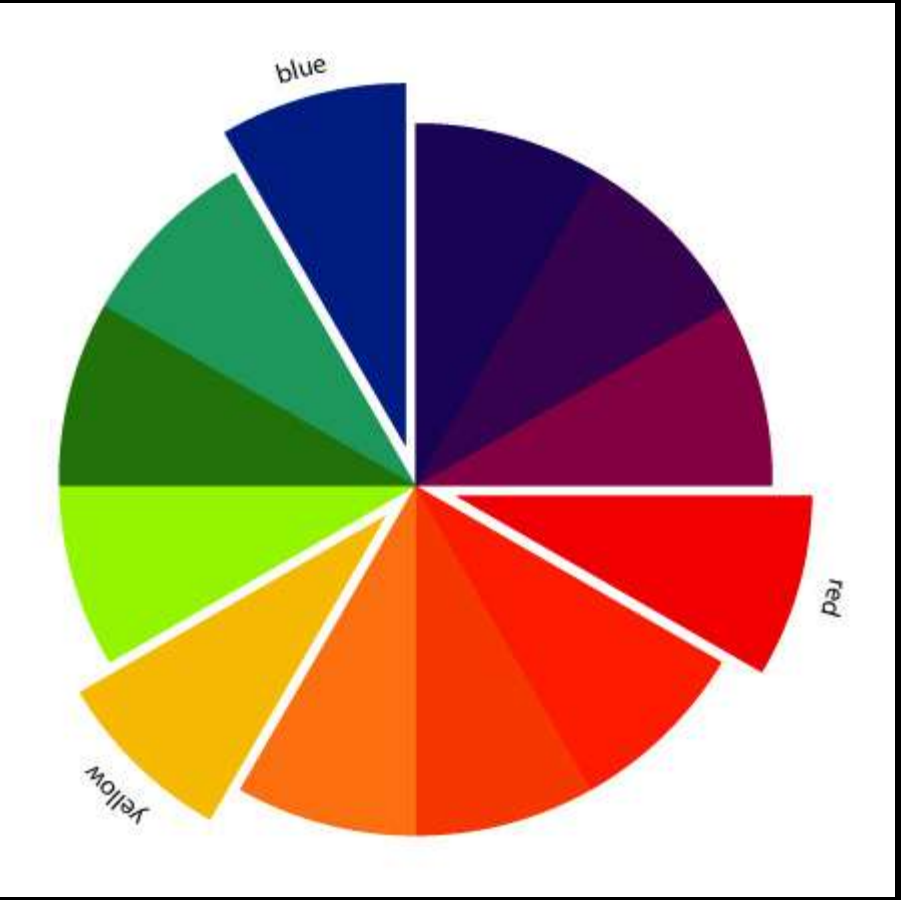
Complementary color schemes are based on colors opposite each other on the color wheel.





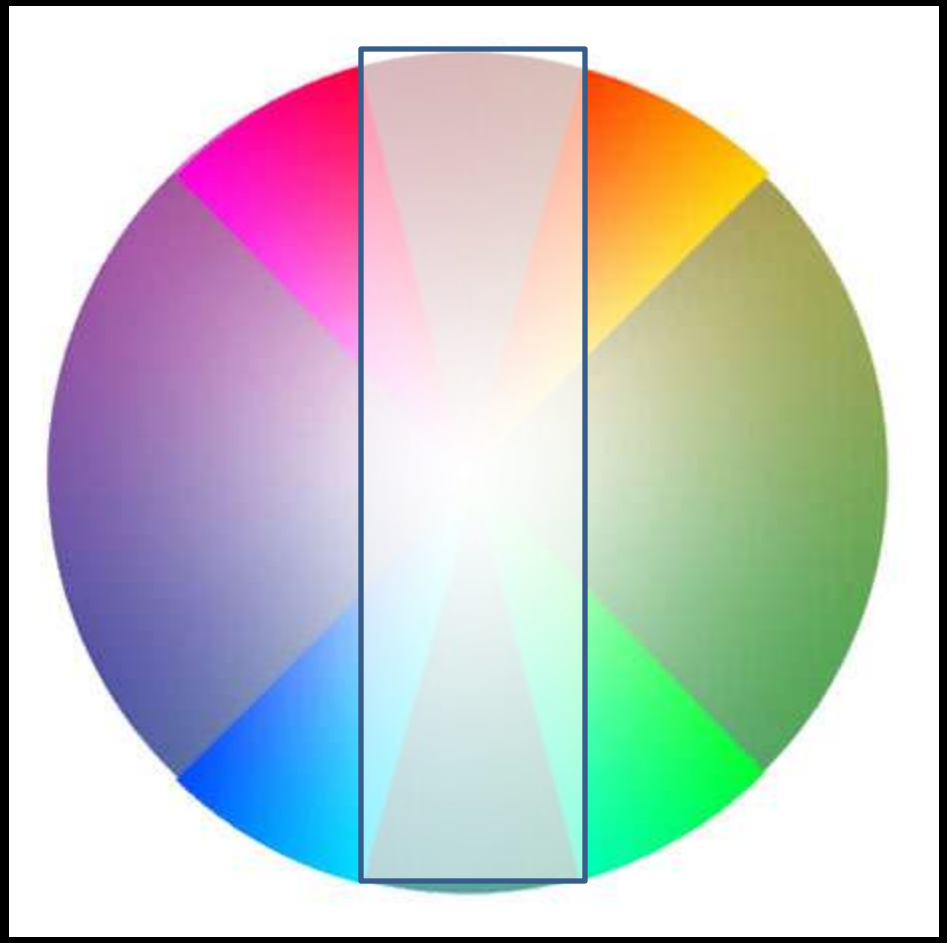
Triadic Color Scheme

Triadic Color Schemes are based off overlaying a perfect triangle over a color wheel- each color is equidistant from the others.



Tetradic/Quadratic Color Schemes

Tetradic/Quadratic color schemes are created by choosing colors at the corners of a rectangle or square inscribed on the color wheel.



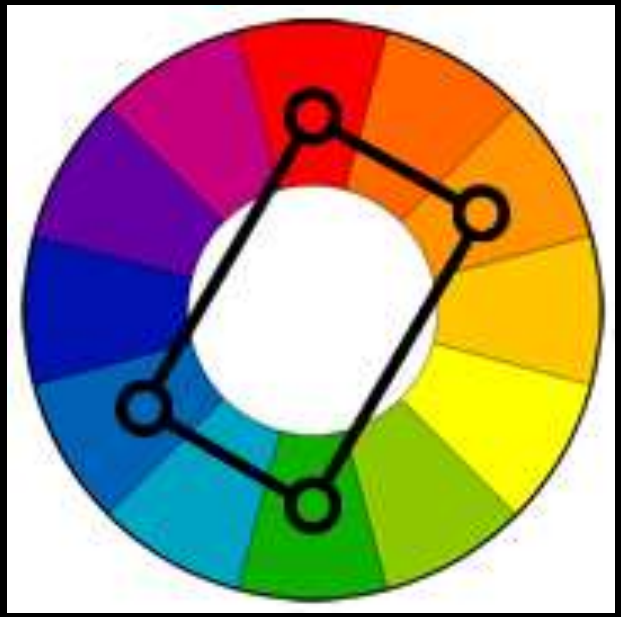
Tetradic Color Schemes

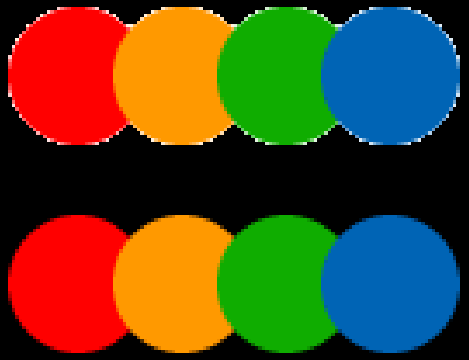
The rectangle or **tetradic color scheme** uses four colors arranged into two complementary pairs.

This rich color scheme offers plenty of possibilities for variation.

Tetradic color schemes works best if you let one color be dominant.

You should also pay attention to the balance between warm and cool colors in your design.

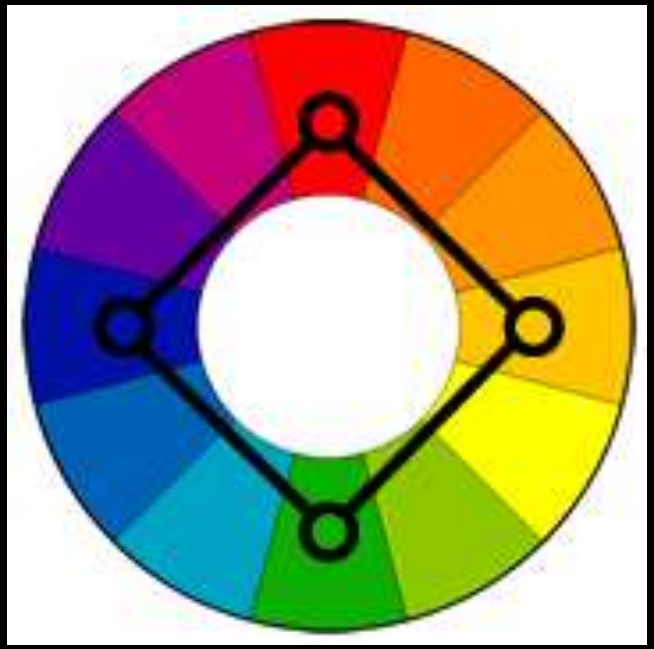




Quadratic Color Schemes

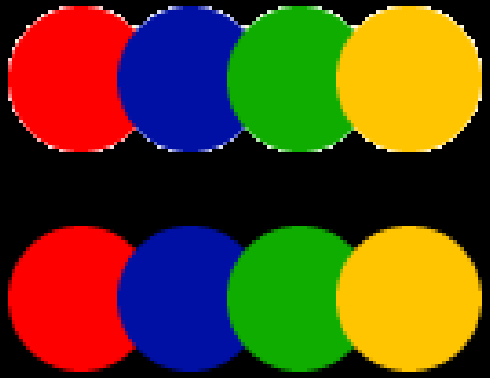
Square color scheme (Quadratic)

The square color scheme is similar to the rectangle, but with all four colors spaced evenly around the color circle.



Square color schemes works best if you let one color be dominant.

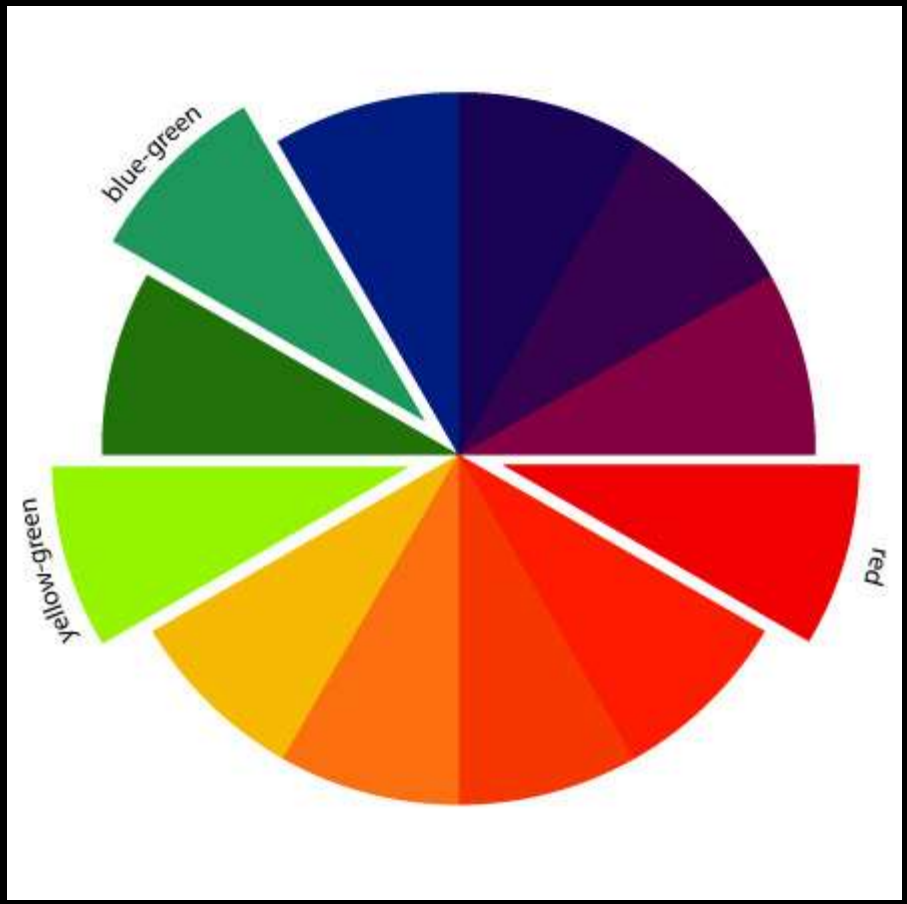
You should also pay attention to the balance between warm and cool colors in your design



Split Complementary Color Schemes

Split Complementary color schemes are created by choosing one color and then two more colors *that are adjacent to the complementary of the initial color.*

Think of it as a combination of a complementary and analogous color scheme.



Split Complementary Color Schemes

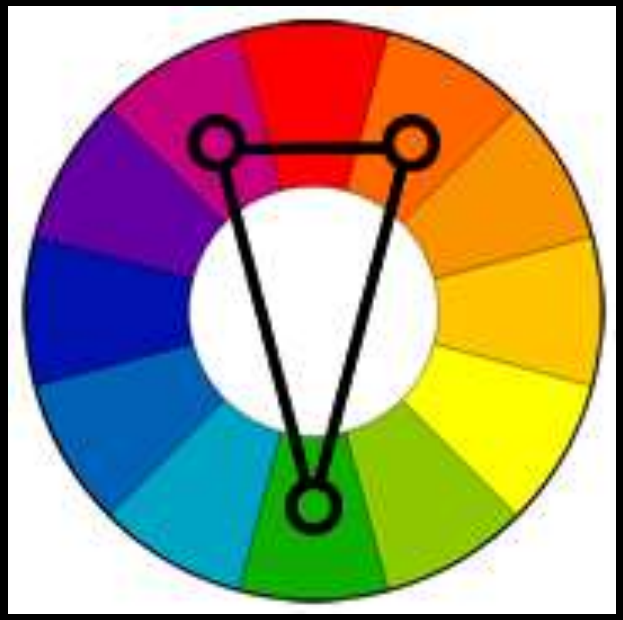
Split-Complementary color scheme

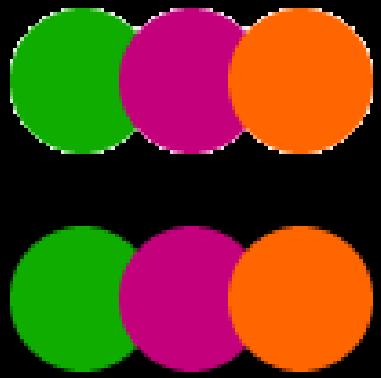
The split-complementary color scheme is a variation of the complementary color scheme.

In addition to the base color, it uses the two colors adjacent to its complement.

This color scheme has the same strong visual contrast as the complementary color scheme, but has less tension.

The split-complimentary color scheme is often a good choice for beginners, because it is difficult to mess up.





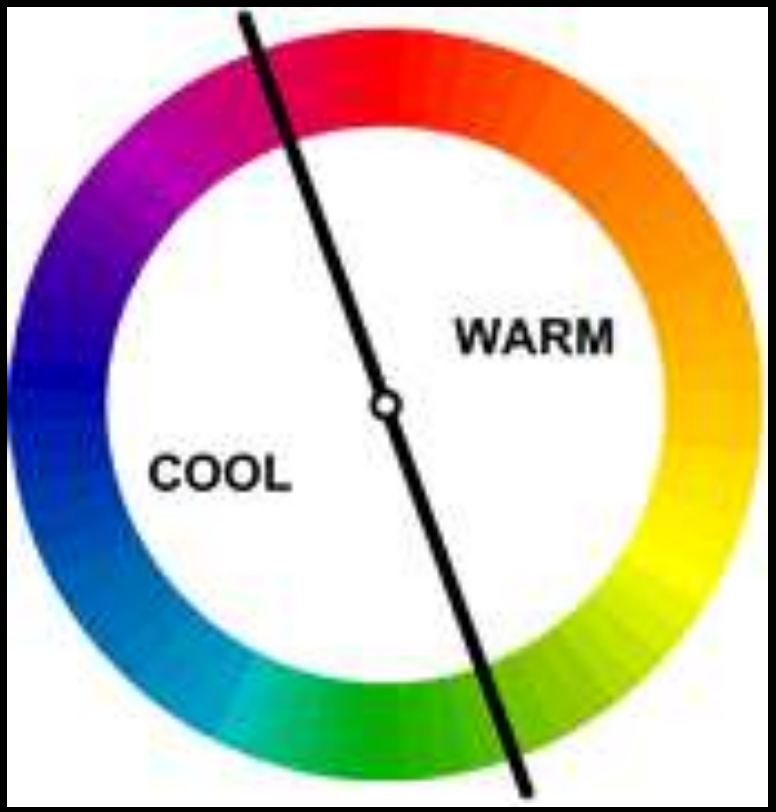
Warm/ Cool Colors

The color circle can be divided into **warm** and **cool** colors.

Warm colors are vivid and energetic, and tend to **advance** in space.

Cool colors give an impression of calm, create a soothing impression, and tend to visually recede in space.

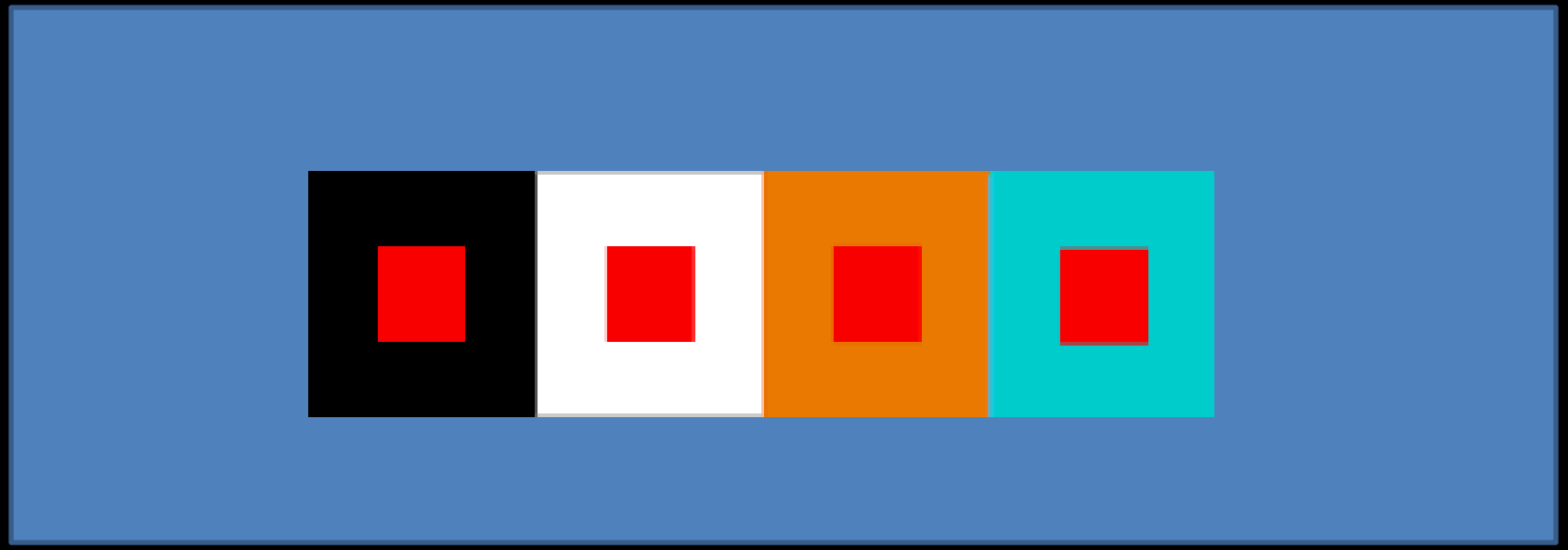
White, black and gray are considered to be neutral



Color Contrast

How color behaves in relation to other colors and shapes is a complex area of color theory.

Compare the contrast effects of different color backgrounds for the same red square.

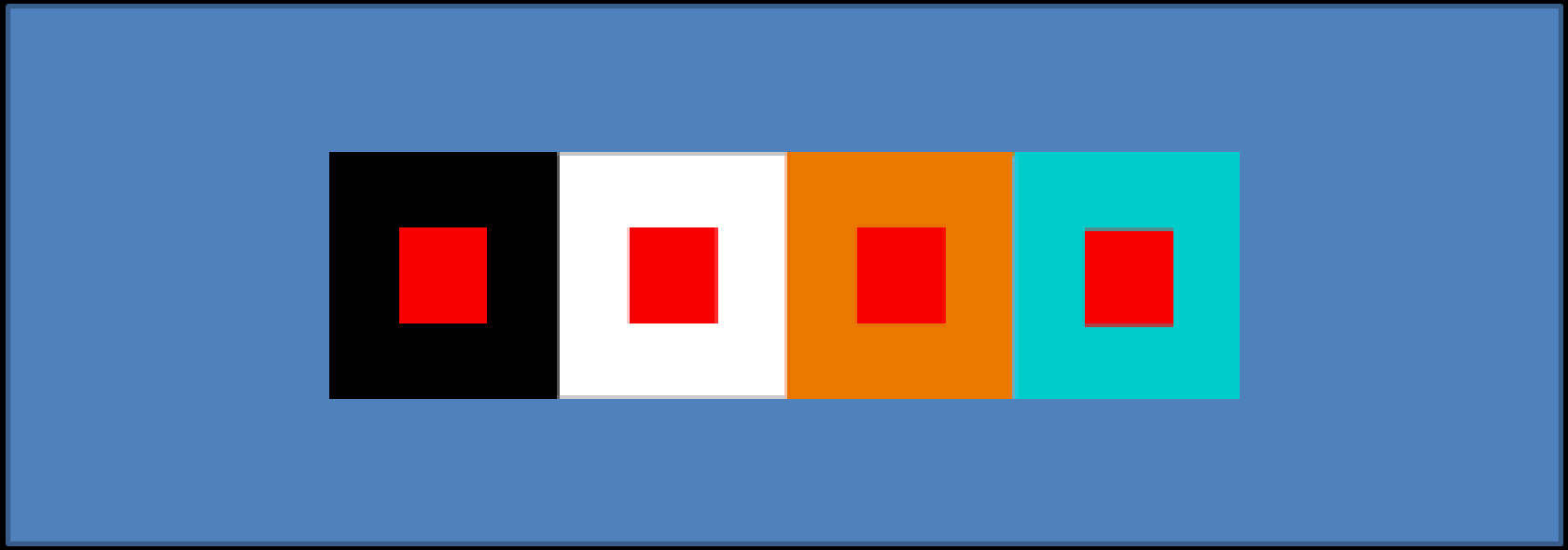


Color Contrast

Red appears more brilliant against a black background and somewhat duller against the white background.

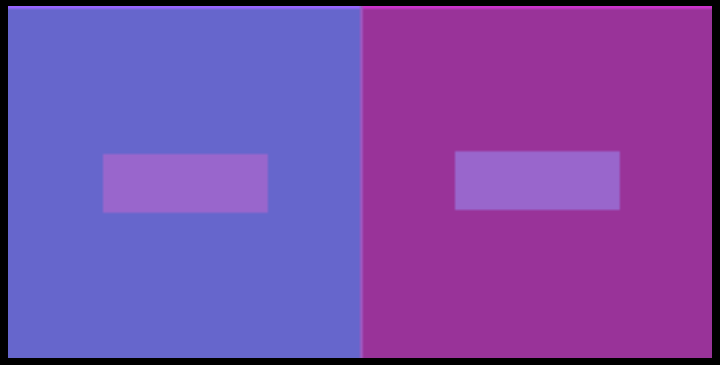
In contrast with orange, the red appears lifeless; in contrast with blue-green, it exhibits brilliance.

Notice that the red square appears larger on black than on other background colors

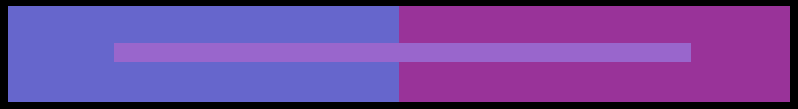


Color Contrast

If your computer has sufficient color stability and gamma correction you will see that the small purple rectangle on the left appears to have a red-purple tinge when compared to the small purple rectangle on the right.



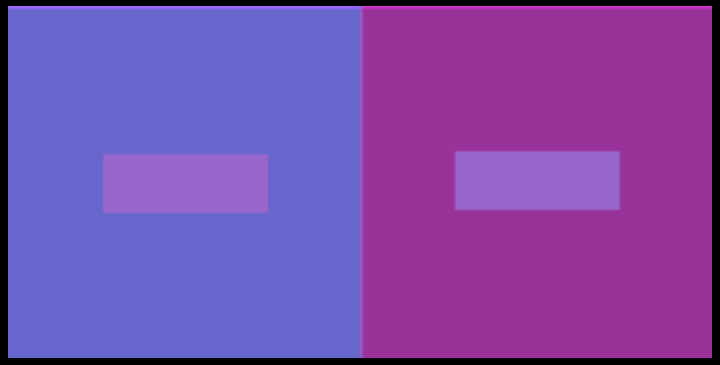
They are both the same color as seen in the illustration at right.



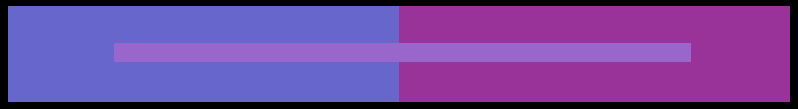
This demonstrates how three colors can be perceived as four colors

Color Contrast

Observing the effects colors have on each other is the starting point for understanding the relativity of color.



The relationship of values, saturations and the warmth or coolness of respective hues can cause noticeable differences in our perception of color.



Color & Branding

Brands and color are inextricably linked because color offers an instantaneous method for conveying meaning and message without words.

Color & Branding

Branding is a word commonly referred to by advertisers and marketing people, but what does it actually mean?

Marketing experts define "brand" as the "name, term, sign, symbol or design, or a combination of them intended to identify a company's products or services."

In other words, a brand communicates the "idea" of company or product. This is what forms the connection with consumers

Color & Branding

The JAL (Japan AirLines) image has several components: The bird symbolizes flight and the color red communicates power.

Red also symbolizes good luck in Asia. The circle and the color red reference the flag of Japan.

Therefore, the brand image communicates powerful air transportation from a Japanese company — and good luck with the journey.

Color & Branding

The AT&T image is an award-winning design. The globe symbolizes a world circled by electronic communications.

More specifically, the symbol is made up of very carefully delineated 'highlight' and 'shadow' elements.

As a result, the symbol may be reproduced to give the impression of a three-dimensional sphere that is lighted from a distance source.

Color & Branding

The UPS (United Parcel Service) image is an excellent example of how a single color communicates meaning.

Brown symbolizes dependability and solidity.

(It is not a snobby color; it is not high technology; brown is grounded in the earth.)

The Power of Color for Branding

Brands and color are inextricably linked because color offers an instantaneous method for conveying meaning and message without words.

Color is the visual component people remember most about a brand followed closely by shapes/symbols then numbers and finally words. For example, the real McDonald's is easy to detect in the image below

The Power of Color for Branding

Many of the most recognizable brands in the world rely on color as a key factor in their instant recognition.

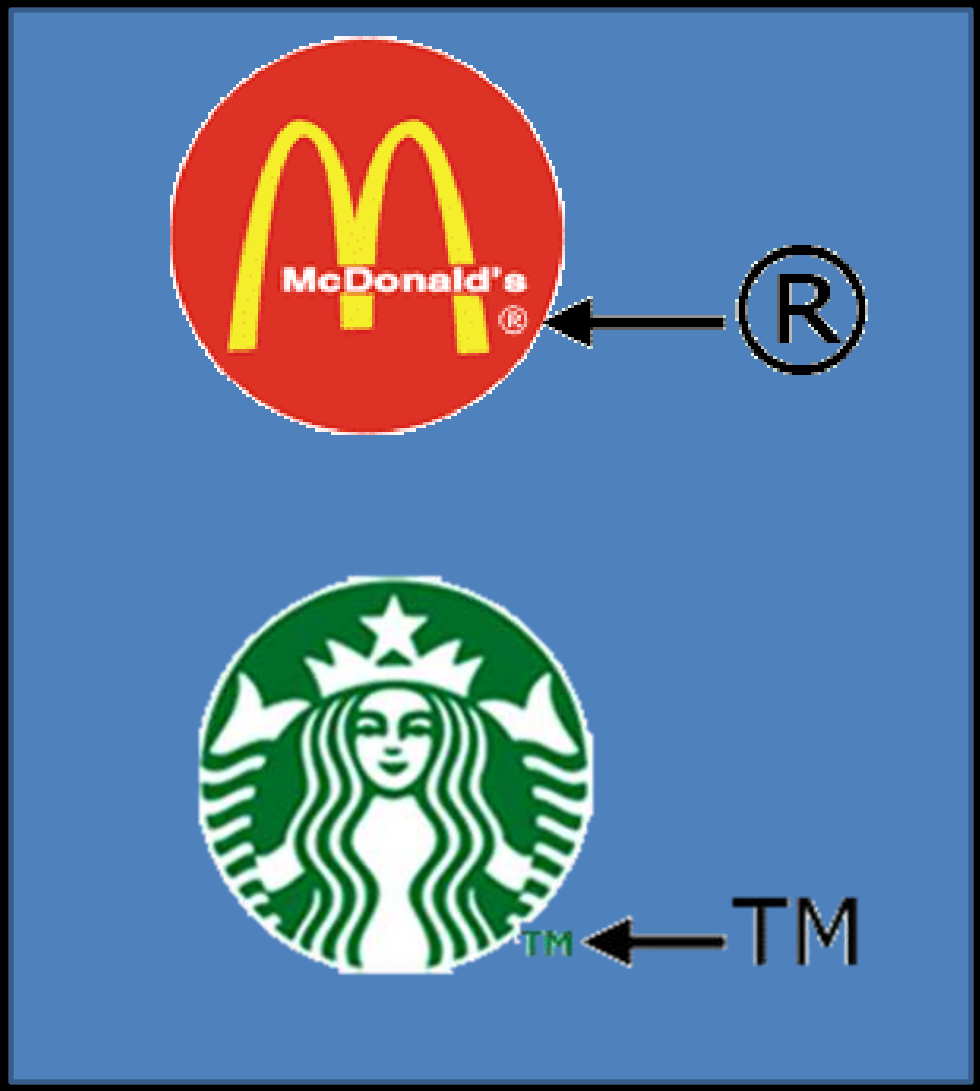
Research has reinforced that 60% of the time people will decide if they are attracted or not to a message - based on color alone!

Color increases brand recognition by up to 80 percent. (Source: University of Loyola, Maryland study

Color & Branding

The color of a brand is different from a color trademark. Even though a TM or ® symbol may appear on a brand's image, it does not mean there are any legal rights to the color or colors.

The TM and ® marks on the Mc Donald's and Starbucks images below means that the company has claimed rights to the image (the symbol or word or combination of both).

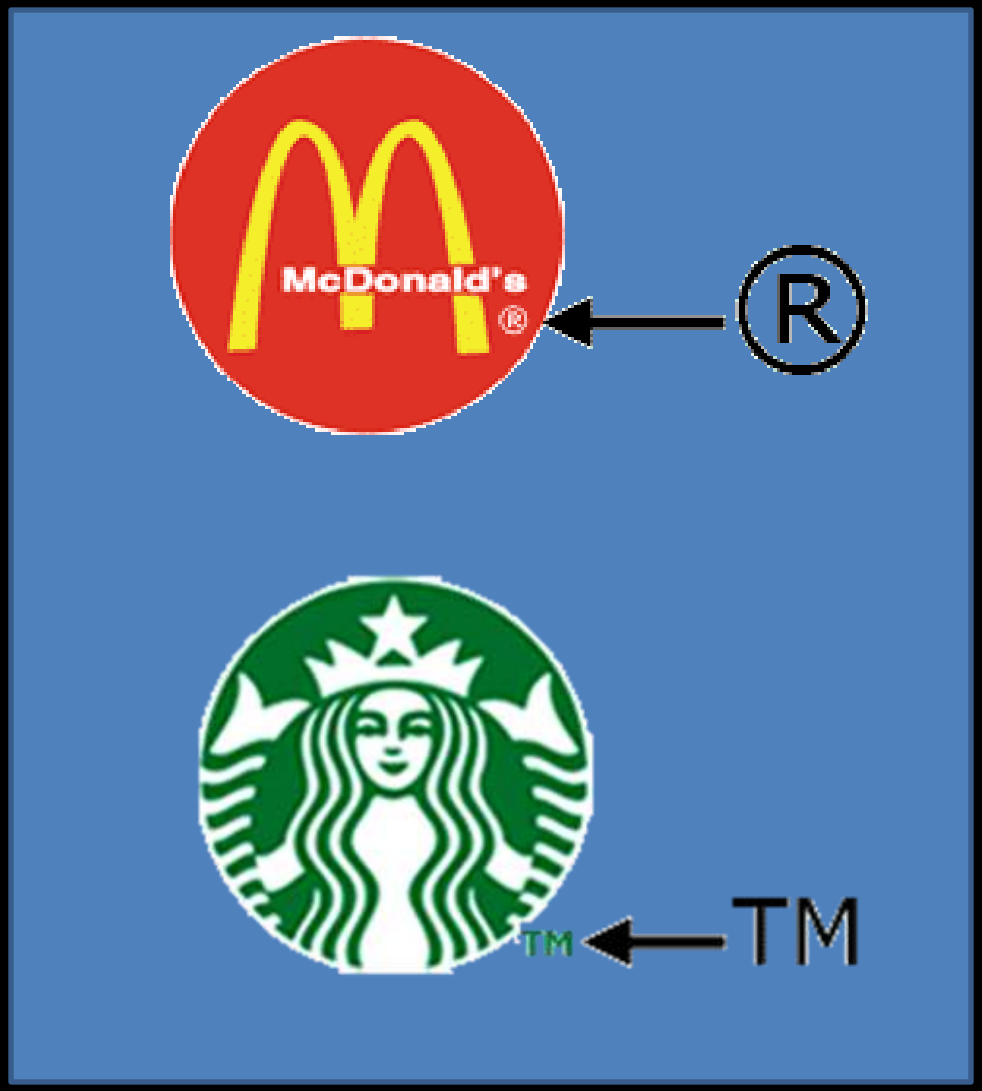


Color Branding & Trademark Rights

You can use TM on any design that you wish to designate as a trademark. The use of the symbol may be governed by local, state, or foreign laws and the laws of a pertinent jurisdiction.

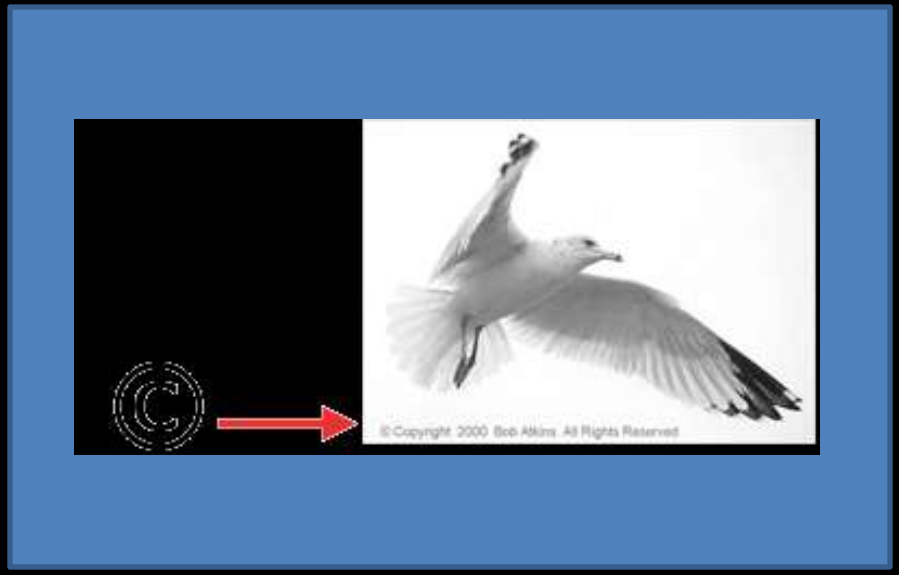
No registration is required in the US. In most states this will actually give you some "common law" trademark rights.

You can use the ® mark in the U.S. only after you obtain a federal trademark registration from the US Patent and Trademark Office



Color Branding & Trademark Rights

Copyright (the © mark) is different.



It means that the original author or creator of any creative work (writing, images, music, software, etc. etc.) has the sole right to copy (distribute, publish, sell, copy) that work for a set period of time unless he or she explicitly hands over that right to someone else.

Most governments enact this law

Color Branding & Trademark Rights

The ® (REGISTERED) mark in these examples protects the brand image - not the color or color combination. In other words, you can use the same yellow and red colors as McDonald's for your business. However, if you used the same design - the yellow arch on a red background - with your business name, you'd be in trouble and even more so if it's for a hamburger restaurant.

The TM (TRADEMARK) symbol on a brand image means the same thing. It protects the design and does not give legal rights to the colors alone

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The TM (TRADEMARK) symbol on a brand image means the same thing. It protects the design and does not give legal rights to the colors alone

Color Branding & Trademark Rights

A color trademark is different. In this case, the **color is the brand**.

The use of the color in a market sector is protected by trademark.

For example, when you see chocolate candy in a purple wrapper, you know it's Cadbury: when you see a turquoise box for jewelry, you know it's from Tiffany & Co

Color Branding & Trademark Rights

However, Cadbury's purple is protected by trademark only for chocolate products.

Anyone else can use the color purple. For example, Royal Motor Oil and Nexium (pills) use purple in their brand.

Color Branding & Trademark Rights

Until the 1980s, U.S. law refused to recognize a single color as a brand.

However, color combinations, had long been protectable.

This changed when Owens-Corning launched the "Think Pink" campaign for its fiberglass building insulation.

In 1985, a U.S. Court of Appeals in Washington ruled that the company had the right to prevent others from using pink for insulation.

Color Branding & Trademark Rights

Pink insulation is a good example of a color that is protected by trademark.

When consumers see pink insulation products, they know it's Owens-Corning.

The color pink doesn't symbolize anything in home construction.

In fact, it's not even a very masculine color

Color Trademarks Today

Color trademarks apply to unique situations because it's not possible to permit every business to own "their color" today.

Otherwise there would be "color depletion." In other words, there are a limited number of colors.

Color Trademarks Today

Tiffany Blue is another example of a color trademark.

It's important to understand that they only own that blue <u>in situations where it could be confused with their products.</u>

Tiffany only owns "robin's egg blue" for its boxes and bags.

Color Trademarks Today

You can paint your house that color, for example, without having a problem.

Given the wide range of products Tiffany sells, and the uniqueness of their shade of blue, they are protected from other jewelers who would use the same color for boxes or packaging.

Otherwise, there would be brand confusion.

Color Trademarks Today

A number of companies have failed to protect single colors.

Pepto-Bismol couldn't get pink and Good Humor failed to protect the color white for its trucks and uniforms.

On the other hand, UPS has protected brown for its trucks and uniforms and 3M "canary yellow" for its adhesive notes.