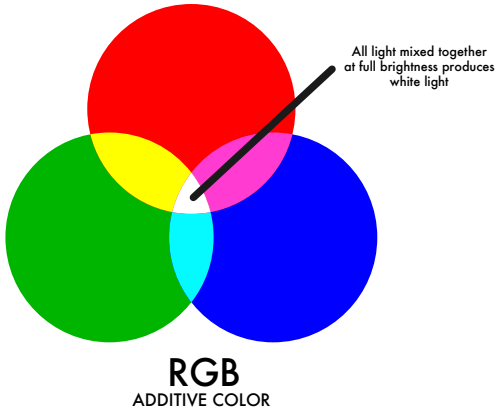
Color Spaces

Creating consistency with color everywhere.

Our designs can appear anywhere. Mobile screens, laptops, printed newspaper, glossy business cards or metal signs. The challenge with this is our chosen color palettes may look different in all of those different places. This section will review the different ways to represent color in both the digital and print space. Knowing how each color mode works will help you to understand how best to tweak color to make it consistent across all channels.



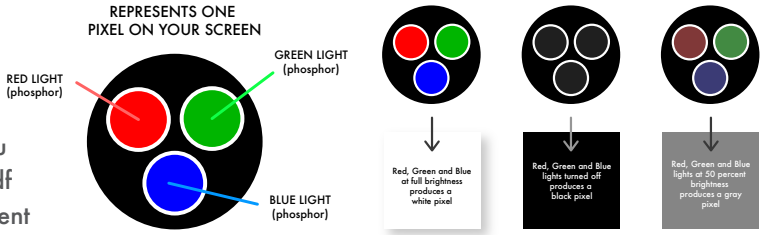
RGB
ADDITIVE COLOR

This is called an additive color system because you add colors together to form other color combinations.

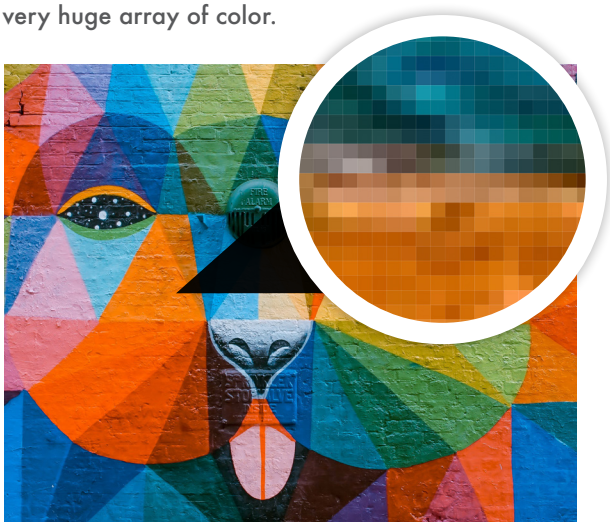
For example, if a screen wanted to produce a pixel that is white, it would have all three of its phosphors (lights) on red, green and blue at full brightness. If it wanted to remain black it would have no light emission and all three light phosphors switched to off. For gray it can have all three lights on but only at half brightness.

RGB (ADDITIVE COLOR SYSTEM)

Used commonly for digital design projects such as social media, website images, mobile apps etc. If you are seeing this on a digital device in the form of a pdf your computer is determining the color of the document by reading the RGB numbers and adjusting the light on your computer screen to put together those colors.

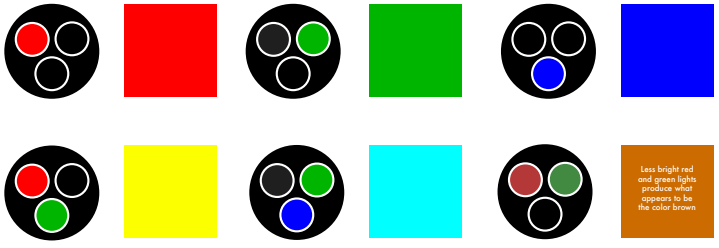


Computer screens consist of thousands of tiny lights that can show blue, green or red light in any given space. It can adjust the brightness of each pixel along with mixing the one of three color light options to give you a very huge array of color.



Zooming in on this digital image in Adobe Photoshop at 8,000% reveals that this image is made up of thousands of tiny pixels, each representing just one color. Combined together they can form complex photos, shapes and colors.

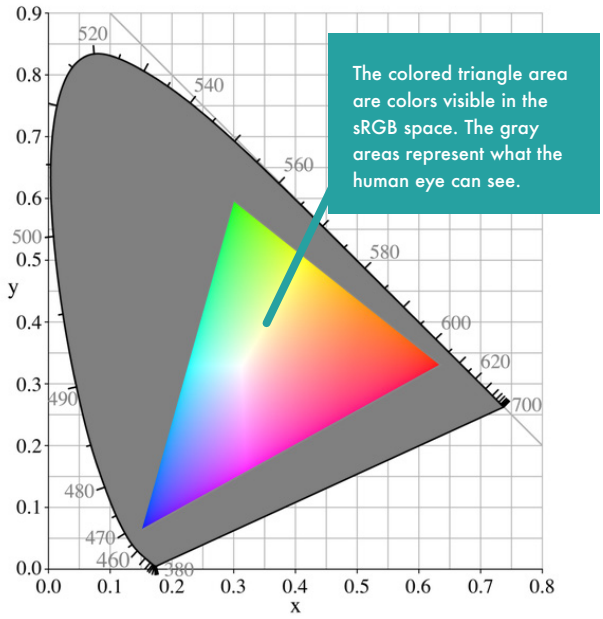
For pure red, it would just have its red phosphors on full brightness and so on. To produce the color yellow it would turn both of its red and green phosphors on. It can also use brightness as a way to dull one or two of the main phosphors to create more secondary and even tertiary colors emulating various shades, tints and tones.



Interestingly enough, brown light does not exist. When you look at the visible color spectrum (a rainbow) you cannot see brown light. To create browns in the RGB space you actually use a combination of red and green and various brightness to create brown.

RGB is used in all digital devices that use light to produce color. It does a great job of representing the total visible colors to the human eye, but it cannot show all visible colors.

COLOR GAMUT



A color gamut is the breadth and reach of how many colors can be represented on any given device. If a color is outside of the gamut of that device it will be shown as the nearest available color in that gamut. This is why having a high quality screen and device with a wide color gamut can improve the range of colors that can be represented on your screen.

sRGB and Adobe RGB are popular color spaces you can use in modern design software. sRGB covers only 35.9% of the total visible gamut while Adobe RGB is slightly better at 52.1%. As screen technology gets better, we are able to push those numbers higher and higher giving us wider color gamuts.

There is a consistency problem with RGB as your design will be shown on possibly hundreds of different screens, monitors and phones. The color of red may look different on my husband's old Dell laptop compared to the latest iPhone. Constantly test your design on multiple screens and sources to help tweak some of the bigger discrepancies. Fortunately, as technology improves we will see less and less difference between screen color representation.

HEX (USED FOR WEB DESIGN)

Hex codes are standard when creating stylesheets for web and mobile applications. Being able to produce these Hex codes for developers and for online use is vital in making sure your color can be displayed consistently online.

Hex codes consist of 6 alphanumeric characters that produce a wide range of colors using a browser. There are three sets of numbers in a hex code. The first two digits represent the color Red, the second, Green and the third Blue. The combination of these colors is the Hex code, producing a final mixed color. The scale moves from 0 (the darkest) to F (lightest) so a hex code number of #000000 would be black and #FFFFFF would be pure white.

#00000

#FFFFFF

#4198C7

#4198C7

RED GREEN BLUE

All modern design software gives you a chance to select a RGB color and see its comparable Hex code number.

WEB SAFE COLORS

Web Safe Colors are 216 Hex code colors that can be shown consistently across most 8-bit devices. Improvements in screen displays have made web safe colors a bit less useful as screen limitations are pushed higher. Web safe colors do have more consistency across multiple screen types, so it can be helpful in finding more consistent color matches across screens.

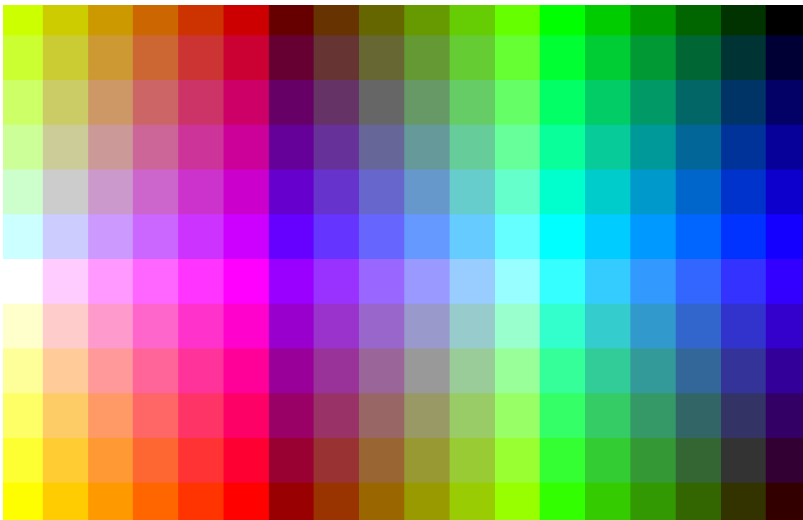


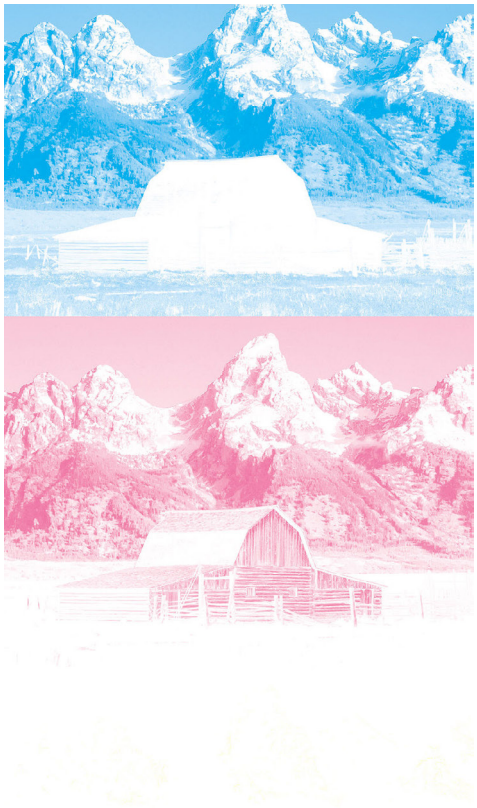
Image Source: htmlcolorcodes.com/color-chart

CYMK (SUBTRACTIVE COLOR SYSTEM)

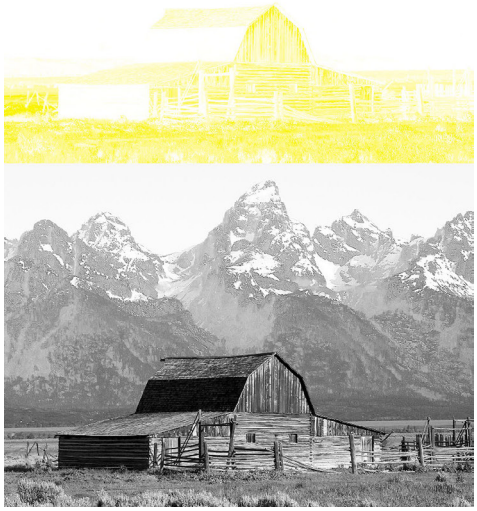
Used for professional print projects.

We covered digital devices but what about printed items? Most professional printers print using four main ink colors represented by CMYK or (Cyan, Magenta, Yellow, and K for Black). The K stands for Key and black ink is used to add a more rich darkness to the other three inks. Without using a pure black ink you could get brown muddy colors trying to produce black by mixing all of the remaining three colors.

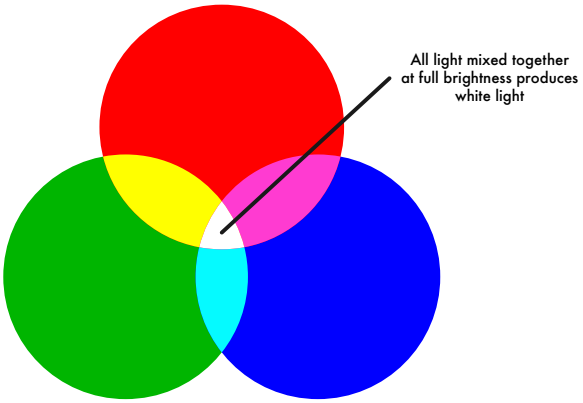
Four metal plates are created in the printing process for any design. The first plate will include only the areas that will print with cyan, the second plate yellow, the third plate magenta and lastly a plate that will include black ink to help to saturate or darken the other areas. When seen separately these colors seem really restrictive and limited. But when printed over top of each other the colors work together to create lots of colors in between.



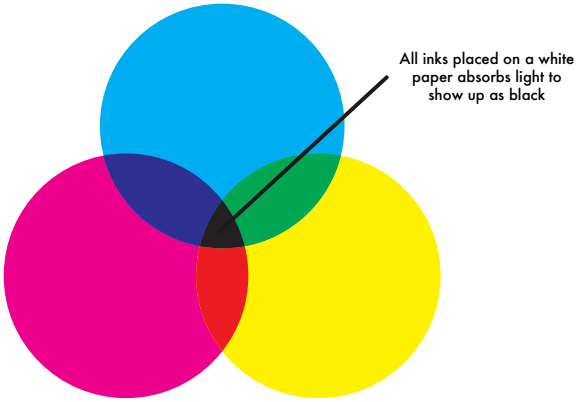
A metal printing plate (CYAN)
www.printrunner.com/blog/what-are-printing-plates



A GCR four-color separation of File:Barns grand tetons.jpg, assuming SWOP uncoated inks at 25% dot gain, with maximum black, created in Adobe Photoshop by Jacob Rus, 2008-09-02.



RGB
ADDITIVE COLOR

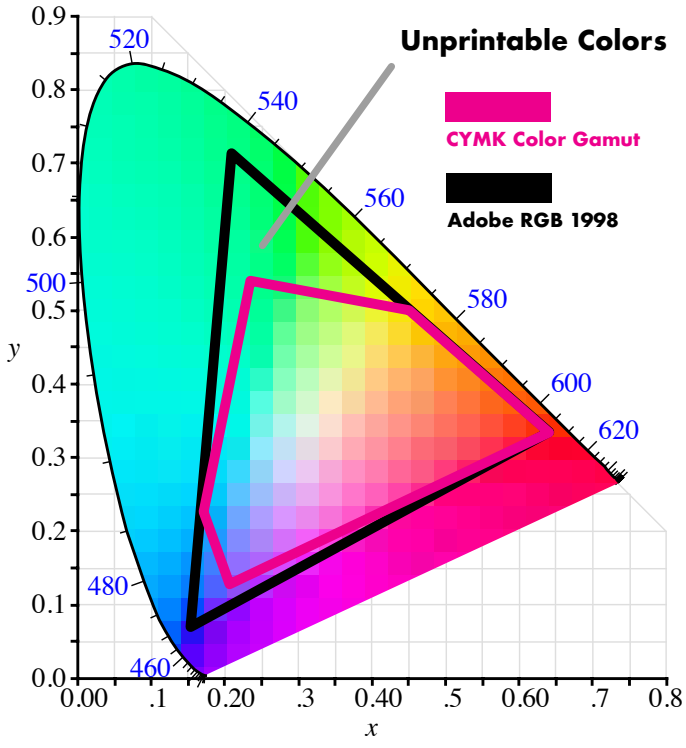


CYMK
SUBTRACTIVE COLOR

RGB is an additive color system, meaning we add colors together with light. It starts off with a darkened black pixel and has light and color added to it.

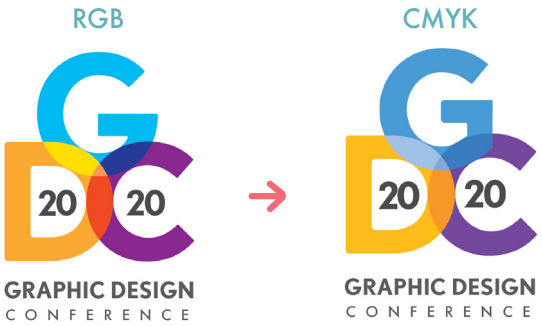
Light forms colors differently than inks do. With reflected light a pure white piece of paper reflects the most light and black absorbs the most light. CMYK is a subtractive color system in that adding all of the colors together produces black and in RGB or additive color mode we add all of the colors and brightness to form a pure white.

Because the RGB color mode uses light and the additive color system, it can produce the most colors in the visible spectrum. CYMK only consists of inks and the reflective quality of light. CMYK has a much more limited color range and this is a big problem in design.



As designers we need to be able to produce the same design for both the print and the digital spaces. That means we need to use CMYK and RGB on the same design and somehow make it look as close as possible.

For example, I have a bright logo here that looks great on my computer screen. It contains vivid, highly saturated colors. When I convert this to the CMYK color mode for printing on a poster, I am dismayed on how the colors become more dull. This is very common and it is a natural struggle we face everyday.



MANUAL COLOR CORRECTION

To help with this, you can manually select the closest matching colors to try to maintain the vibrancy. You will not be able to match it to RGB perfectly but you can get a little bit closer than what the automatic RGB to CYMK conversion algorithm can get at times.

One thing we can do is switch into the CMYK color space to see how our colors convert from RGB to CMYK. This will give us an idea of how it might change in appearance when we get our item printed compared to how it looks as a social media post. There is one way to increase the possible colors displayed using printed ink and that is by using what are called Pantone colors.

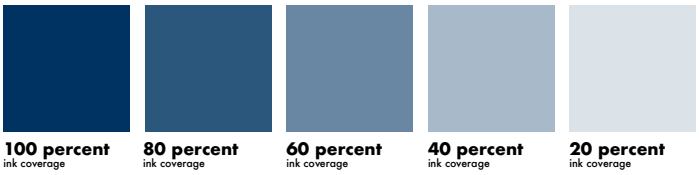
PANTONE COLOR:

Pantones are special color inks that have special formulas that show the color the same way each time it is printed. So Classic Blue and Living Coral will look the same each time. In the printing process we use the four metal ink plates to overlay each color together. When you use a Pantone color a new metal plate is created for where that particular color we be used. With each new Pantone color that is used a new metal ink plate is created.

This also makes Pantone colors a bit expensive to use as it costs additional money to add each new ink plate.

Some companies may save on costs by producing a large annual report using only one or two of their branded colors using Pantone inks. With only two ink plates needed for the entire project it saves money.

Pantone colors are not just one solid color either. You can take this classic blue color and reduce the percentage of ink coverage to produce many different shades of that color.



100 percent ink coverage | **80 percent** ink coverage | **60 percent** ink coverage | **40 percent** ink coverage | **20 percent** ink coverage

You can even order a Pantone swatch book to reference different colors and see how it might look printed. These are helpful when working with larger companies who frequently use Pantone inks.

Pantone has tons of different color options and some include metallic colors and swatches that can add a visible shine to your printed inks.

You can purchase Pantone color books in different types depending on the type of paper coating you are going to print with. Some are "coated" Pantone colors which are for papers that are glossy, semi-gloss, or matte finishes. There is also "uncoated" which is less common and is paper that is more porous and absorbs more of the ink, therefore the need for slightly tweaked colors for uncoated paper. Types of uncoated paper include art books and natural recycled papers.