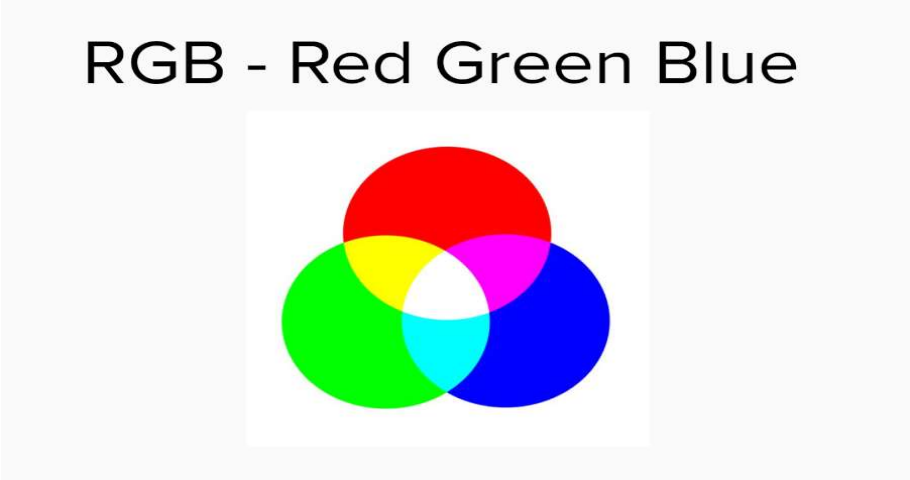
Differences between RGB and CMYK color schemes

Both RGB and CMYK are color schemes used for mixing color in graphic design. CMYK and RGB colors are rendered differently depending on which medium they are used for, mainly electronic-based or print based.

1. RGB Color Scheme :
RGB stands for Red Green Blue. It is the color scheme for digital images. RGB color mode is used if the project is to be displayed on any screen. RGB color scheme is used in electronic displays such as LCD, CRT, cameras, scanners, etc.



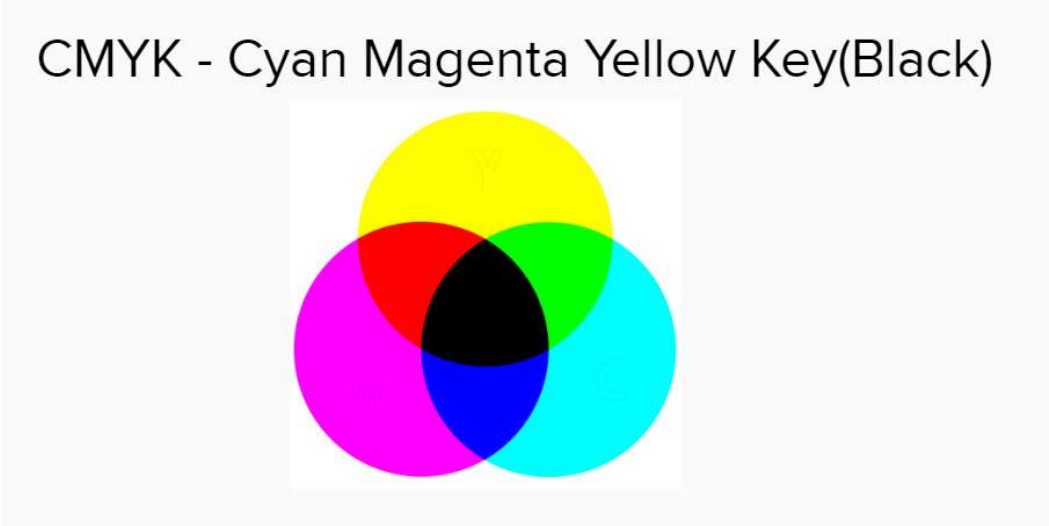
This color scheme is an additive type mode that combines the colors:- red, green, and blue, in various degrees which creates a variety of different colors. When all three colors are combined and displayed to the fullest degree, the combination gives us white color, for example for white combination will be RGB (255, 255, 255). When all three colors are combined to their lowest degree or value, the result is black, for example for black combination is RGB (0, 0, 0).

RGB color Scheme offers the widest range of colors and hence preferred in many computer software's.

Uses of RGB Color Scheme –

- Used when project involves digital screens like computers, mobile, TV etc.
- Used in web and application design.
- Used in online branding.
- Used in social media.

2. CMYK Color Scheme :
CMYK stands for Cyan Magenta Yellow Key (Black). It is the color scheme used for projects including printed materials. This color mode uses the colors cyan, magenta, yellow and black as primary colors which are combined in different extents to get different colors.



This color scheme is a subtractive type mode that combines the colors:- cyan, magenta, yellow and black in various degrees which creates a variety of different colors. A printing machine creates images by combining these colors with physical ink. when all colors are mixed with 0% degree white color is created, exp CMYK(0%, 0%, 0%, 0%) for white, when all colors are mixed, we get the black color.

Uses of CMYK Color scheme –

- Used when project involves physically printed designs etc.
- Used in physical branding like business cards etc.
- Used in advertising like posters, billboards, flyers etc.
- Used in cloth branding like t-shirts etc.

When to use which color scheme?

- If the project involves printing something, such as a business cards, poster, or a newsletter, use CMYK scheme.
- If the project involves something that will only be seen digitally, use RGB Scheme.

Differences between RGB and CMYK color schemes:

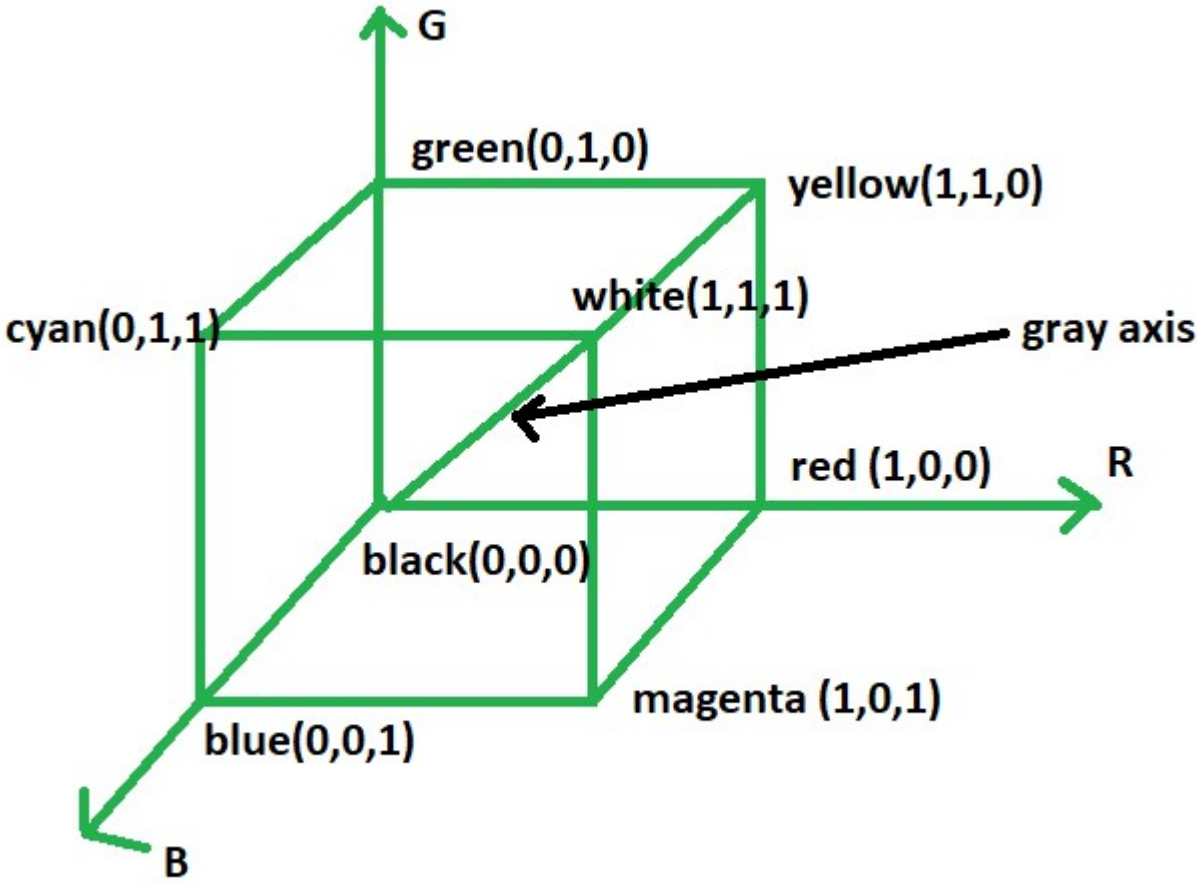
RGB Color Scheme	CMYK Color Scheme
Used for digital works.	Used for print works.
Primary colors: Red, Green, Blue	Primary Colors: Cyan, Magenta, Yellow, Black
Additive Type Mixing	Subtractive Type Mixing.
Colors of images are more vibrant	Colors of lass vibrant.
RGB Scheme has wider range of colors than CMYK	CMYK has lesser range of colors than RGB.
file formats:- JPEG, PNG, GIF etc.	file formats:- PDF, EPS etc
Basically it is used for online logos, online ads, digital graphics, photographs for website, social media, or apps etc.	Basically it is used for business cards, stationary, stickers, posters, brochures etc.

Computer Graphics | The RGB color model

The RGB color model is one of the most widely used color representation method in computer graphics. It use a color coordinate system with three primary colors:

R(red), G(green), B(blue)

Each primary color can take an intensity value ranging from 0(lowest) to 1(highest). Mixing these three primary colors at different intensity levels produces a variety of colors. The collection of all the colors obtained by such a linear combination of red, green and blue forms the cube shaped RGB color space.



The corner of RGB color cube that is at the origin of the coordinate system corresponds to black, whereas the corner of the cube that is diagonally opposite to the origin represents white. The diagonal line connecting black and white corresponds to all the gray colors between black and white, which is also known as **gray axis**.

In the RGB color model, an arbitrary color within the cubic color space can be specified by its color coordinates: (r, g.b).

Example:

(0, 0, 0) for black, (1, 1, 1) for white,

(1, 1, 0) for yellow, (0.7, 0.7, 0.7) for gray

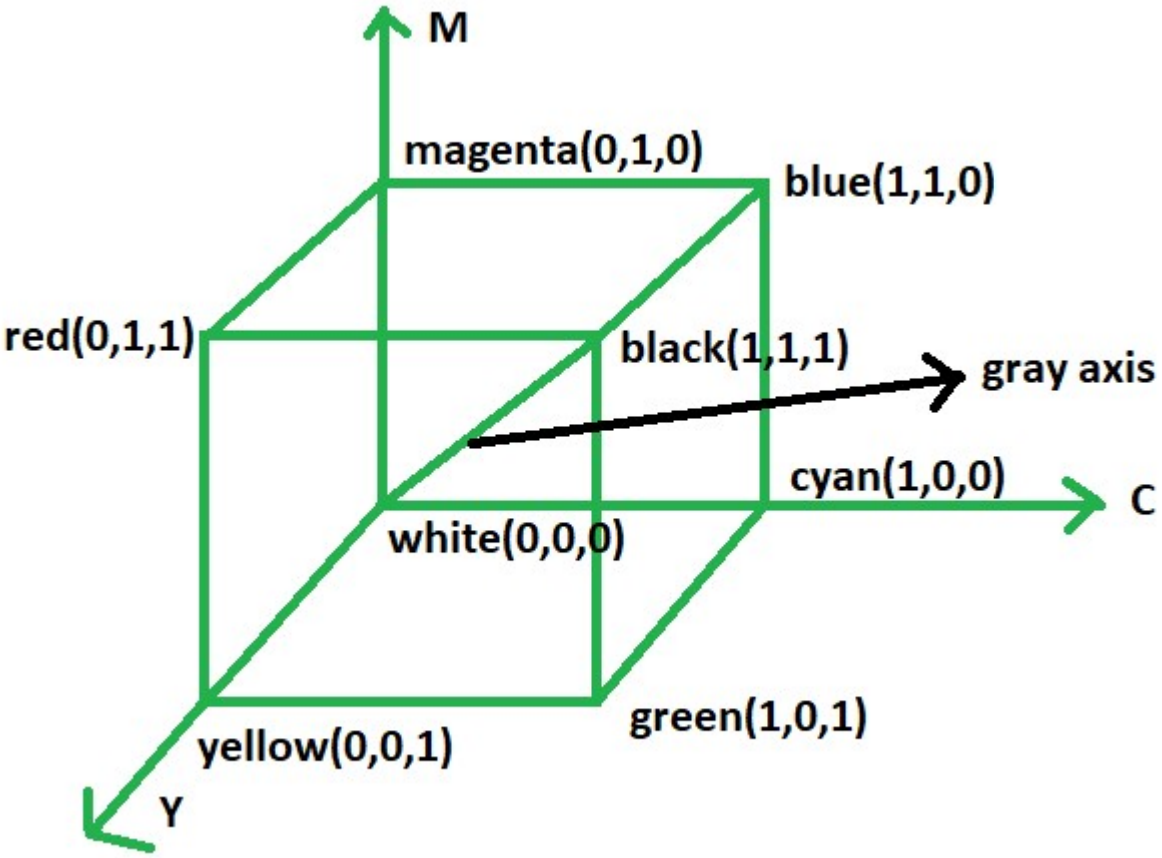
Color specification using the RGB model is an **additive process**. We begin with black and add on the appropriate primary components to yield a desired color. The concept RGB color model is used in **Display monitor**. On the other hand, there is a complementary color model known as **CMY color model**. The CMY color model use a **subtraction process** and this concept is used in the **printer**.

In CMY model, we begin with white and take away the appropriate primary components to yield a desired color.

Example:

If we subtract red from white, what remains consists of green and blue which is cyan. The coordinate system of CMY model use the three primaries' complementary colors:

C(cray), M(magenta) and Y(yellow)



The corner of the CMY color cube that is at (0, 0, 0) corresponds to white, whereas the corner of the cube that is at (1, 1, 1) represents black. The following formulas summarize the conversion between the two color models:

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} C \\ M \\ Y \end{bmatrix} \qquad \begin{bmatrix} C \\ M \\ Y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$