

A decorative border surrounds the central content area. It features a repeating pattern of stylized leaves and circular motifs, alternating between a light blue color and a white or off-white color.

GRAPHIC MEDIA

UNIT 2

Definition

- Graphics refer to the software and hardware technologies used in a computer system to create, modify and display still images stored in a digital form
- Graphic media is made up of visual techniques, mark making, digital vector and bitmap images like logos, layouts, traditional, digital document and painting, 3D modeling, and anything that makes an image on the surface.
- Graphics can be developed using various methods:
 - Illustration Software
 - Graphic/Image Manipulation Software
 - Acquiring through scanning or camera transfer

Uses of Graphics

The main uses of graphic media are for:

- Posters
- TV and movies
- Leaflets
- Websites
- Game and movie cover art
- Billboards
- Paintings
- concept designs
- magazines
- newspapers
- info-graphics
- packaging

Graphic techniques

Graphic techniques are used when making an image on a surface, whether it be a piece of paper, canvas or a computer screen. The technique is the method(s) you have used to create the image on the surface. Here are some examples of the methods and techniques that can be used when creating a piece of graphic media.

- **Traditional mark making** (pen, pencil, inking, painting, chalk, charcoal, markers)
- **Digital mark making** (digital painting in packages such as photoshop, illustrator, coral draw, coral painter)
- **Digital flat graphics**
- **3D modelling** (rendered out into a 2d image)
- **Animation** (digital 2d, using flash and 3d using packages such as pencil 2d, 3DS max etc., traditional, drawing individual frames using traditional mark making techniques)

Graphic technologies

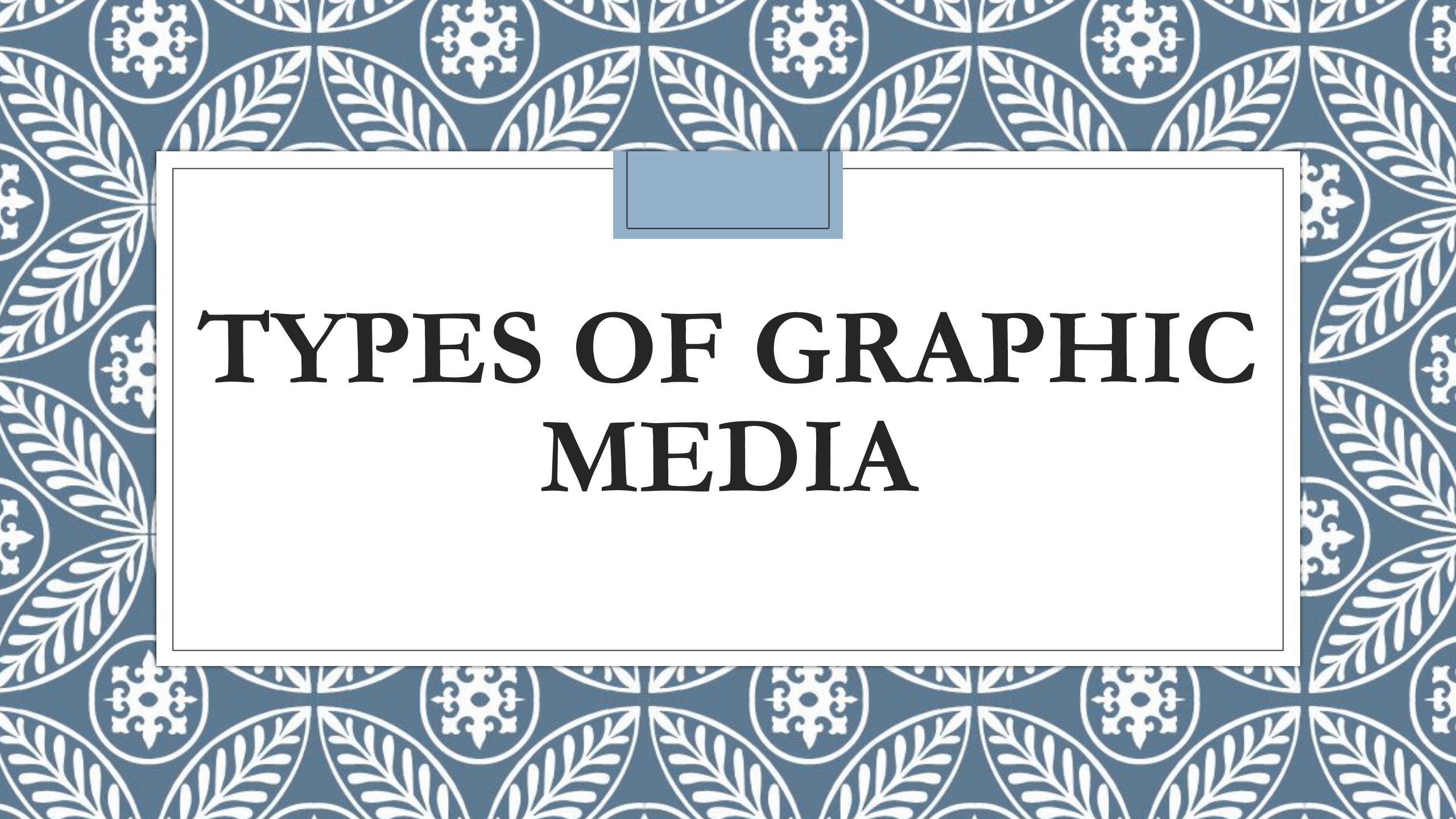
Graphic technologies is the method that we use to create our graphic images, both traditional technologies and digital technologies.

Traditional Methods

- Dry media (pencils, charcoal, chalk)
- Wet media (ink, marker, biro, brush pen, paint, watercolour, acrylics, oils, gouache)
- Different types of paper and surface(newsprint for quick throwaway designs, drawing paper with thicker quality more or less grain, watercolour paper very absorbent and grainy, marker paper absorbent and smooth, also has a plastic surface on one side to stop ink bleeding through, canvas rough/smooth thick and water resistant, board similar properties to canvas.)
- Traditional film camera, to put an image from real life into traditional media.
- Printer, to turn digital media into traditional media.

Graphic media in Advertising

- Graphic designs in marketing and advertising are used throughout the packaging, brochures, logo creation, website design, display ads, and billboards. Graphic design plays a crucial role in advertising.
- The main goal is to create a visually appealing graphic that emphasizes the product or service being offered. Graphic media in advertising uses visual elements to convey a message or promote a product.



TYPES OF GRAPHIC MEDIA

Graphic Media

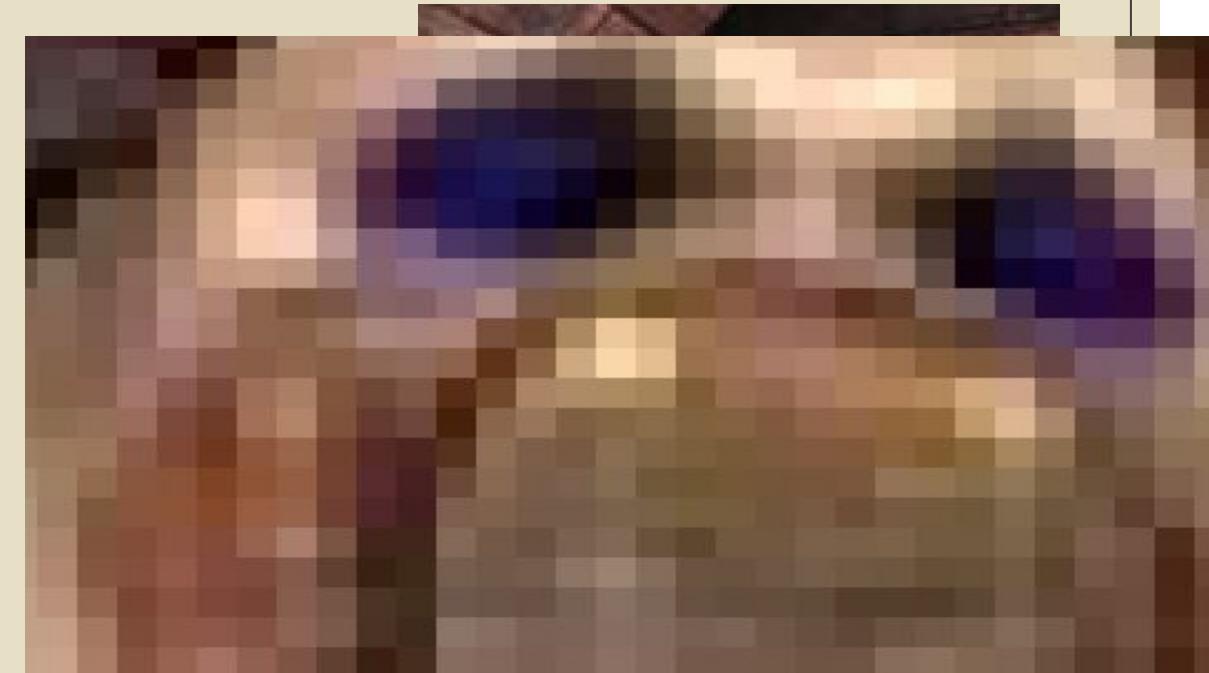
- When Represented digitally graphics media can be broadly categorized into two types
 - Raster Graphics
 - Vector Graphics



WHAT IS A RASTER IMAGE?

- Raster images, also known as bitmaps, are comprised of individual pixels of color.
- Each color pixel contributes to the overall image.

- Images are made up of pixels



WHAT IS A RASTER IMAGE?

Raster images are composed with a series of individually-colored dots of paint.

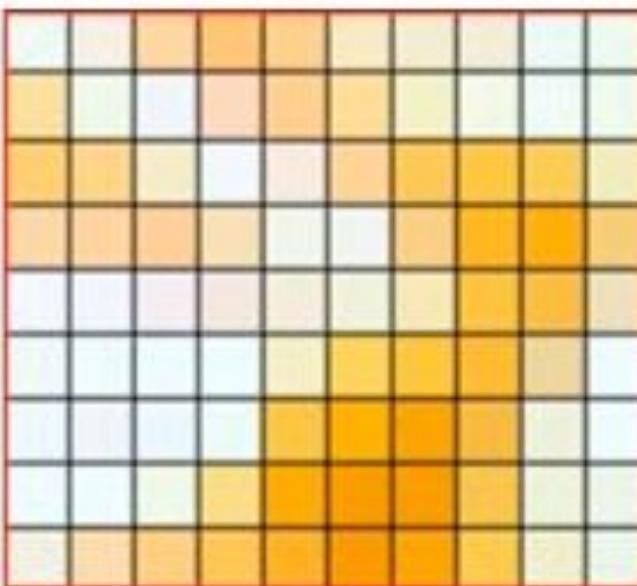
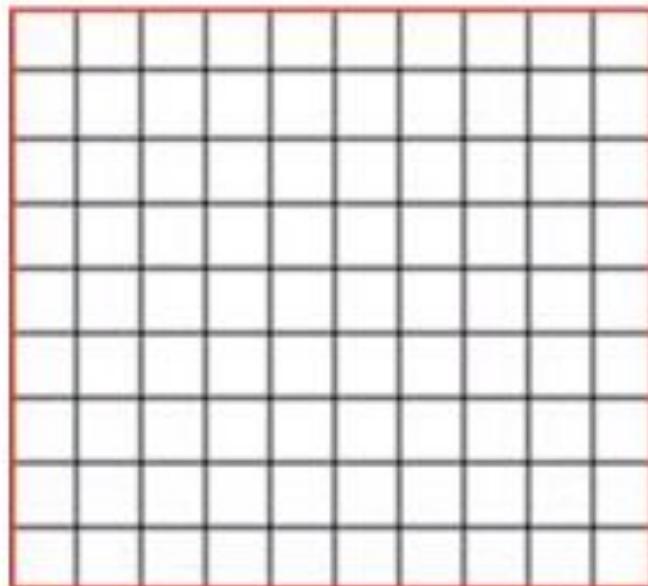
Each paint dot represent a single pixel in a raster image.

WHAT IS A RASTER IMAGE?

Raster images are capable of rendering complex, multi-colored visuals, including soft color gradients.

Digital cameras create raster images, and all the photographs you see in print and online are raster images.

Raster (or Bitmap) Images



- A raster graphic (also called "bitmap") is basically a large grid, filled with boxes called *pixels*
- When you stand far enough away from the grid, the individual grid squares blend together and you see a complete photographic image.

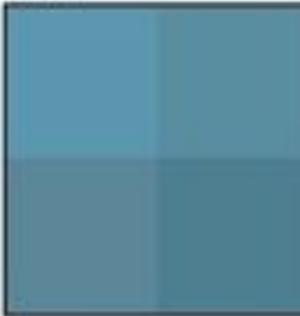
Raster Resolution

- ▶ The more pixels in an image, the more accurate to the original it can be
- ▶ The more pixels in an image, the higher the resolution

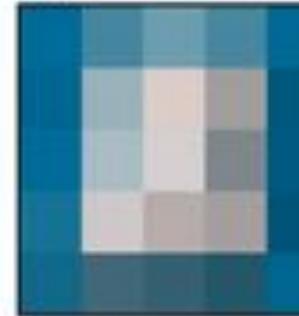
1×1



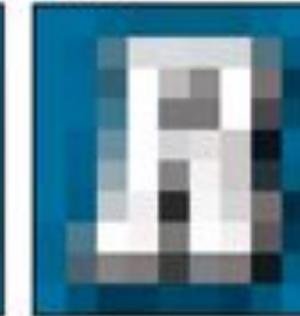
2×2



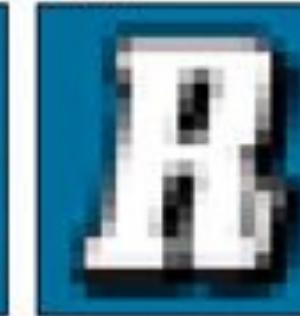
5×5



10×10



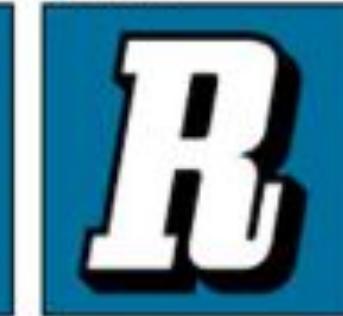
20×20



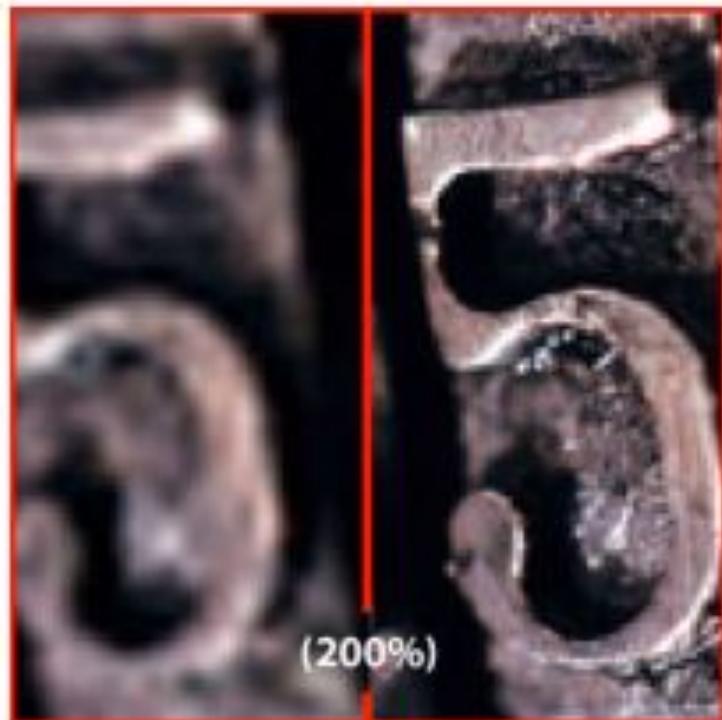
50×50



100×100



Enlarging Raster Images

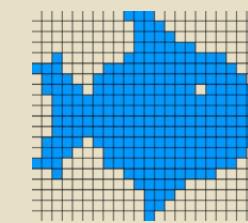
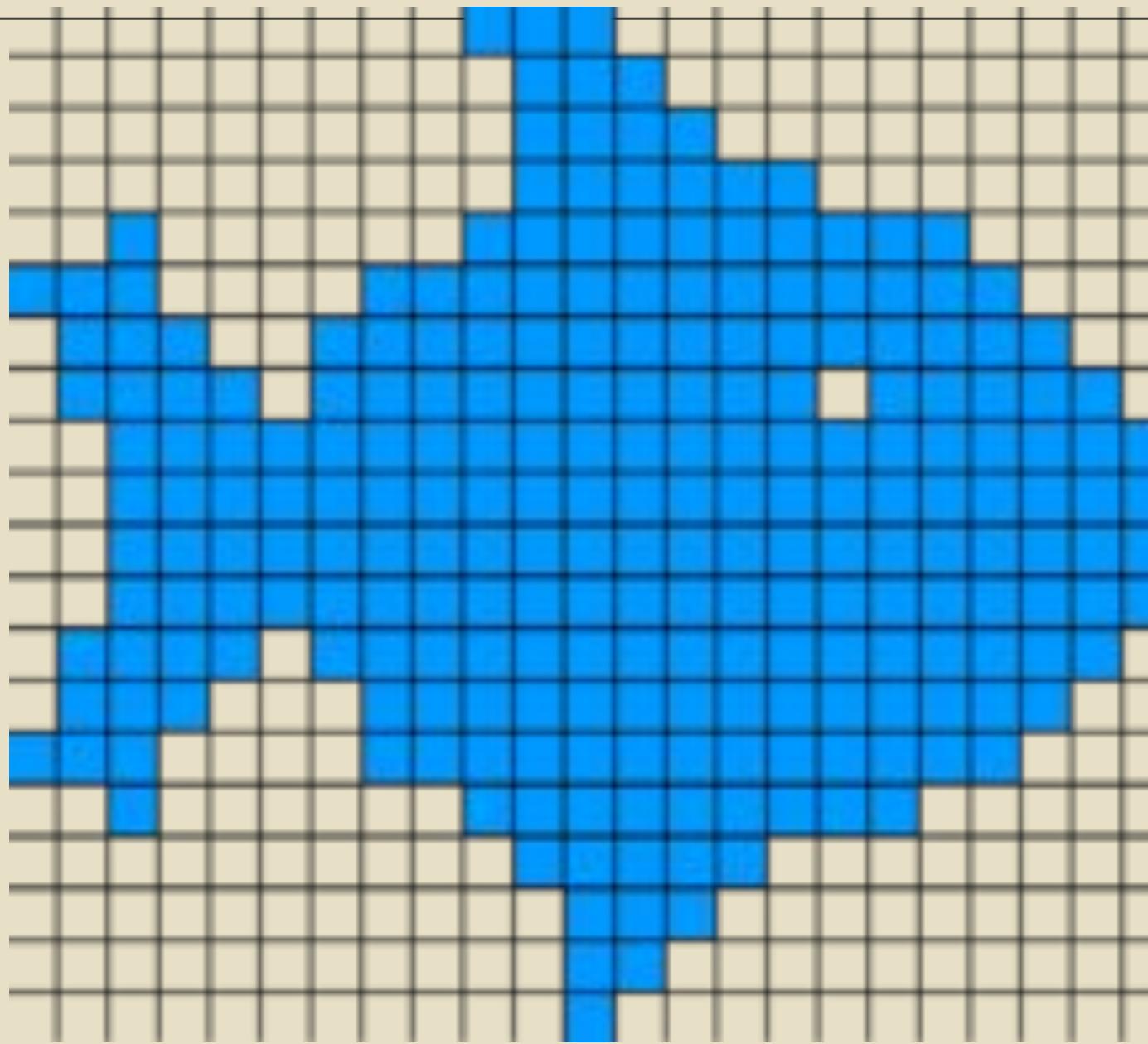


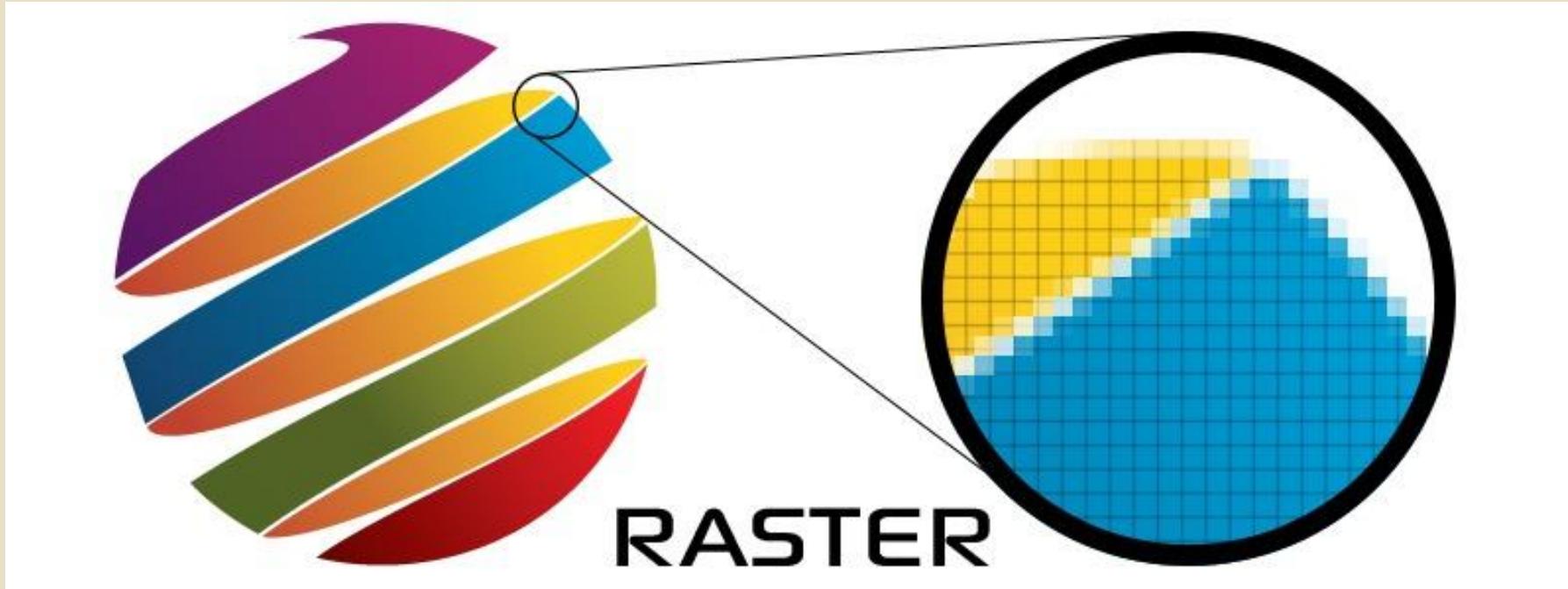
Photoshop will look at what it has to work with and create a best guess as to what is needed. It actually does a pretty good job, but the image may well suffer noticeably if you increase the image size more than 10 percent or so.

- The way to avoid this is to start a larger size than is needed. We can always shrink an image with no loss of quality, but increasing an image will cause it to become pixilated.

Raster Graphics

- Raster graphics, also called bitmap graphics, is a type of digital image that uses tiny rectangular pixels, or picture elements, arranged in a grid formation to represent an image.
- A raster graphic is made up of a collection of tiny, uniformly sized pixels, which are arranged in a two-dimensional grid made up of columns and rows.
- **Each pixel contains one or more bits of information**, depending on the degree of detail in the image. For example, a black-and-white image contains **only one bit per pixel** (a binary bit can be in one of two states; thus, a single bit can represent white or black); an image with shading and colour commonly contains **24 bits of information per pixel**—with 2²⁴, or more than 16 million, possible states per pixel.





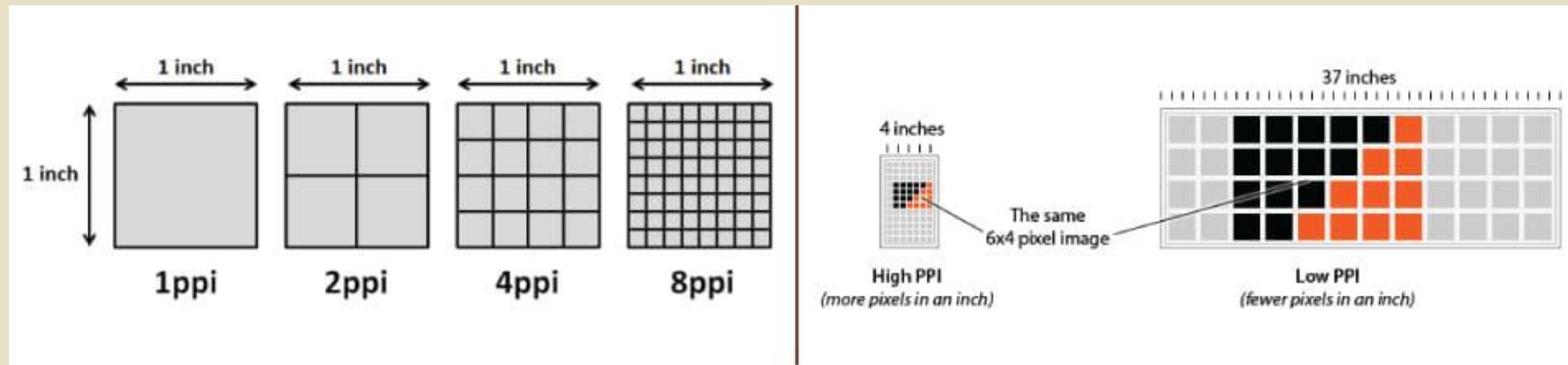
Color depth/Bit depth and Resolution

The number of bits stored in each pixel is known as the **bit depth**. Each pixel consists of two or more colors.

Color depth refers to **the amount of color that each pixel can display**. It is measured by the number of colors each pixel in an image can show. The higher the color depth, the more colors an image can display. Pixels store color information in a specific number of computer bits, ranging from one bit to 48 bits. Color depth is measured in **bits per pixel**.

The number of pixels in a display, called **resolution**, affects how much detail can be depicted in an image. Resolution is often expressed as the number of pixels in a column times the number of pixels in a row (for example, 800×600).

DPI vs PPI



DPI - Dots per Inch

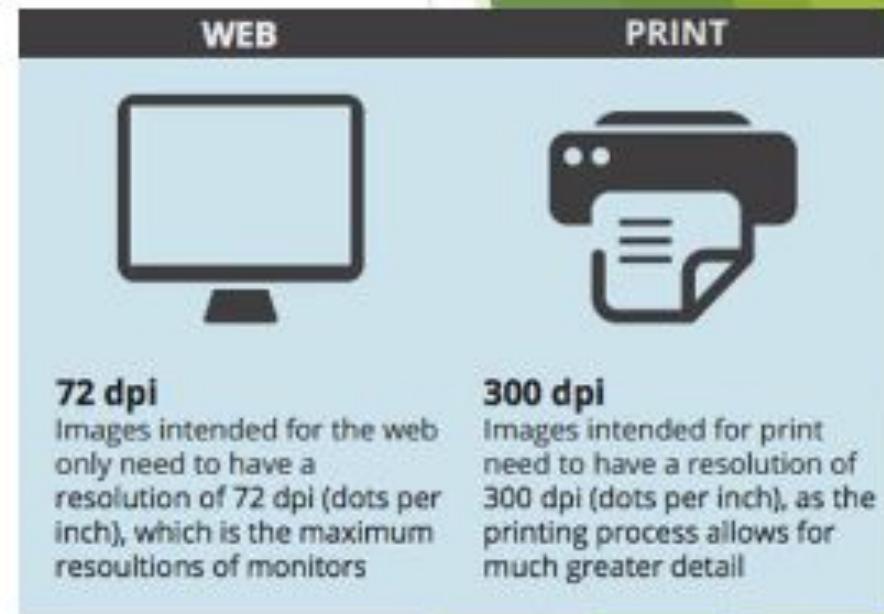
This is the amount of ink dots the printer will put on each pixel of your image. The DPI is set by the actual printer device and it is not something in the image for the graphic designer to manipulate.

PPI - Pixels per Inch

Digital raster images are measured in pixels, or picture elements. How many pixels per inch is determined by the device you create the digital image with: camera, scanner, or graphics software and can be modified with a photo/paint editing software.

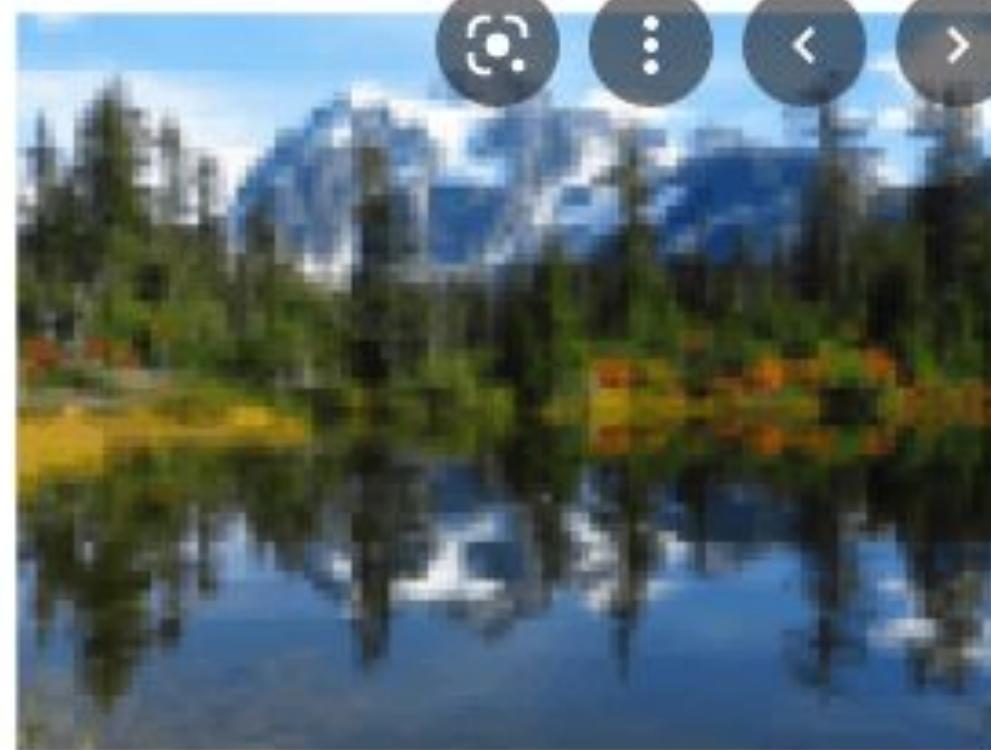
Know Your Final Output!

- ▶ In Raster, you need to work at the correct resolution for where your design will end up.
- ▶ TV and monitor screens only have 72 pixels per inch. If you are making something that only will be seen on a screen, you can keep your resolution at 72 ppi.
- ▶ If it is going to be printed, you will need to begin much higher. Consumer printers can print at 300 ppi.
- ▶ Professional printing can be as much as 600 ppi.
- ▶ High resolutions take up a bunch of storage space and take longer to work with.
- ▶ Low resolutions tend to look bad.





HIGH RES IMAGE 300dpi



LOW RES IMAGE 72dpi

Color depth

1 bit per pixel = 2 colours (monochrome)

2 bits per pixel = 4 colours

4 bits per pixel = 16 colours

8 bits per pixel = 256 colours

Generally good enough for colour images

16 bits per pixel = 65536 colours

Better quality for photograph-like images, also known as *high colour*

24 bits per pixel = >16 million possible colours

Used to recreate photo realistic images, also known as *true colour*

Image Bit Depth

Bit Depth	Possible Pixel Values
1-bit	$2^1 = 2$ values
2-bit	$2^2 = 4$ values
4-bit	$2^4 = 16$ values
8-bit	$2^8 = 256$ values
16-bit (integer)	$2^{16} = 65536$ values
16-bit (floating point)	Any value from -5.96×10^{-8} to 65504
32-bit (floating point)	Any value from 1.4×10^{-45} to 3.4×10^{38}
24-bit RGB (3×8 bit/channel)	$2^{24} = 1.68$ million values
32-bit	$2^{32} = 4.3$ billion values
48-bit RGB (3×16 bit/channel)	$2^{48} = 281$ trillion values

1-Bit Color

On a computer monitor, a color display in which each pixel (or smallest point of color) is described by 1 bit of information. (One bit is either a 1 or a 0; 1-Bit color can be thought of as one of these two numbers taken to the first power; thus $2^1 = 2$ possible colors.)

The color of a pixel on a computer display is commonly expressed as some amount of red, green, and blue. Greater numbers of combinations of these amounts require more processing power on the part of the computer. At 1 bit per pixel, a total of only two colors (typically black and white, or any other two colors) can be described and displayed.

8-Bit Color

On a computer monitor, a color display in which each pixel (or smallest point of color) is described by 8 bits of information. (One bit is either a 1 or a 0; 8-Bit color can be thought of as one of these two numbers taken to the eighth power; thus $2^8 = 256$ possible colors.) The color of a pixel on a computer display is commonly expressed as some amount of red, green, and blue. Greater numbers of combinations of these amounts require more processing power on the part of the computer.

At 8 bits per pixel, a total of 256 colors can be described and displayed. (Some programs allow you to specify which colors can be included in that palette.) The 8-Bit, 256-color monitor is also known as **VGA (Video Graphics Array)**, and is a default set-up for many monitors.

16-Bit Color

16-Bit Color

On a computer monitor, a color display in which each pixel (or smallest point of color) is described by 16 bits of information. (One bit is either a 1 or a 0; 16-Bit color can be thought of as one of these two numbers taken to the sixteenth power; thus $2^{16} = 65,536$ possible colors.) The color of a pixel on a computer display is commonly expressed as some amount of red, green, and blue. Greater numbers of combinations of these amounts require more processing power on the part of the computer.

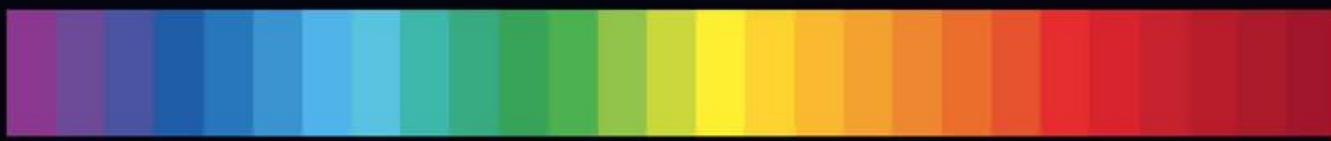
At 16 bits per pixel, a total of 65,536 colors (commonly referred to simply as "thousands of colors") can be described and displayed.

24-Bit Color

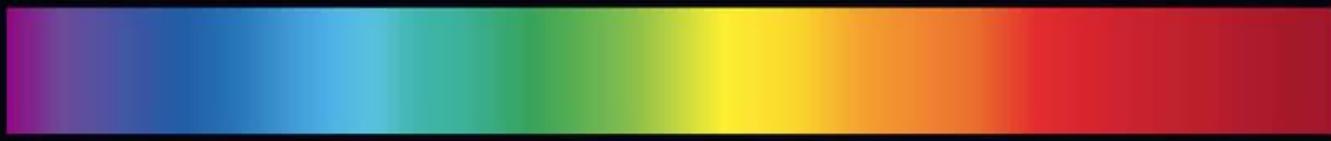
On a computer monitor, a color display in which each pixel (or smallest point of color) is described by 24 bits of information, or 8 bits for each of the three colors of red, green, and blue. (One bit is either a 1 or a 0; 24-Bit color can be thought of as one of these two numbers taken to the twenty-fourth power; thus $2^{24} = 16,777,216$ possible colors.) The color of a pixel on a computer display is commonly expressed as some amount of red, green, and blue. Greater numbers of combinations of these amounts require more processing power on the part of the computer.

At 24 bits per pixel, a total of 16,777,216 colors (commonly referred to simply as "millions of colors") can be described and displayed.

8 BIT



10 BIT



8 Bits



16 Bits



Raster image file formats

- JPG/JPEG (acronym for Joint Photographic Experts Group which created the format)
- GIF (Graphics Interchange Format)
- PNG (Portable Network Graphics)
- TIF/TIFF (Tagged Image File Format)
- BMP (Bitmap)

QUALITY OF AN IMAGE

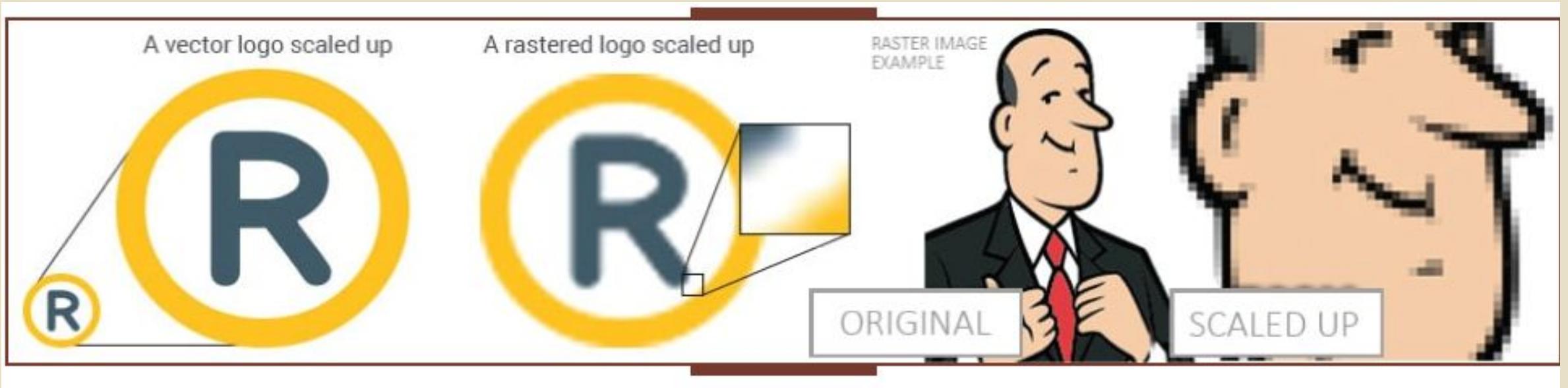
- The main disadvantage of raster graphics is that it is dependent on resolution.
- Resolution is a measure used to describe the sharpness and clarity of an image or picture.

QUALITY OF AN IMAGE

- Pixel resolution is the set of two positive integer numbers, where the first number is the number of pixel columns (width) and the second is the number of pixel rows (height).
- As an example, consider an image with 2048 pixels width and 1536 pixels height. This image has a total of $2048 \times 1536 = 3,145,728$ pixels or 3.1 megapixels

QUALITY OF AN IMAGE

- Raster graphics are resolution dependent, meaning they cannot scale up to an arbitrary resolution without loss of apparent quality.
- Raster graphics deal more practically with photographs and photo-realistic images



- °Though raster images can't be scaled up, they can be scaled down; which is typically the case for web images

RESOLUTION AND QUALITY

Resolution in this case will then refer to how many pixels the display can produce horizontally (width) and vertically (height). This measure also applies to digital images. The number of pixels in an image is often described in terms of megapixels.

RESOLUTION AND QUALITY

A megapixel(MP) is a unit that describes the resolution of a camera or the images that camera produces.

It is equal to one million pixels, and is represented by the most basic element that comprises an image: a simple dot.

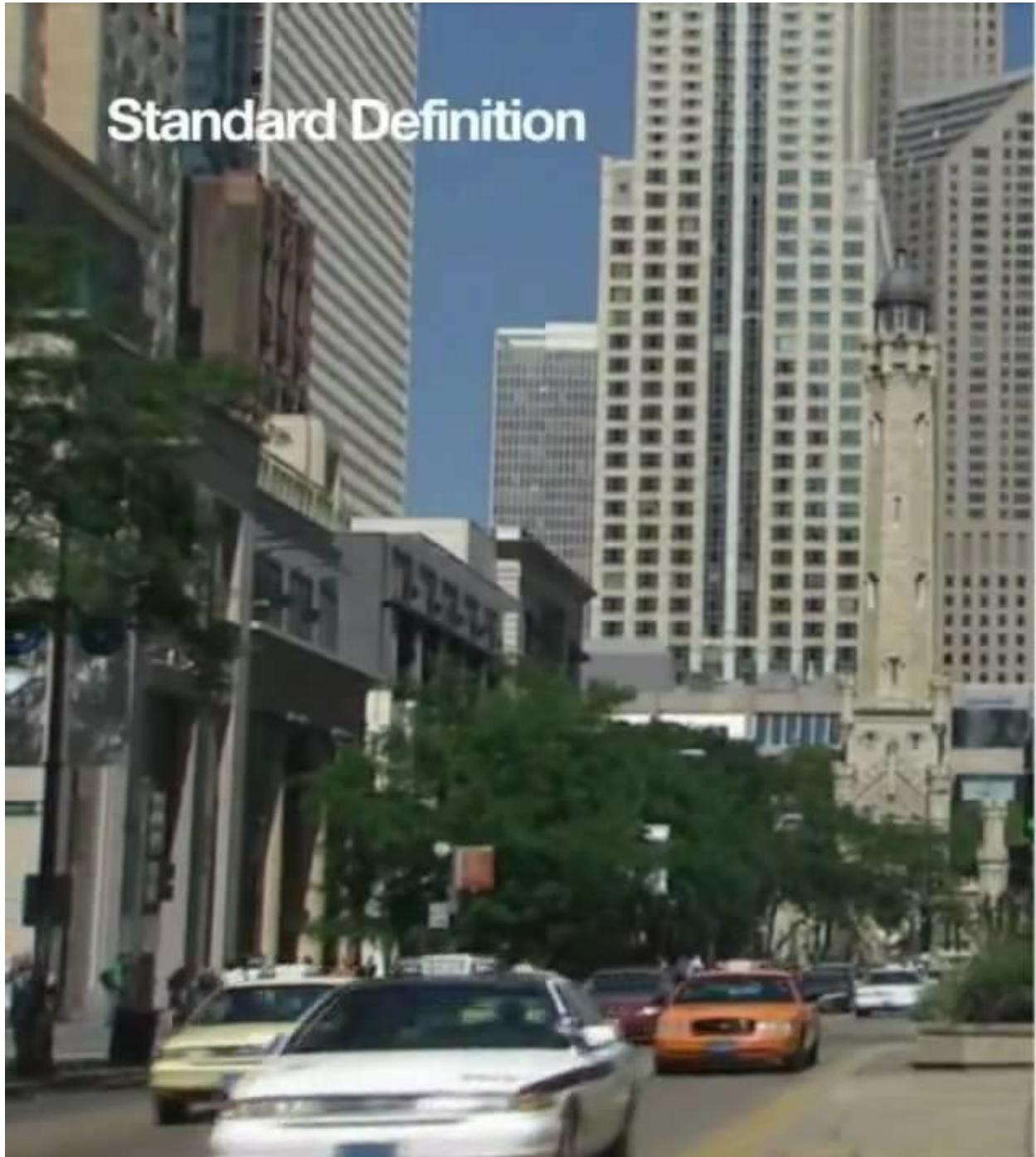
RESOLUTION AND QUALITY

A megapixel is simply a million pixels; the difference between a 4MP image and an 8MP image is the 8MP image has twice as many pixels.

A simple equation can be used to derive the megapixel measure of any image:

size in megapixels = pixel width * pixel height /
1,000,000

Standard Definition



High Definition



NVIDIA

QUALITY

How large a raster image can be printed - and maintain quality - depends on 2 things:

- The pixel dimension of the image (e.g. 6824 pixels wide by 2345 pixels high)
- The pixel resolution: pixels-per-inch (ppi), how many pixels per inch are required by the particular printer

QUALITY

Different types of printing have different resolution requirements.

On an average:

- Paper printing require a minimum of 300 ppi
- Shirt printers require a minimum of 240 ppi

HOW TO DETERMINE WHAT SIZE YOUR RASTER IMAGE MUST BE FOR PRINTING?

Multiply the resolution required by the area to be printed.

For example: If a printer requires a minimum of 300 ppi and you want to print an image in an area that is 5 inches wide, multiply 300 pixels x 5 inches = 1500. Your image must be at least 1500 pixels wide.

HOW TO DETERMINE WHAT DIMENSION YOUR IMAGE CAN BE PRINTED AT GOOD QUALITY?

Divide the pixel dimension of your image by the resolution required by your printer.

For example: If image is 1024 pixels wide & printer requires 300 ppi $(1024 \div 300) =$ image can be printed at 3.413" wide.

Calculate the size of a raster image

$$\text{size in bytes} = \frac{\text{width} \times \text{height} \times \text{colour depth}}{8}$$

□ Where:

- Width of the images measured in pixels
- Height of the images measured in pixels
- Colour depth is the number of bits used for color measured in bits per pixel
- A 640×480 pixel image in 24-bit colour would require how much disk space?

$$\begin{aligned}\text{size in bytes} &= \frac{640 \times 480 \times 24}{8} = \frac{7372800}{8} \\ &= 921600 \text{bytes} \\ &= \underline{900 \text{KB}}\end{aligned}$$

CAN WE ENLARGE THE PIXEL DIMENSION & RESOLUTION OF A RASTER IMAGE?

Once the image is created at a certain dimension, you may not be able to use this image at a larger size without losing quality.

When you manually increase the resolution with a program like Photoshop, Photoshop randomly adds pixels and the result will most likely be a high resolution image of poor quality.

Problems

1. If a printer requires a minimum of 400 ppi and you want to print an image in an area that is 6 inches wide, how many pixels are required for the image
2. If image is 2048 pixels wide & printer requires 400 ppi find how many inch wide the image can be printed
3. A 2048×1536 pixel image in a 16 bit color would require how much disk space?

Vector Graphics

Vector graphics are comprised of paths, which are defined by a start and end point, along with other points, curves, and angles along the way. A path can be a line, a square, a triangle, or a curvy shape. These paths can be used to create simple drawings or complex diagrams. Paths are even used to define the characters of specific typefaces.

Because vector-based images are not made up of a specific number of dots, they can be scaled to a larger size and not lose any image quality. If you scale up a raster graphic, it will look blocky, or "pixelated." When you blow up a vector graphic, the edges of each object within the graphic stay smooth and clean.



Vector Graphics

- Vector images are stored as the **set of graphic primitives** required to represent the image
- A **graphic primitive** is a simple graphic based on drawing elements or objects such as **shape**
 - e.g. square, line, ellipse, arc, etc.
- The image consists of a set of commands (mathematical equations) that are drawn the object when needed.

Vector Graphics file formats

.AI (Adobe Illustrator)

.EPS (Encapsulated Postscript)

.SVG (Scalable Vector Graphics)

.DRW (DRaWing)

.CDR (Corel draw)

Vector Graphics Software

- Illustrator
- Sketch
- Adobe Capture
- Affinity Designer
- CorelDRAW
- Adobe Illustrator Draw
- Inkscape
- DesignEvo

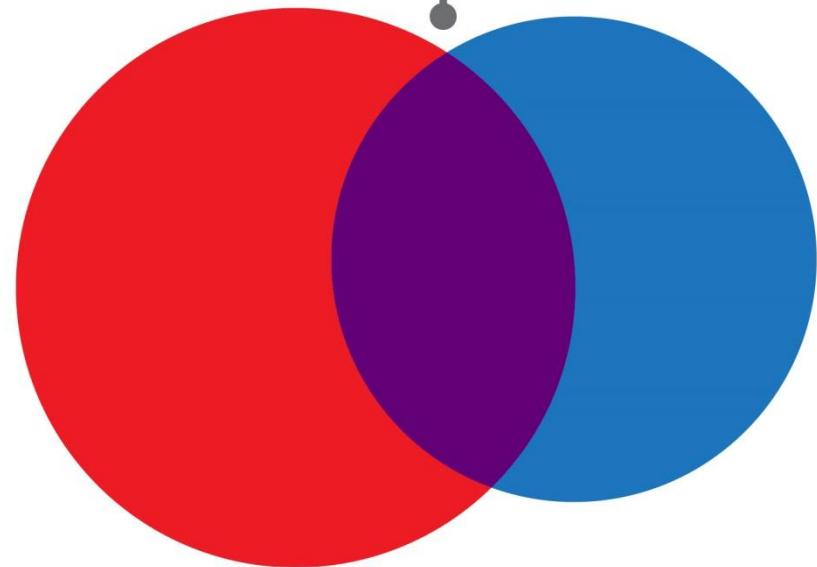


FIG.1
Pixel-based raster image

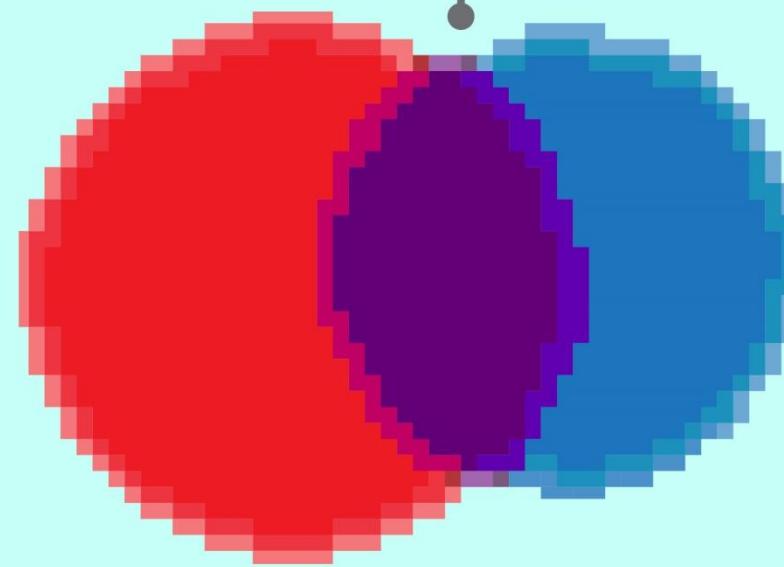
FIG.2
Vector-based graphic

vector-conversions.com

Vector



Raster



AI

EPS

CGM

PDF

SVG

CDR

BMP

TIFF

PCX

GIF

PNG

JPEG



VECTOR

Raster Images

VS

Vector Images



RASTER

Differences between Vector and Raster

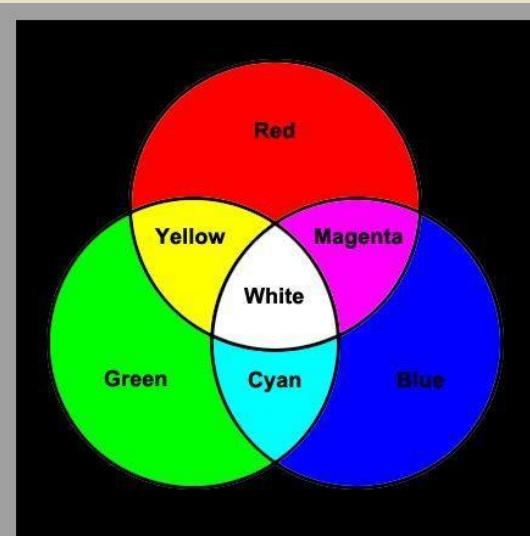
Raster Graphics	Vector Graphics
They are composed of pixels.	They are composed of paths.
In Raster Graphics, refresh process is independent of the complexity of the image.	Vector displays flicker when the number of primitives in the image become too large.
Graphic primitives are specified in terms of end points and must be scan converted into corresponding pixels.	Scan conversion is not required.
Raster graphics can draw mathematical curves, polygons and boundaries of curved primitives only by pixel approximation.	Vector graphics draw continuous and smooth lines.
Raster graphics cost less.	Vector graphics cost more as compared to raster graphics.
They occupy more space which depends on image quality.	They occupy less space.
File extensions: .BMP, .TIF, .GIF, .JPG	File Extensions: .SVG, .EPS, .PDF, .AI, .DXF



COLOUR MODES

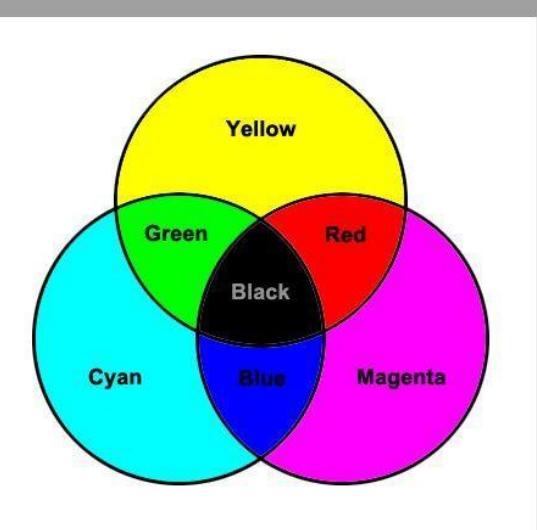
COLOR SYSTEMS

Color systems are dependent on the medium with which a designer is working. When painting, an artist has a variety of paints to choose from, and mixed colors are achieved through the subtractive color method. When a designer is utilizing the computer to generate digital media, colors are achieved with the additive color method.



Additive color mixing

Additive color systems start without light (black). Light sources of various wavelengths combine to make a color.



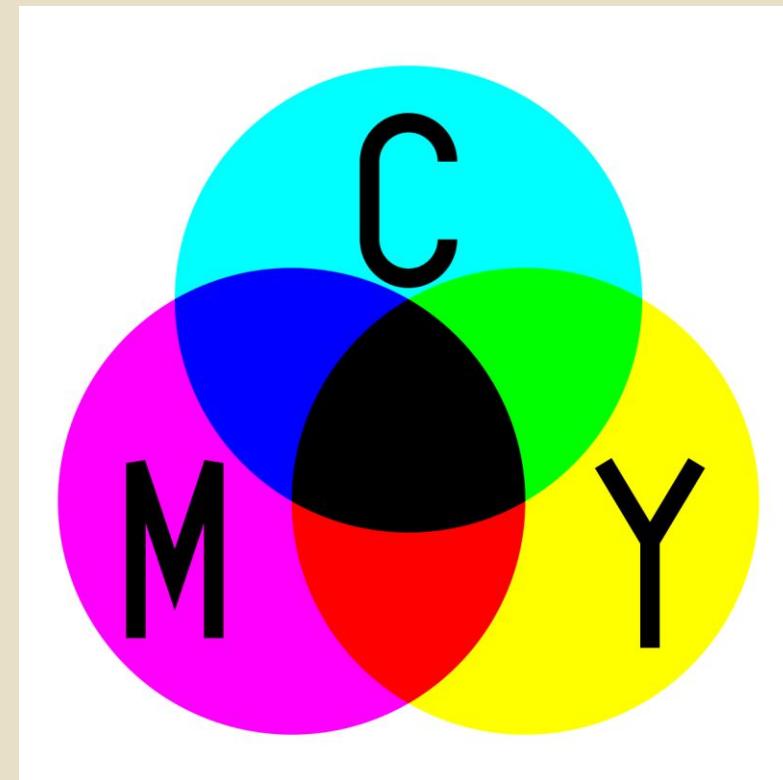
Subtractive color mixing

Subtractive color systems start with light (white). Colored inks, paints, or filters between the viewer and the light source or reflective surface subtract wavelengths from the light, giving it color.

COLOR SYSTEMS

SUBTRACTIVE COLOR

When we mix colors using paint, or through the printing process, we are using the subtractive color method. Subtractive color mixing means that one begins with white and ends with black; as one adds color, the result gets darker and tends to black.



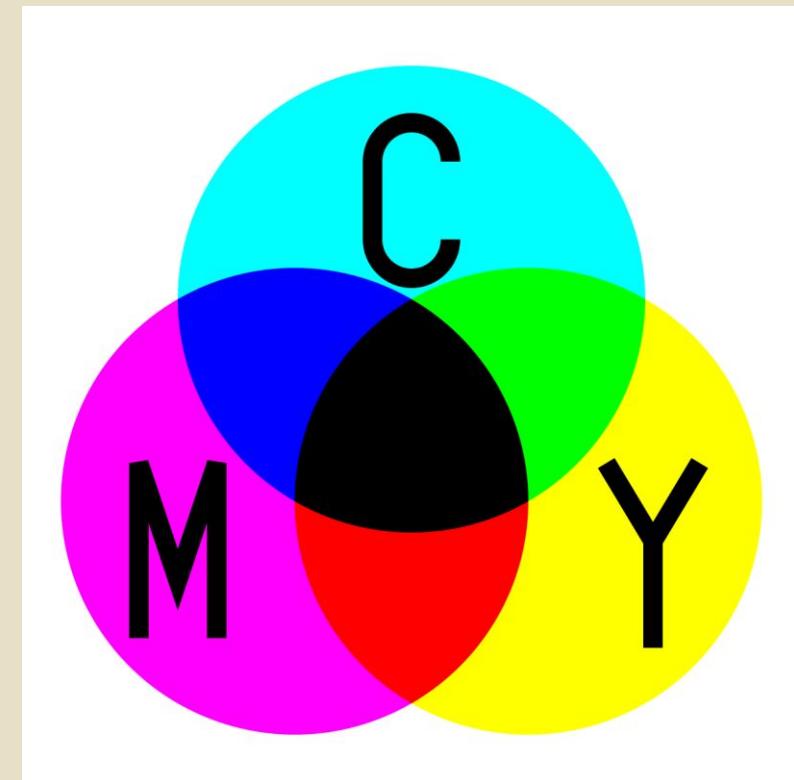
COLOR SYSTEMS

SUBTRACTIVE COLOR

The CMYK color system is the color system used for printing.

Those colors used in painting—an example of the subtractive color method.

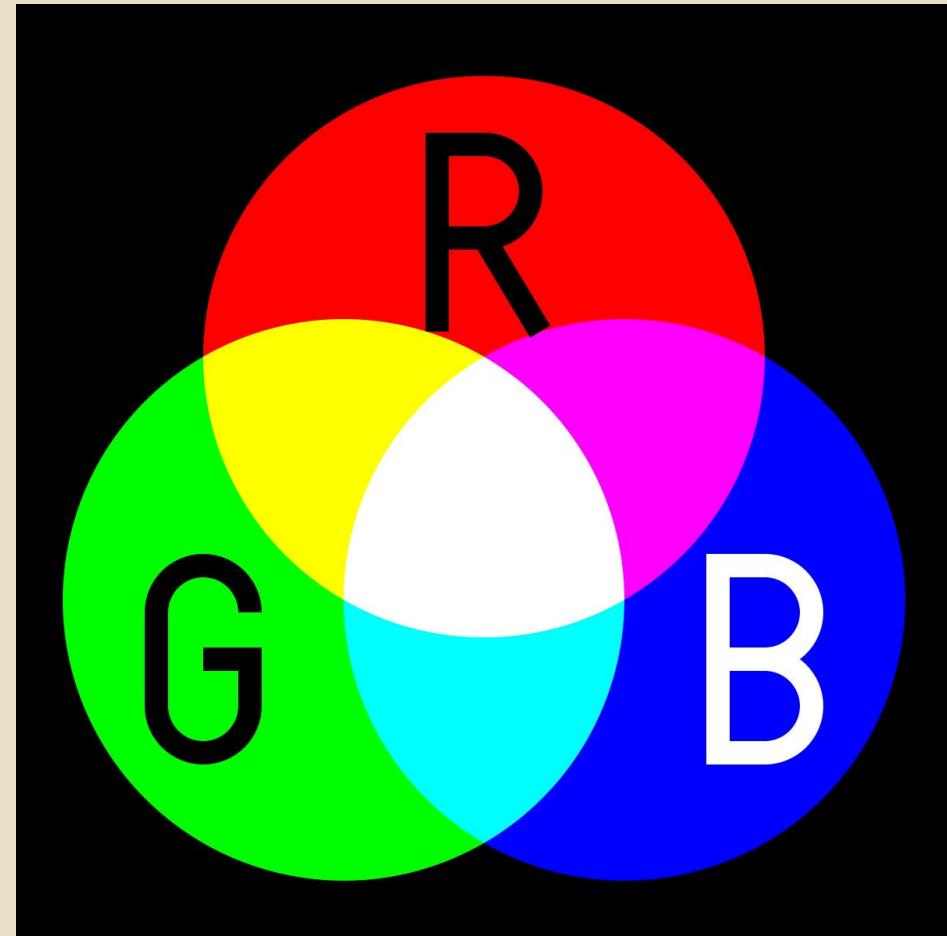
Subtractive color mixing is the kind of mixing you get if you illuminate colored filters with white light from behind. The commonly used subtractive color are cyan, magenta and yellow, and if you overlap all three in effectively equal mixture, all the light is subtracted giving black.



COLOR SYSTEMS

ADDITIVE COLOR

If we are working on a computer, the colors we see on the screen are created with light using the additive color method. Additive color mixing begins with black and ends with white; as more color is added, the result is lighter and tends to white.

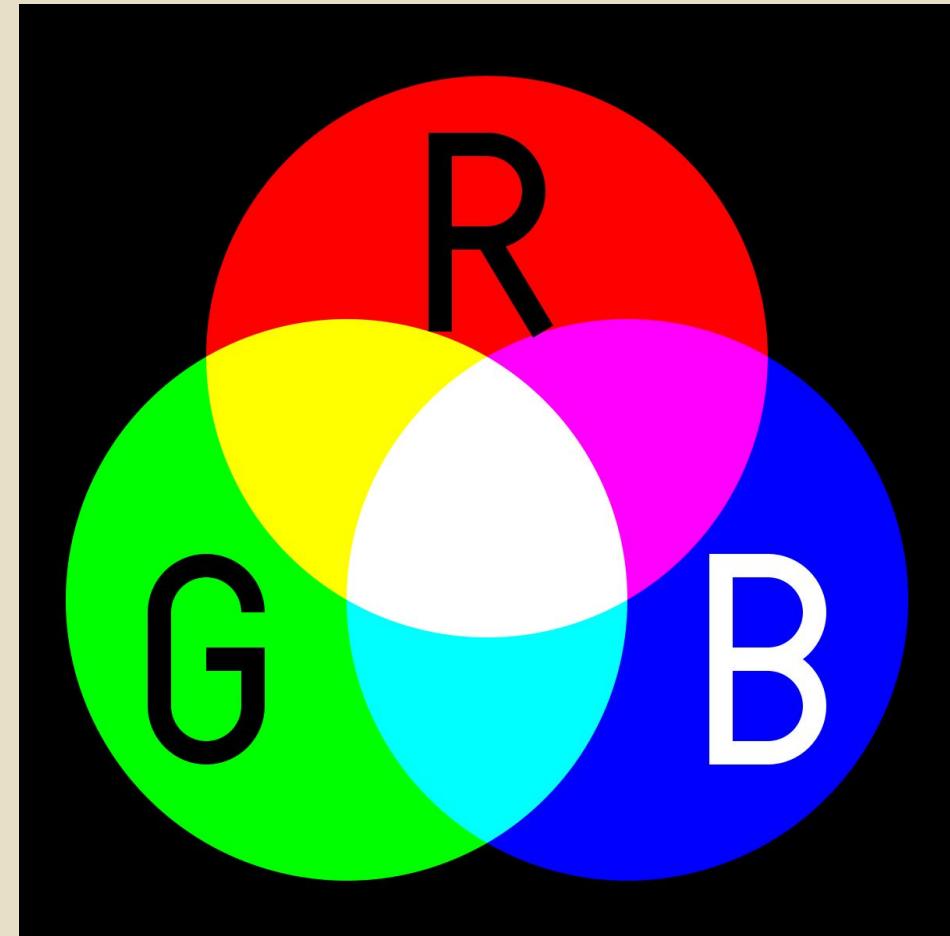


COLOR SYSTEMS

ADDITIVE COLOR

The RGB colors are light primaries and colors are created with light.

Percentages of red, green, & blue light are used to generate color on a computer screen.



RGB COLOR MODE

- RGB color model is an additive color model in which red, green and blue colors are mixed together in various proportions to form a different array of colors.
- RGB (Red, Green and Blue) is the color space for digital images. Use the RGB color mode if your design is supposed to be displayed on any kind of screen. RGB color model is used in various digital displays like TV and video displays, Computer displays, digital cameras, and other light-based display devices.
- If the three colors are superimposed with the least intensity, then the black color is formed, and if it is added with the full intensity of light, then the white color is formed. To make a different array of colors, these primary colors should be superimposed in different intensities.
- For each primary color, it is possible to take 256 different shades of that color. So by adding 256 shades of 3 primary colors, we can produce over **16 million** different colors. Cone cells or photoreceptors are part of the human eye that is responsible for color perception. In the RGB color model, the combination of primary colors creates different colors that we perceive by stimulating the different cone cells simultaneously.

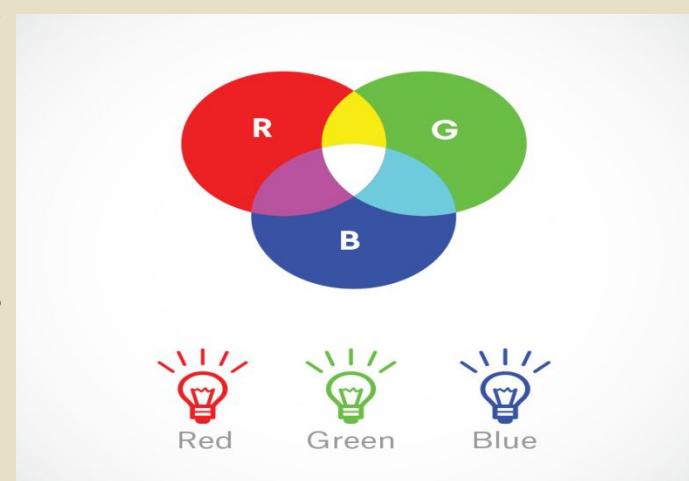
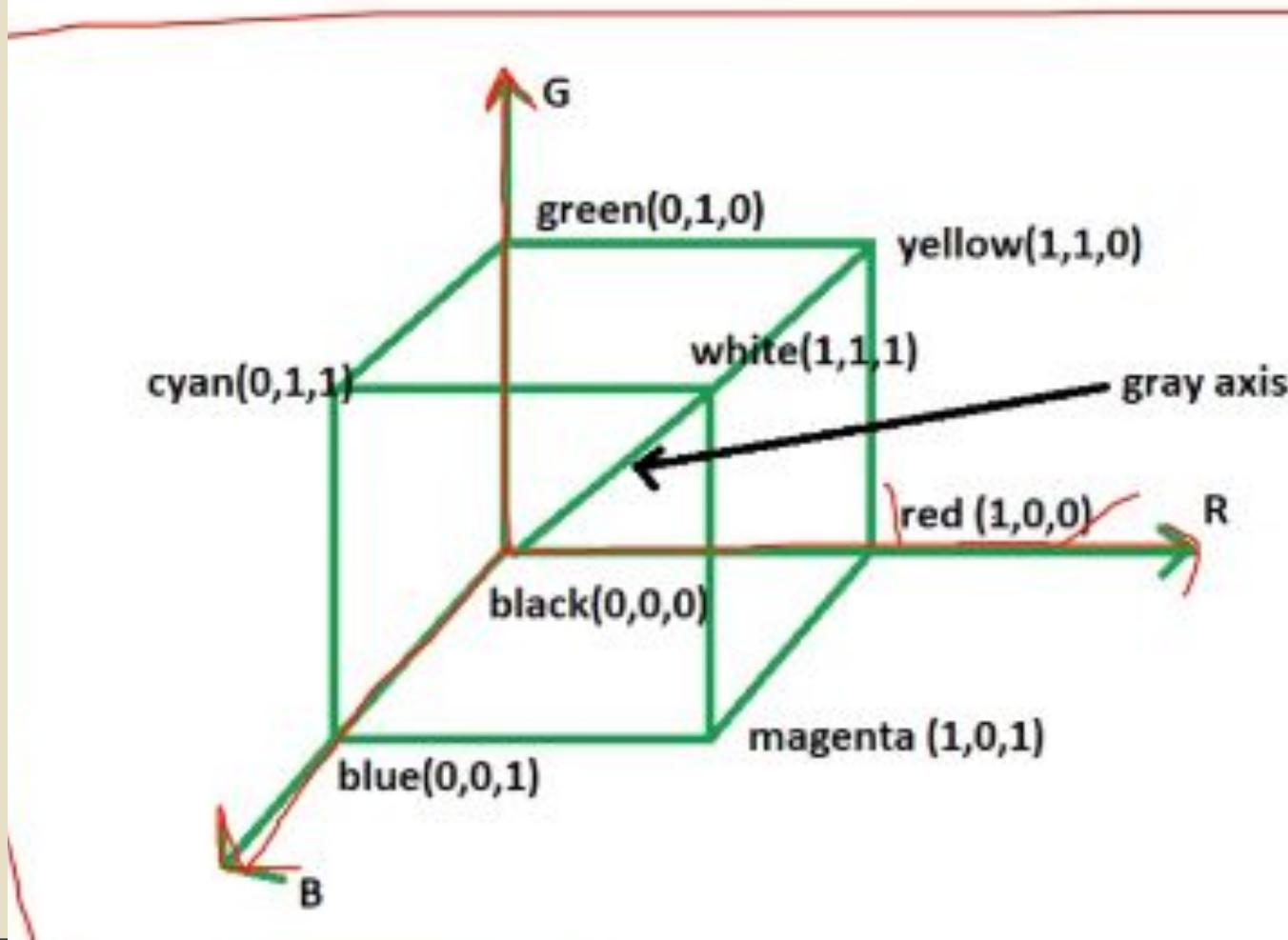
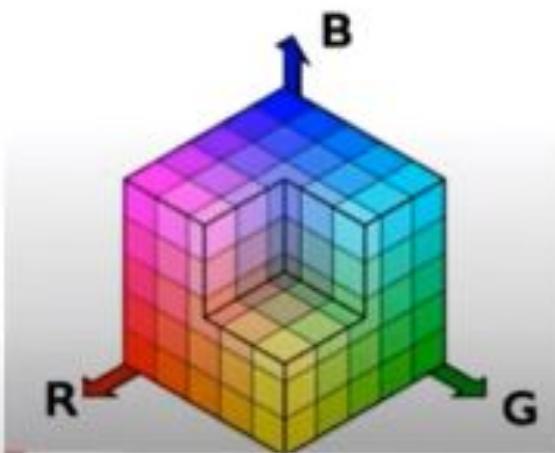


Figure shows the geometry of the RGB colour model for specifying colours using a Cartesian coordinate system.



The greyscale spectrum, i.e. those colours made from equal amounts of each primary, lies on the line joining the black and white vertices.

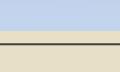


We can represent each R, G,B from 0 to 255

100	123	147
122	161	200
148	202	246

43	67	96
67	114	156
95	155	208

78	96	115
96	122	143
113	145	172

1	R	G	B	HEX	Colour
2	255	0	0	FF0000	
3	255	128	0	FF8000	
4	191	255	0	BFFF00	
5	0	255	11	00FF08	
6	0	255	191	00FFBF	
7	0	64	255	0040FF	
8	128	0	255	8000FF	
9	255	0	191	FF00BF	
10	255	0	0	FF0000	
11	211	0	148	D30094	

$$\circ 2^{24} = 16777216$$

Red \rightarrow 8 bit \rightarrow 0 to 255

Green \rightarrow 8 bit \rightarrow 0 to 255

Blue \rightarrow 8 bit \rightarrow 0 to 255

$\underbrace{\hspace{1cm}}$
Pixel depth = 24 bit.

RGB COLOR MODE

A light source within a device creates any color you need by mixing red, green and blue and varying their intensity.

This is known as additive mixing: all colors begin as black darkness and then red, green and blue light is *added* on top of each other to brighten it and create the perfect pigment. When red, green and blue light is mixed together at equal intensity, they create pure white.

Designers can control aspects like saturation, vibrancy and shading by modifying any of the three source colors. Because it's done digitally, the designer manipulates how the light on the screen manifests to create the color they want.

When To Use RGB Color Mode

If the end destination of your design project is a digital screen, use the RGB color mode. This would go for anything that involves computers, smartphones, tablets, TVs, cameras, etc.

- **Web & app design**

- icons
- buttons
- graphics

- **Branding**

- online logos
- online ads

- **Social media**

- images for posts
- profile pictures
- profile backgrounds

- **Visual content**

- video
- digital graphics
- infographics
- photographs for website, social media, or apps

Best file formats for RGB

JPEGs are ideal for RGB files because they're a nice middle-ground between file size and quality, and they're readable almost anywhere.

PNGs support transparency and are better for graphics that need to be superimposed over others. Consider this file type for interface elements like buttons, icons or banners.

GIFs capture motion, so if you're using an animated element, such as a moving logo or a bouncing icon, this file type would be ideal.

CMYK COLOR MODE

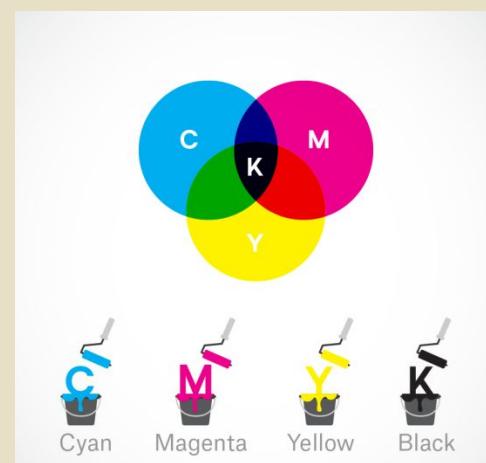
This subtractive color mode comprises Cyan, Magenta, Yellow and Key (Black), which combine to produce a range of hues. This four-color process works for most printers.

Printed images are essentially a series of layered four-color dots (measured in dots per inch) that create different hues and gradations..

CMYK (Cyan, Magenta, Yellow, Key/Black) is the color space for printed materials.

A printing machine creates images by combining CMYK colors to varying degrees with physical ink.

All colors start as blank white, and each layer of ink *reduces* the initial brightness to create the preferred color. When all colors are mixed together, they create pure black.



When To Use CMYK Color Mode

Use CMYK for any project design that will be physically printed, not viewed on a screen. If you need to recreate your design with ink or paint, the CMYK color mode will give you more accurate results.

•Branding

- business cards
- stationary
- stickers
- signs & storefronts

•Advertising

- billboards
- posters
- flyers
- vehicle wraps
- brochures

•Merchandise

- t-shirts, hats and other branded clothing
- promotional swag (pens, mugs, etc.)

•Essential materials

- product packaging
- restaurant menus

Best file formats for CMYK

PDFs are ideal for CMYK files, because they are compatible with most programs.

EPS can be a great source file alternative to AI because it is compatible with other vector programs.

SVG is short for “Scalable Vector Graphics”. It's a XML based two-dimensional graphic file format. SVG format was developed as an open standard format by World Wide Web Consortium (W3C). The primary use of SVG files are for sharing graphics contents on the Internet.

RGB to CMYK and Vice Versa

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

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

RGB to CMYK and Vice Versa

RGB TO CMY CONVERSION

- **RGB (98, 35, 146) TO CMY**
 - 1ST STEP – NORMALIZATION
 - $R' = 98/255 = 0.384$
 - $G' = 35/255 = 0.137$
 - $B' = 146/255 = 0.572$
- **TO CMY**
 - $C = 1 - 0.384 = 0.616$
 - $M = 1 - 0.137 = 0.863$
 - $Y = 1 - 0.572 = 0.428$

GRAYSCALE

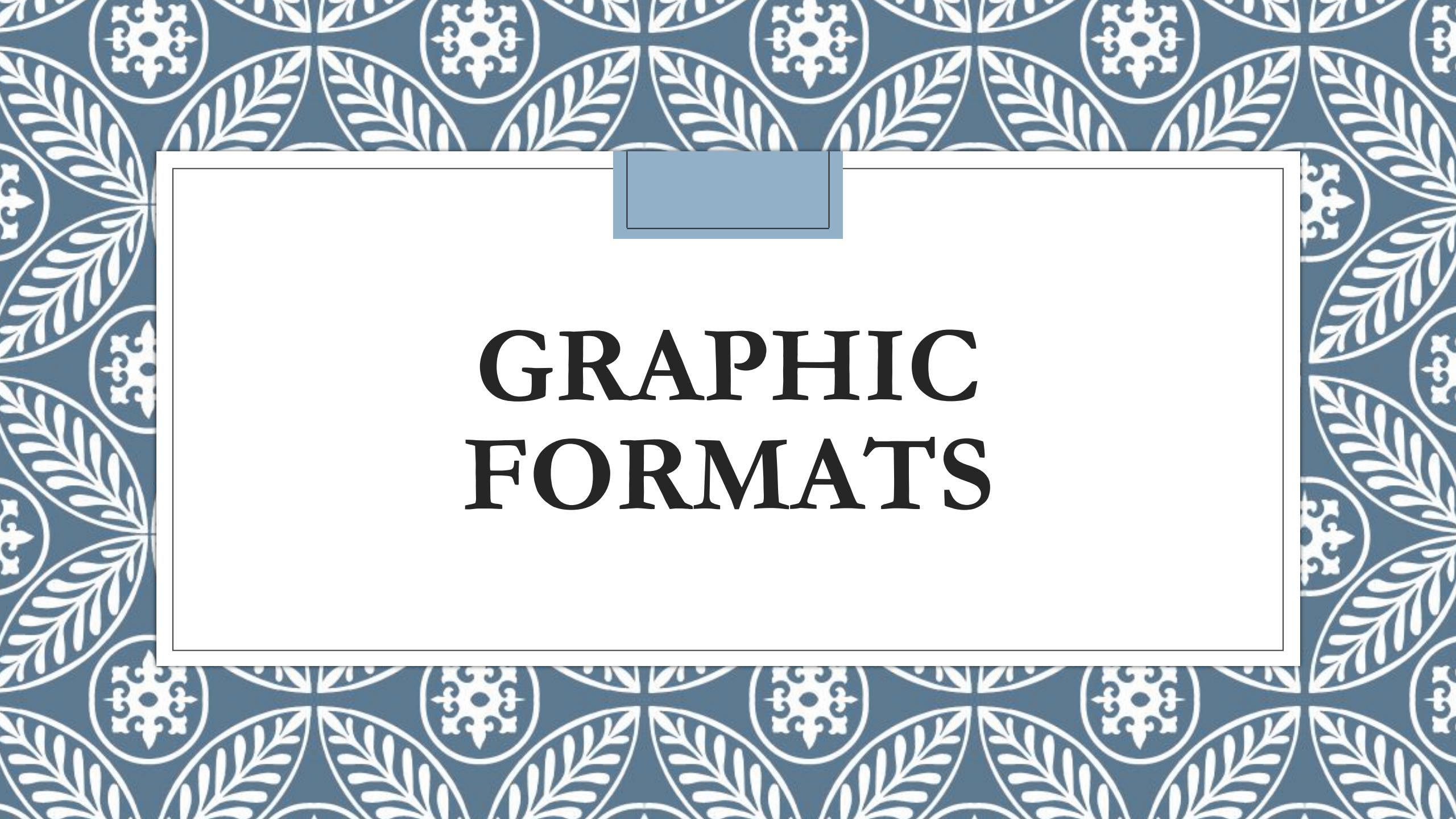
Grayscale is a color mode, made up of 256 shades of grey.

These 256 colors include absolute black, absolute white and 254 shades of grey in-between.

Images in grayscale mode have 8-bits of information in them. Black and white photographic images are the most common examples of the grayscale color mode.

We call them black and white photographs but the photo is actually made up of lots of different shades of grey (it probably doesn't help that when a photo is printed from a computer, it is converted to a "halftone" image which is made up of purely black or white dots). Black and White (line) drawings are NOT grayscale images.

If you need to put a picture in a printed document that has no color, you could insert a colored picture (even though you won't see it in color). This will make the overall document file size larger. A better option is to convert the picture to grayscale first.



**GRAPHIC
FORMATS**



BMP (Bitmap)

What is a BMP file?

- .BMP is an image file format that contains **bitmap graphics data**.
- **The MS-Windows standard** format is BMP and was developed as a **device-independent** bitmap (DIB) format that will allow Windows to display the bitmap on any type of display device.
- The term "device independent" means that the bitmap specifies pixel color in a form independent of the method used by a display to represent color. This file format can be stored uncompressed, so reading BMP files is fairly simple. **They require no graphics adapter to display them**.
- Image data in BMP files are usually **uncompressed or compressed with a lossless compression**. This format supports Various **Color Depths, alpha channels, color profiles, and optional data compression**.
- It was introduced on the Windows platform, but is now recognized by many programs on both Macs and PCs.
- It is compatible with all major image editing applications like CorelDRAW, Photoshop etc.

Characteristics of bitmap?

- The BMP format is a commonly used raster graphic format for saving image files.
- Bitmap images can contain any number of colors.
- The BMP format stores color data for each pixel in the image without any compression.
- A bitmap image depends on resolution in that it contains a fixed number of pixels to represent the image data. For example, a 10x10 pixel BMP image will include color data for 100 pixels. This method of storing image information allows for crisp, high-quality graphics, but also produces large file sizes.
- Bitmap images are best for representing subtle gradations of shades and colour such as in photographs.

Purpose of BMP file format

- The simplicity of the BMP file format, and its widespread familiarity on Windows and on other platforms, as well as the fact that this format is relatively well documented and has an open format, serves the purpose of BMP being a very common format that image processing programs from many operating systems can read and write.

Advantages of BMP file format

- BMP files are device-independent, meaning it can be stored and displayed across different devices and screens without losing quality.
- The BMP format is highly versatile — it can handle multiple color depths, profiles and alpha channels. It can also support data compression.
- BMPs are compatible with numerous web browsers and software types.

Disadvantages of BMP file format

- Some believe that the BMP file format may be outdated because it was designed for older Windows desktop applications, before mobile Android and Apple devices became popular.
- Uncompressed BMPs can have much larger file sizes than JPEGs and PNGs, making it more difficult to share them. They can also be too big to use on websites or to store on hard drives that don't have a lot of extra space available.
- BMPs can only contain RGB images, which is something to keep in mind if you regularly work in CMYK.

When to use BMP files

- **Storing high-quality digital photos**

BMP files come in the raster format, which means that the images they contain are made of pixels. This lets BMPs store images with a wide array of colors and details, making them ideal for high-quality 2D digital photographs. And, because they're generally uncompressed, BMPs can handle high levels of image data.

- **Supporting the photo printing process.**

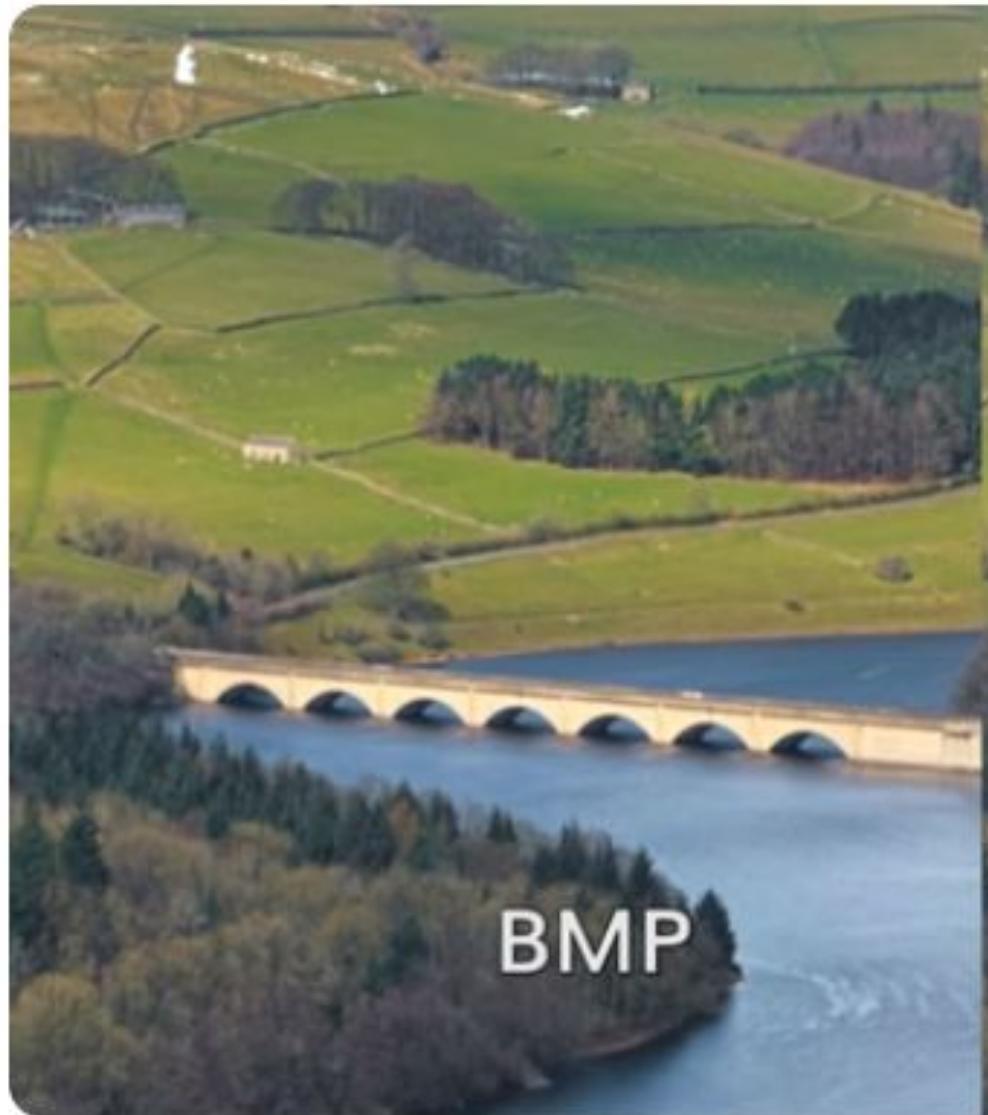
- For many of the same reasons that BMP files are great for storing photos, they're also a good option when you want to print intricate, full-color photos. Unlike JPEGs, which compress image file data, BMPs don't lose data each time you edit and save them.

When not to use BMP file format

- They can be very large, particularly if the image contains a large number of colors. Data compression can shrink the size of pixel data, but the data must be expanded before it can be used, and this can slow down the reading and rendering process considerably. Also, the more complex a bitmap image (large number of colors and minute detail), the less efficient the compression process will be.
- They typically do not scale very well. It does not tend to resize very well. While it may be easy to scale down an image without loss of clarity, it is not easy to enlarge the image without the image becoming pixelated.

A screenshot of a Windows File Explorer window. The title bar says "File Explorer". The address bar shows the path: "This PC > Desktop > 20220621_142424 > sample > New folder". The main area displays a list of files:

	Name	Date	Type	Size	Tags
<input checked="" type="checkbox"/>	DSC04694.bmp	21/06/2022 14:24	BMP File	41,778 KB	
<input checked="" type="checkbox"/>	DSC04694.jpg	31/03/2022 11:09	JPG File	2,978 KB	

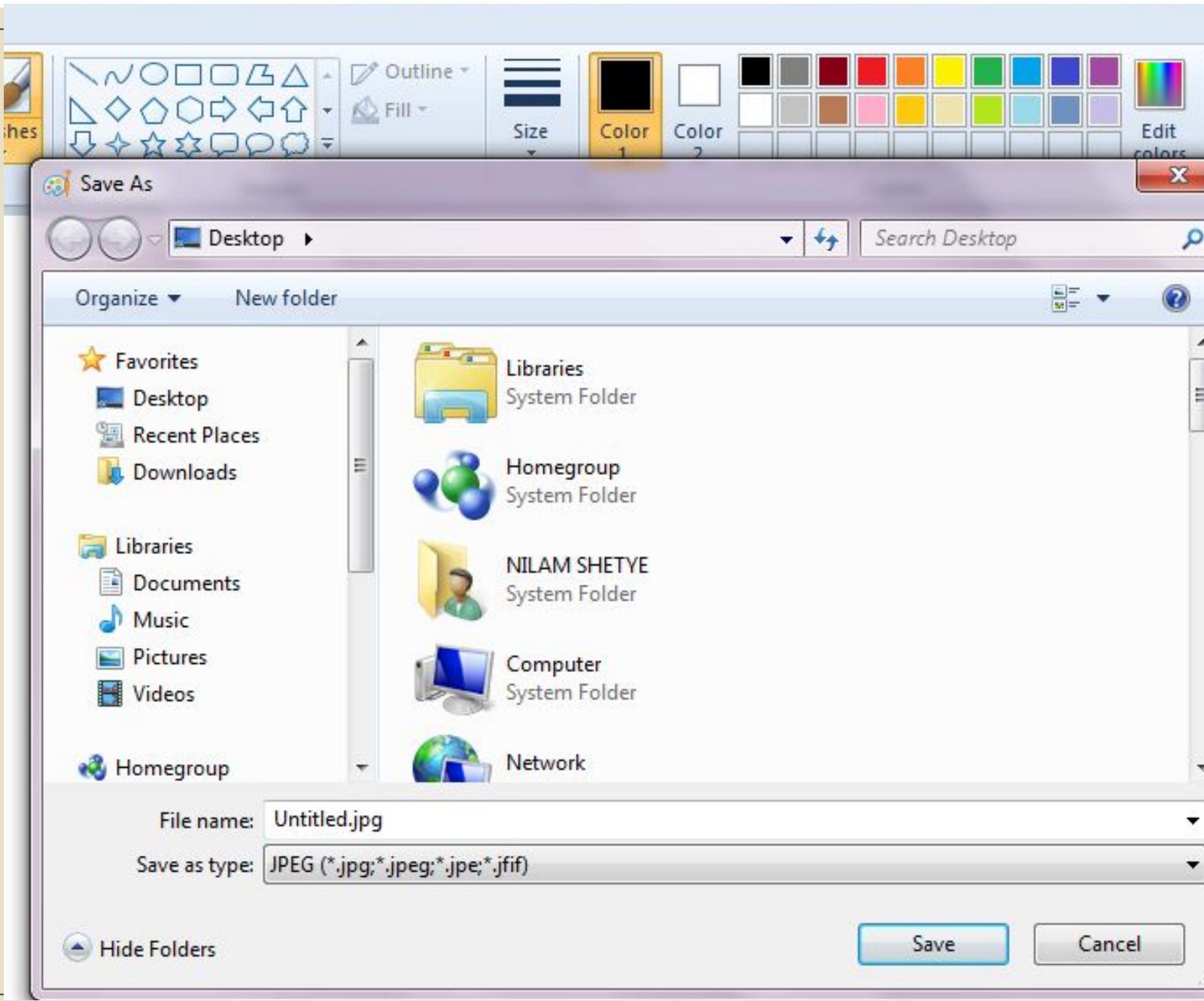




JPEG (JOINT PHOTOGRAPHIC EXPERT GROUP)

What is JPEG?

- JPEG stands for Joint Photographic Experts Group, an international organization that standardized the format during the late 1980s and early 1990s.
- A JPEG file supports up to 24-bit color and uses lossy compression to compress images for more convenient storage and sending. This may make JPEGs better for everyday use, but it does mean sacrificing some of the original image quality.
- It is the most common file format for photo storage.
- JPEG images group together the following filename extensions:
 - .jpg, .jpeg, .jpe, .jfif, .jfif, .jfi



Characteristics of JPEG

- The main characteristics of JPEG is that, it uses lossy compression technique, so that the size of the image is less.
- JPEG standard works by averaging color variation and discard the information what the human eye cannot see to reduce the size of the image. For this it is lossy compression.
- JPEG has an improved way to compress a file, that it automatically looks over the file and chooses the best way to compress it.
- JPEG can work with multiple files, that is, it can work on several image at the same time.

Advantages of .jpeg

- 1. Portability** - The JPEG files are highly compressible. The small file size means that JPEG images can easily be uploaded on web pages.
- 2. Small file size** - When it comes to size, JPEG images can't be compared to any other type. Using JPEG is the best way to save space in your camera or smartphone
- 3. Fast delivery and quick transfers** - The format's small size makes it the best storage option, online distribution, and file transfers
- 4. Sharing in social media** - A JPEG can be shared right out of the camera while RAW files, for example, are more massive and must be edited before they can be shared.
- 5. Ultimate compatibility** - Another vital advantage of JPEG over other formats is that JPEG photos can be opened or edited by almost every computer, smartphone, camera, and software on the market.

Disadvantages of .jpeg

- JPEG file format uses lossy compression technique. Lossy compression means that after the image is compressed in JPEG format, it loses certain actual contents of the image
- Quality of Image is reduced after JPEG compression
- **No support for Layered Images:-**JPEG images do not support layered images. That's why most graphic designers avoid this standard. You might need to work extra on layered images in order to adjust and edit graphic images, which is not possible with JPEG Images.
- **No transparency or opacity:** Unlike PNG format, JPEG format doesn't support transparency or opacity.

When to use .jpeg?

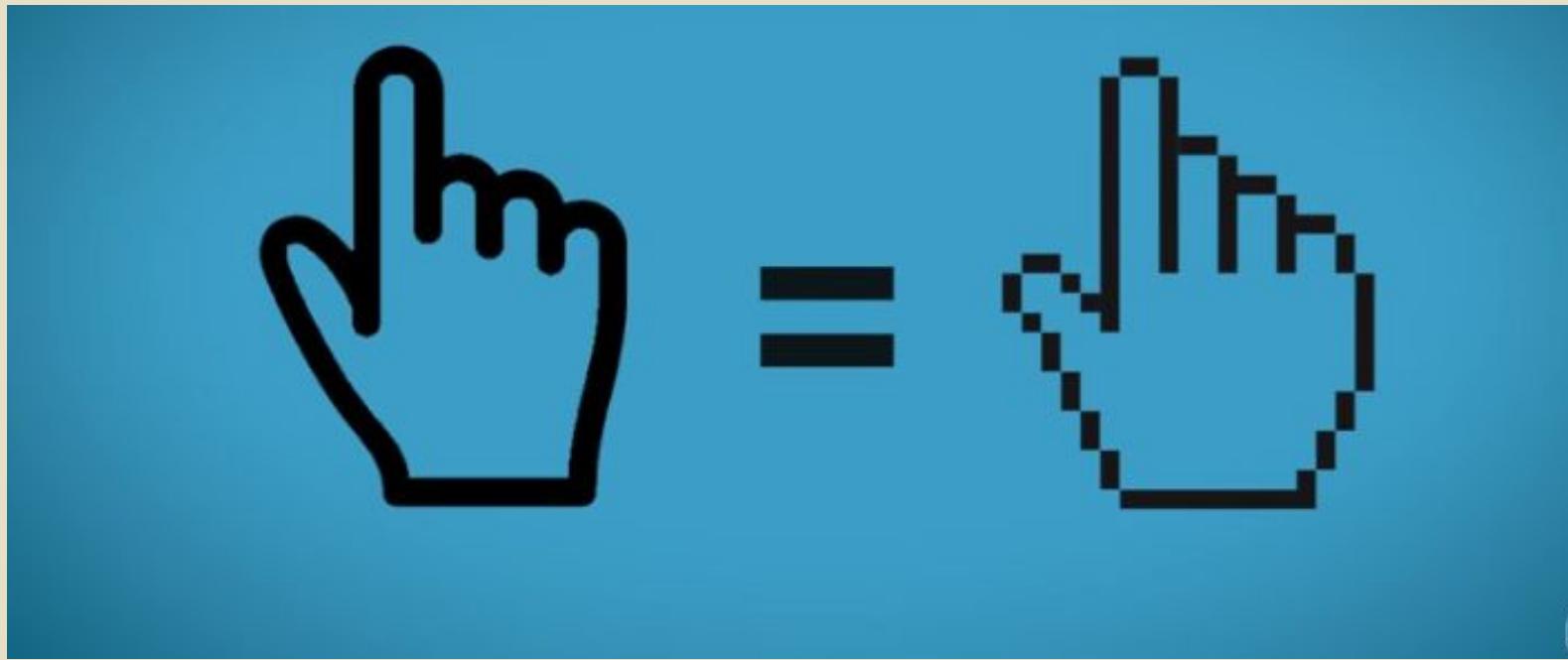
- JPEGs offer you the most flexibility with raster editing and compression making them ideal for web images that need to be downloaded quickly.
- At high resolution files with low compression, JPEGs are perfect for editing and then printing.
- JPEG images can be reduced to very small sizes making them great for emailing.
- Due to its high compression ratio it will load website as fast as possible,

When not to use .jpeg

- JPEGs do not have a transparency channel and must have a solid color background. GIF and PNG are your best options for transparency.
- You need a layered, editable image. JPEGs are a flat image format meaning that all edits are saved into one image layer and cannot be undone.

Purpose of using .jpeg

- A JPEG is a standardized lossy compression mechanism for digital images. One of the main purpose is that **Digital cameras compress raw photographs as JPEG images to make the files smaller in size.** It is the most common file format for photo storage. JPEGs became popular as they save more storage space compared to older formats such as Bitmap.
- A JPEG file supports up to 24-bit color and uses lossy compression to compress images for more convenient storage and sending. This may make JPEGs better for everyday use, but it does mean sacrificing some of the original image quality.





PNG :PORTABLE NETWORK GRAPHIC

What is PNG?

- PNG is short for Portable Network Graphic, a type of raster image file format. It's particularly a popular file type with **web designers because it can handle graphics with transparent or semi-transparent backgrounds.**
- PNG is open format. The file format isn't patented, so you can open a PNG using any image editing software without the need for licensing.
- PNG files, which use the .png extension, can handle 16 million colours — which definitely sets them apart from most file types.

Purpose of PNG files

- The Portable Network Graphic is a versatile image file format. PNG (Portable Network Graphics) is a file format used for lossless image compression. PNG has almost entirely replaced the Graphics Interchange Format (GIF).
- Designers often use PNG files for logos. That's because the format supports transparent backgrounds, which means designers can layer logo files on different backgrounds in a way that looks natural.
- The PNG format uses lossless compression, which means that this file type retains all its original data when compressed. This makes PNGs great for detailed graphics and charts on websites because none of the vital information gets lost.

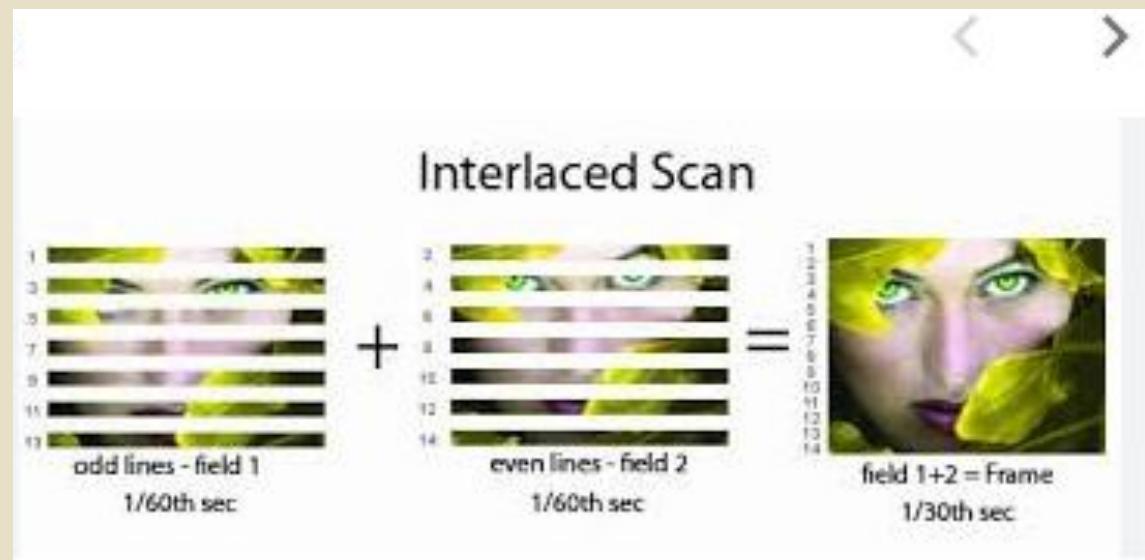


Characteristics of PNG

- The main advantage of PNG is that the **compression is lossless**, which means there's no loss in quality each time a file is opened and saved again.
- Another key feature of PNG is that it **supports transparency**. With both grayscale and color images, pixels in PNG files can be transparent, enabling users to create images that overlay neatly with the content of a website or image.
- Not only can one color be made transparent, but the degree of transparency, called opacity, can be controlled.
- Supports image interlacing and develops faster than in interlaced GIF format.

Interlacing

- Interlacing describes how the picture is created in the system's display unit.
- An interlaced display creates an image by scanning each line, and in the next scan, it scans the line opposite the previous line.
- The screen refreshes information at a relatively less cost.
- It provides a faster refresh rate.
- The only issue with that method is that the content displayed on the screen can flicker or have noticeable lines in it.



Advantages of PNG

The advantages of the PNG format include:

- **Lossless compression** -- doesn't lose detail and quality after image compression.
- **Supports a large number of colors** -- the format is suitable for different types of digital images, including photographs and graphics.
- **Support for transparency** -- supports compression of digital images with transparent areas.
- **Perfect for editing images** – lossless compressions makes it perfect for storing digital images for editing.
- **Sharp edges and solid colors** -- ideal for images containing texts, line arts and graphics.

Disadvantages of PNG

The disadvantages of the PNG format include:

- **Bigger file size** -- compresses digital images at a larger file size.
- **Not ideal for professional-quality print graphics** -- doesn't support non-RGB color spaces such as CMYK (cyan, magenta, yellow and black).
- Doesn't support embedding EXIF metadata used by most digital cameras.
- Doesn't natively support animation, but there are unofficial extensions available.
- Although compressed PNGs contain high-quality, detailed image data, their larger file size means slower page loading times and responsiveness.

EXIF metadata

- EXIF (Exchangeable Image File Format) files store important data about photographs.
- Almost all digital cameras create these data files each time you snap a new picture.
- An EXIF file holds all the information about the image itself — such as the exposure level, where you took the photo, and any settings you used.

When to use PNG?

- PNGs are often used if size is not an issue and the image is complex, because a PNG file holds more information than a JPG.
- You need high-quality transparent web graphics. PNG images have a variable “alpha channel” that can have any degree of transparency (in contrast with GIFs that only have on/off transparency). Plus, with greater color depths, you’ll have a more vibrant image than you would with a GIF.
- Photos with line art, such as drawings, illustrations and comics.
- Photos or scans of text, such as handwritten letters or newspaper articles.
- Charts, logos, graphs, architectural plans and blueprints.
- Anything with text, such as page layouts made in Photoshop or InDesign then saved as images.

When not to use PNG?

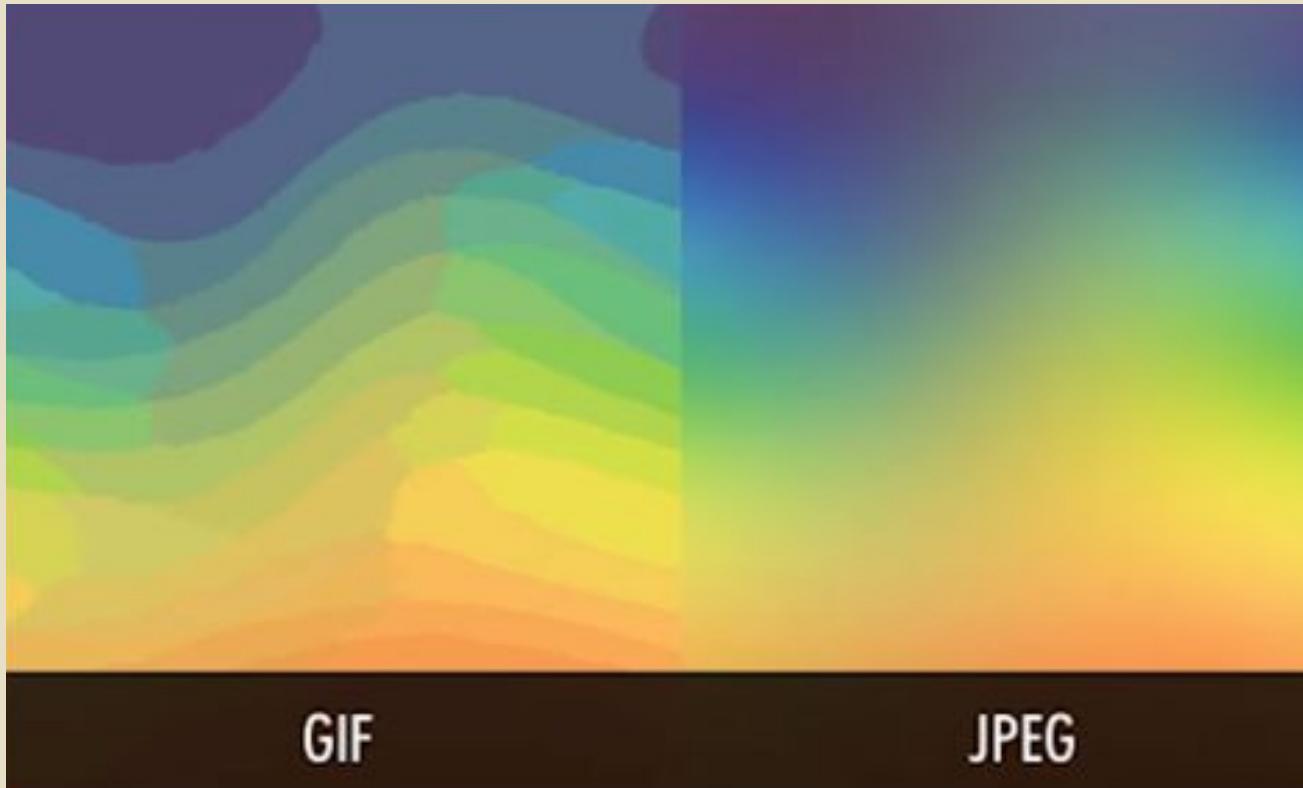
- With PNGs' high color depth, the format can easily handle high resolution photos. However, because it is a lossless web format, file sizes tend to get very large, which leads to higher load time for websites.
- PNG graphics are optimized for the screen. You can definitely print a PNG, but not ideal for professional-quality print graphics



GIF: GRAPHIC INTERCHANGE FORMAT

What is GIF?

- GIF stands for Graphics Interchange Format.
- GIF is a raster file format designed for relatively basic images that appear mainly on the Internet.
 - Each file can support up to 8 bits per pixel and can contain 256 indexed colors.
 - GIF files also allow images or frames to be combined, creating basic animations.
 - These files use the .gif extension and can be opened in a wide range of programmes.



GIF

JPEG

Purpose of GIF

GIF is a versatile format for condensing color images for use on the Web. It is particularly well suited for any image with areas of **flat color, such as logos, line art, icons, cartoon-like illustrations, etc.** It compresses them cleanly and efficiently.

GIF files have a fixed-sized graphical area filled by zero or more images.

Some GIF files divide the fixed-sized graphical area or blocks into sub-images capable of functioning as animated frames in case of animated GIF.

Characteristics of GIF

- A GIF image can contain 2, 4, 8, 16, 32, 64, 128, or 256 colors which are stored in a color palette or color lookup table within the image file.
- The limited number of colors in GIF is used to limit the file size of images.
- GIF supports **lossless data compression** technique. This technique is used to reduce the file size without degrading the quality of the image.
- GIF supports interlacing .i.e it makes images appear faster on screen

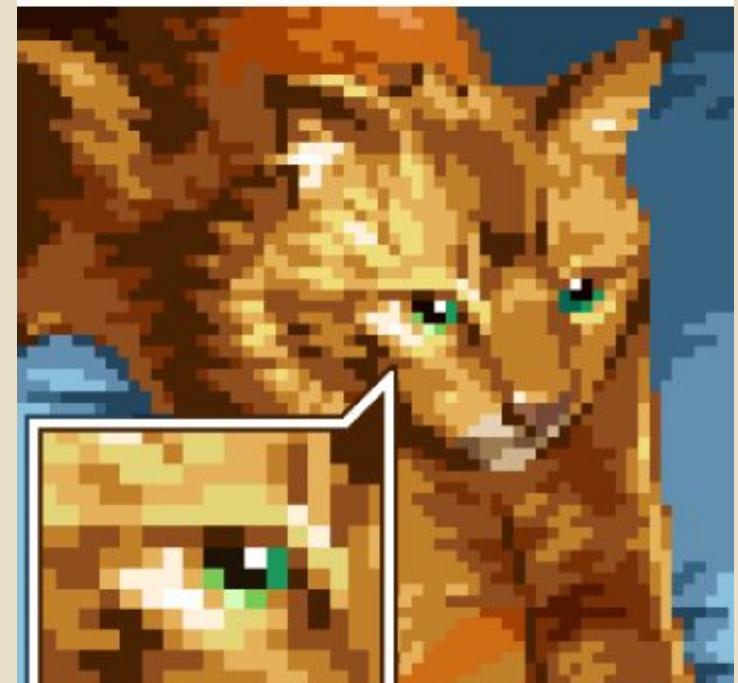


Advantages of GIF

- Small File Size
- Professional Looking Images
- Convey Messages Better
- They have lossless compression so that the file size can be reduced without too much distortion
- They are supported by all web browsers

Disadvantages of GIF

- They have a maximum colour depth of 256 bit
- They can slow a webpage down
- They often have a ‘Blocky’ or ‘Pixelly’ appearance
- Too few frames in the animation results in a jerky animation
- If not done well they can make a website visually unappealing



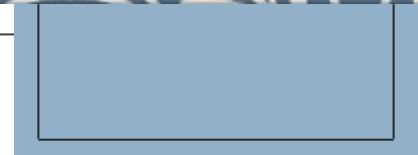
When to use GIF?

- GIF are suitable for sharp-edged line art (such as logo) with a limited number of colors.
- It uses the lossless technique for data compression so there is no fear of data loss and it favors flat areas of uniform color with well defined edges.
- It can be used in small animations and low resolution film clip.
- It can be used in games.
- It supports transparent backgrounds so it can be used to blend GIF files with website background colors.



When not to use GIF?

- GIFs are not particularly good for photographic images.
- With the 8-bit limit, true color information is lost and the subtle gradations of tone become pixelated when the image is reduced to 256 colors. The quality of the image may be greatly reduced.
- Do not use too many of them on your website since it will increase loading time



TIFF FILE FORMAT



Definition

- TIFF or TIF, Tagged Image File Format, represents raster images that are meant for usage on a variety of devices that comply with this file format standard.
- It is capable of describing bilevel, grayscale, palette-color and full-color image data in several color spaces.
- It supports lossy as well as lossless compression schemes to choose between space and time for applications using the format.
- The format is not machine dependent and is free from bounds like processor, operating system, or file systems.

Characteristics of TIFF

- A high-quality graphics format. It is often used for storing images with many colors, typically digital photos, and includes support for layers and multiple pages.
- TIF files can be saved in an uncompressed (lossless) format or may incorporate JPEG (lossy) compression. They may also use lossless compression, which reduces the TIF file size but does not reduce the quality of the image.
- TIFF does not depend on specific hardware.
- TIFF is a portable file format.

PURPOSE OF TIFF

TIFF format is much less common, but you may know it if you use Photoshop. TIFF files are much larger than JPEGs, but they're also lossless. That means you lose no quality after saving and editing the file, no matter how many times you do it.

This makes TIFF files perfect for images that require big editing jobs in Photoshop or other photo editing software.

Advantages of TIFF

- ✓ Platform independent
- ✓ Lossless compression
- ✓ Transparencies through alpha channel
- ✓ Data is very secure
- ✓ Ideal for print

Disadvantages of TIFF

- ✗ Higher data volume
- ✗ More complex
- ✗ Difficult to edit and work with
- ✗ Limited to a maximum of 4 gigabytes per file

When to use TIFF?

- You need **high-quality print graphics**. Along with RAW, TIFF files are among the highest quality graphic formats available. If you're printing photos—especially at enormous sizes—use this format.
- You are making a **high-quality scan**. Using TIFF to scan your documents, photos and artwork will ensure that you have the best original file to work off of.

When not to use TIFF?

- You're working with web graphics. While many web browsers support it, TIFF files are optimized for print.



EPS:

**ENCAPSULATED
POSTSCRIPT**

EPS

An EPS (Encapsulated PostScript) file is a vector image file used for storing illustrations in Adobe Illustrator and other illustration software like CorelDraw.

EPS is actually a text-based document that outlines shapes and lines with code, rather than mapping pixels and colors. As a result, EPS files also support lossless scaling.

PostScript printers and image setters typically use EPS to produce vast, detailed images — such as billboard advertising, large posters and attention-grabbing marketing collateral.

CHARACTERISTICS OF EPS

- EPS Encapsulated postscript is standard graphic file format for exchange image drawings such as logo and maps.
- EPS simply stands for encapsulated postscript format also EPS file have the extension of EPS OR EPSF
- It can include bitmap and vector data
- EPS file internally contains a description of such as objects and layout.
- Sometime EPS files are called EPSF files

Uses of EPS files

EPS files have a variety of uses for designing and printing graphics.

Legacy format.

Though they've been overtaken by more modern file formats such as PDFs, EPS files still have a function as a legacy format compatible with almost all systems and software.

Printing.

Many professional printers use EPS files for large-scale jobs. The backward compatibility feature of the file format makes it suitable for a wide range of printers — including those that may outdate more modern formats such as PDF. Computer-controlled engraving machines may also find EPS data simpler to render in detail.

Billboards.

The individual image data stored in vector files means EPS files retain resolution regardless of scale. That makes EPS ideal for expanded images, such as billboards and other large-scale marketing collateral.

Advantages of EPS files

- **Wide compatibility:** It's a more transferable version of the PostScript (PS) file type.
- **Various capabilities:** The EPS format can be used for printing high-quality images on paper printers and is capable of storing 2D graphics data on a web page. EPS files can also be used to convert a drawing to G-code instructions for a CNC machine.
- **Vector file type:** As a vector file type, vector data from an EPS file (e.g. image or drawing) can be scaled without a loss in quality, and the content can be edited.
- **Preview feature:** Devices without a PostScript interpreter program can still visualize the contents of an EPS file. This means EPS files can be opened by any vector graphics software.

Disadvantages of EPS files.

- **Not widely used anymore:** The EPS format has been overtaken by newer, more powerful, more popular technologies, like embedded scripts.
- **Takes up a lot of space:** EPS files tend to take up a lot of storage space, especially when certain illustration features are used.
- **Requires a minimum resolution:** EPS files need a minimum resolution of 300 dots per inch or they could lose their quality.
- **Page limitations:** Most programs that accept EPS format don't permit multiple pages for an EPS file.



AI: ADOBE ILLUSTRATOR ARTWORK

AI — Adobe Illustrator Artwork

- AI is another image format specifically developed by Adobe to not just save the image, but also the project state.
- It's not meant for use on the web and isn't supported by any browsers, nor most default image viewers.
- You can freely scale AI files without any loss in quality.

Advantages of AI

- All strokes, lines, shapes, filters, are customizable and reversible.
- Scale up or down illustration sizes freely.

Disadvantages of AI

- Large file sizes.



PSD: PHOTOSHOP DOCUMENT

PSD — Photoshop Document

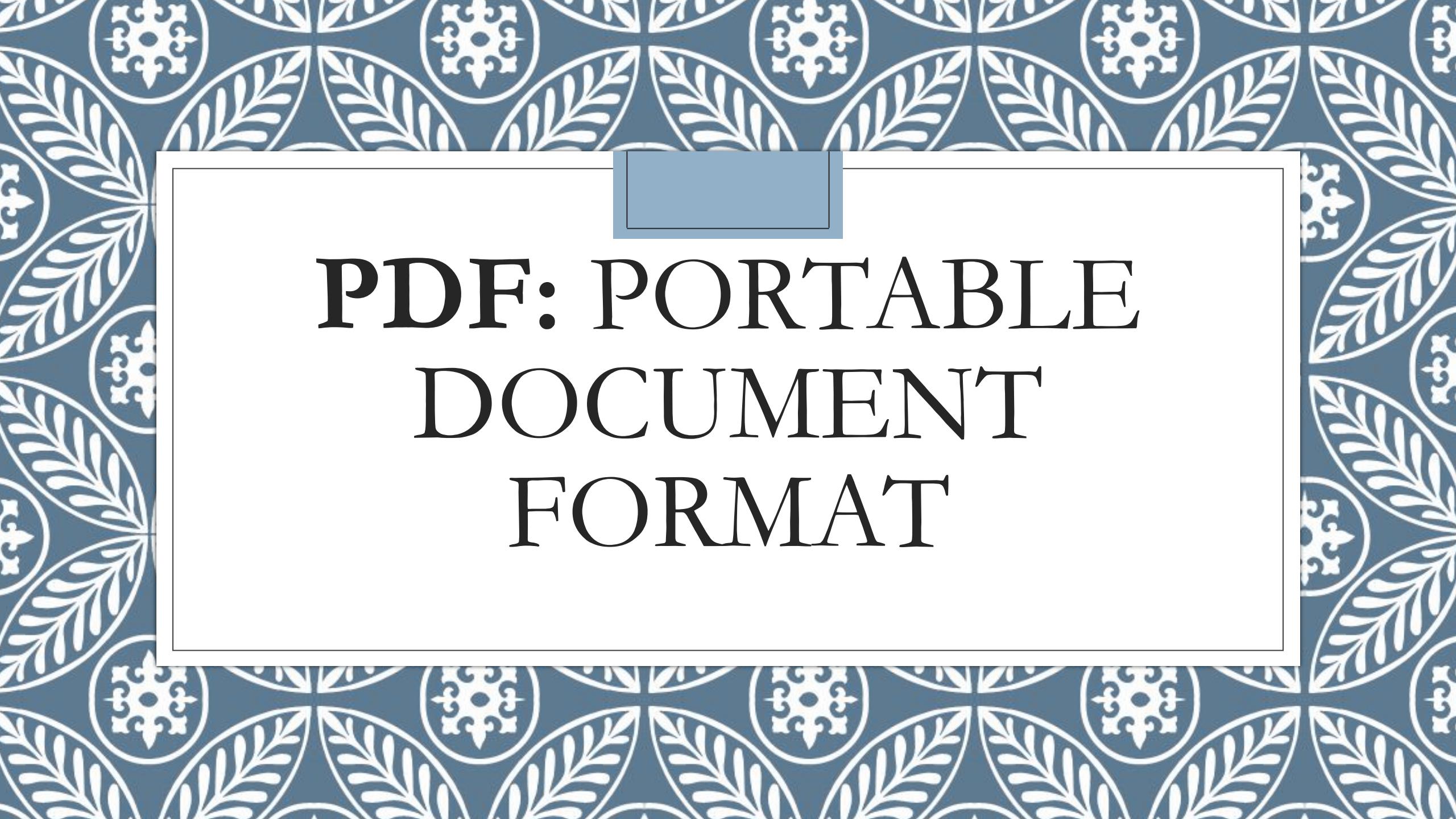
- The PSD file format is an image format used for saving image documents and works in progress with Adobe Photoshop.
- It's not a web-safe image format, so it's not supported by any browsers or standard image viewers or editors.

Advantages of PSD

- All filters, transparency, paths, and edits are fully customizable and reversible.
- Lossless image quality.

Disadvantages of PSD

- Large file sizes.



**PDF: PORTABLE
DOCUMENT
FORMAT**

PDF — Portable Document Format

- PDF files are actually based on the same PostScript language that powers EPS vector image files and can be used to save images and illustrations as well.
- It's the image format of choice for storing illustrations, magazine covers, and more for later printing.

Advantages of PDF

- Indexable and searchable text makes it perfect for in-depth infographics or reports.
- Can include links, CTA buttons, and other interactive elements.
- Lossless scalability.

Disadvantages of PDF

Cannot be included in web content, must be loaded and read as a separate file.

Browsers and OS Support

- Supported by all major browsers, but you are forced to open the PDF as a separate file. (You cannot use PDF files to display images throughout your HTML content.)
- Supported as a format by most standard document editors (like MS Word or Google Docs), and illustration software (AI, Inkscape) but not by image editing software.



RAW FILE FORMATS

Comparison between RAW, TIFF, PNG vs JPEG



What is a RAW file?

- A RAW file is the uncompressed and unprocessed image data captured by a digital camera or scanner’s sensors. Shooting in RAW captures a high level of image detail, with large file sizes and lossless quality.
- RAW files are a type of raster file format, but not actually images themselves. This means you need to import them into relevant software before you can edit or export them as a different raster image file, like a JPEG.

What is a RAW file?

- Raw image formats are the file types a digital camera uses to store full-quality images for later post-production and editing.
- Major raw image file types by camera maker:
 - Kodak: CR, K25, KDC
 - Canon: CRW CR2 CR3
 - Epson: ERF
 - Nikon: NEF NRW
 - Olympus: ORF
 - Pentax: PEF
 - Panasonic: RW2
 - Sony: ARW, SRF, SR2
- Rather than the 256 shades per color channel (8 bit) available in a JPEG file, RAW files offer up to 16,384 shades per color channel (14 bit) in a single picture. That gives you more flexibility when tweaking colors and contrast in post-processing.

Purpose of RAW files?

- The highest-quality images often start out as RAW files. DSLR cameras capture and hold image data in RAW files, which are typically large and highly detailed because there is no compression.
- The purpose of raw image formats is to save, with minimum loss of information, data obtained from the image sensors.



Characteristics of RAW file formats

- RAW files are processed directly from the camera's sensor, thus they do not use compression.
- Because they are lossless, the images are extremely high-quality. They show more shades of colors and better representation of white balance, contrast, exposure etc.
- Changes made to RAW files are non-destructive. Only the metadata that controls the rendering is altered, but the original file data remains untouched.
- Few images can be saved in a memory card or hard drive due to the massive amount of data in the RAW file.
- There is no widespread adoption of a standard RAW format. So, specialized software may be needed to open RAW files.

Advantages of RAW files.

- **Great detail.**

The main advantage of RAW files is that they contain the most detail compared to other raster and vector file types. This gives you a lot more to work with when editing photos.

- **Wide color range.**

RAW files can contain millions more colors than a JPEG image, plus increased RGB tonal values.

- **Lossless compression.**

This ensures that the quality of your RAW image files won't drop due to compression.

Disadvantages of RAW files.

- **Large size.**

Their size can require both additional camera and computer storage space.

- **Format compatibility issues.**

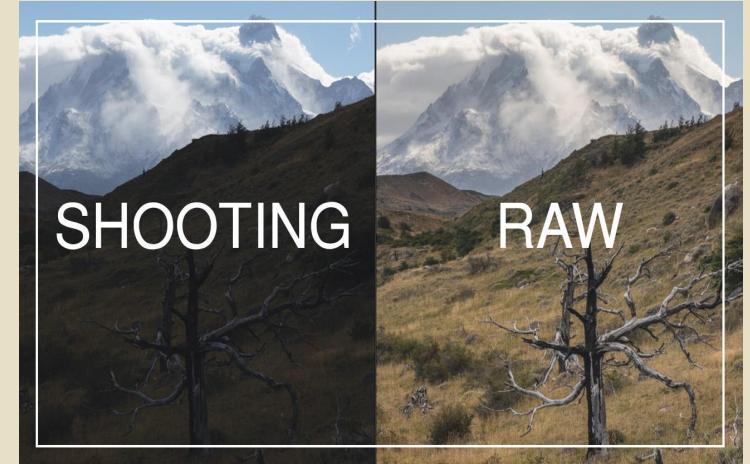
RAW files aren't standardized, so some software can't read the files from certain cameras.

- **Processing requirements.**

It can add time to convert the RAW file into a raster image file for both print and online.

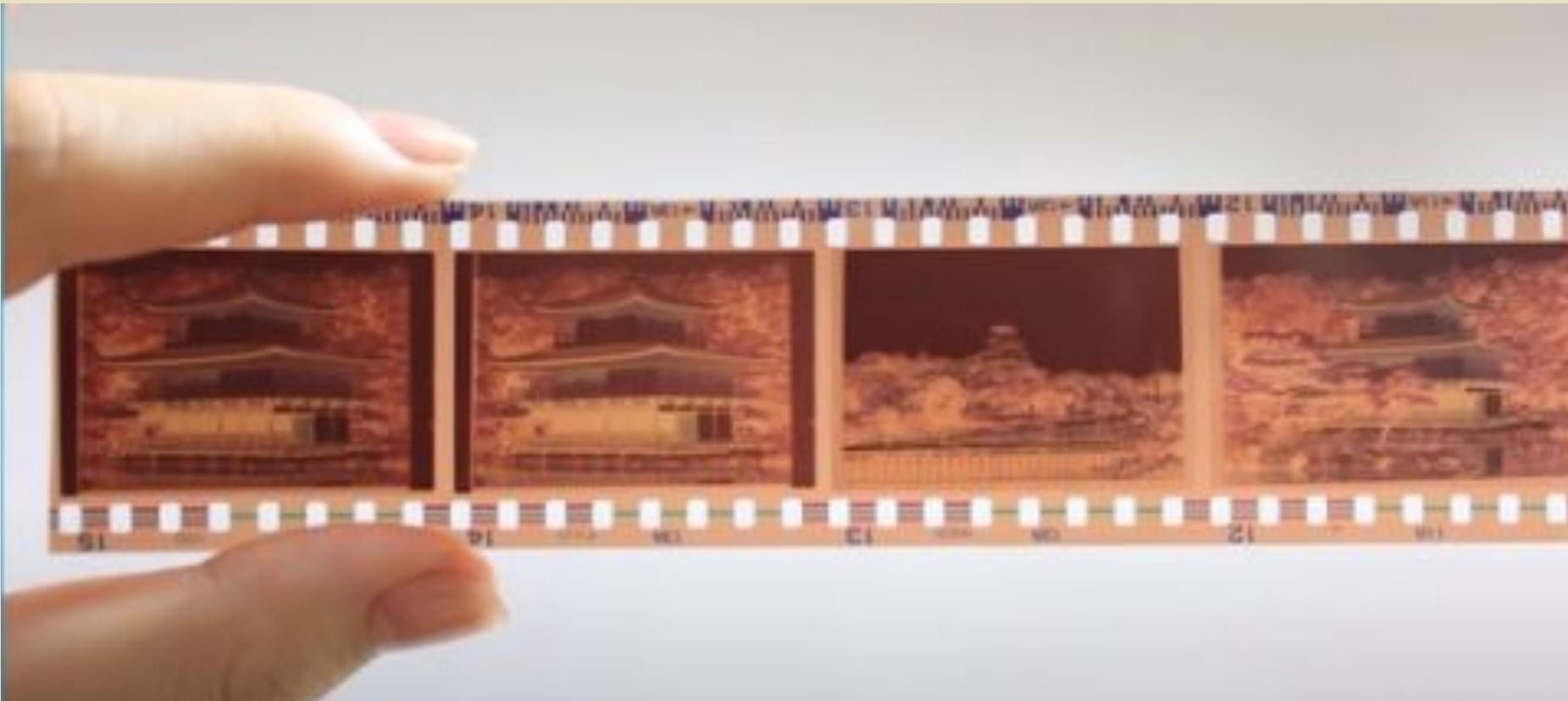
When to use RAW format?

- The RAW format is ideal if you are shooting with the intent of editing the images later.
- Shots where you are trying to capture a lot of detail or color, and images where you want to tweak light and shadow, should be shot in RAW.
- When you want to get the Highest Level of Quality.
- To Record Greater Levels of Brightness(between 4,096 to 16,384 levels)
- To Easily Adjust White Balance, Get Better Detail and Get Better Prints.



When not to use RAW format?

- If smaller file sizes are needed then it is best not to use raw format.
- When you need to save time. As additional processing of Raw files is mostly required which can take a lot of time. It may also take long time to download, sort through and store all of your images.
- When you require instant compatibility and use.
- Raw images aren't meant for the web or sharing and aren't supported by any major browser or image viewer.



CR2- RAW FILE FORMAT

- CR2 file extension is a Canon Raw Version 2 image file created by a Canon digital camera. They are based on the TIFF file specification, so they're usually high quality, uncompressed, and large.
- This file format stores lossless details from the camera sensor without any processing of the image. Unlike other processed image formats like Jpeg which only records 8 bits of RGB, CR2 records up to 14 bits of RGB.
- The lossless feature of this image format makes it ideal for storing image's originality and a lot of post processing can be done later.

NEF- RAW FILE FORMAT

- NEF(Nikon Electronic Format) is Nikon's RAW file format. RAW image files, sometimes referred to as digital negatives, contain all the image information captured by the camera's sensor, along with the image's metadata (the camera's identification and its settings, the lens used and other information).
- The NEF file is written to the memory card in either an uncompressed or "lossless" compressed form.
- The primary benefit of writing images to the memory card in NEF format rather than TIFF or JPEG is that no in-camera processing for white balance, hue, tone and sharpening are applied to the NEF file; rather, those values are retained as instruction sets included in the file.
- You can change the instruction set as many times as you like without ever disturbing the original image's RAW data.
- Another benefit of the NEF file is that depending on the camera, it retains 12-bit or 14-bit data, resulting in an image with a far greater tonal range than an eight-bit JPEG or TIFF file.



A small blue rectangular element is positioned at the top center of the white content area.

COMPRESSION TECHNIQUES

What is Image Compression?

- *Image compression* is a process applied to a graphics file to minimize its size in bytes without degrading image quality below an acceptable threshold.
- Compression is used to reduce image file size for storage, processing, and transmission. The file size for digital images can be quite large, taxing the computing and networking capabilities of many systems.

Need for Image Compression

- **Reduction in file size**

- Allows more images to be stored in a given amount of disk or memory space.

- **Reduction in transmission time**

- The image also requires less bandwidth when being transmitted over the internet or downloaded from a webpage, reducing network congestion and speeding up content delivery.

Types of Image Compression

- The methods used to compress image files typically fall into one of two categories:
 - Lossy* and
 - Lossless*.

Lossy Compression

- Lossy compression reduces an image file size by permanently removing less critical information, particularly redundant data.
- Lossy compression can significantly reduce file size, but it can also reduce image quality to the point of distortion, especially if the image is overly compressed. However, quality can be maintained when compression is carefully applied.
- One of the challenges with lossy compression is that it's irreversible. Once it has been applied to an image, that image can never be restored to its original state.
- Lossy compression has proved to be a valuable strategy for the web, where a moderate amount of image degradation can often be tolerated

Lossy Compression

--Advantages and Disadvantages

◦Advantages

- Very small file sizes
- Lots of tools, plugins, and software support it.

◦Disadvantages

- Quality degrades with higher ratio of compression.
- Can't get original image back after compressing

Use of Lossy Compression

- **Compress multimedia data:** Especially in applications such as streaming media and internet telephony.
- **An eCommerce site or a blog:** Theses may find lossy compression more beneficial as it offers a significant file size reduction which helps the site performance. This, in turn, creates a better user experience and improves SEO ranking.
- The most common example of lossy compression is **JPEG**, an image compression format used extensively on the web and in digital photography. This widely recognized format is supported by numerous tools and applications. Additionally, compression can be applied in degrees, making it possible to use JPEG compression that best strikes a balance between file size and quality.

Lossless Compression

- Lossless compression reduces file without removing critical data or reducing image quality and results in a compressed image that can be restored to its original state with no degradation or distortion. Usually this is done by removing unnecessary metadata
- However, lossless compression doesn't reduce the file size nearly as much as lossy compression, offering little advantage in terms of storage space, network bandwidth or download speeds.
- Lossless compression is generally used in situations where image quality is more important than disk space or network performance, such as for product images or to showcase artwork.

Lossless Compression

--Advantages and Disadvantages

- **Advantages:**

- ❑ No loss of quality.

- **Disadvantages:**

- ❑ Larger files compared to lossy compression.

Use of Lossless Compression

- **Photography website:** Lossless compression method prioritizes high quality over reducing the size, which means you can showcase your photographs in more detail.
- **Creating an online portfolio**
- One of the most common lossless formats is **PNG**, a widely used format that reduces file size by identifying patterns and compressing those patterns together. Although PNG files are generally larger than JPEG files, websites use them extensively when more image detail is needed, such as for logos, icons, screenshots or images with text.

Difference between Lossy and Lossless

S.NO	Lossy Compression	Lossless Compression
1.	Lossy compression is the method which eliminates the data which is not noticeable.	While Lossless Compression does not eliminate the data which is not noticeable.
2.	In Lossy compression, A file does not restore or rebuilt in its original form.	While in Lossless Compression, A file can be restored in its original form.
3.	In Lossy compression, Data's quality is compromised.	But Lossless Compression does not compromise the data's quality.
4.	Lossy compression reduces the size of data.	But Lossless Compression does not reduce the size of data.
5.	Lossy compression is used in Images, audio, video.	Lossless Compression is used in Text, images, sound.
6.	Lossy compression has more data-holding capacity.	Lossless Compression has less data-holding capacity than Lossy compression technique.
7.	Lossy compression is also termed as irreversible compression.	Lossless Compression is also termed as reversible compression.