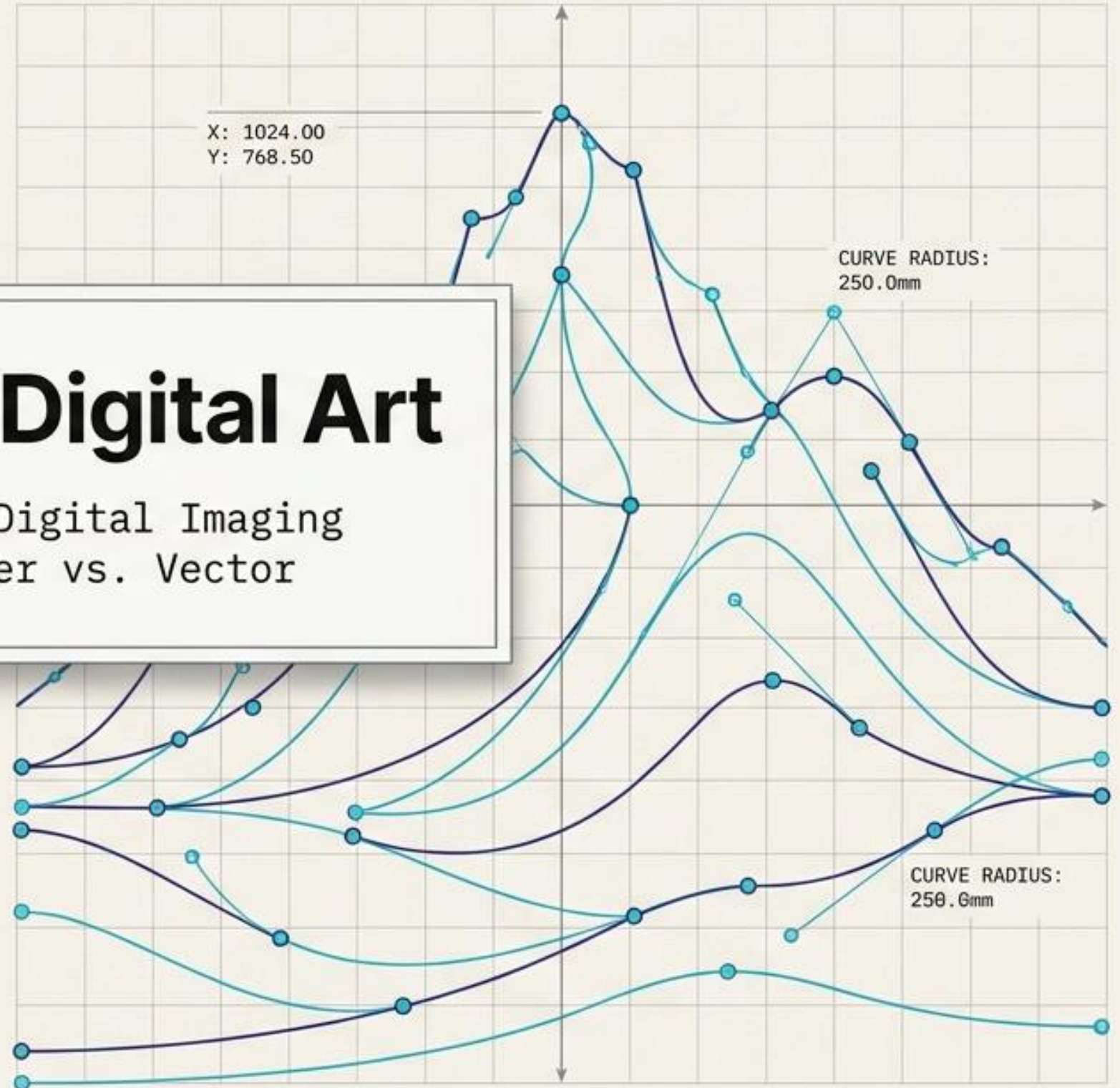
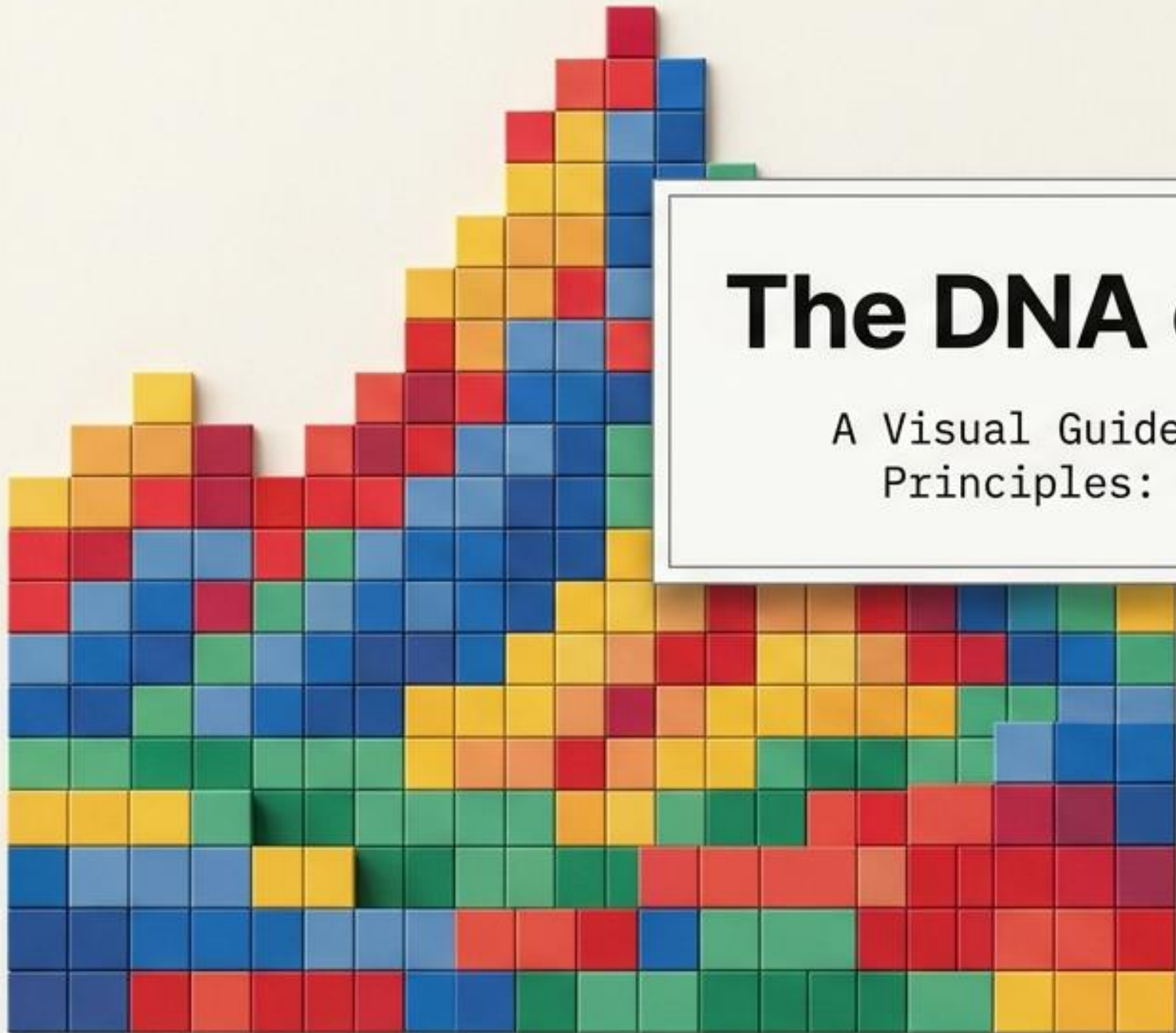


The Digital Mosaic

The Designer's Blueprint

The DNA of Digital Art

A Visual Guide to Digital Imaging
Principles: Raster vs. Vector



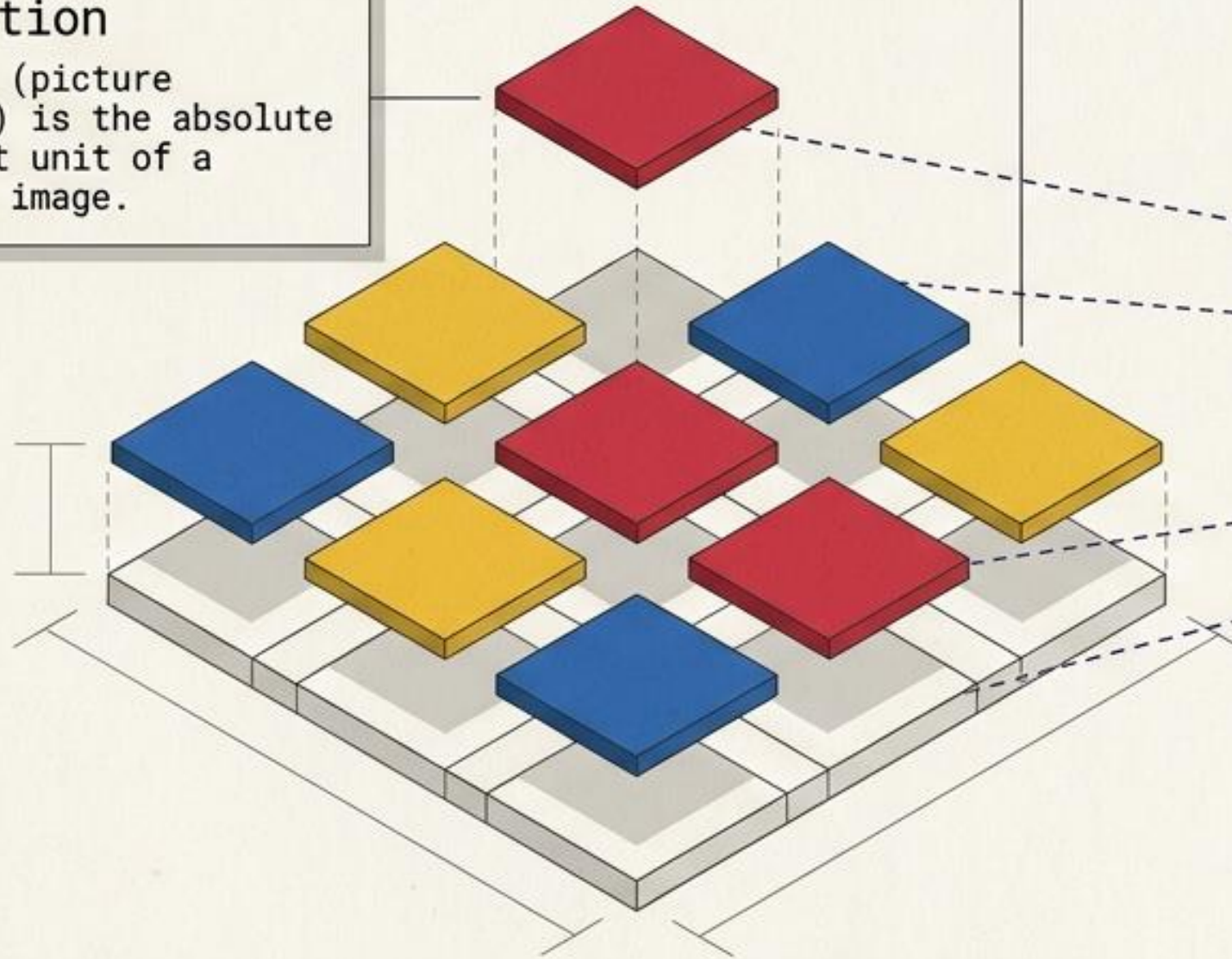
The Foundational Block: What is a Pixel?

Definition

A pixel (picture element) is the absolute smallest unit of a digital image.

The Grid

Pixels are arranged in a rigid grid. Each pixel represents one specific color and brightness at a particular point.



The Illusion

The human eye perceives the combination of these distinct square elements as one continuous, smooth image when viewed from a distance.

Anatomy of a Pixel

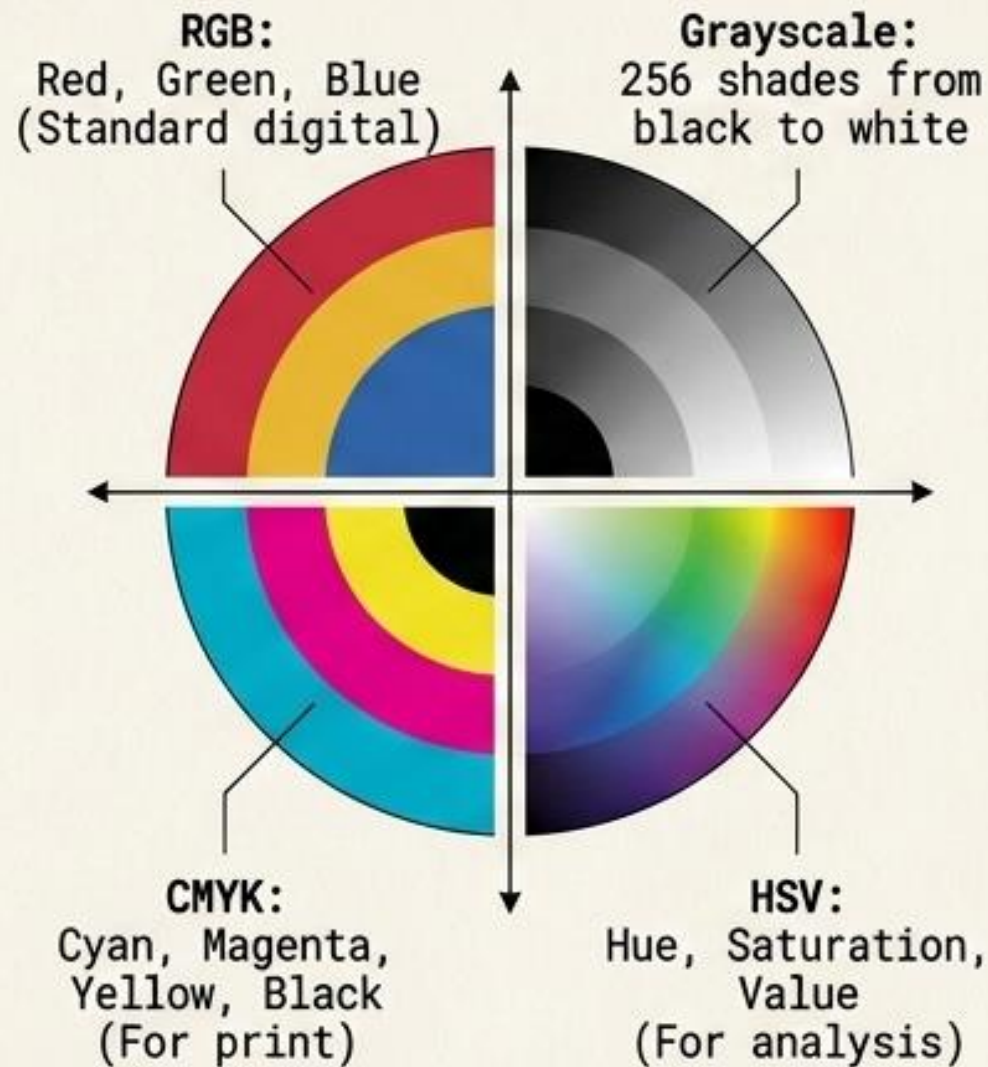
The three core theoretical properties that define digital image data.

Color Depth (Bit Depth)

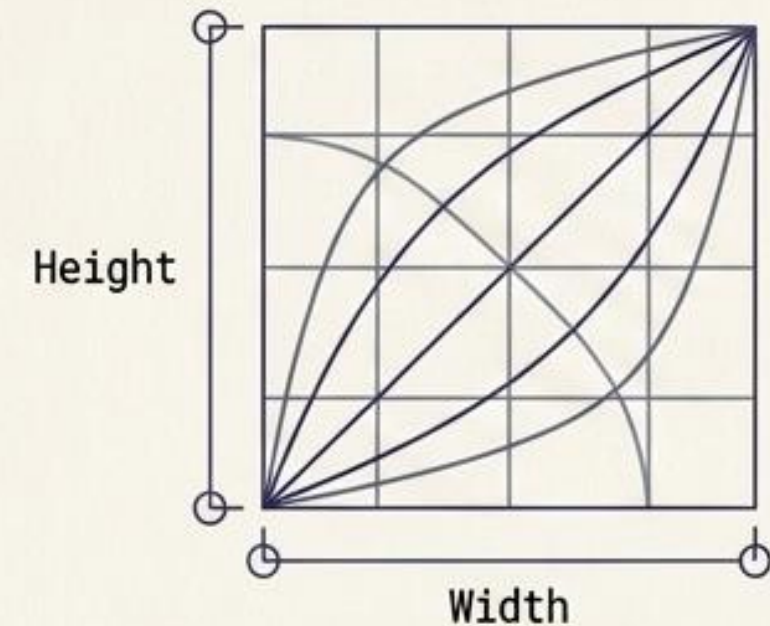


- Indicates the number of bits used to represent color.
- 8-bit = 256 colors.
- 24-bit = Over 16 million colors (8 bits allocated for Red, Green, Blue channels).

Color Models



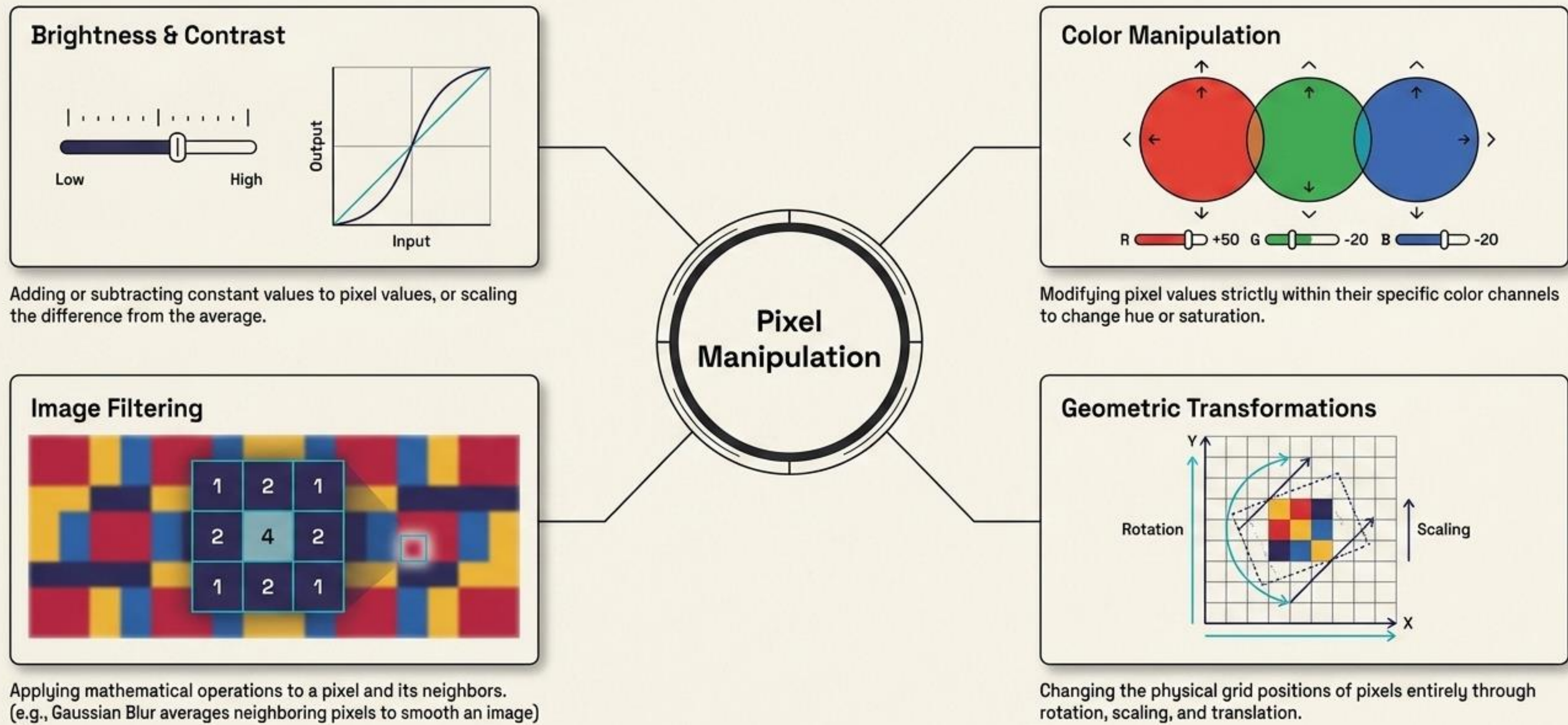
Resolution



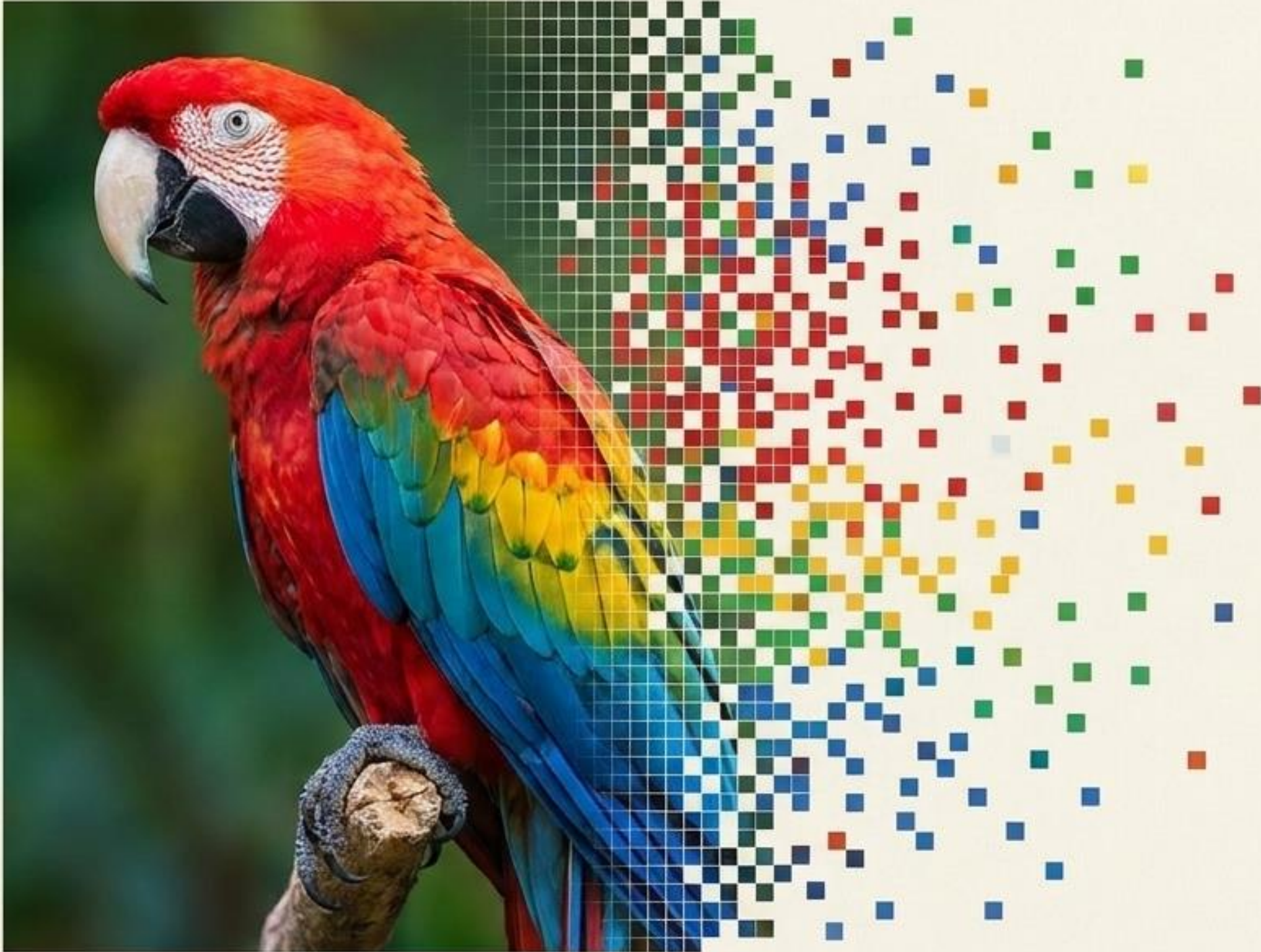
- The total number of pixels in an image, expressed as width x height (e.g., 1920x1080).
- Higher resolution means more detail, but requires more storage space and processing power.

The Pixel Sandbox

How mathematical operations manipulate raw pixel data.



Paradigm One: Raster Images



The Blueprint

Built entirely from pixels—millions of tiny color squares mapped to a rigid grid that visually combine to form highly detailed imagery.

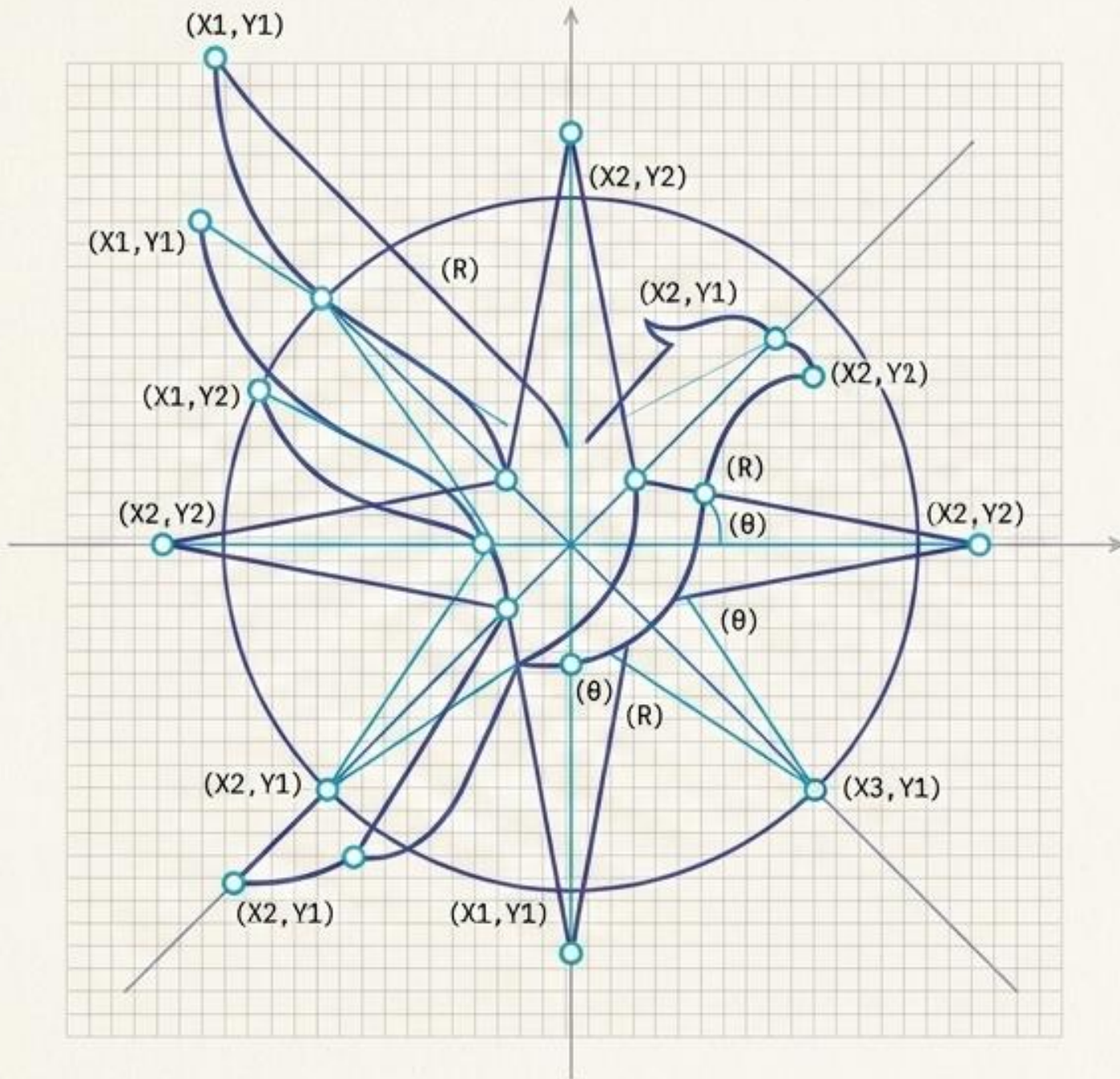
The Rule

Resolution Dependent. The more pixels an image has, the higher the quality. Resizing or stretching the image beyond its pixel count will cause blurring.

Best For

Digital photographs. Digital cameras automatically shoot and save these formats. They are the standard for editing photos and most web graphics.

Paradigm Two: Vector Images



The Blueprint

Uses mathematical equations, lines, and curves with fixed points on a grid to produce an image. Zero pixels are used.

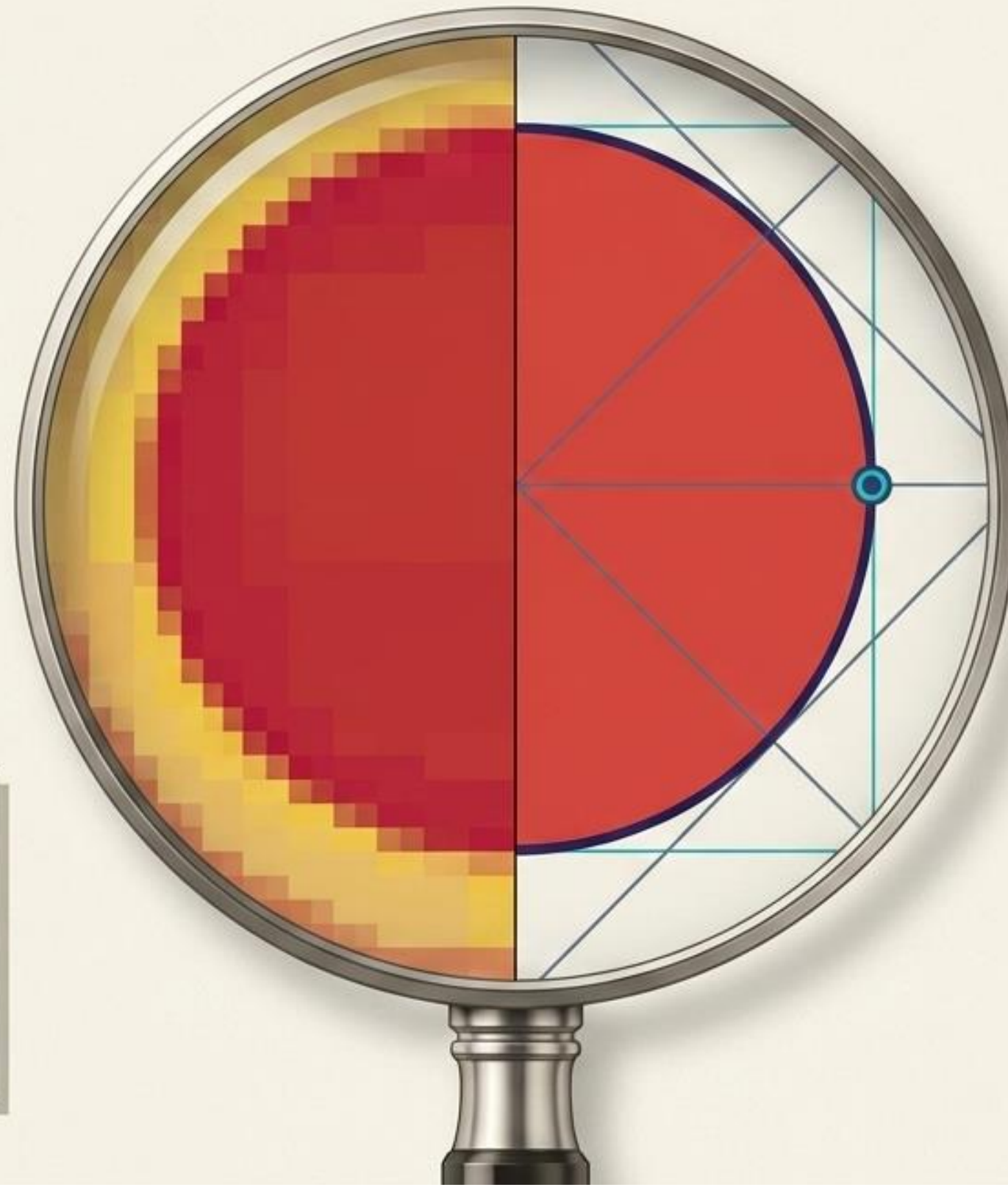
The Rule

Infinite Scalability. Because formulas mathematically recalibrate to any size, you can scale a vector image up or down without impacting its quality.

Best For

Digital illustrations, complex graphics, and logos. The resolution remains perfect whether printed on a small business card or a massive highway billboard.

The Zoom Test: What happens when we scale up?



Raster Resolution

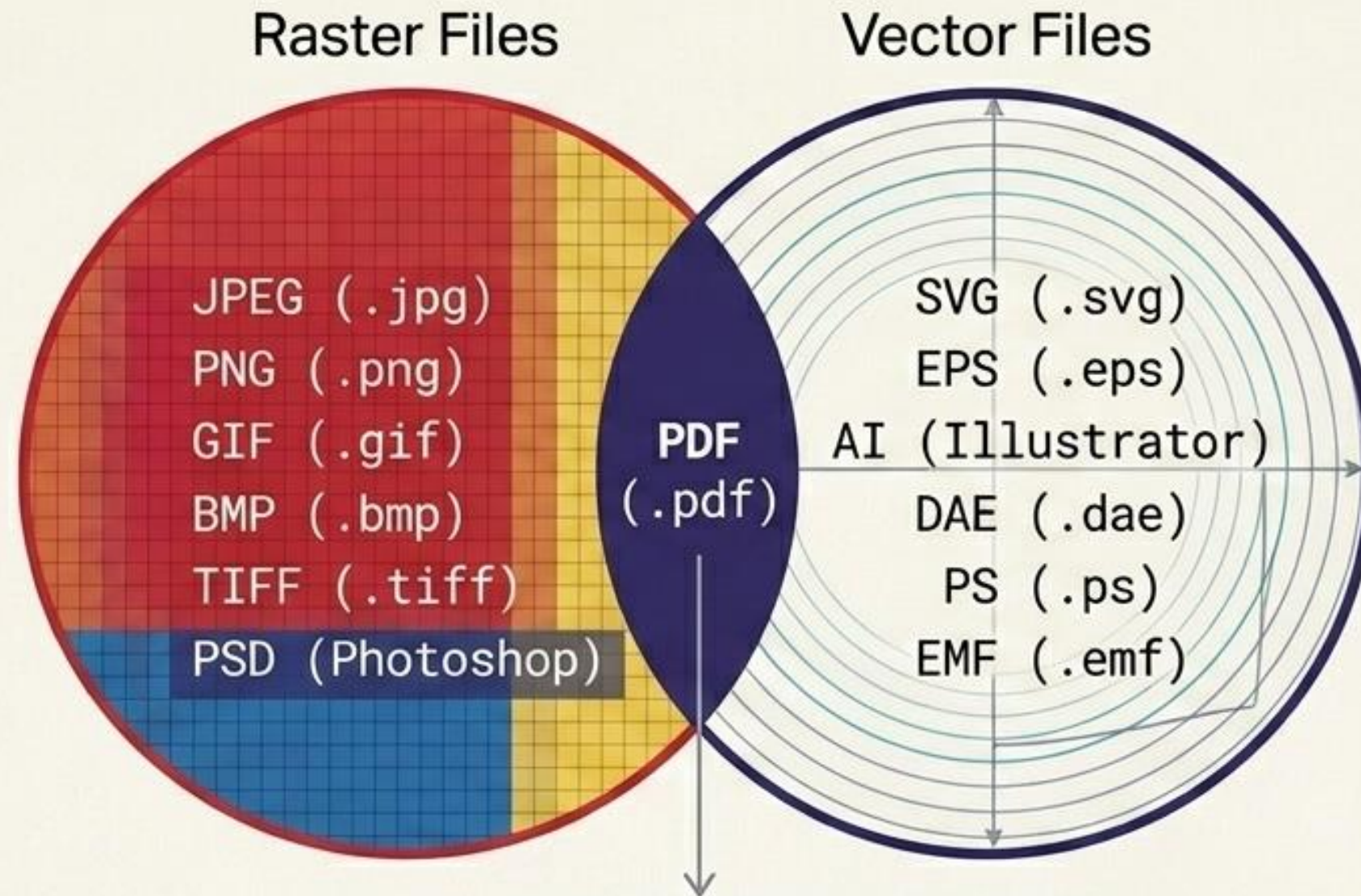
Measured in DPI (dots per inch) or PPI (pixels per inch). Increasing the size simply stretches the grid, revealing individual pixels and causing extreme blurriness and pixelation.

Vector Resolution

Resolution is completely irrelevant. Mathematical formulas instantly recalibrate to the new size, rendering perfectly smooth edges without losing a single drop of quality.

The File Type Sorting Hat

Categorizing standard image extensions by their theoretical foundation.



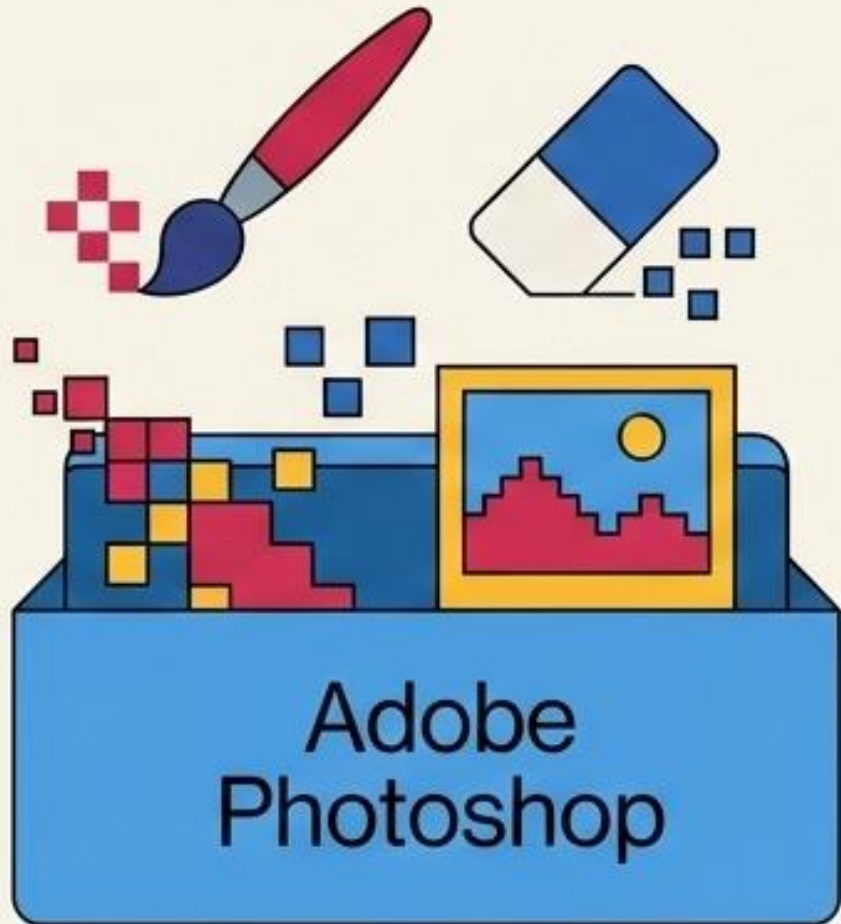
The Exception: Most PDFs are Vector, but it depends entirely on the creation tool. A PDF exported directly from Adobe Photoshop is saved as a Raster file!

The Ultimate Showdown

A diagnostic comparison matrix of digital imaging principles.

Attribute	 Raster Graphics	 Vector Graphics
Core Building Block	Pixels (tiny squares mapped to a rigid grid)	Mathematical equations (lines and curves mapped to fixed points)
Color & Detail	Displays a wider array of colors, fine shading, and complex lighting.	Better suited for flat shapes, crisp borders, and solid fill colors.
File Size	Generally larger; contains millions of pixels which impacts device storage.	Extremely lightweight; files contain only the underlying mathematical formulas.
Software & Compatibility	Opens universally across web browsers and generic apps (e.g., Adobe Photoshop).	Often requires specialized design software to view and edit (e.g., Adobe Illustrator).

Software Ecosystems & Conversion



A raster-based program. Primary use is editing detailed digital photos and intricate pixel-level imagery.

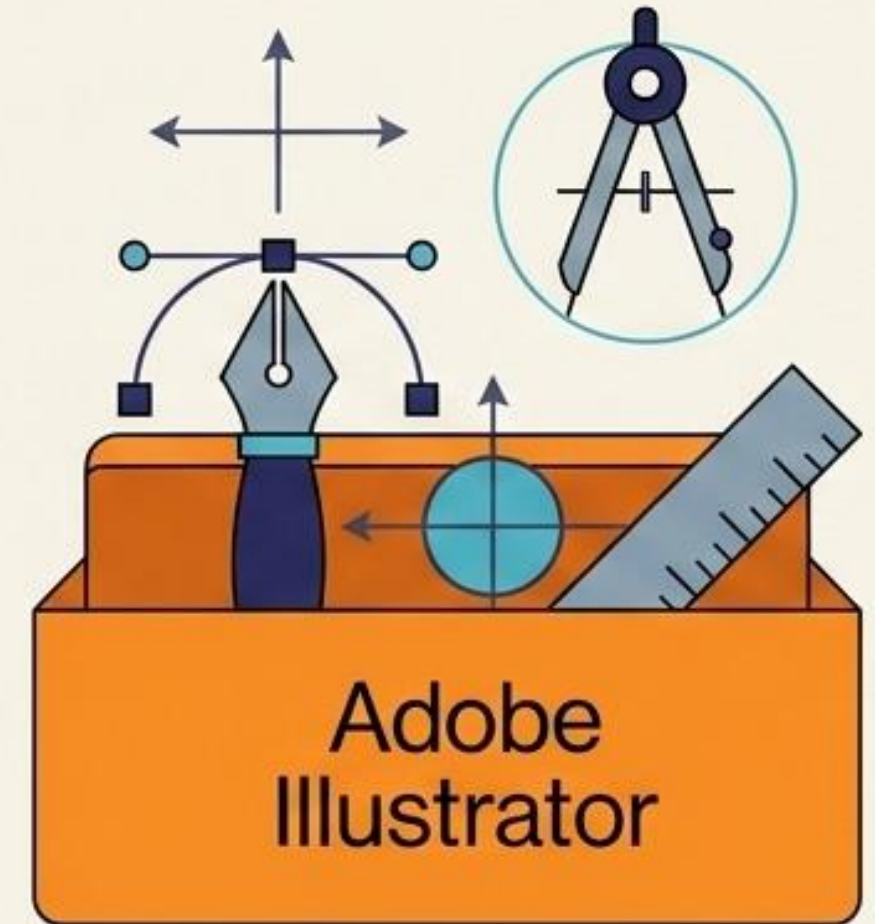
Conversion Diagram

The Image Trace Method

Open a JPEG in Illustrator -> Use 'Image Trace' -> Click 'Expand' -> 'Ungroup' to mathematically convert pixels into scalable vector paths.

The Rasterize Method

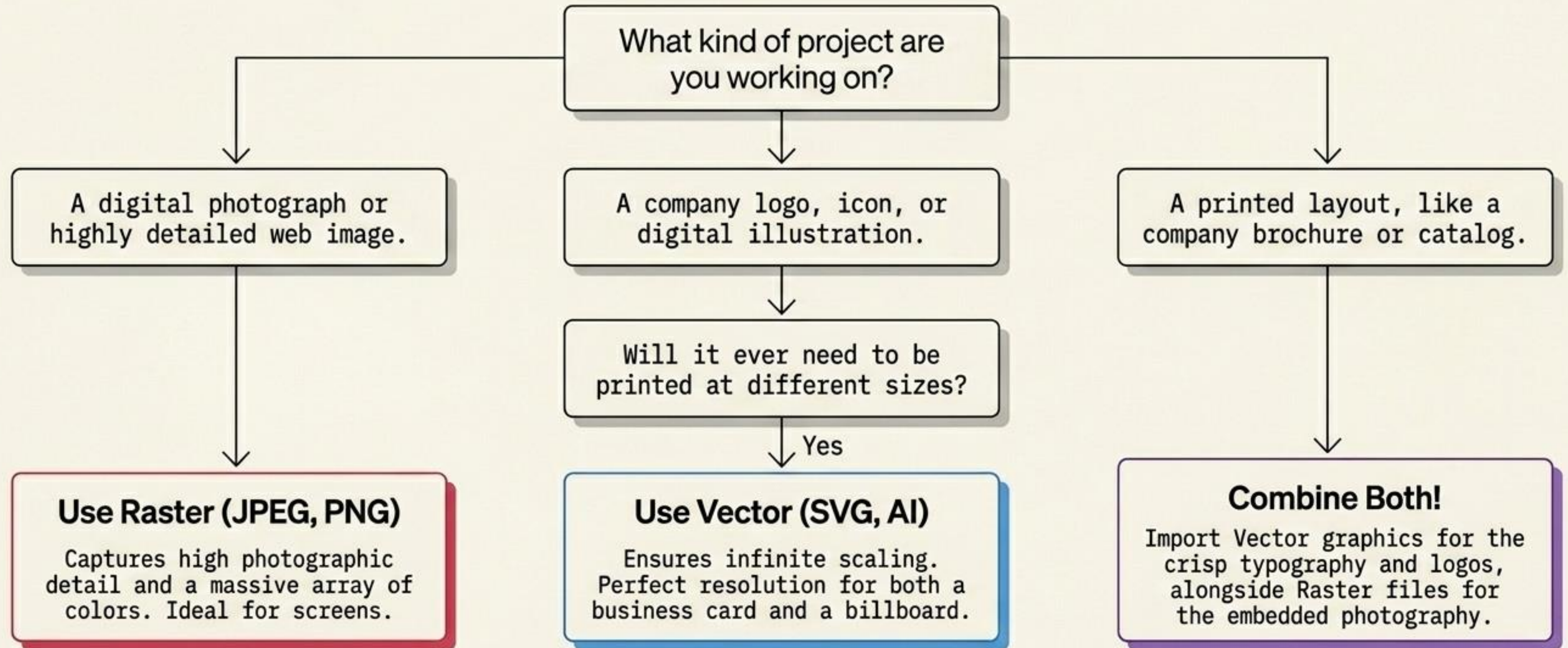
Open a Vector file in Photoshop -> 'Rasterize' layer. This permanently bakes the mathematical curves into a fixed grid of pixels.



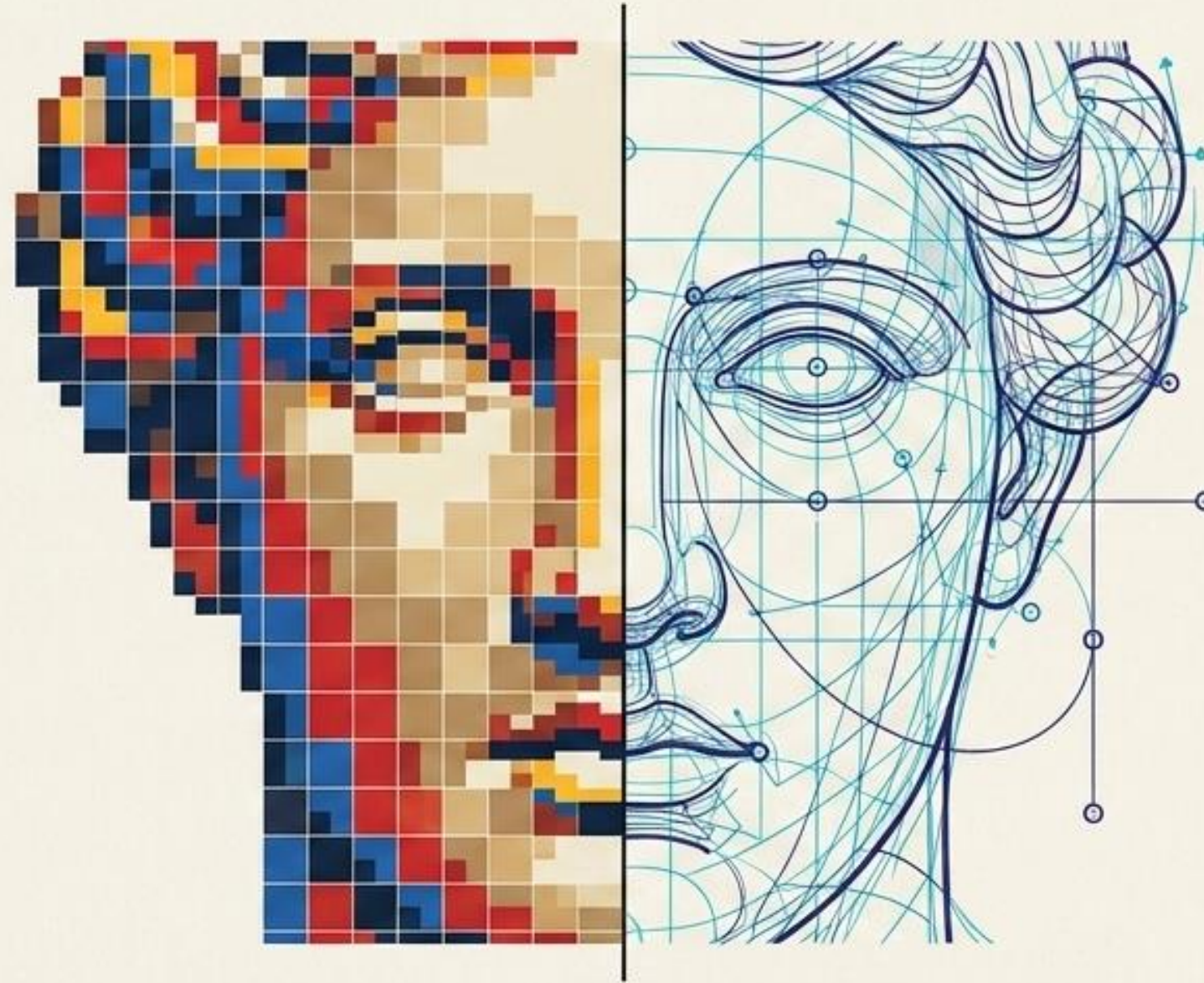
A vector-based program. Specializes in creating highly scalable graphics, branding logos, and precise design elements.

Which Format Should I Use?

A practical decision tree for everyday design tasks.



The Two Languages of Digital Art



Whether you are manipulating millions of individual colored pixels to capture a photorealistic moment, or writing mathematical equations to build an infinitely scalable logo, digital imaging relies on these two distinct foundational paradigms. Mastering both is the key to creative technology.

Raster vs. Vector

The Ultimate Guide to Digital Images for Creative Technologies



RASTER (PIXELS)

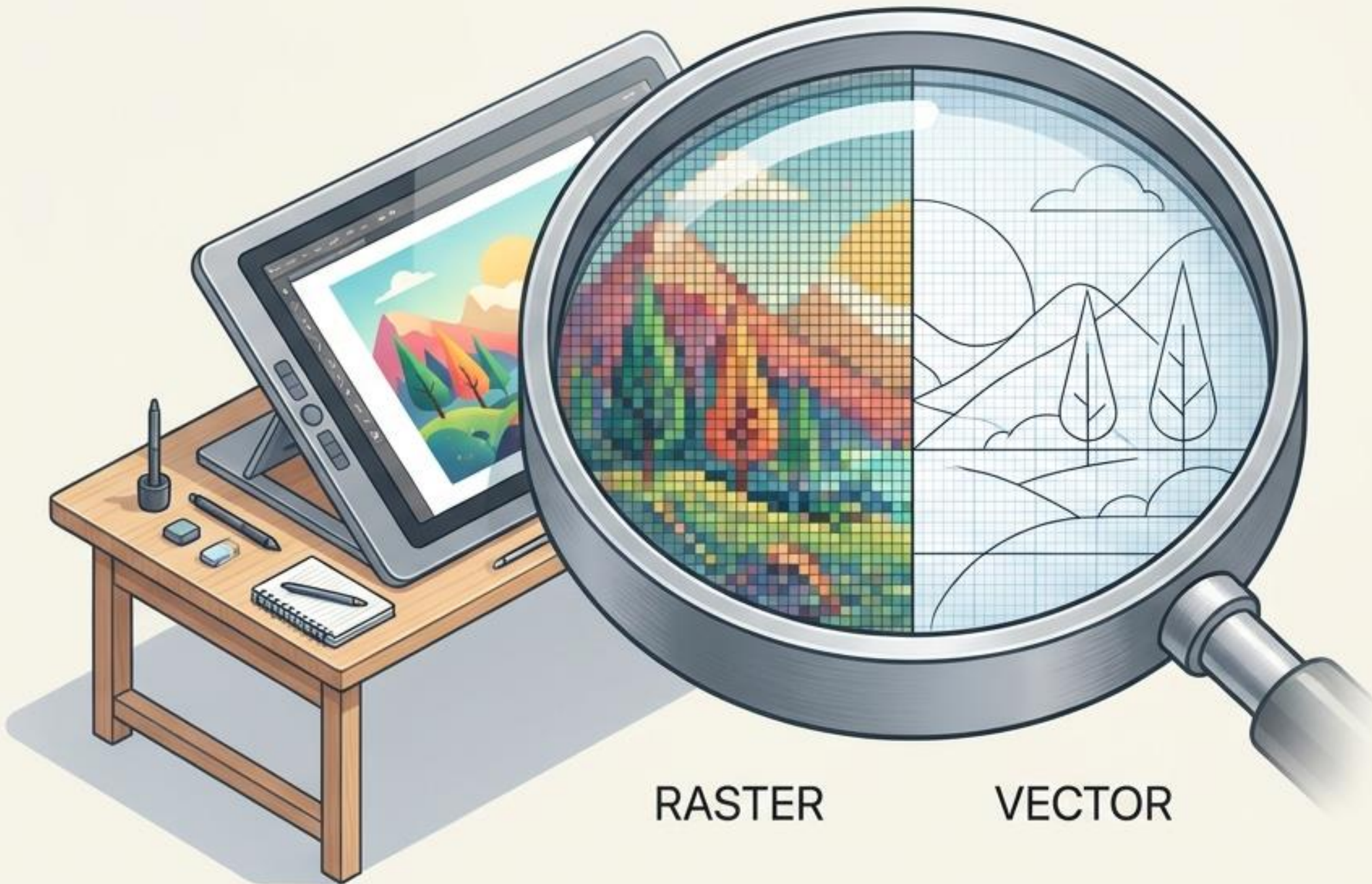
Resolution-dependent, based on a grid of pixels.
Best for photos and complex textures.



VECTOR (PATHS)

Resolution-independent, based on mathematical paths.
Best for logos, icons, and scalable graphics.

The building blocks of your digital canvas



Whenever you work with digital photos, graphic design, or logos, you will encounter two main file types: **Raster** and **Vector**.

They look similar on the surface, but underneath, they are built in completely different ways. Knowing which one to use is the secret to professional creative projects.

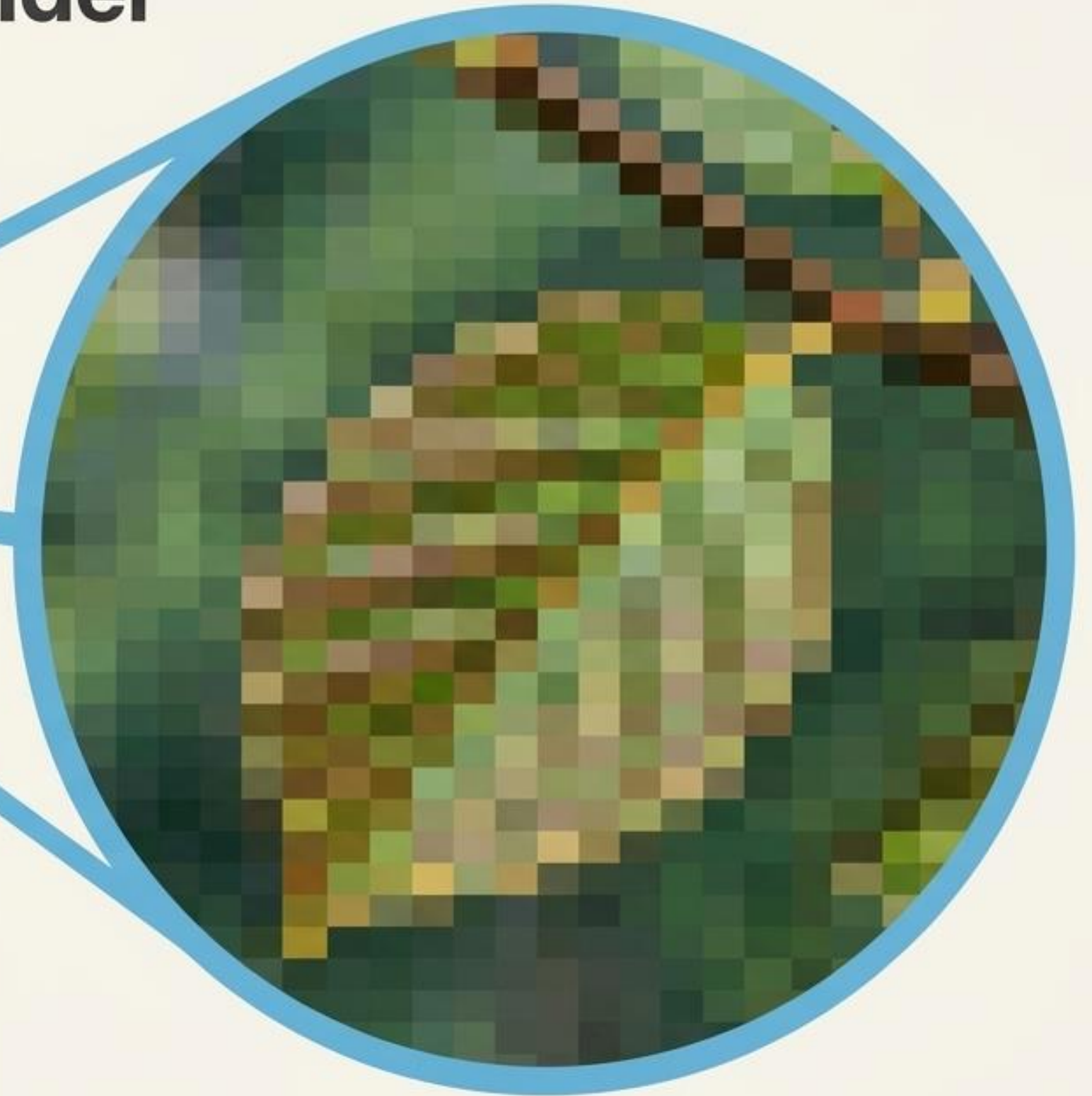
Meet Raster: The Pixel Builder



What is a raster file?
Images built entirely from tiny color squares called pixels.

How it works:
In great quantity, these pixels form highly detailed images, displaying a massive array of colors and fine lighting/shading.

The Golden Rule:
The more pixels an image has, the higher the quality will be.



Meet Vector: The Math Magician

What is a vector file?

Images built using mathematical equations, lines, and curves with fixed points on a grid.

How it works:

Mathematical formulas capture the exact shape, border, and fill color to build the image.

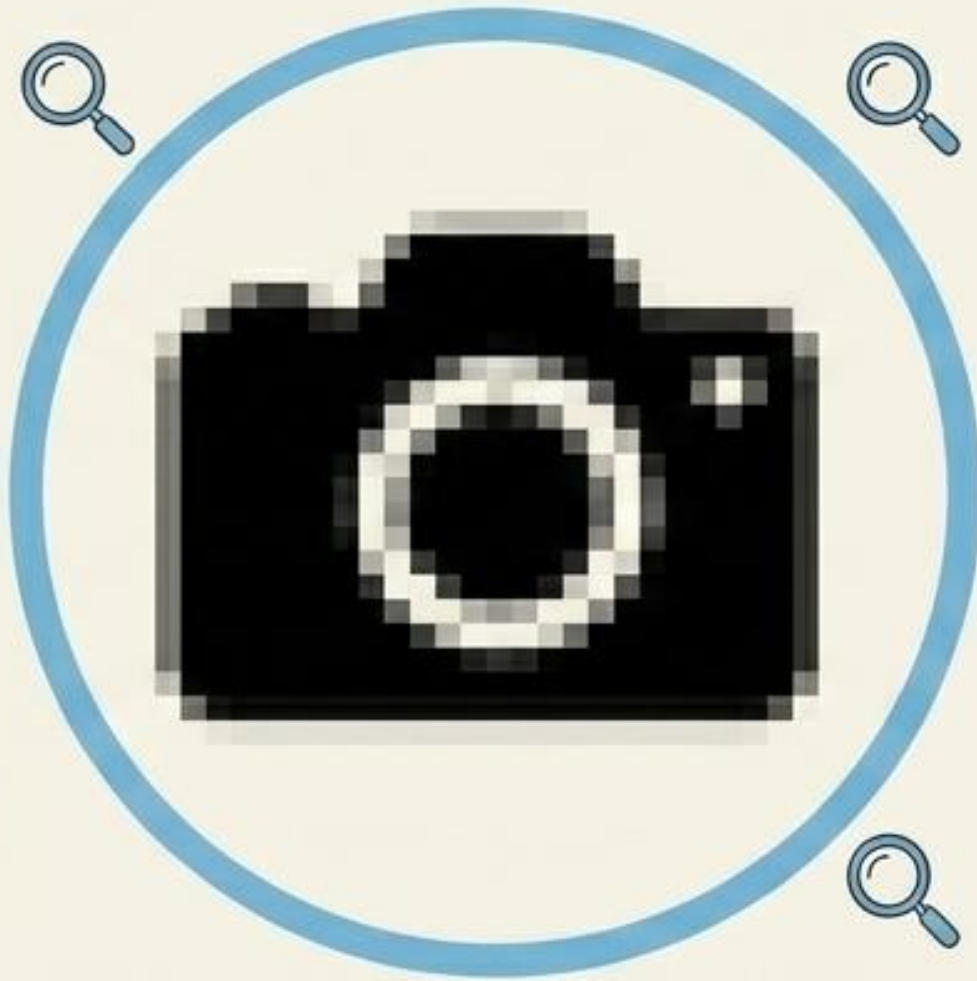
The Golden Rule:

There are absolutely no pixels in a vector file.



The Zoom Test: What happens when you scale up?

Raster Resolution



DPI / PPI (Dots/Pixels per inch)

Loses quality when resized. If you expand it, you see the individual pixels (it becomes blurred or pixelated).

Vector Resolution



Infinite resolution. Because math recalibrates to any size, you can scale it up or down endlessly without losing any image quality.

The Creative Toolkit: When to use which?

Use Raster For:



Digital photographs, online web images, and editing complex light and shading.

Use Vector For:



Digital illustrations, complex graphics, and logos that need to look perfect on both a tiny business card and a giant billboard.

Pro-Tip: Many projects combine both! A brochure uses Vector for the logo, but Raster for the background photos.

File Sizes: Heavyweights vs. Lightweight

Vector = Lightweight Files

Much smaller file sizes because they only contain the mathematical formulas determining the design.



Math Formulas

Millions of Pixels

Raster = Larger Files

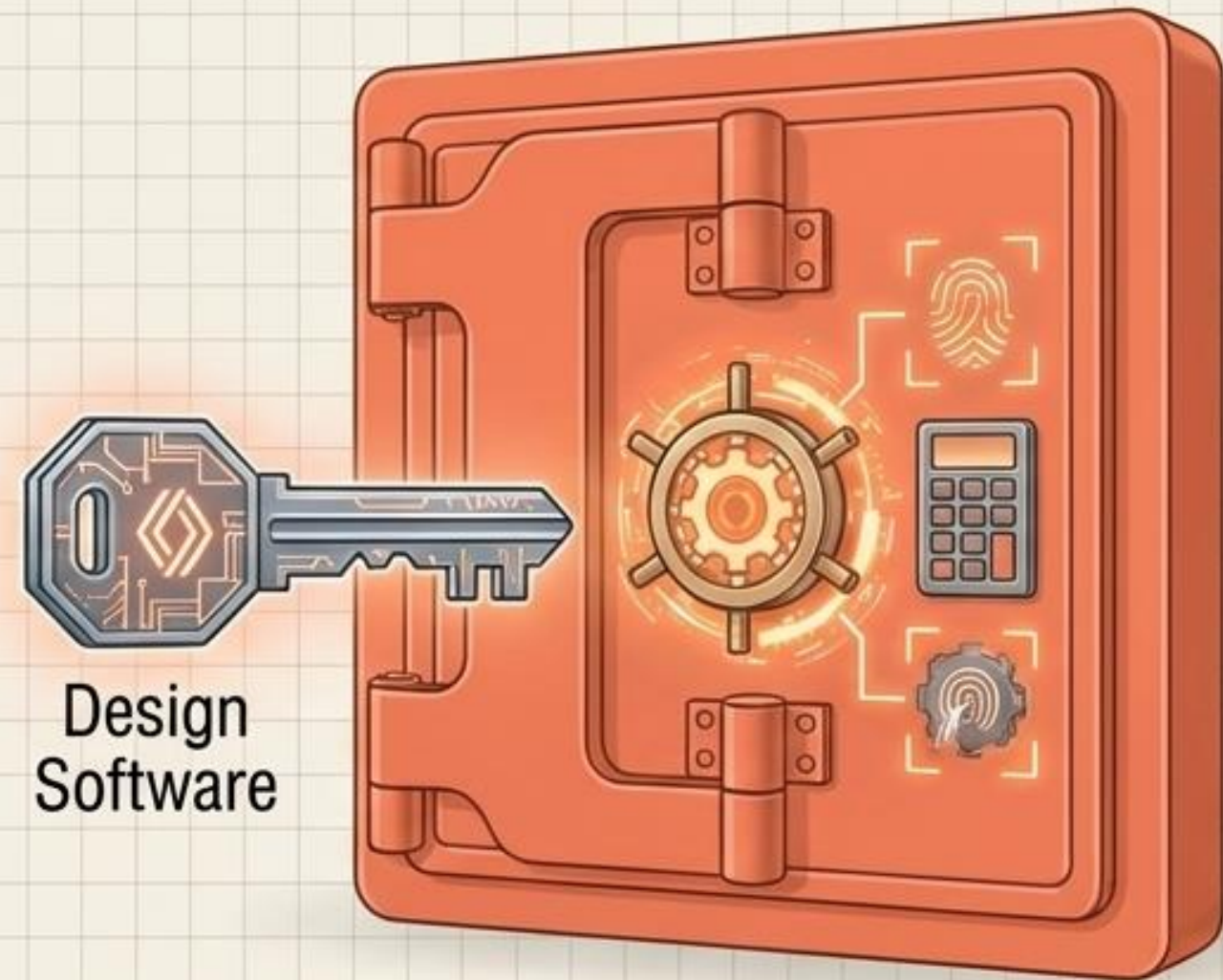
Contains millions of pixels and high detail. This large size can eat up storage space and slow down web page loading speeds.

Compatibility: Who can open what?



Raster is Universal

Easy to view, edit, and share. Raster files open seamlessly in almost all apps, devices, and web browsers.



Vector is Exclusive

Less accessible. To open, view, and edit many vector file types, you require specialized graphic design software.

The Software Showdown



Adobe Photoshop (Ps)

A raster-based program. It uses pixels to create and edit detailed images. It is the ultimate tool for editing digital photos.



Adobe Illustrator (Ai)

A vector-based program. It relies on math and paths. It is the ultimate tool for creating scalable vector graphics, logos, and design elements.

The Raster Cheat Sheet

.jpg

Joint Photographic Experts Group

.png

Portable Network Graphics

.gif

Graphics Interchange Format

.bmp

Bitmap Image File

.tiff

Tagged Image File Format

.psd

Adobe Photoshop File

The Vector Cheat Sheet

.svg

Scalable Vector Graphics

.eps

Encapsulated PostScript File

.ai

Adobe Illustrator File

.dae

Collaborative Design Activity

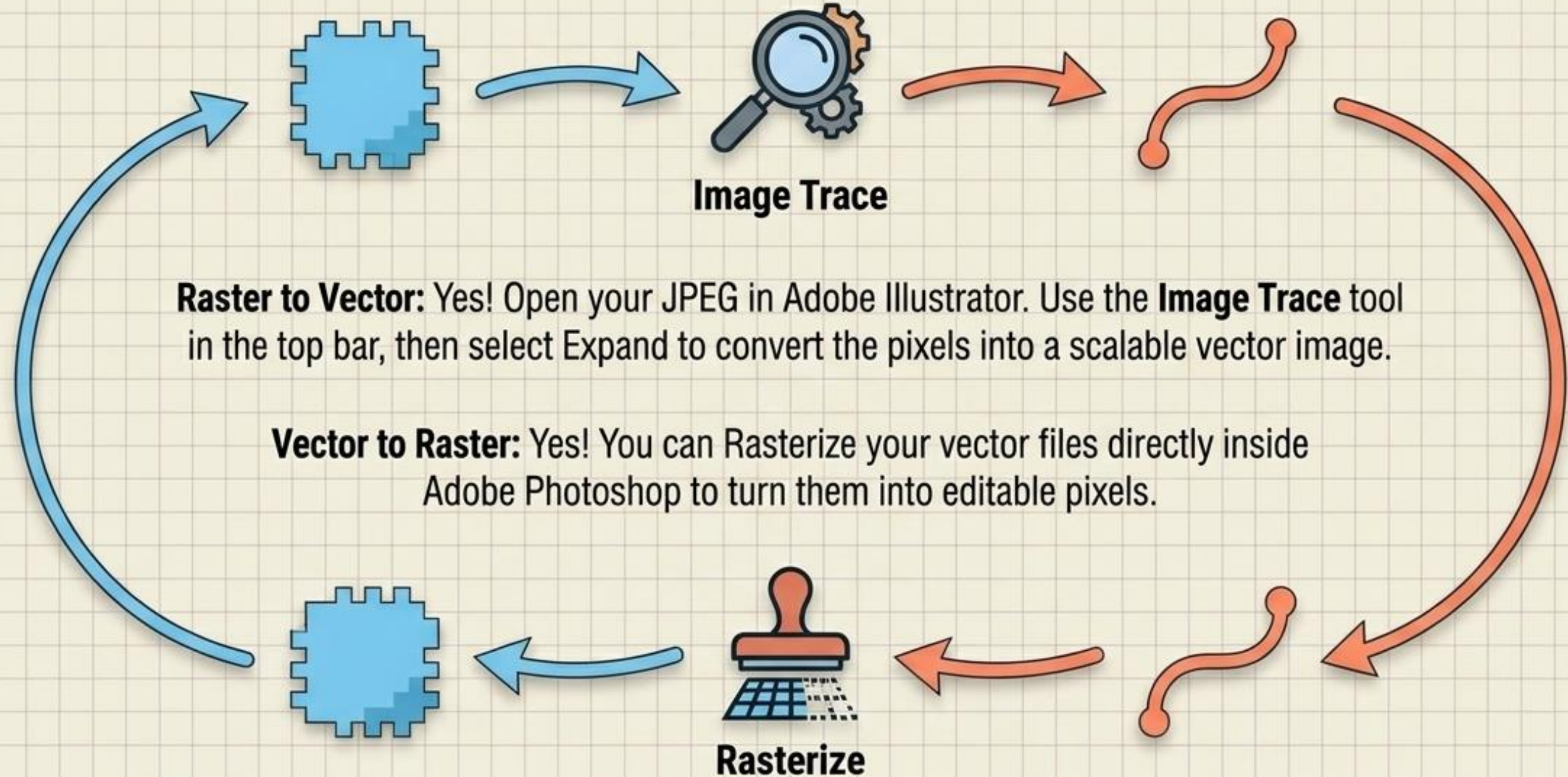
.ps

PostScript

.emf

Enhanced MetaFile

Shape Shifting: Can you convert them?



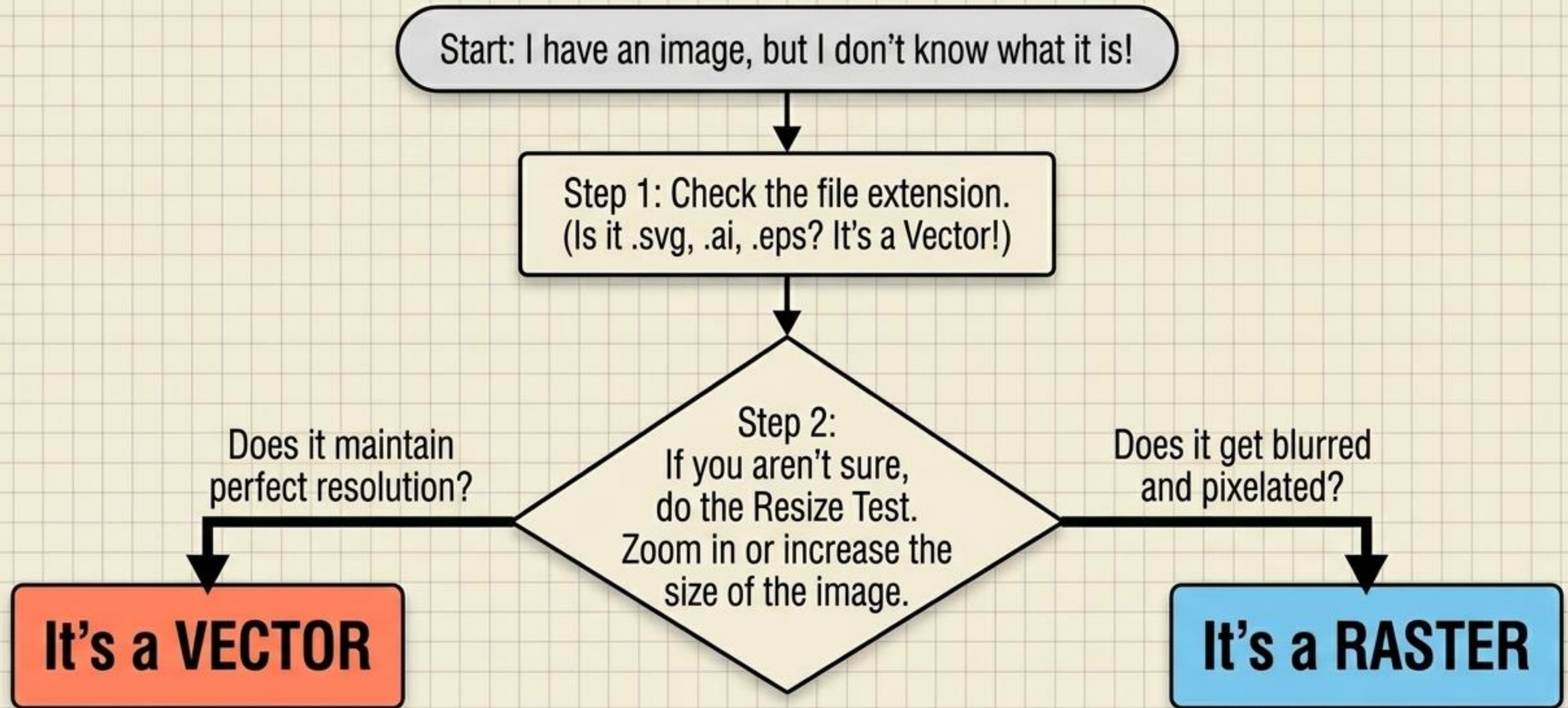
FAQ: The PDF Wildcard

Is a PDF a raster or a vector?



Most of the time, PDFs act as vector files. However... it completely depends on how it was created! If you create a PDF using a raster-based program like Adobe Photoshop, it will be saved as a raster file. The file adopts the nature of the software that created it.

FAQ: How to test your image



The Ultimate Comparison Matrix

Feature	Raster	Vector
Made of	Pixels (tiny color squares)	Math (lines, curves, fixed points)
Resolution	Loses quality (gets pixelated)	Infinite (never loses quality)
Best for	Photos, complex light/shading	Logos, illustrations, scalable art
File Size	Larger (millions of pixels)	Lightweight (math formulas)
Top Software	Adobe Photoshop (.psd)	Adobe Illustrator (.ai)
Common Files	.jpg, .png, .gif, .bmp, .tiff	.svg, .eps, .dae, .ps, .emf