



VECTOR IMAGERY

Basics on Working with Objects

Before using a draw application, the artist should prepare properly by learning the fundamental characteristics of draw images. A mathematical formula describes several characteristics of the draw object. The artist can edit each component of the formula at any time. This description functions as the object's blueprint: a specific set of instructions used to recreate the object on screen or for printing. The formula describes characteristics of the object, including the following:

- Exterior shape and size;
- Any exterior line characteristics (width, color, pattern, and color characteristics);
- All interior fill characteristics (color, color characteristics, and pattern); and
- Location on the page (x, y coordinates and stacking order).

Draw graphics are created like constructions or assemblages. They are collages of two dimensional, independent shapes. The objects are located in different positions on the picture plane, or computer screen. Working with draw is similar to working with shapes cut out of paper and words and pictures torn from newspapers and magazines. When creating a traditional collage, these shapes are arranged and rearranged on a flat surface. Each piece of paper is complete, a single object. They partially overlap one another, stack on top of each other, or completely cover one another. If the collage doesn't look right, the artist rearranges the elements by placing different pieces on top of others. Like a traditional collage, all computer objects are present in the file description, whether they are partially visible or completely obscured.

In a draw application, this overlapping is called the stacking order. In draw, each object resides on an invisible plane parallel to the picture plane. The stacking order refers to the order in which these invisible planes are placed. Since these planes are invisible, all objects are seen simultaneously. Objects are displayed in a horizontal orientation—front to back.

Note: The stacking order is different from the system of layers available in Illustrator. Each layer has its own stacking order.

The Benefits of Vector

An artist can revise or edit draw objects easily by replacing the portion of the formula that describes the outline with a different outline description. Once the artist correctly draws and places the shapes, choosing the Group command unites the shapes as a single element. The artist relocates the group as a single object rather than as several individual ones. The Lock command goes one step beyond grouping. The artist cannot accidentally edit or relocate a locked object. The artist can impose the Group and Lock commands separately or in tandem and can remove them at any time. Grouped objects are easy to reposition. Locked objects are protected from all unwanted changes. Both commands facilitate efficient image creation. Once the graphic is complete, removing these commands decreases the amount of information the printer must process.

The artist can accurately transform objects since shapes are created on a horizontal and vertical axis that can be resized, rotated, reflected, or sheared by a transformation command or tool. Redrawing the original shape as a believable transformation of the original requires accurate plotting. The shape's characteristics—exterior outline, line width, and fill pattern—must remain true to the original. Since higher resolution printers can more accurately plot shapes, transformed objects reproduce more precisely on this finer grid.

Resolution is not part of a draw object's file description. The file description plots the shape according to its characteristics to any output or video display resolution. If the file is output to a high-resolution printer, such as an image setter, or a low-resolution printer, such as a dot-matrix printer, the final output of each looks dramatically different. The high-resolution printer outputs shapes with smooth edges, and a low-resolution printer outputs shapes with

jagged, stair-stepped edges. The file description remains unchanged and unaffected. When outline fonts are used in a draw application, the edges of the letters are smooth in accordance with the printer's resolution.

Postscript Draw

As discussed previously, draw applications are object oriented. More specifically, they are vector-based applications. A vector is a line created by connecting two or more points. The completed line is a single object. The mathematical formula for a straight line plots the location of two points (a and b) and connects them with a straight line. Point A is located at one end of the line and point B is at the other. A square, on the other hand, has four points connected by four equal length straight lines. Adjacent lines are perpendicular at each point. The point's location determines the angle and length of line that connects it to another point.

Adobe Illustrator's PostScript draw capabilities follow the vector explanation but introduce finer controls. The PostScript page description language uses Bezier (BAY-zee-ay) mathematical principles to calculate and manipulate lines. According to Bezier principles, a single line is actually a series of connected points. The entire line is referred to as a path. In Illustrator, the path is composed of points, called anchor points, and segments. A segment joins two anchor points. The simplest Bezier line consists of two anchor points and a connecting segment. Since these anchor points are on either end of the path, they are also called endpoints. A Bezier line with a distinct beginning and end is called an open path. A Bezier line with no distinct beginning and end (no endpoints) is a closed path.

A path consists of multiple points connected by segments. The overall appearance of a path, how it bends and turns, is determined at the anchor points. An anchor point dictates the visual appearance of the segments on either side of it.

Each anchor point comes with a form of manual control so the artist can individually adjust the appearance of each and every segment in the path. Direction points, also called Bezier handles, extend out from each anchor point and determine a segment's curvature. Every point has a maximum of two direction points. A direction point, a small black dot, is located at the end of a straight line that extends out from the anchor point. These lines, called direction lines, are always visible on screen. Dragging the direction point—in and out, or up and down—with the selection arrow changes the characteristics of the adjacent segment.

Illustrator uses two different types of anchor points: corner points and smooth points. All anchor points appear identical to one another on screen. The type of point determines how the direction points move. Since an anchor point joins segments, it is important to use the correct point to make a smooth juncture; every anchor point creates the opportunity for a "blip" in the path—a rough joint. Because of that, it is advisable to use as few anchor points as possible.

Type as Bezier Objects

Object oriented fonts, also referred to, as outline, printer, or scalable fonts, are individual shapes described by mathematical formulas. Type shapes are repositioned, resized, and transformed just like other shapes in draw applications. In Illustrator, the artist can convert letterforms to editable Bezier paths and then manipulate the letterform's points, segments, and direction points, just like any other Bezier object. The letter's interior fill and counter fill (the negative space within a letterform) can even be changed. Many excellent logotypes and "typographs" are based on existing typefaces. A well-designed typographic unit can result from stretching, shortening, and manipulating portions of letterforms.

Create Draw Graphic Efficiently

Efficient creation is the key to a successful draw illustration. If the artist can accomplish the same task with two large shapes rather than four small ones, the two large shapes are more efficient. Draw remembers a mathematical formula for each shape. A formula for recreating one large shape takes less computer memory than the formulas for three small ones. These mathematical descriptions take up space in RAM and on disk. Creating multiple shapes instead of a single large one adds unnecessary complexity to a draw file and requires the printer to process unnecessary steps when preparing an illustration for printing.

Use complex draw effects, such as gradients, intricate patterns, and complicated fills, prudently. The computer executes gradients in a jiffy. The slowdown occurs when the file goes to the printer. The printer must execute the mathematical calculations for each and every gradient, pattern, and shape. The computer has provided access to a wide range of graphic possibilities, but the printer bears the brunt of their overuse.

Remember: Just because it can be done doesn't mean it should be done. Use sound artistic judgment.