1. Complete the directions using the text on pages 2, 3, and 4 of this document.
2. Save this document and name it Columns
3. Make the following changes to the document:
   a. Change to the Print Layout View.
   b. Select the title and then change the font to 18-point Times New Roman bold.
   c. Select the text in the document from the beginning of the first paragraph (begins with Graphics are pictures) to the end of the document. With the text selected, make the following changes:
      i. Change the font to 11-point Times New Roman
      ii. Change the line spacing to single
      iii. Format the text into two newspaper columns by click the Columns button on the Standard toolbar, moving the arrow pointer down and to the right until two columns display with a dark blue background on the Columns grid (and 2 Columns displays below the grid), and then clicking the mouse button.
   d. Deselect the text
   e. Select and then bold each of the headings (Early Painting and Drawing Programs, Development in Painting and Drawing Programs, and Painting and Drawing Programs Today).
   f. Insert 6 points of space before and after each of the three headings in the document (Early Painting and Drawing Programs, Development in Painting and Drawing Programs, and Painting and Drawing Programs Today). Hint: Do this with the before and after options at the Paragraph dialog box.
   g. Format the document to have even columns.
   h. Save your document.
GRAPHICS SOFTWARE

Graphics are pictures, still and moving, such as illustrations, photographs, animations, and films. In 1963, Ivan Sutherland, a graduate student at MIT, created the first graphics program for small computers. Sutherland’s Sketchpad, which ran on a minicomputer and used a light pen to draw lines on a screen, was the first of a long line of graphics software programs that have revolutionized commercial and, to some extent, noncommercial illustration and design.

Early Painting and Drawing Programs

In the early days of personal computing, software developers created two types of programs for producing computer graphics. Bitmap-based or raster image-based graphics programs, commonly called painting programs, allowed users to create pictures by changing the pixels, or picture elements, on the screen from white to black. Object-based or vector-based graphics programs, commonly called drawing programs, allowed users to construct pictures by creating, editing, and combining mathematically defined geometric shapes.

Eventually, color and grayscale versions of both painting and drawing programs were developed. Early painting programs were great for free-form sketching, but because of their low resolution, corresponding to the limited dot-per-inch (dpi) resolutions of computer screens, they tended to produce work with a jagged, or pixelated, look along slopes or curves.

Developments in Painting and Drawing Programs

The pixelization problem in painting programs was resolved in two ways. First, as the RAM and storage capacities of personal computers grew, raster image-processing programs were created that could handle images with a greater number of dots per inch.
Today’s high-end raster image programs can handle full-screen images at 2400 dpi or higher in 16.7 million different colors. Another solution to the pixelization problem was the development of antialiasing, whereby pixels along the edge of an image are progressively lightened or darkened to produce the effect of a smooth edge.

The difficulty of producing irregular forms in drawing programs was resolved by the introduction of bezier curves. A bezier curve is a straight line or a curve that is described by its tangents—straight lines that are perpendicular to and bisect the line. Programs using bezier curves create curved lines, join them together, and modify the curvature of lines by manipulating tangent lines connected to points on the curves. The next great innovation in drawing programs was the introduction of freehand tools, which allowed users to draw an irregular line on the screen that was then automatically transformed into bezier curves that could be adjusted.

Painting and Drawing Programs Today

In the early days of personal computers, choosing among graphics programs was simple. One could use a painting program or a drawing program. The former was a good choice for producing graphics with irregular shapes. The latter was a good choice for producing graphic containing lots of regular geometric shapes, such as pie charts, bar graphs, and geometric figures. Today, distinctions between painting and drawing programs have blurred considerably because high-end drawing programs contain both drawing and painting features. Relatively simple painting and drawing programs are still available such as Microsoft Paint, which is bundled with the Windows 95 operating system. Professional computer illustrators generally work, however, in some more powerful and sophisticated programs.