CHAPTER 1 - ONE-POINT LINEAR PERSPECTIVE

The term “perspective” might simply be defined as the way an artist or an engineer represents the real, three-dimensional world on a flat, two-dimensional surface. The proper understanding and use of the principles of perspective was a problem that haunted artists from the most ancient times to the age of the Renaissance.

Prior to the discovery of linear perspective, artists used several techniques to represent depth. Early works of art often depict figures and landscapes moving upward as opposed to backward into space. Artists used the techniques of overlapping, decreasing size, and atmospheric perspective even up to 1,000 years ago. The discovery of the theory of one-point linear perspective is generally attributed to Filippo Brunelleschi. His “invention” is dated approximately 1420. This idea spread with the publication of Leone Battista Alberti’s treatise De Pictura (On Painting). He made the method simpler and readily available to the masses.

Objective

Develop an understanding of one-point perspective.

Vocabulary

Perspective
Linear Perspective
Atmospheric or Arial Perspective
Picture Plane
Vanishing Point
Orthogonal
Visual Perspective
Fresco
Mosaic
Vertex
Foreground

Good illustrations of historic attempts to capture a three-dimensional effect in one-point perspective may be found in Art History texts, slide libraries or on the World Wide Web, and would certainly include such typical examples as:

Prehistoric cave paintings, Lascaux, France, 15,000 – 13,000 B.C. (http://www.culture.gouv.fr:80/culture/arcnat/lascaux/en/) in which the background legs of certain animals are “cut off,” or horns of animals seen in profile are “twisted” so that both are visible.

The Pool in Nebamun's Garden, Thebes, 1450 B.C. (http://www.thebritishmuseum.ac.uk/explore/highlights/highlight_objects/aes/a/a_garden_pool_fragment_of_wal.aspx) an Egyptian fresco in which the pool is represented as a flat rectangle seen from above, with the surrounding trees "flattened out" on all four sides.

Any of the "flattened" representations of people in Egyptian art
http://www.netserves.com/moca/lectures/skuzegyp.htm

Roman frescos and mosaics in which depth effects are attempted, such as the *Rehearsal of a Satyr Play* mosaic, 62-79 A.D., (http://www.darlington.k12.sc.us/dmc/Visual%20Arts/Fine%20Art/rom.htm)

The Battle of Issus mosaic, 1st century B.C., (http://sights.seindal.dk/sight/1098_Mosaic_of_the_Battle_of_Issus.html)

Oblique projection, such as we find in Japanese and Chinese art, in which all "depth" lines (orthogonals) are parallel instead of meeting at a vanishing point.
http://www.japaneseart.org/exhibition/Exhibition.htm
http://www.chinapage.com/tang01.html

Ambrogio Lorenzetti, *Good Government in the City*, Palazzo Pubblico, Siena, 1338-40. This reveals the artist's desire to create a perspective effect without understanding the principles.
http://www.kfki.hu/~/arthp/html/l/lorenzet/ambrogio/governme/2effect1.html

Leonardo da Vinci, *Last Supper,* Santa Maria delle Grazie, Milan, 1495-98. This is a perfect example of one-point perspective. Some Art History texts reproduce this image with lines superimposed to demonstrate its application here.
http://en.wikipedia.org/wiki/Image:Leonardo_da_Vinci_%281452-1519%29_-_The_Last_Supper_%281495-1498%29.jpg

Many other Renaissance artists made dramatic use of one-point perspective, such as:

Tintoretto, *The Last Supper*, 1592-94.
Piero della Francesca, *An Ideal City*, 1470.
Raffael, *Marriage of the Virgin*, 1504.
Perugino, *Christ Giving the Keys to St. Peter*, 1480-81.
Andrea Pozzo, *Glory of St. Ignatius*,
Hobbema, *The Avenue at Middelharnis*, 1689.
Saenredam, *Interior of the church of St. Odulphus at Assendelft*, 1649.
Lorrain, *The Disembarkation of Cleopatra at Tarsus*, 1642-43.
Jan Vermeer, *The Music Lesson*, 1670.
Robert Campin, *Merode Altarpiece*, 1427.

Exercise 1

Materials needed for exercise:
Several sheets of Graph paper (8-1/2 x 11-inch format, grid 4 x 4 to the inch),
A straightedge
Sharp No. 2 pencils
An eraser

Steps:
1. Take a clean sheet of graph paper and lay it length-wise on your work-table (Figure 1.1). This sheet now represents the "picture plane" or "window" upon which you will create your first perspective drawing. Using your straight-edge and pencil, begin by drawing a horizontal line through the approximate center of your graph paper, and place a small but visible dot at the very center of that line. **(Figure 1.1)** This line becomes the "Horizon Line," (line HL) and the point becomes the "Vanishing Point" (V). We use the term "Horizon Line" in perspective because this line represents the place where earth and sky meet. In an outdoor landscape painting, this line is usually quite visible, but in an interior scene it is not. Still, a Horizon Line is implied, and necessary to produce a true perspective. Houses, trees, and other objects may be placed in front of it, but the Horizon Line is always there! The purpose of the "Vanishing Point" will become clear.

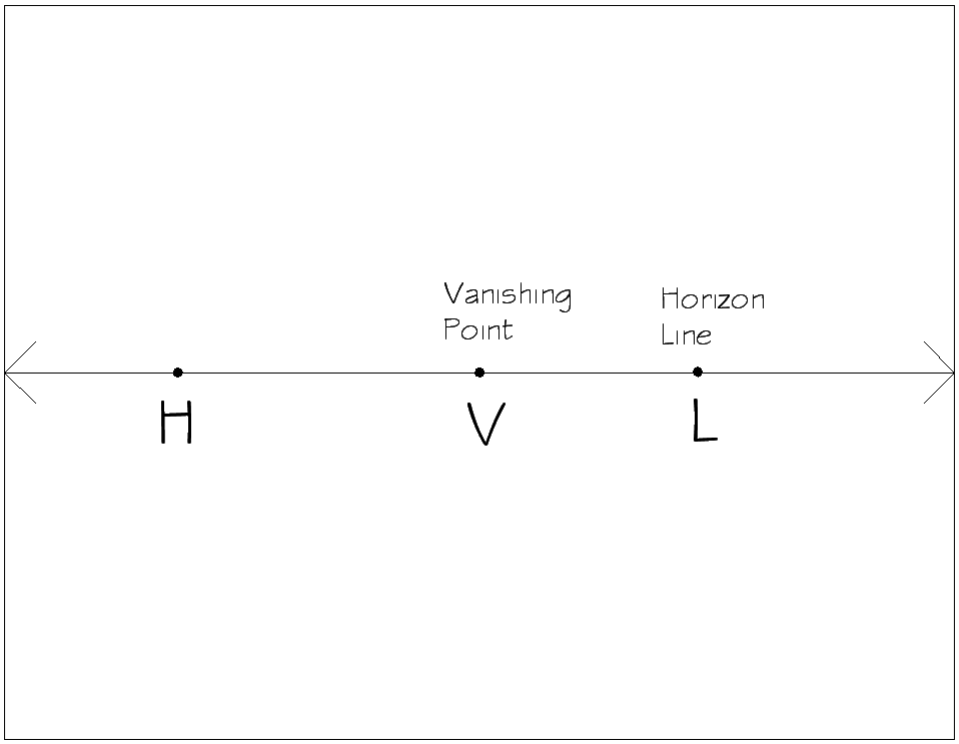

Figure 1.1

2. Guided by the square grid lines on your graph paper, draw a vertical rectangle to the left side of the picture plane and which incorporates line HL, labeling the vertices, A, B, C, and D. **(Figure 1.2)** The size of your rectangle does not matter, but every line should be drawn using your straightedge and the gridlines of the graph paper. There are many rules to be followed in perspective drawing, and the "artistic freedom" found in other art forms only comes much later in perspective drawing, when these rules are fully mastered.

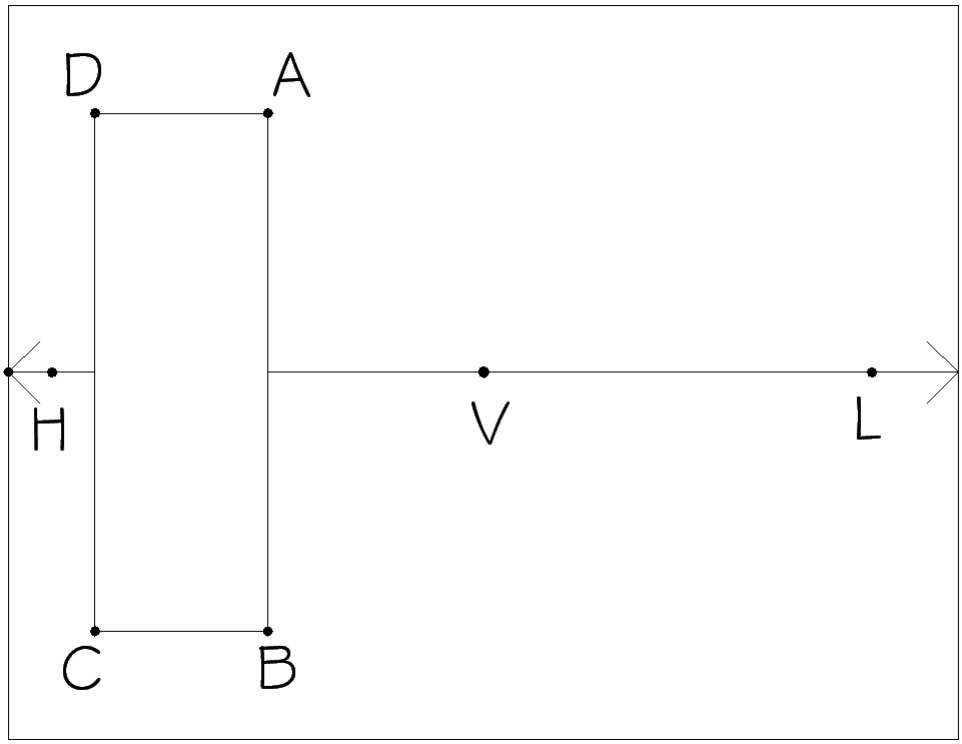

Figure 1.2

3. Once you have completed your rectangle, erase the portion of line HL that the rectangle covers. Imagine now, that this rectangle is the front of a box, or a building. But as it is, it is nothing more than a flat surface. We must be able to "see" at least one side of this box in order to give it a "three-dimensional" effect.

4. To do this, certain lines must be drawn from points A and B on the rectangle to point V, our vanishing point. **(Figure 1.3)** All lines that move toward the vanishing point are called "orthogonals." Our "building" now has a side, but it is a very long side, going on to infinity! Can you picture this side as a long wall going to the vanishing point? If you can you are on your way to conceptualizing in three dimensions.

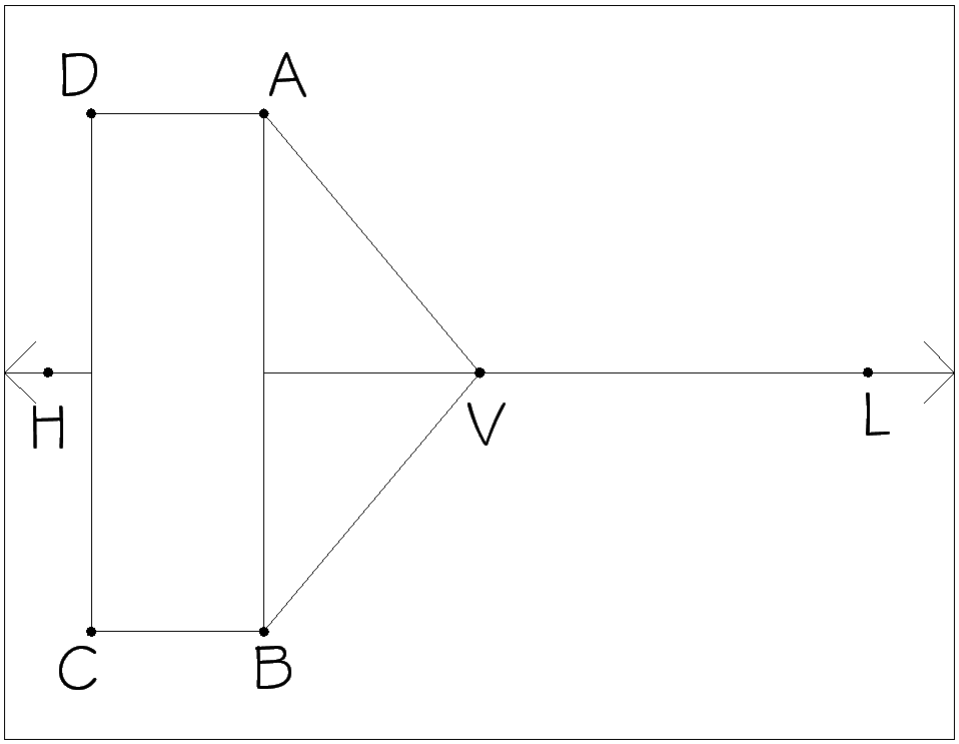

Figure 1.3

5. We don't want this side to go on forever, so we must decide how big we want the building to be and construct a line segment perpendicular to line HL and parallel to line segment AB just to the left of the vanishing point P. The endpoints of this line segment should be labeled E and F. The portion of the horizon line running through the front of your building can now be erased, as well as the portions of both orthogonals that are no longer necessary. **(Figure 1.4)**

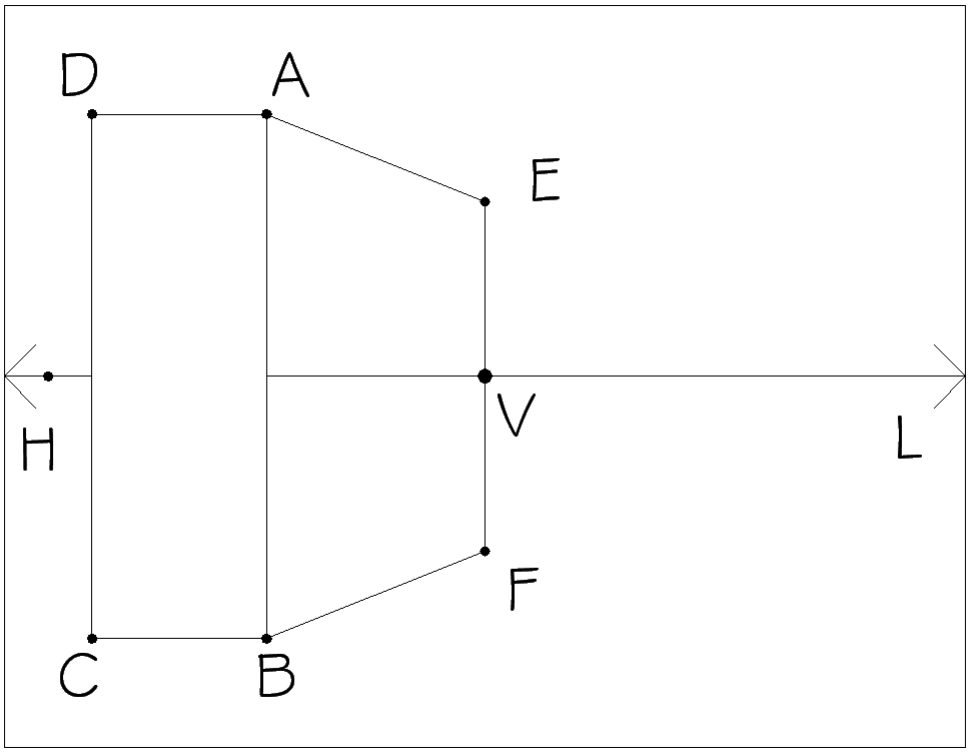

Figure 1.4

6. Now, draw two rectangles on the right side of point V, one above line HL, and the other somewhat below it. A precautionary tip: rectangles drawn too close to the horizon line will be difficult to work with, and will diminish the effect. We will identify these two rectangles by their vertices, GIJK and MNOP. **(Figure 1.5)**

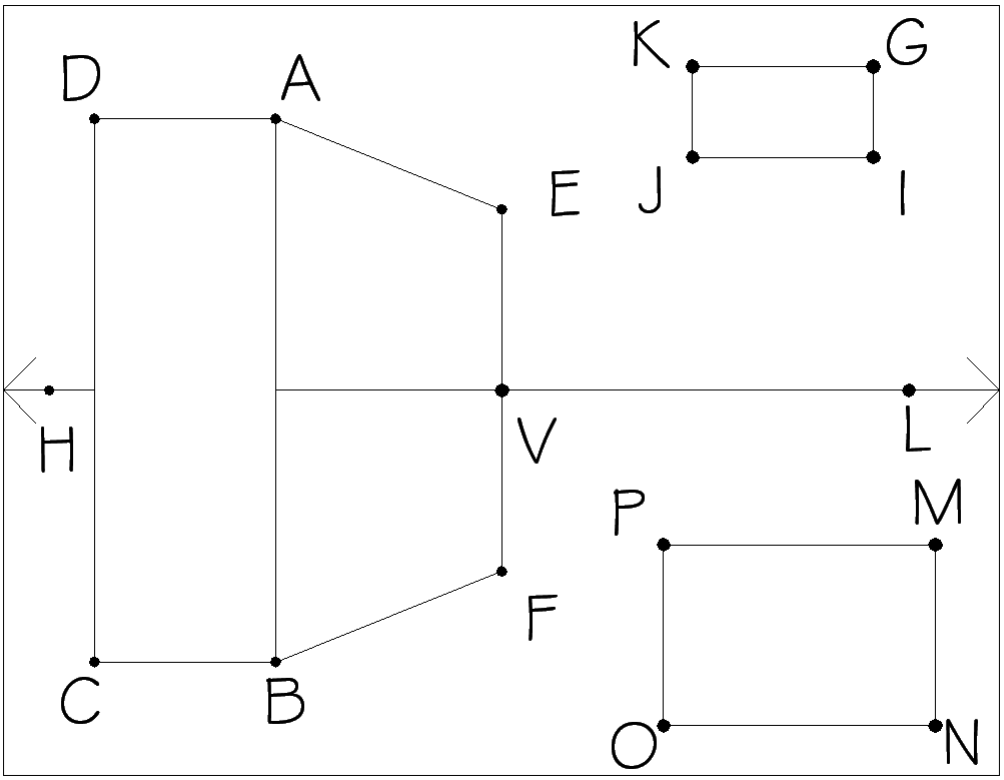

Figure 1.5

7. How are these two rectangles different from the first one we drew? Rectangle ABCD crosses the horizon line, so we cannot see the top of the building we created from it. The top is above our line of vision. The bottom is below our line of vision. Rectangle GIJK is above the horizon line, and appears to be "floating" in the distance. Rectangle, MNOP, is below line HL and appears to be in the foreground. Orthogonals drawn to point V from points I, J, and K and N, O, P will help to create sides for both, a bottom for one and a top for the other. **(Figure 1.6)**

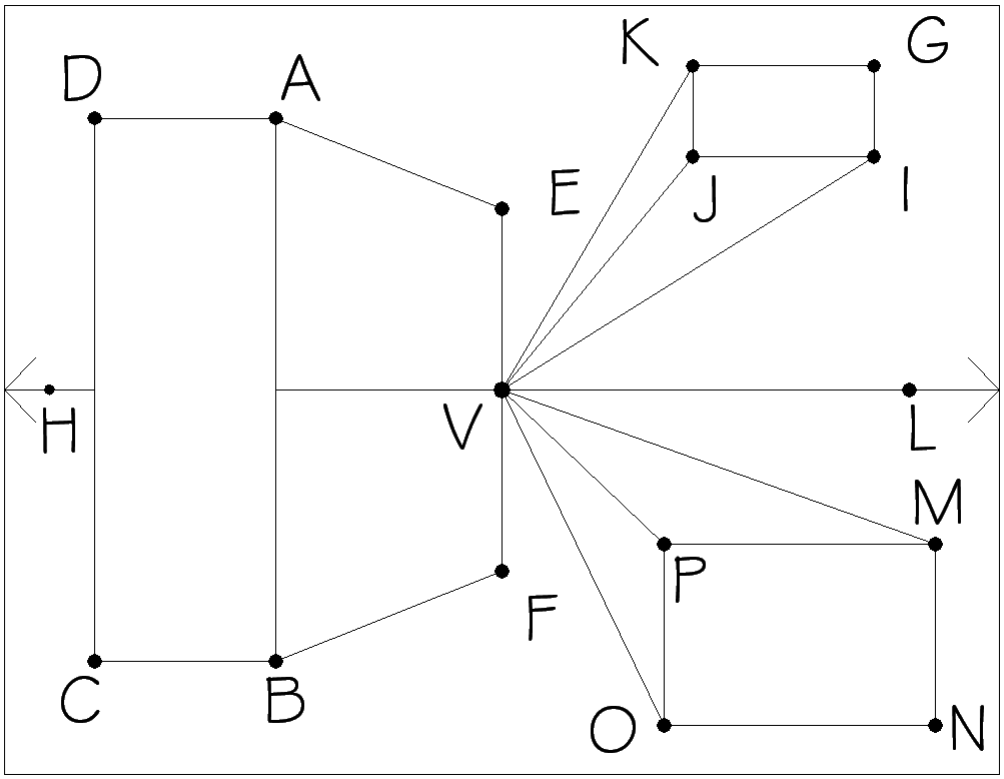

Figure 1.6

8. Since all of these orthogonals appear to go off to infinity, we again need to cut them off at some point. Vertical line QR drawn between orthogonals line segments GV and JV of the one rectangle and vertical line YZ drawn between orthogonals line segments PV and OV of the other will give us the desired sides. **(Figure 1.7)**

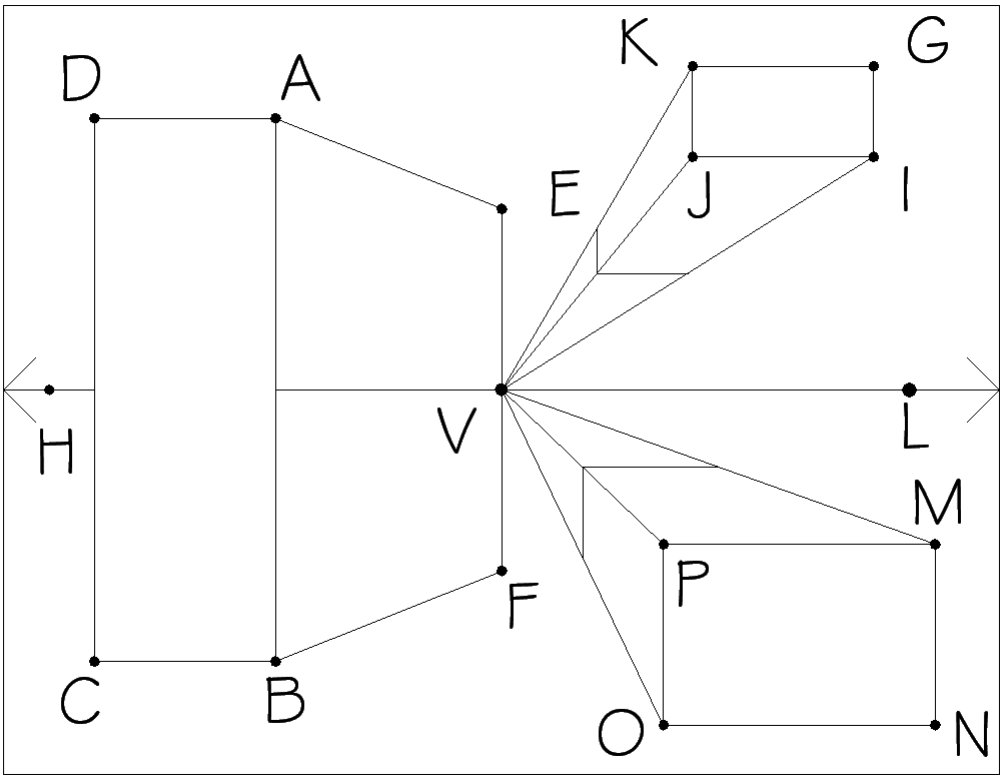

Figure 1.7

9. To complete the boxes, a horizontal line drawn from point R over to orthogonal line segment IV at point S provides us with a perfect bottom to one and a horizontal line drawn from point Y to orthogonal line segment MV will give us a top for the other. We can now erase the remaining portions of the orthogonals that are no longer necessary. **(Figure 1.8)**

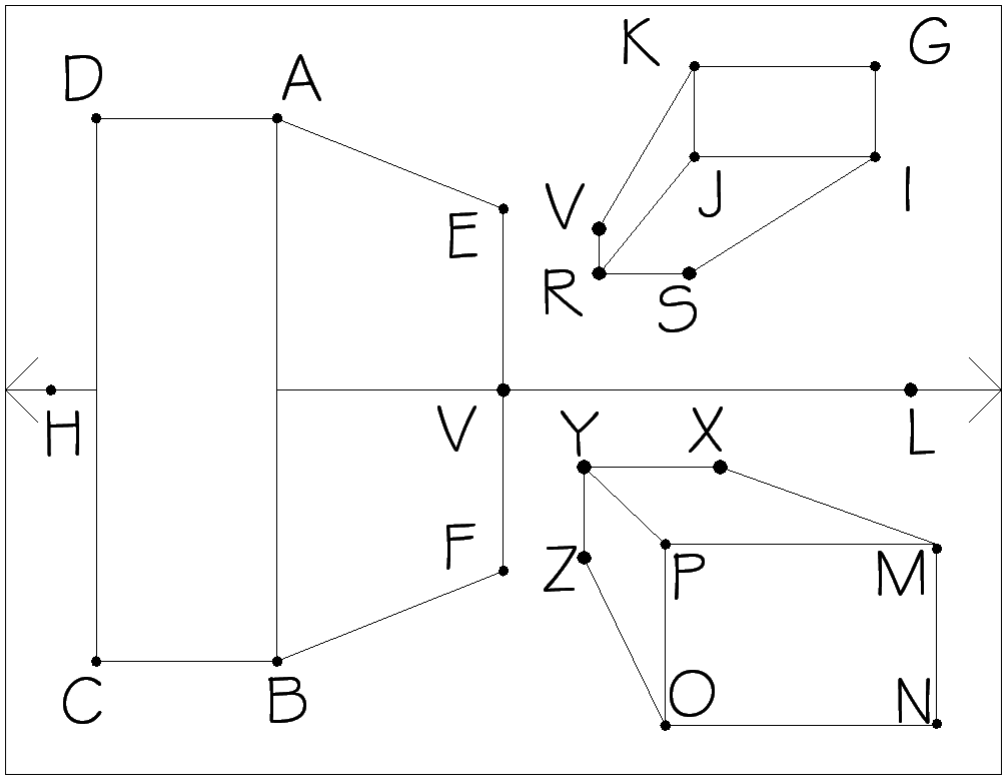

Figure 1.8

*Note that the line segments marking off the top, bottom, and sides of these two shapes are always parallel: line segments YZ to PO and YX to PM, QR to KJ, and KG to JI. Drawings in one-point perspective are always facing front, running parallel to the picture plane. Such drawings will be made up of three types of lines: verticals, horizontals, and orthogonals. The sides, tops, and bottoms of these rectangular shapes will be indicated by orthogonals going back to a common vanishing point. Now that you have completed these three "boxes," turn your work up side down just to see how it looks!

Additional Exercises:

1. Students can visualize their classroom in one-point perspective by taking turns standing at the center front of the room (that is, if all the desks are arranged in rows). Take an instant photo from this point, and note in the picture how all the orthogonals go to the same vanishing point by using a straight-edge. (After completing the Two-point Perspective exercises in chapter 2, repeat the same demonstration from a corner of the room, and note how the orthogonals will go off both sides of the photo.)

2. Stand on a chair in these same positions and visualize the room, noting how you can see all of the tops of the desks, etc. Then kneel or sit on the floor with your eyes at desk-level, and note your altered perspective. Lay flat on the floor, and all of the desks (and the other students) will loom over you, like giant shapes or monsters.

3. For an interesting experiment in perspective, try using the old artist's trick of closing one eye and using your thumb as a gauge of size. Close one eye and look at someone a few feet away. Using your thumb and forefinger as a gauge, visualize the "size" of another person's head between these two fingers and measure this distance with a ruler. Then do the same experiment by looking at the head of a more distant person. Again, measure the distance between the fingers and compare this measurement with the earlier one. In perspective, as in the real world, objects that are closer appear larger, and those farther away appear proportionately smaller.

4. An exciting exercise in one-point perspective is to create a "street scene," drawing in a number of buildings of different heights along the picture plane, with a central street going off into infinity. **(Figure 1.9)** The enthusiastic student will want to put doors and windows on the buildings, and perhaps even introduce trees, people, automobiles, and other objects. Such additions will be proportionately correct if drawn along the picture plane, but if drawn further back into the scene will require more advanced formulas of perspective drawing not covered by this section. In this case, both student and instructor are encouraged to refer to one of the excellent books on basic perspective listed in the Bibliography.

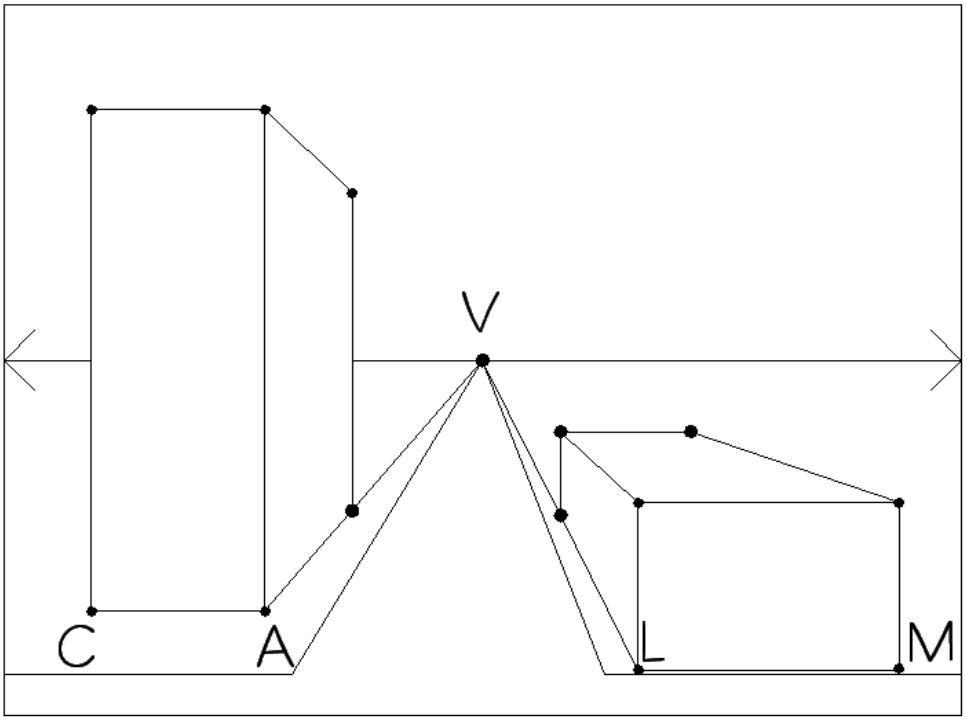

Figure 1.9