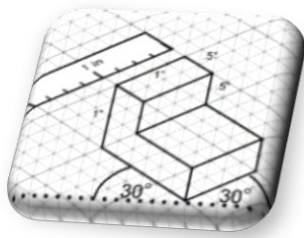


UNIT 2.2: TECHNICAL DRAWING (ISOMETRIC)

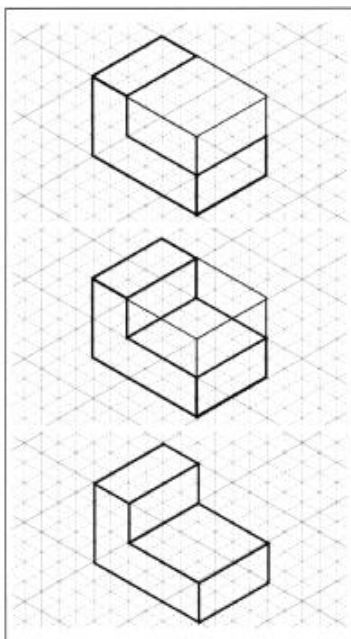
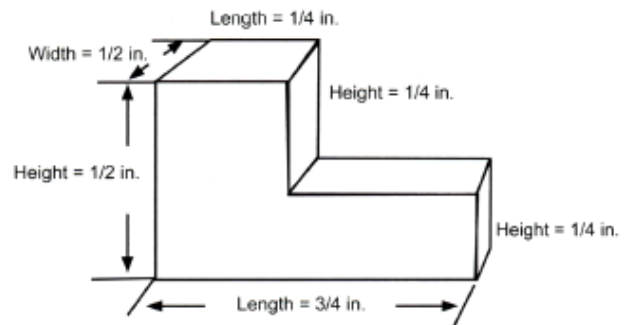
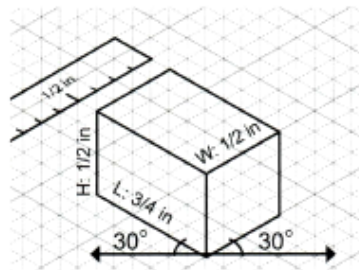


Remember that **isometric** drawings show the front, top, and right-side views, and all lines are drawn to scale. The word “isometric” is from the Greek, meaning “equal measure.” Depth is shown by slanting the edges up at 30° angle from the horizontal. This type of drawing is especially useful to engineers because it shows depth, and each line is drawn to scale.

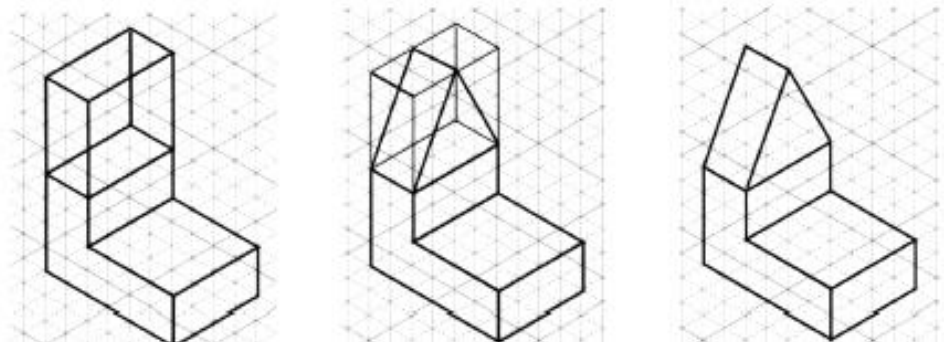
How to Make an Isometric Drawing

To make an isometric drawing, start with an orthographic drawing or with the object itself. One method is a “reductive” method which involves drawing a “bounding box” around what will ultimately become the final drawing and “cutting away” the unnecessary parts.

1. Measure the overall length, width, and height, and use isometric graph paper to draw a scaled 3-D box that will fit the object.



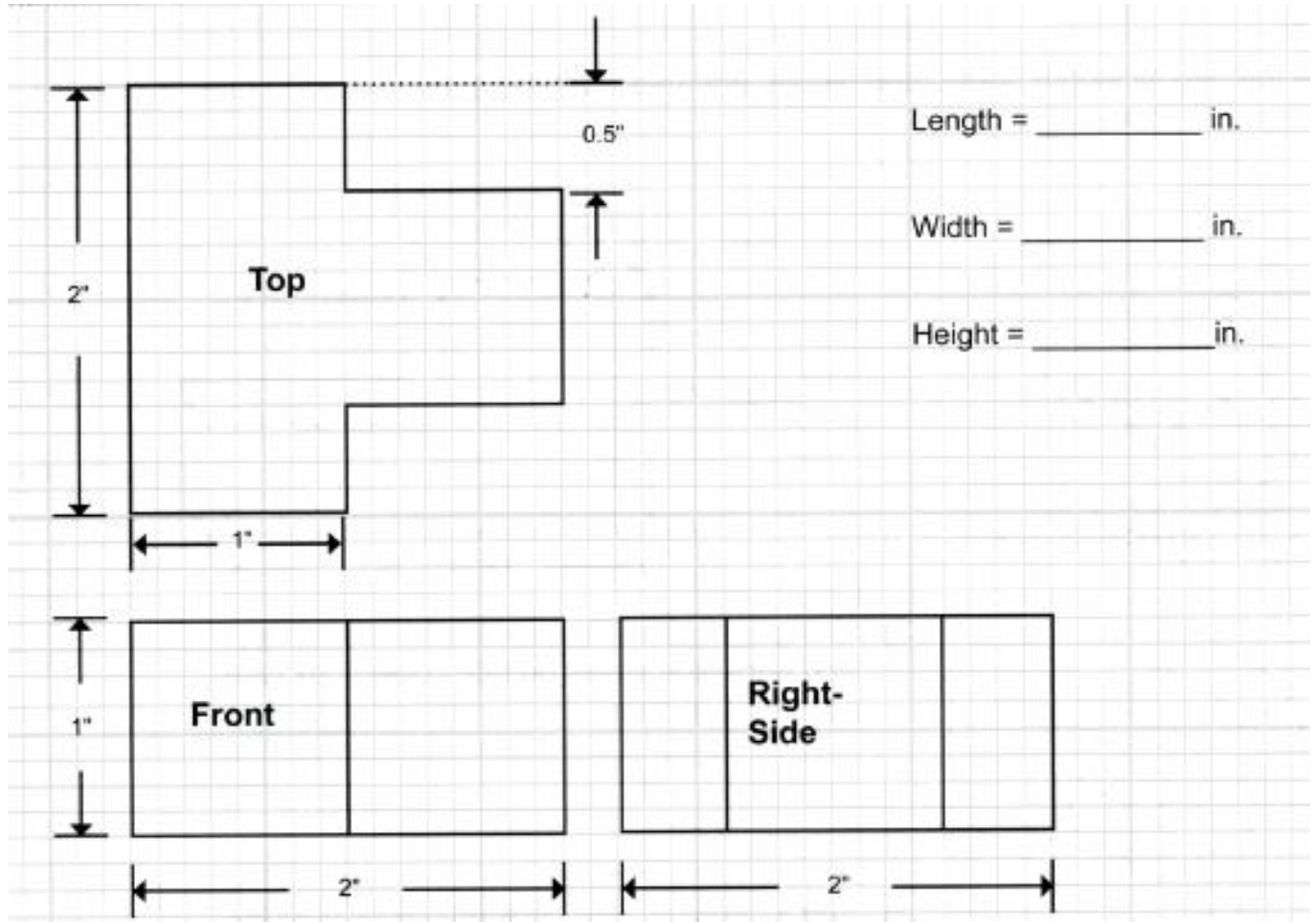
2. Using light pencil lines, draw the front, top, and right side views on this scaled box with construction lines.
3. Add additional lines for further details of the object. As you add these lines, the process might feel a little like sculpting away the material you want removed.
4. Darken the object lines and erase the construction lines to finish your isometric drawing.
5. This technique can be used to add material onto an isometric drawing, making it a very useful way to sketch out ideas quickly!



Practice Using the Reductive Method (Problem #1)

Using the reductive method, convert the following orthographic drawing to an isometric drawing.

Step 1: Determine the total length, width and height of the imaginary bounding box which surrounds the object.



Step 2: Draw a cube which would encompass the object based on the measured length, width and height

Step 3: Connect all interior lines while following the lines on the isometric paper

Step 4: Erase the bounding box lines which are not part of the object

Check this box when you have completed this drawing and then proceed to the next page.



Tips for drawing isometric drawings

- Start at the lowest point of the object and place it in the lower section at the center of the page.
- All horizontal lines on the original object will be drawn at a 30° angle.
- All vertical lines on the original object will be drawn vertically.

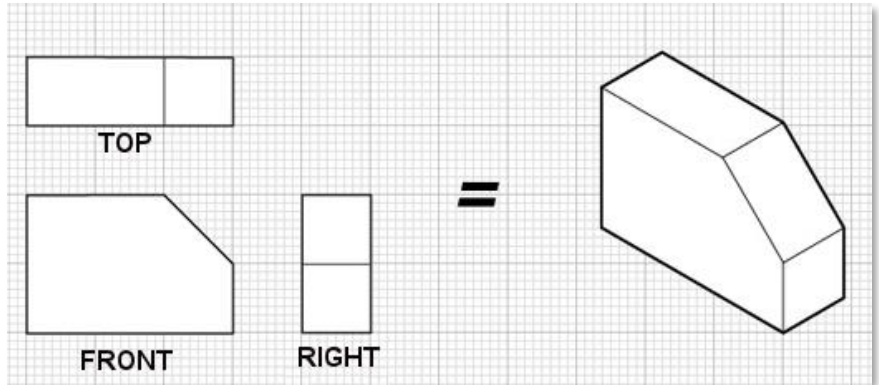
The Additive Method

The second method is an “additive” method in which you start at a single point – usually the lower right point between the front and right sides and draw one line at a time, moving from front to top to side, until it takes shape. Your ability to use this method may be determined by your ability to visualize. Even if you have difficulty now, you will likely be able to develop this ability over time.

Both methods are valid and you can choose whichever works for you or whichever makes the most sense for the object in question.

Observe the drawing to the right. Can you see how they are simply two different ways of looking at the same

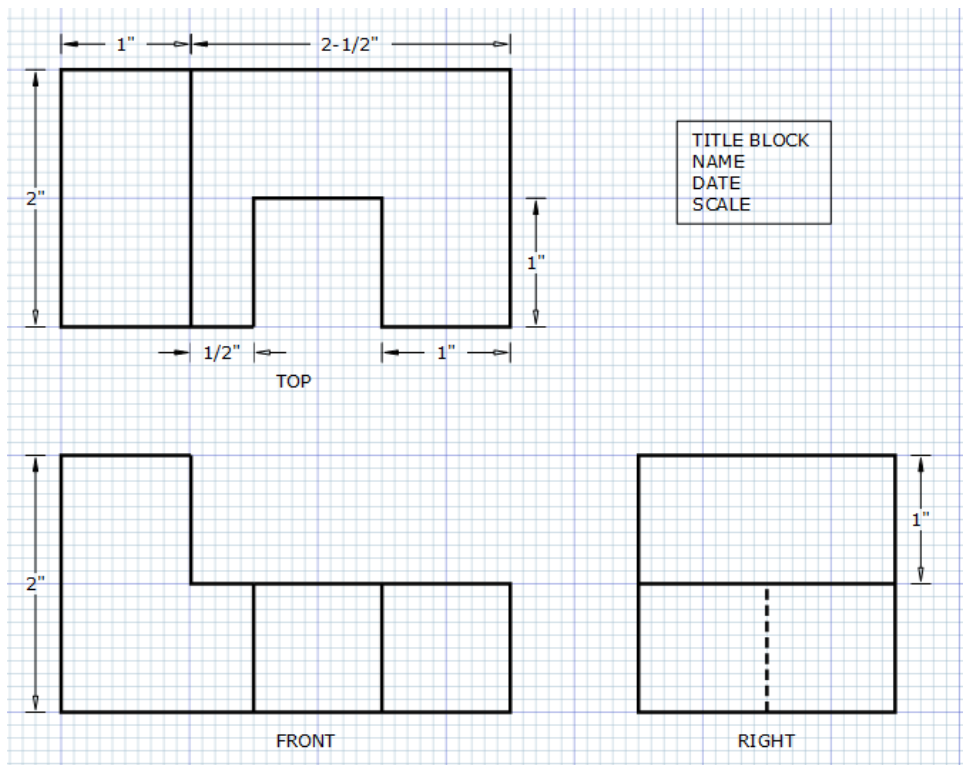
object? Can you see which lines correspond to each other on both drawings? Can you see that you can draw the angle without creating a bounding box simply by leaving it for last and joining the remaining lines? You could use an additive or reductive method on this one.



Practice Using the Additive Method (Problem #2)

Convert the following orthographic drawing to isometric drawing using the additive method.

- Use a separate sheet of isometric paper.
- Remember to add dimensions and a title block.
- Assume that each **major grid line** is equal to one inch.
- When complete, attach it to this document.



Check this box when you have completed this drawing and then turn it in for credit and proceed to the next page.



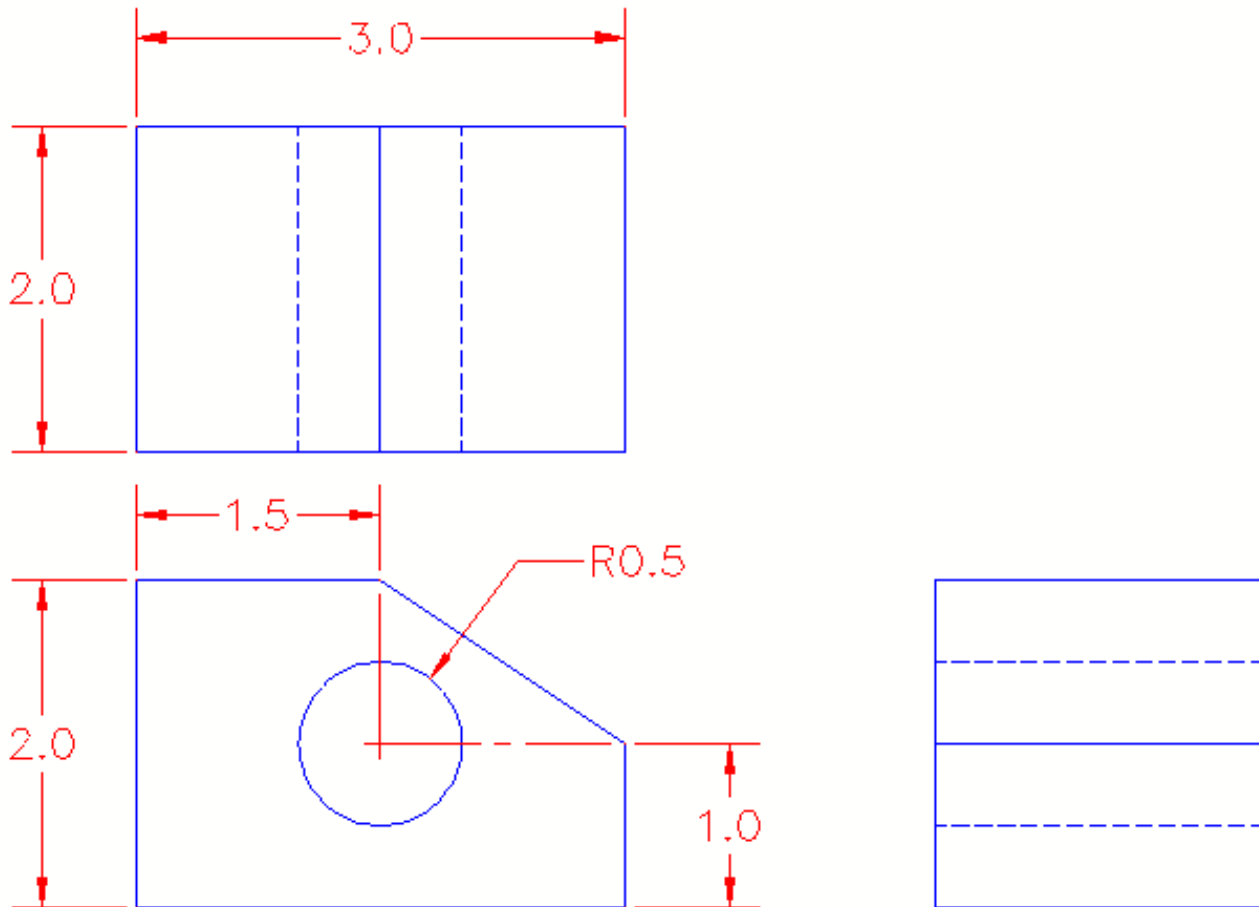
Isometric drawing practice #3

Convert this orthographic drawing to an isometric drawing showing front, top and right sides. Be sure to include labels, dimensions and a title block.

When you are finished, bring it to me and I will check it. Do not proceed until I have approved your work. Use any method you wish.



Notice there is a hole in this block. Holes held at a 30° receding angle are not round, they are elliptical! Use an ellipse template to make the hole. Your instructor will show you how.



- Use a separate sheet of isometric paper.
- Remember to add dimensions and a title block.
- Dimensions are in inches.
- When complete, bring it to the teacher for feedback.

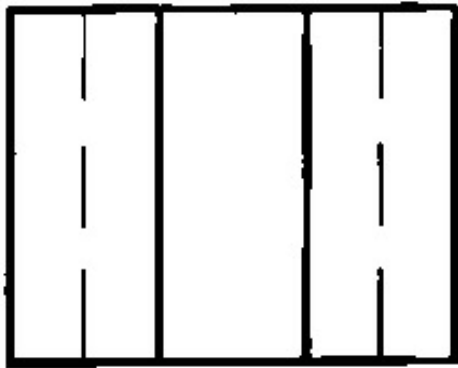
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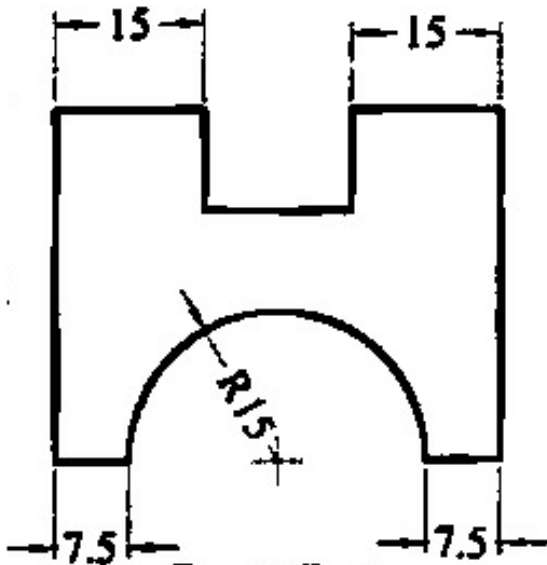
Isometric Drawing Practice #4

Convert this orthographic drawing to an isometric drawing showing front, top and right sides. Be sure to include labels, dimensions and a title block.

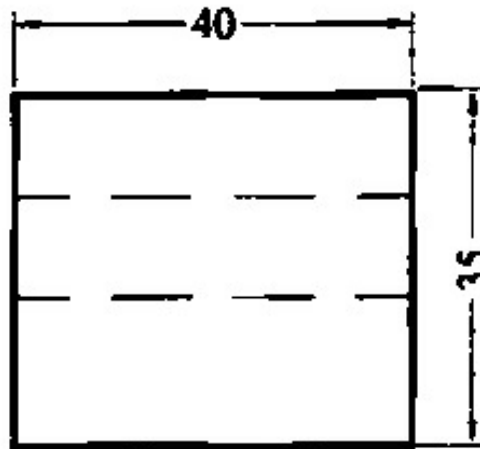
When you are finished, bring it to me and I will check it. Do not proceed until I have approved your work. Use any method you wish.



Top View



Front View



Side View

- Use a separate sheet of isometric paper.
- Remember to add dimensions and a title block.
- Dimensions are in inches.
- When complete, turn it in for credit.

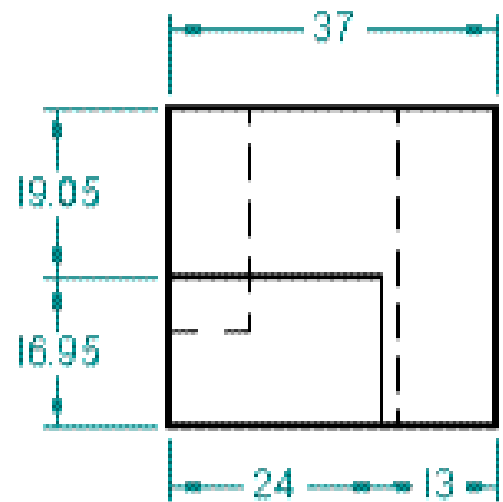
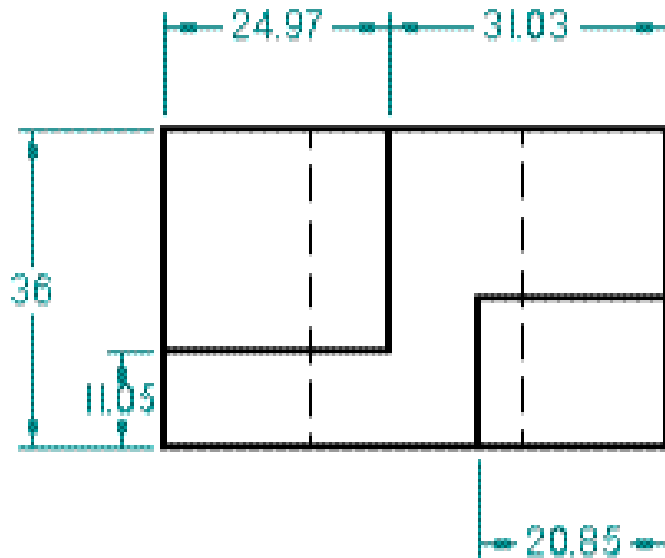
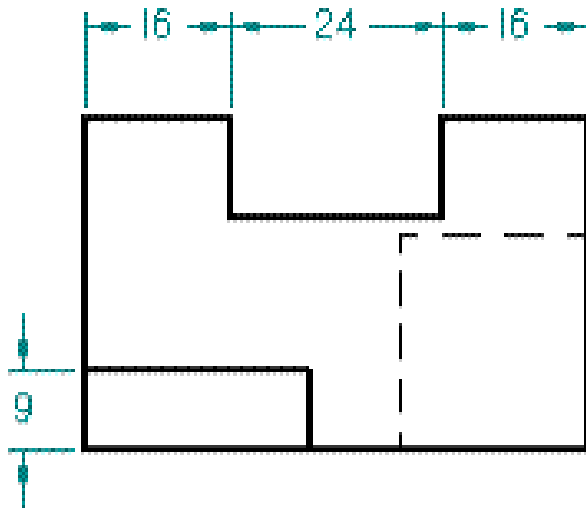
Check this box when you have completed this drawing and then proceed to the next page.



Isometric Drawing Practice #5 (Open Honors only)

Convert this orthographic drawing to an isometric drawing showing front, top and right sides. Be sure to include labels, dimensions and a title block.

When you are finished, bring it to me and I will check it. Do not proceed until I have approved your work. Use any method you wish.



- Use a separate sheet of isometric paper.
- Remember to add dimensions and a title block.
- Dimensions are in inches.
- When complete, turn it in for credit.

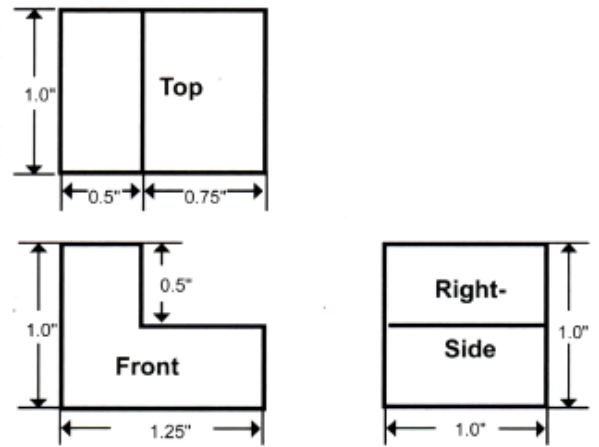
Check this box when you have completed this drawing and then proceed to the next page.



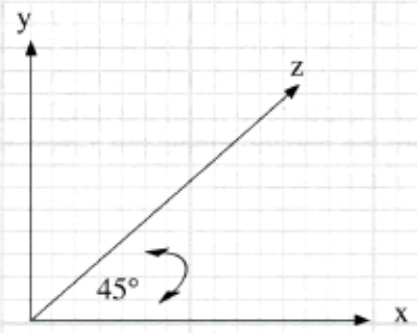
How to Make an Oblique Drawing

Oblique drawings show the front, top, and one side of an object. The front face of the object is drawn as though you are looking at it from the front. Horizontal edges are then drawn back from the front at a 45° angle to give the impression of depth, but these lines are not drawn to scale. Because oblique drawings are not drawn to scale, they are not as useful to engineers as isometric or orthographic drawings.

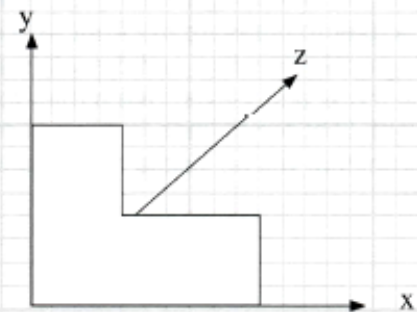
An oblique drawing of an object can be made from its orthographic drawing. Here is the orthographic drawing of an object that was used in previous examples. To convert an orthographic drawing to an oblique drawing, follow these steps:



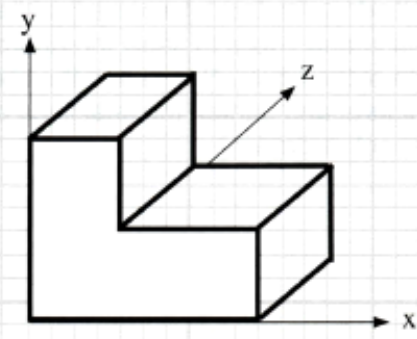
1) Use light pencil lines to draw three axes. Imagine x- and z-axis to be flat on the ground, while the y-axis points straight up. Draw the z-axis 45° from the x-axis.



2) Use a ruler to measure the front side in the orthographic drawing. With light pencil lines, draw this shape using the x- and y-axis. Erase the part of the z-axis behind the figure.



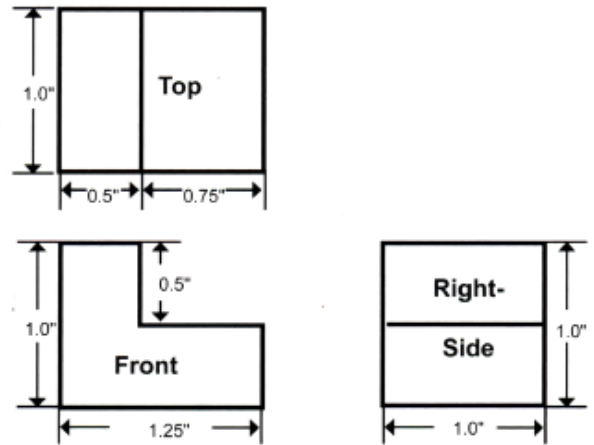
3) Lightly draw lines parallel to the z-axis from each corner of the front that will be visible. These lines should be one half the actual length. Connect the ends of the lines with short lines parallel to the x- and y-axis. Now darken the final lines of the oblique figure.



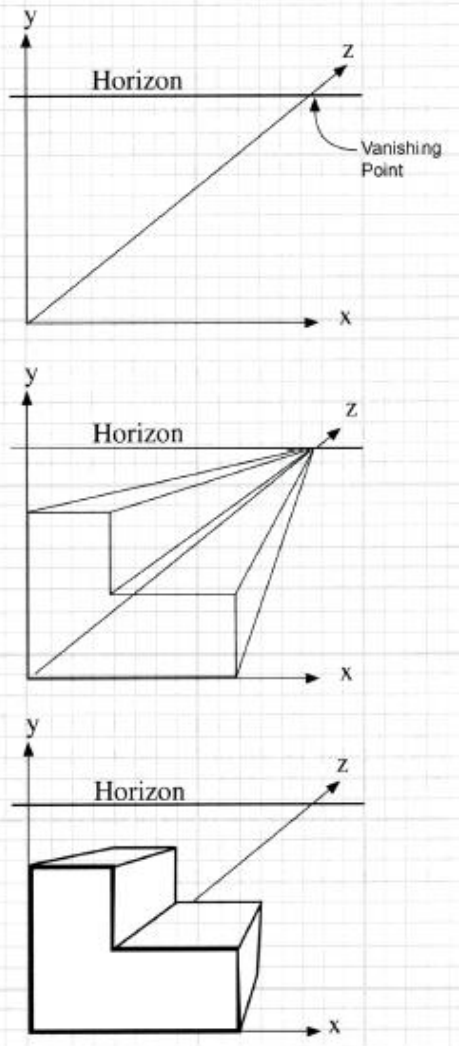
How to Make a Perspective Drawing

Perspective drawings show objects as they would appear to the naked eye, or as they would appear in a photograph. Lines showing depth converge toward an imaginary “vanishing point.” This creates the appearance of distance. Artists and architects like oblique and perspective drawings because they make it easy to picture what buildings and other three-dimensional objects look like in the real world. But, like oblique drawings, they are of limited use to engineers due to the lack of accurate scale.

A perspective drawing of an object can be made from its orthographic drawing. Here is the orthographic drawing used in previous examples. To convert an orthographic drawing to a perspective drawing, follow these steps:



- 1) Use light pencil lines to draw x-, y-, and z-axes. The z-axis can be at any angle. Draw a horizontal line that will be the “horizon” (where the sky appears to meet the land). The spot where the horizon meets the z-axis is called the “vanishing point.”
- 2) As you did in making an oblique drawing, use a ruler to measure the front side in the orthographic drawing, and draw this shape using the x- and y-axis. Use a ruler to draw straight, light pencil lines from each corner of the front that will be visible to the vanishing point.
- 3) Lightly draw horizontal and vertical lines parallel to the x- and y-axis to show the approximate depth of the figure. Now erase the lines behind the figure, and darken the final lines of the perspective drawing.



Choose an object and make a perspective and oblique drawing of that object. Turn it in for credit.