

PICTORIAL SKETCHING

Pictorial sketching is widely used in industry because this type of sketching is easy to read and understand, Figure 7-1. It is also a quick and easy means of communicating technical ideas. Isometric sketching, one of several types of pictorial drawing, is the most frequently used. With the use of pictorial grid sheets and ellipse templates, pictorial drawings can be sketched quickly and accurately.

Viewing Direction

The pictorial sketch may be drawn so the part is viewed from above (bird's eye view), or from below (worm's eye view), Figure 7-2. The part features you wish to show normally govern the viewing direction selected.

ISOMETRIC SKETCHING

All isometric sketches are started by constructing the isometric axes, which includes a vertical line for height and isometric lines to the left and right, at an

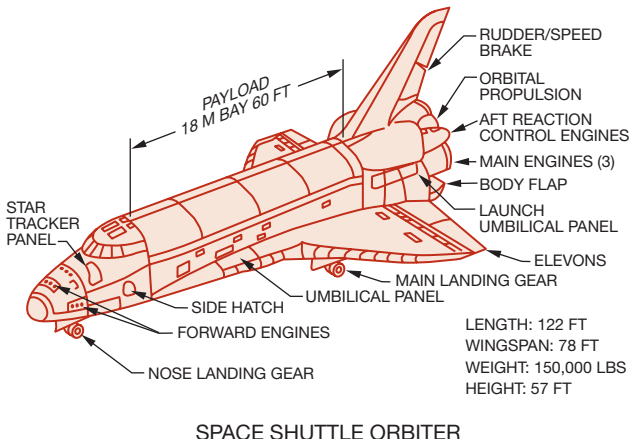
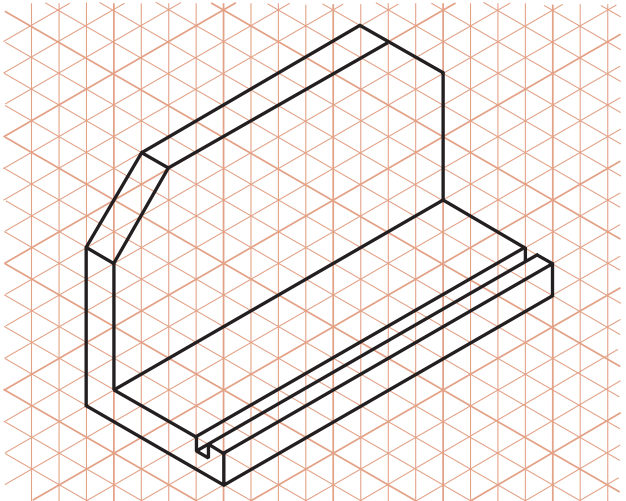
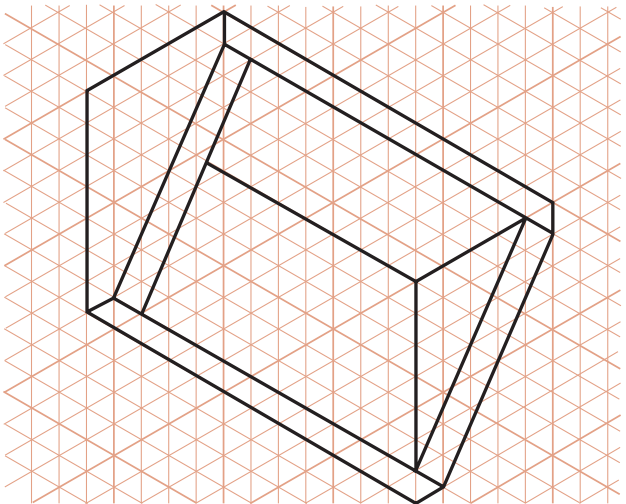


FIGURE 7-1 ■ Application of a pictorial sketch.

angle of 30° from the horizon, for width and depth. The three faces seen in the isometric view are the same faces that would be seen in the normal orthographic views: top, front, and side, as shown in Figure 7-3(A). Figure 7-3(B) shows the selection of



(A) BIRD'S EYE VIEW



(B) WORM'S EYE VIEW

FIGURE 7-2 ■ Viewing direction.

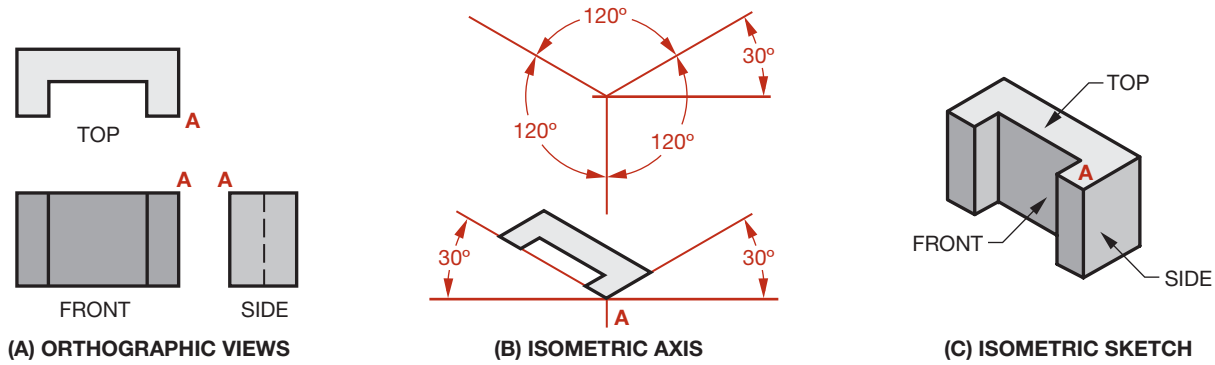


FIGURE 7-3 ■ Isometric axes and projection

the front corner “A” and the construction of the isometric axes. Figure 7-3(C) shows the completed isometric view. All lines are drawn to their true length, measured along the isometric axes, and hidden lines are usually omitted.

Isometric Grid Sheets

This type of isometric sketching paper has evenly spaced lines running in three directions. Two sets of lines are sloped in the direction of the isometric axes. The third set of lines is vertical and passes through the intersection of the sloping lines, as in Figure 7-2. The most commonly used grids are the inch, which is further subdivided into either 4 or 10 equal grids, and the centimeter, which is further subdivided into 10 equal grids of 1 mm. No units of measure are shown on these sheets; therefore the spaces could represent any convenient unit of size.

Inclined Surfaces

Many objects have inclined surfaces that are represented by sloping lines in orthographic views. In isometric drawings, sloping surfaces appear as *nonisometric lines*. To create them, their endpoints, which are found on the ends of isometric lines, are joined with a straight line. Figure 7-4 shows how to construct nonisometric lines.

Circles and Arcs

A circle on the three faces of an object drawn in isometric has the shape of an ellipse, as shown in Figure 7-5. Practically all circles and arcs shown on isometric sketches are made with the use of an isometric ellipse template. The template shown in

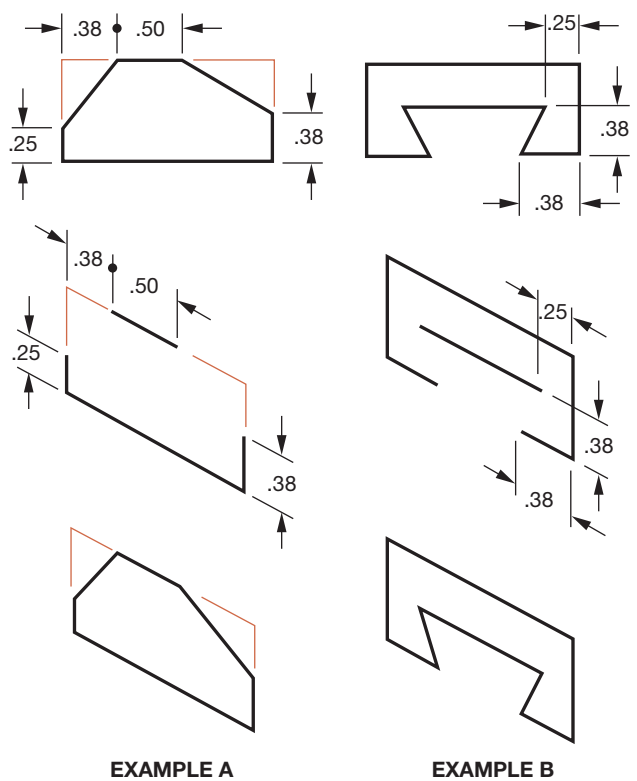


FIGURE 7-4 ■ Construction of nonisometric lines.

Figure 7-5 combines ellipses, scales, and angles. Markings on the ellipse coincide with the center lines of the holes, speeding up the drawing of circles and arcs.

Basic Steps to Follow for Isometric Sketching

To save time and to make a more accurate and neater-looking sketch, use an isometric ellipse template for drawing arcs and circles and a straightedge for drawing long lines.

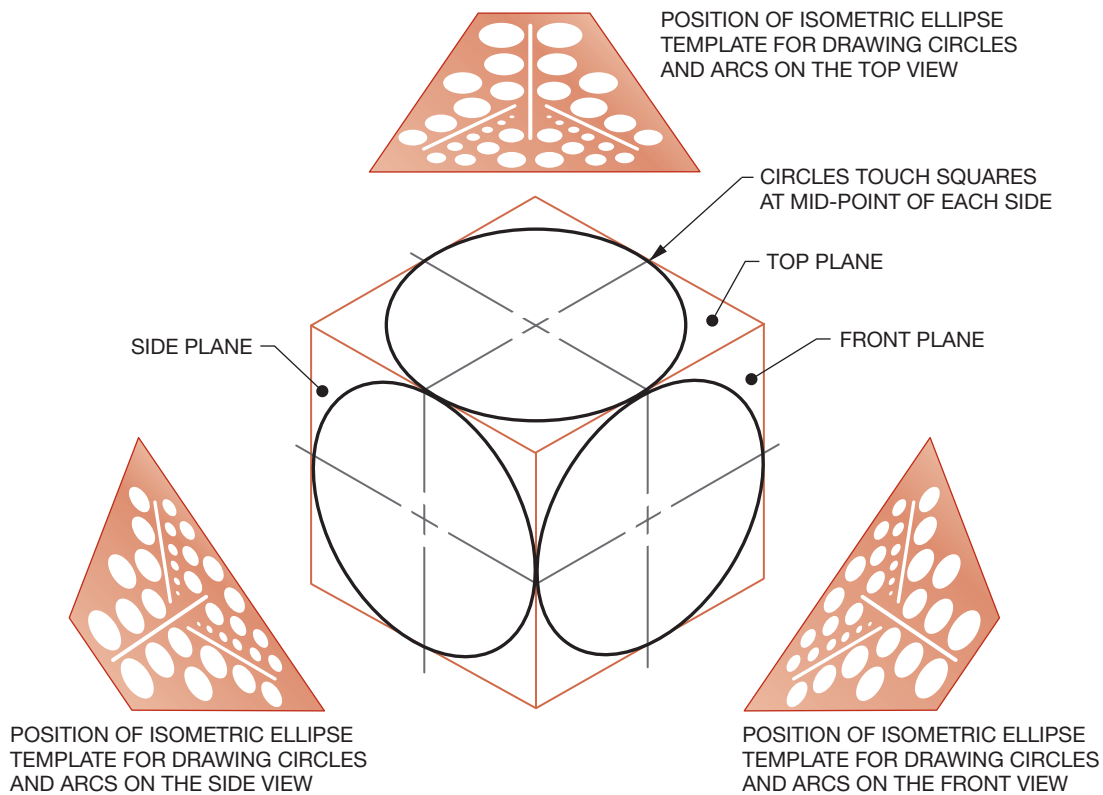


FIGURE 7-5 ■ Using the isometric ellipse template for drawing circles and arcs.

A commonly used technique for sketching is to sketch a box having the maximum height, width, and depth of the object, and then the parts of the box, which are not part of the object, are removed, leaving the parts that form the total object, Figure 7-6.

Step 1. Build a Frame. The frame (or box) is the overall size of the part to be drawn. It is drawn with construction lines.

Step 2. Block in the Overall Sizes for Each Detail. These subblocks or frames enclose each detail. They are drawn with construction lines.

Step 3. Add the Details. Lightly sketch the shapes of the details using construction lines. For circles, draw squares equal to the size of the diameter. Also sketch in the lines to represent the center lines of the circle.

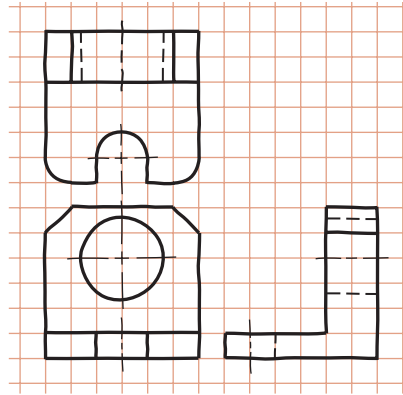
Step 4. Darken the Lines. Using a soft lead pencil, darken in the visible object lines.

OBLIQUE SKETCHING

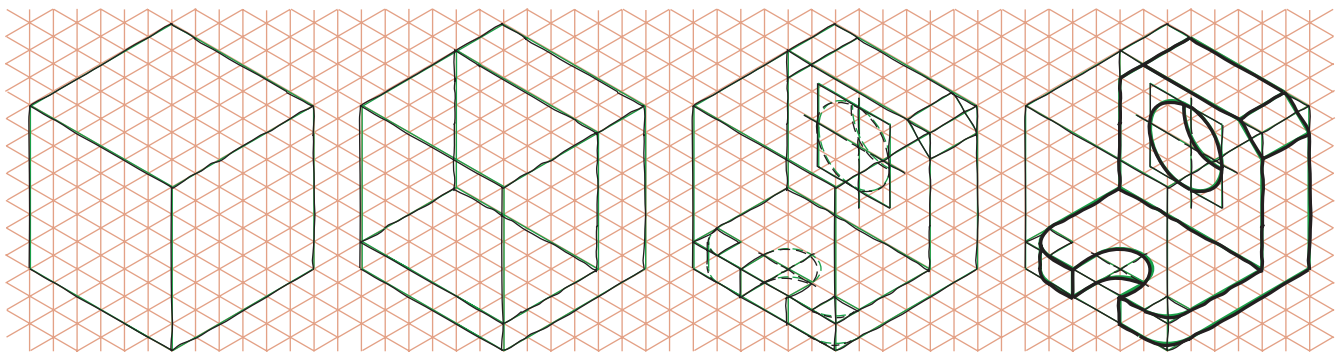
This method of pictorial drawing is based on the procedure of placing the object with one face parallel to the frontal plane and placing the other two

faces on oblique (or receding) planes, to left or right, top or bottom, at any convenient angle. The three axes of projection are vertical, horizontal, and receding. Figure 7-7 illustrates a cube drawn in typical positions with the receding axes at 60° , 45° , and 30° . This form of projection has the advantage of showing one face of the object without distortion. The face with the greatest irregularity of outline or contour, the face with the greatest number of circular features, or the face with the longest dimension faces the front, Figure 7-8.

Two types of oblique projection are used extensively. In *cavalier oblique*, all lines are made to their true length, measured on the axes of the projection. In *cabinet oblique*, the lines on the receding axis are shortened by one-half their true length to compensate for distortion and to approximate more closely what the human eye would see. For this reason, and because of the simplicity of projection, cabinet oblique is a commonly used form of pictorial representation, especially when circles and arcs are to be drawn. Figure 7-9 shows a comparison of cavalier and cabinet oblique. Note that hidden lines are omitted unless required for clarity. Most of the drawing techniques for isometric projection apply to oblique projection.



(A) THE PART



STEP 1
BUILD THE FRAME

STEP 2
BLOCK IN THE DETAILS

STEP 3
ADD THE DETAILS

STEP 4
DARKEN THE LINES

(B) BASIC SKETCHING STEPS

FIGURE 7-6 ■ Basic steps to follow for isometric sketching.

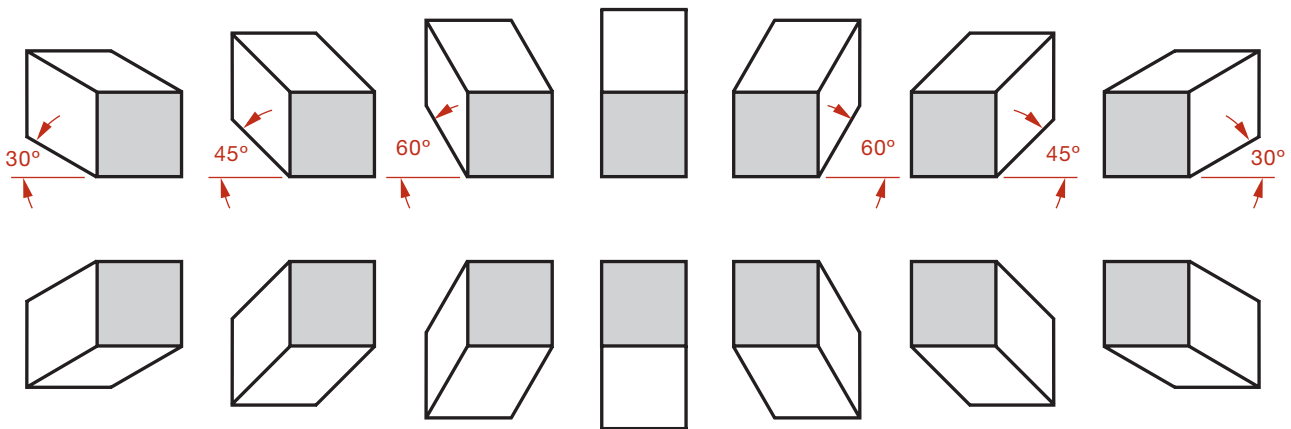


FIGURE 7-7 ■ Typical positions of receding axes for oblique projection.

Oblique Grid Sheets

This type of sketching paper is similar to the two-dimensional sketching paper except that 45° lines, which pass through the intersecting horizontal and vertical lines, are added in either one or both

directions. The most commonly used grids are the inch, which is subdivided into smaller evenly spaced grids, and the centimeter. As there are no units of measurements shown on these sheets, the spaces can represent any convenient unit of length, Figure 7-10.

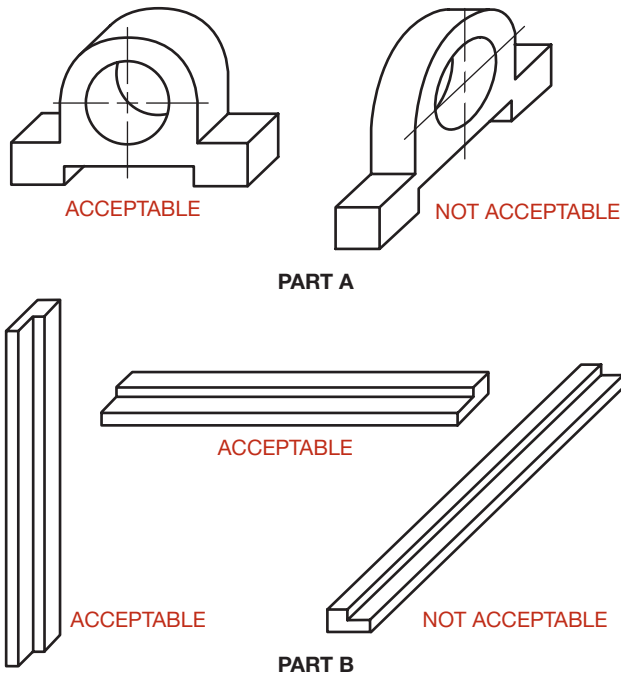


FIGURE 7-8 ■ Two general rules for oblique projection.

Inclined Surfaces

Angles that are parallel to the picture plane are drawn as their true size. Other angles can be laid off by locating the ends of the inclined line.

A part with notched corners is shown in Figure 7-11(A). An oblique drawing with the angles parallel to the picture plane is shown in Figure 7-11(B). In Figure 7-11(C) the angles are parallel to the profile plane. In each case, the angle is laid off by measurement parallel to the oblique axes, as shown by the construction lines. Because the part, in each case, is drawn in cabinet oblique, the receding lines are shortened by one-half their true length.

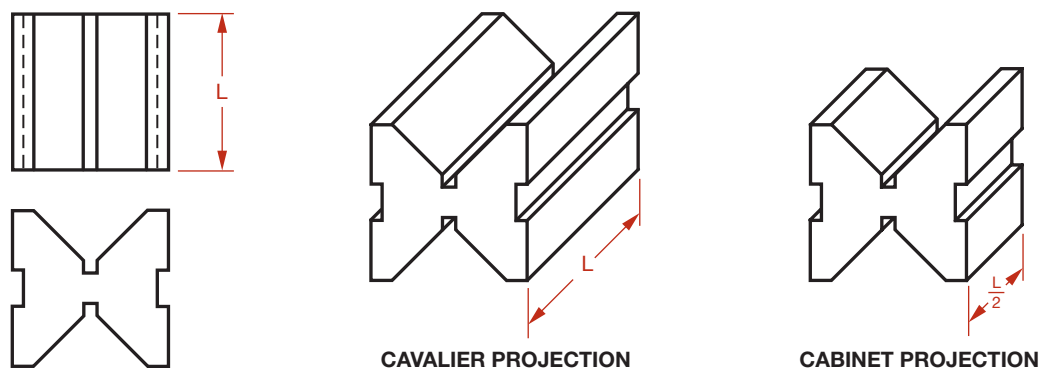


FIGURE 7-9 ■ Types of oblique projection.

Circles and Arcs

Whenever possible, the face of the object having circles or arcs should be selected as the front face, so that such circles or arcs can be easily drawn in their true shape, Figure 7-12.

When circles or arcs must be drawn on one of the oblique faces, the following method is recommended. With reference to Figure 7-12(B):

- Block off an oblique square with center lines equal to the diameter of the circle required. Blocking in the circle first also helps to get the proper size and shape of the ellipse. If an ellipse template is available, select an ellipse that fits within the square and touches the sides of the square at its midpoints. Using thick, dark lines (object lines), draw the oblique circle (ellipse), Figure 7-12(C).
- If an ellipse template is not available, lightly sketch an ellipse within this square with the circumference of the ellipse making contact with the square at its midpoints, Figure 7-12(B).
- Using object lines, darken the oblique circle, Figure 7-12(C).

Basic Steps to Follow for Oblique Sketching (Figure 7-13)

Step 1. Build a Frame. The frame or box is the overall size of the part to be drawn. It is drawn with light, thin lines.

Step 2. Block in the Overall Size of Each Detail. These subblocks or frames enclose each detail. For circles, draw squares equal to the diameter size.

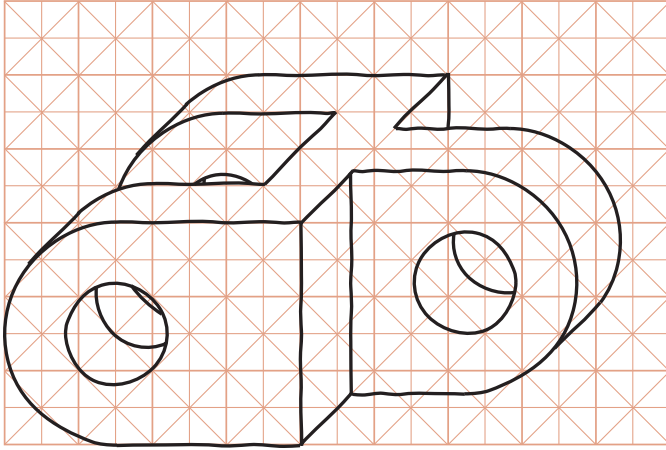


FIGURE 7-10 ■ Oblique sketching paper.

Also sketch the center lines. They are drawn using light, thin lines.

Step 3. Add the Details. Lightly sketch the shape of the details in each of their frames. These details are drawn using light, thin lines. If an oblique circle (ellipse) template is available, the arcs and circles are drawn using thick, dark (visible object) lines.

Step 4. Darken the Lines. Use a soft lead pencil to darken the lines.

REFERENCES

ASME Y14.4M-1989 (R1999) Pictorial Drawing

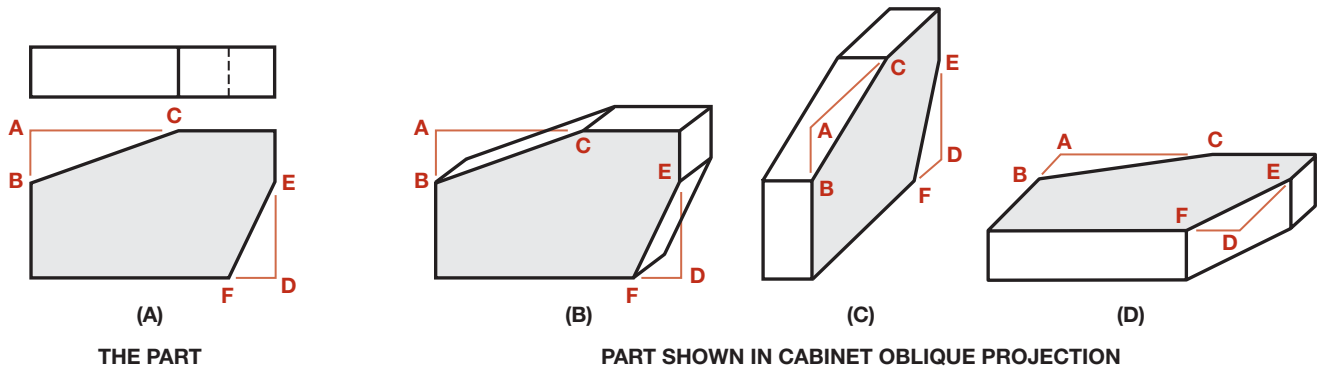


FIGURE 7-11 ■ Drawing inclined surfaces.

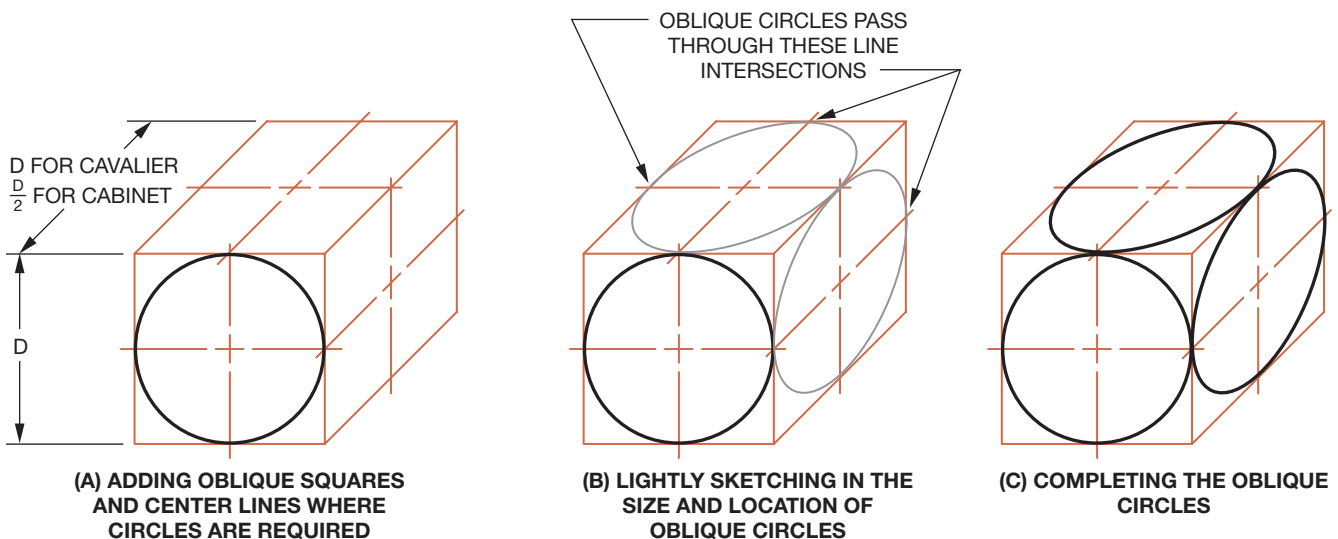
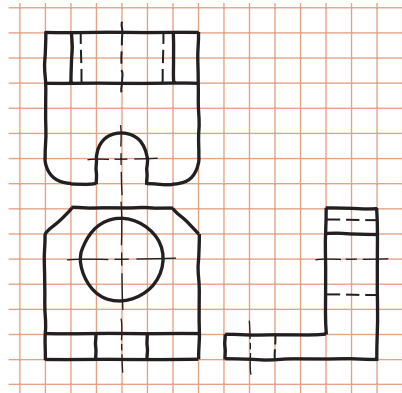
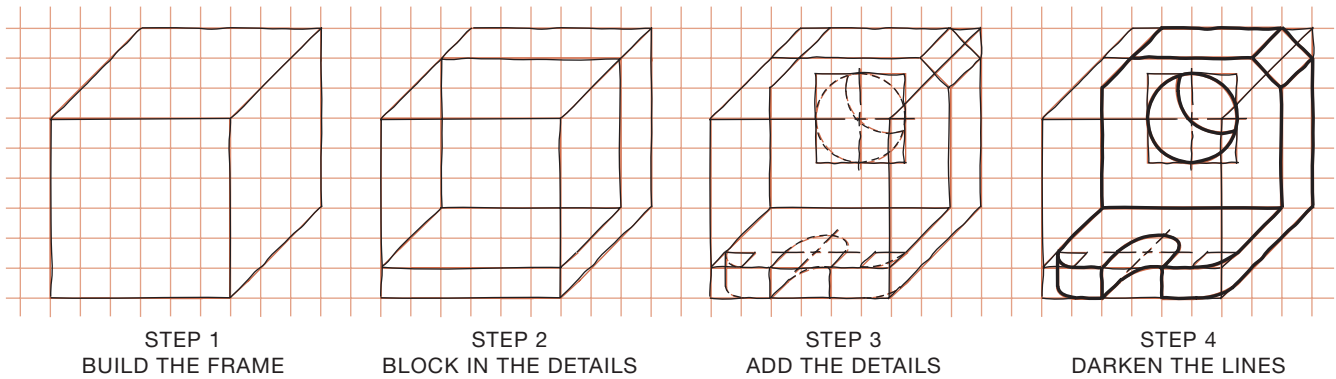


FIGURE 7-12 ■ Sketching oblique circles.



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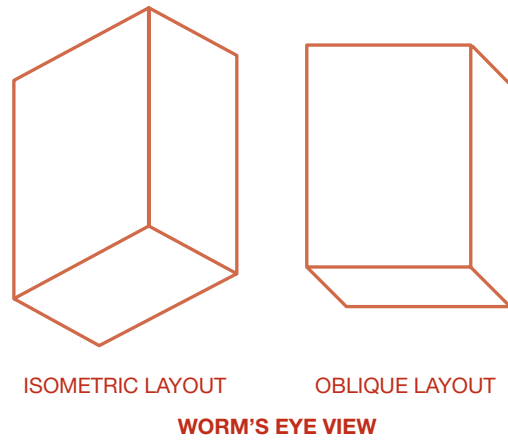
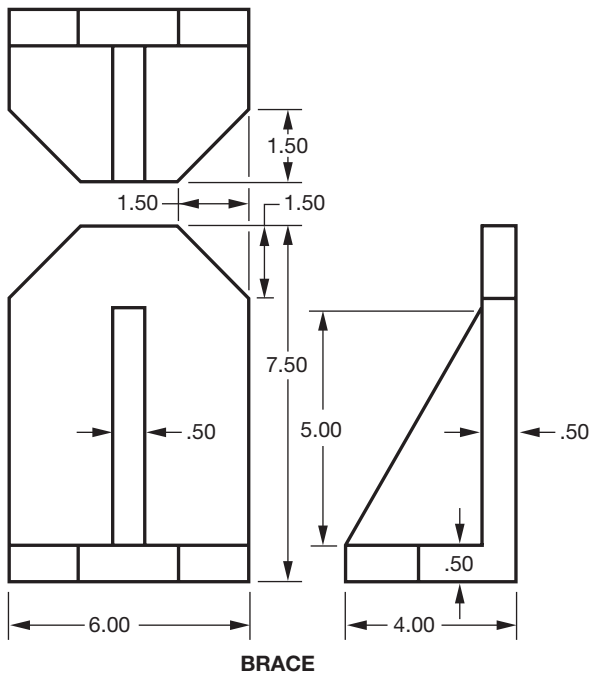
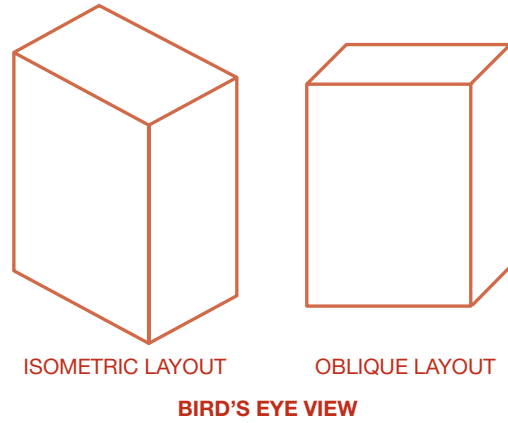
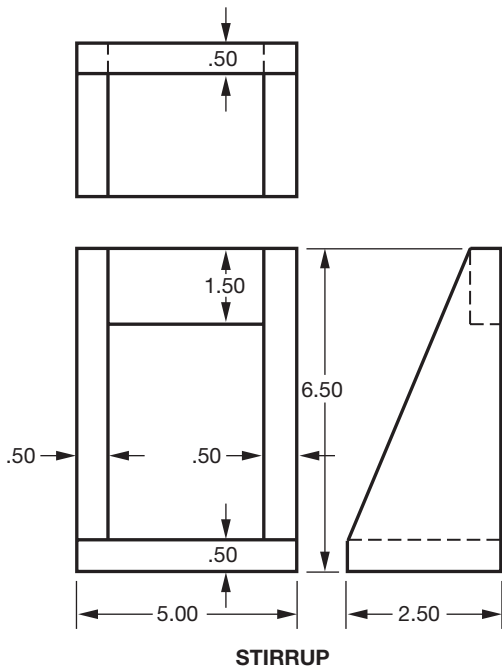
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BLOCK IN THE DETAILSSTEP 3
ADD THE DETAILSSTEP 4
DARKEN THE LINES

(B) BASIC SKETCHING STEPS

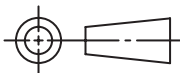
FIGURE 7-13 ■ Basic steps to follow for oblique sketching.

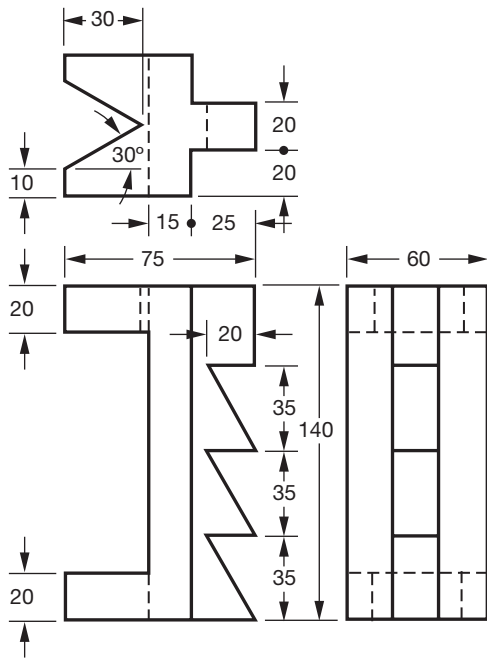
INTERNET RESOURCES

Animated Worksheets. For information on isometric and perspective drawings, see: <http://www.animatedworksheets.co.uk>.

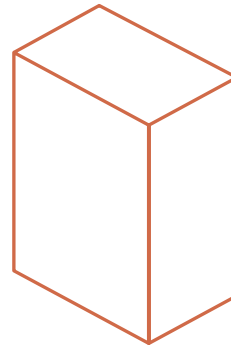


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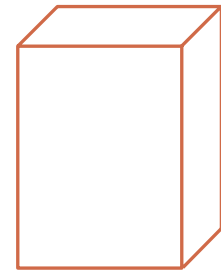




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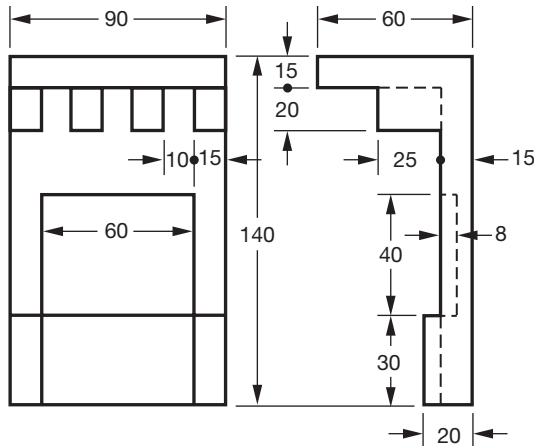


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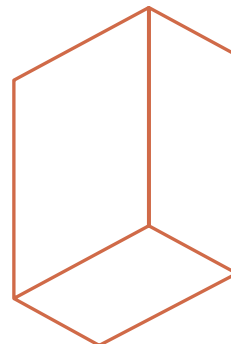


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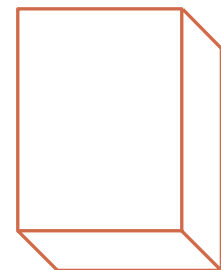
BIRD'S EYE VIEW



TABLET



ISOMETRIC LAYOUT

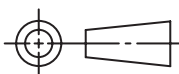


OBLIQUE LAYOUT

WORM'S EYE VIEW

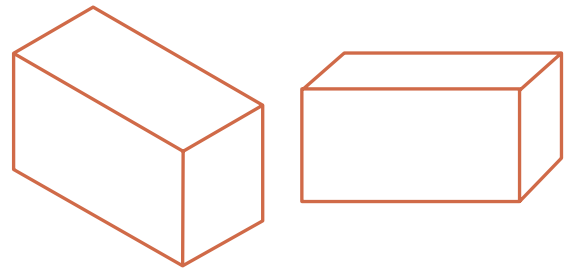
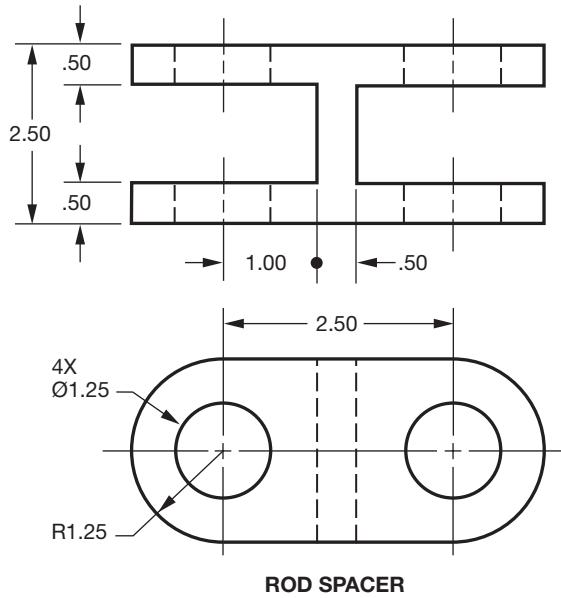
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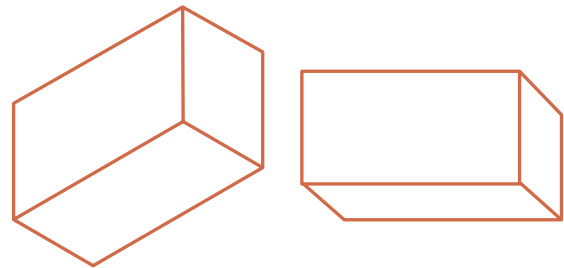
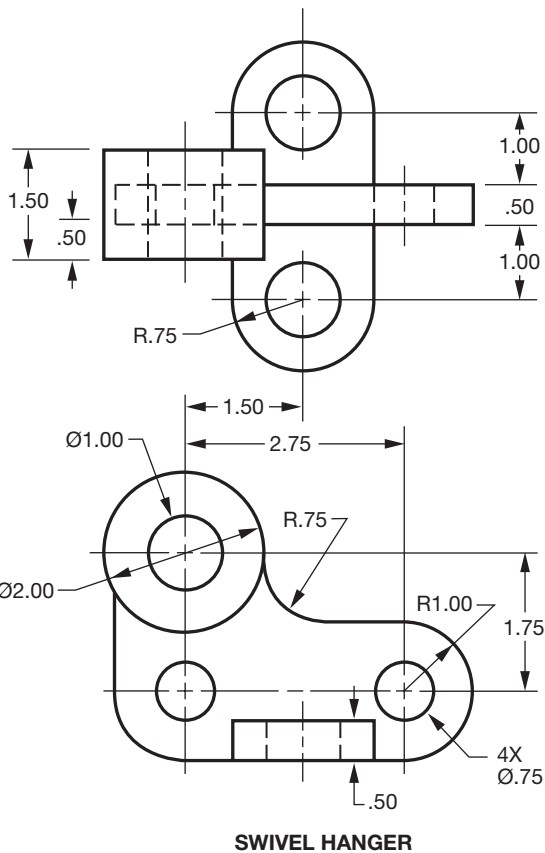


PICTORIAL SKETCHING OF PARTS HAVING FLAT SURFACES USING METRIC DIMENSIONING

A-24M

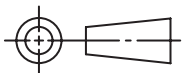


ISOMETRIC LAYOUT OBLIQUE LAYOUT
BIRD'S EYE VIEW

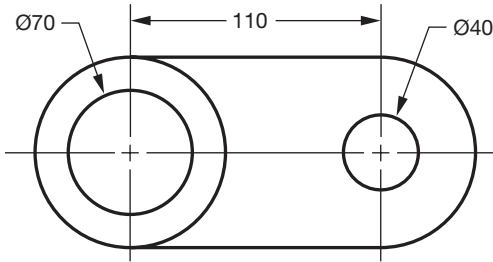
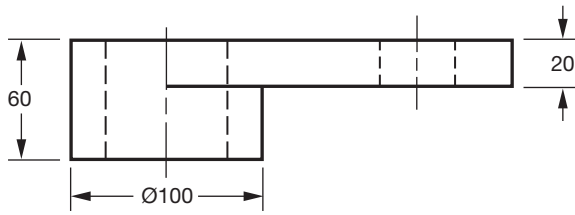


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WORM'S EYE VIEW

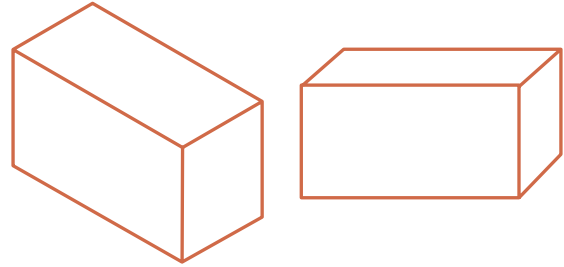
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**PICTORIAL SKETCHING OF PARTS HAVING CIRCULAR
FEATURES USING DECIMAL-INCH DIMENSIONING**



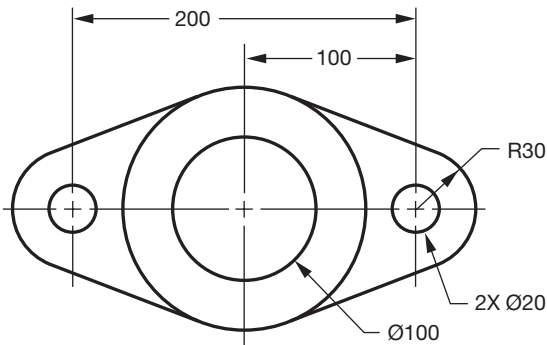
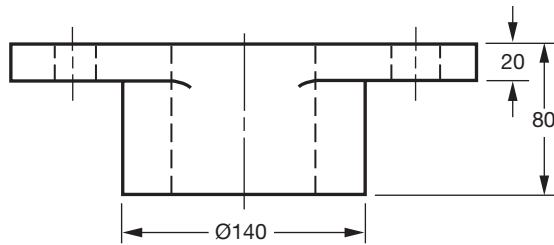
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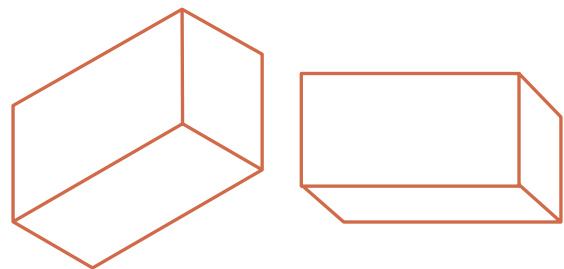
ISOMETRIC LAYOUT

OBLIQUE LAYOUT

BIRD'S EYE VIEW



BEARING SUPPORT



ISOMETRIC LAYOUT

OBLIQUE LAYOUT

WORM'S EYE VIEW

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METRIC
DIMENSIONS IN MILLIMETERS

