Activities

Q1., Q2. and Q3.

Draw the given plan and elevation and draw an isometric view of the solid, Figures 6.20, 6.21 and 6.22.

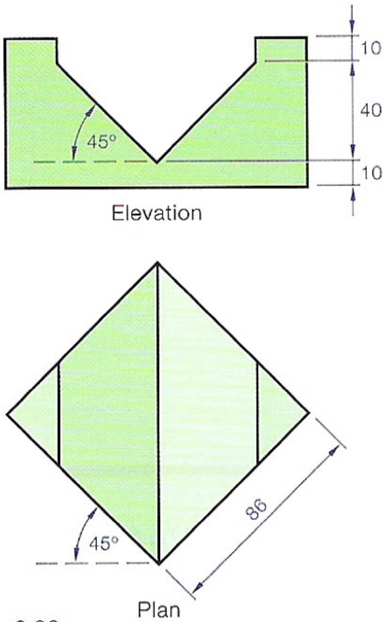


Fig. 6.20

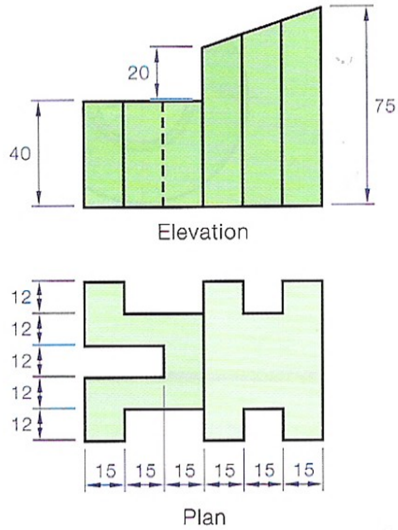


Fig. 6.21

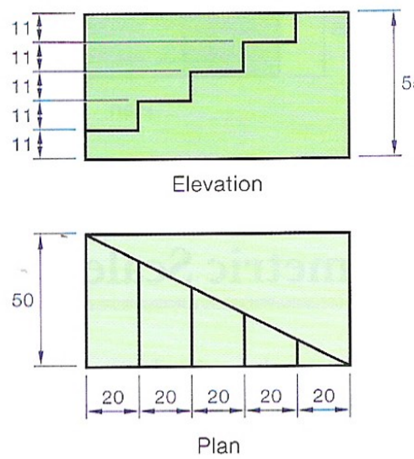


Fig. 6.22

Q4., Q5. and Q6.

Draw the given plan and elevation. Produce an isometric of the solid. Curves should be found with ordinates, Figures 6.23, 6.24 and 6.25.

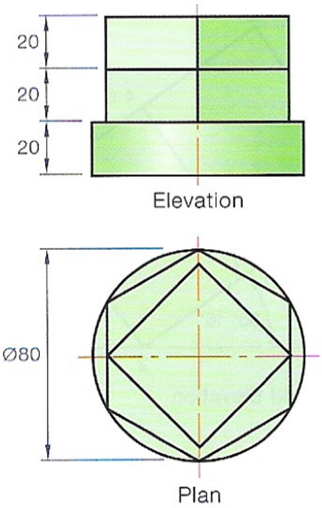


Fig. 6.23

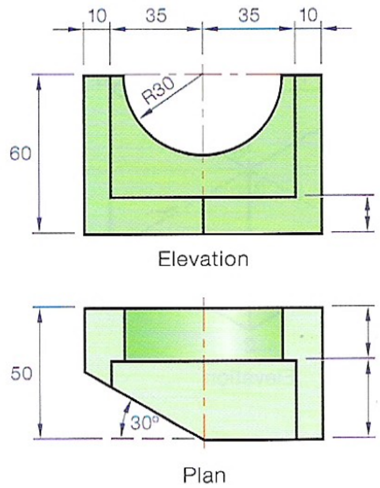


Fig. 6.24

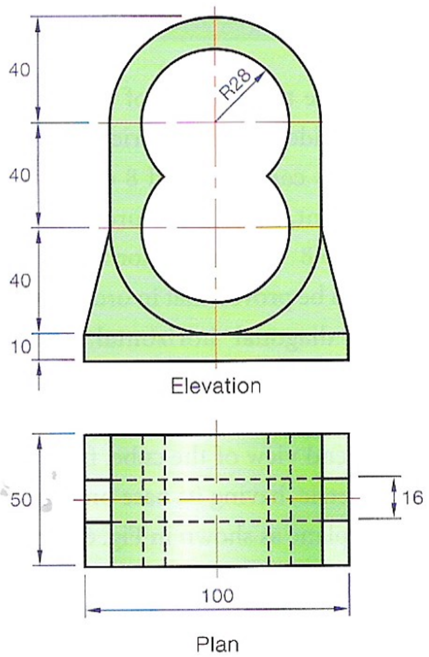


Fig. 6.25

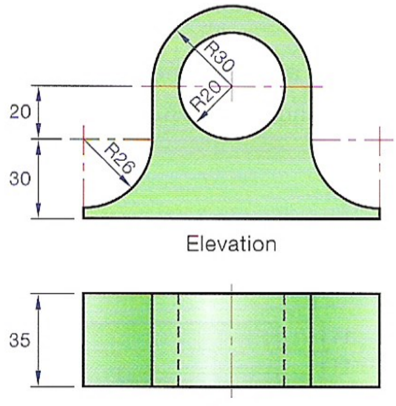


Fig. 6.26

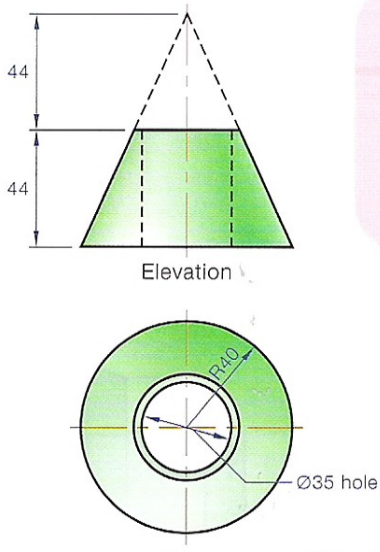


Fig. 6.27

Q7. and Q8.

Draw the given plan and elevation. Draw an isometric of the solid. In each case use the four centre ellipse to draw the curves, Figures 6.26 and 6.27.

Isometric Scale

When we make a visual comparison between the orthographic projections of the solids in Figures 6.17a, 6.18a and 6.19a with their corresponding isometric projections, it can be seen that the isometric appears and actually is larger. The reason for this is that the solid drawn in isometric is inclined to the horizontal plane, tilted up on one of its corners. This means that all edges are sloping and therefore do not show their true length. When we draw an isometric we ignore this fact and measure the full measurement along the axes, thus making the isometric larger than the orthographic. In order to give the correct proportions between the two types of drawing we must use an **isometric scale.**

EXAMPLE OF HOW ISOMETRIC GIVES A DISTORTED VIEW.

We will take the example of a cube of 30 mm sides. The isometric of the cube shows corners 3 and 8 on the same point, so therefore the diagonal 3,8 will be a horizontal line. It can be proved that in order to get this diagonal horizontal, we must tilt the cube by 35°16′ (35 degrees 16 minutes). We may now draw an end view of the cube, from the isometric, having its base on the inclined plane as shown in Fig. 6.28. All edges of the cube will be inclined to the vertical plane and will not show true lengths in the isometric.

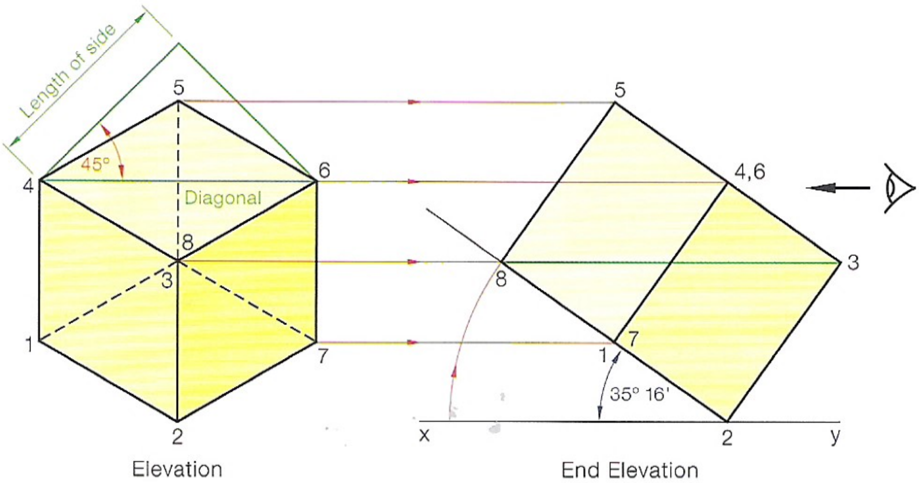


Fig. 6.28

Getting back to the isometric (elevation). The diagonal 4,6 will be seen as a true length in this view. If we have the diagonal of a square we can easily find the length of the side of that square (the sides of a square make an angle of 45° to the diagonal). When we do this we find that the length of the side is much more than 30 mm, as was required. The isometric cube is too big and does not represent a cube of 30 mm side. To rectify this we need a reducing scale.

ISOMETRIC SCALE

The scaling factor needed for isometric is a constant for all isometrics and can be derived from the cube example given previously. The 45° line shows the true length of the cube side and the 30° line shows the isometric representation of that length, Fig. 6.29.

We set up a 45° line (Fig. 6.30) to show true lengths and a 30° line to show their isometric equivalents. Lengths oa, ob and oc are drawn on the 45° line. These are projected vertically to give oa, ob and oc as the isometrical scaled distances. An isometric scale measurement is 0.816 of the true length distance.

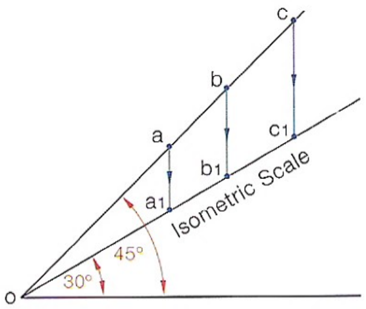


Fig. 6.30

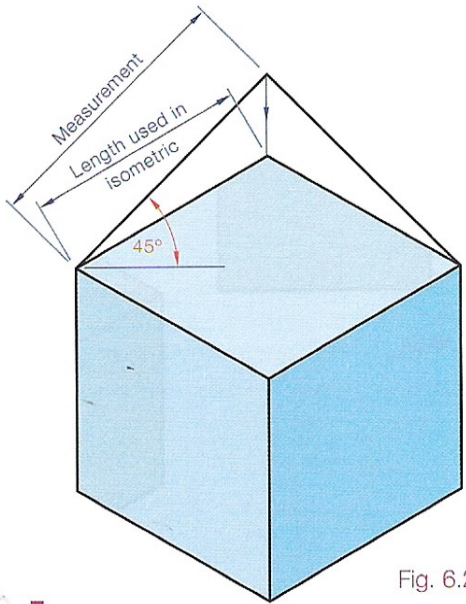


Fig. 6.29

Worked Example Using Isometric Scale

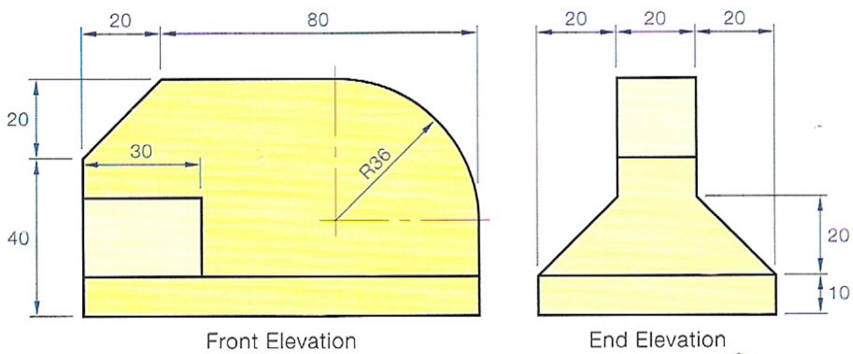


Fig. 6.31

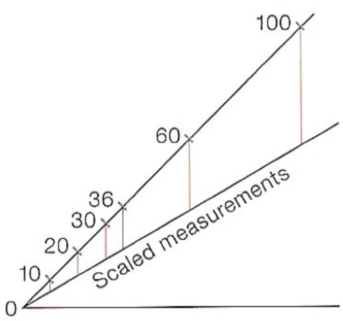


Fig. 6.32

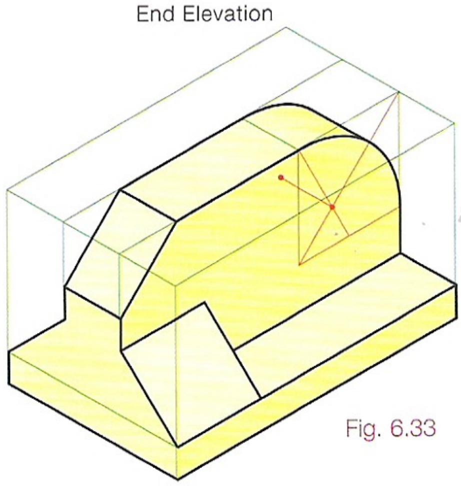


Fig. 6.33

(1) Draw the front and end elevation of the shaped solid using full measurements, Fig. 6.31.

(2) Set up the isometric scale using a 45° line and a 30° line as explained earlier.

(3) Any measurement needed for the isometric is set out from the corner, along the 45° line, e.g. 10, 20, 30, 36 etc., Fig 6.32.

(4) Drop each measurement vertically to give the scaled measurements used in the isometric. Draw the isometric, Fig. 6.33.

(5) If you are constructing a circle or curve using ordinates, the length of each ordinate would have to be scaled also.

The Sphere in Isometric

When drawing a sphere in isometric we must first consider what type of isometric we are producing. Are we drawing an isometric using full sizes or with scaled sizes? It should be noted that a sphere looks the same regardless of which way it is viewed or which plane it is projected onto. Having said that, it must also be noted that an unscaled isometric gives a distorted view, an enlarged view of objects. It stands to reason therefore that an unscaled drawing of an object containing a sphere, or part of a sphere, should give an enlarged view of that sphere. When drawing a sphere in isometric we must lengthen the radius unless we are producing a scaled isometric.

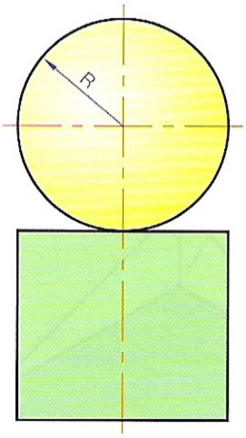


Fig. 6.34

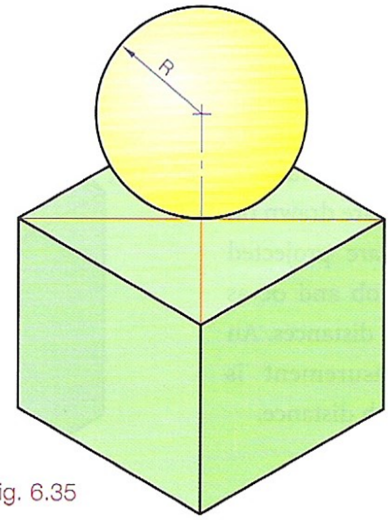


Fig. 6.35

Fig. 6.34 shows the elevation of a pedestal with a sphere on top having a diameter equal to the pedestal width. Fig. 6.35 shows the isometric and it can be seen that the sphere appears too small even though the radius is the same as in Fig. 6.34.

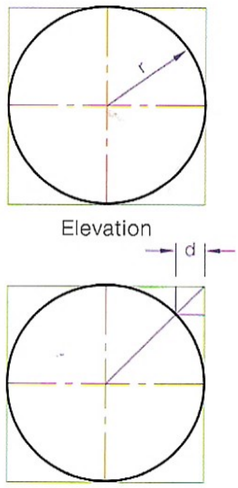
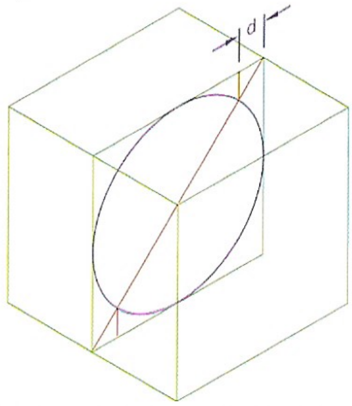


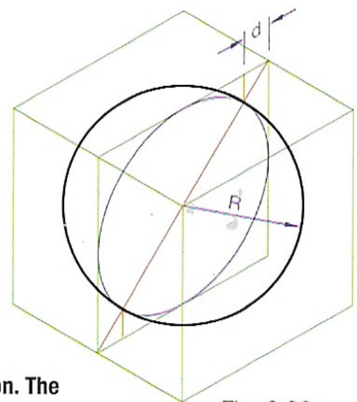
Fig. 6.36a



Section through the centre, in isometric

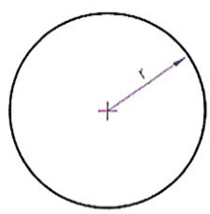
Fig. 6.36b

Fig. 6.36 shows how to find the radius for an unscaled isometric sphere. The radius of the sphere will equal half the major axis of the ellipse. The sectional ellipse need not be drawn. The length of the major is all that is needed.



Isometric drawing of a sphere.
The sphere surrounds the section. The sphere is larger than in orthographic.

Fig. 6.36c



Original sphere as comparison

Fig. 6.36d

Scaled Isometric of a Sphere

When drawing an isometric using the isometric scale the size of the sphere will not be distorted and its radius remains unchanged, Fig. 6.37.

(1) Draw the elevation.
(2) Set up the isometric scale.
(3) The width of the pedestal changes from W to W_1 for the isometric.
(4) The height changes from h to h_1 for the isometric.
(5) The point of contact between the two solids is found by joining the diagonals.
(6) The centre of the ellipse is stepped up. The distance used is R_1 the scaled radius. The sphere is drawn with radius R.

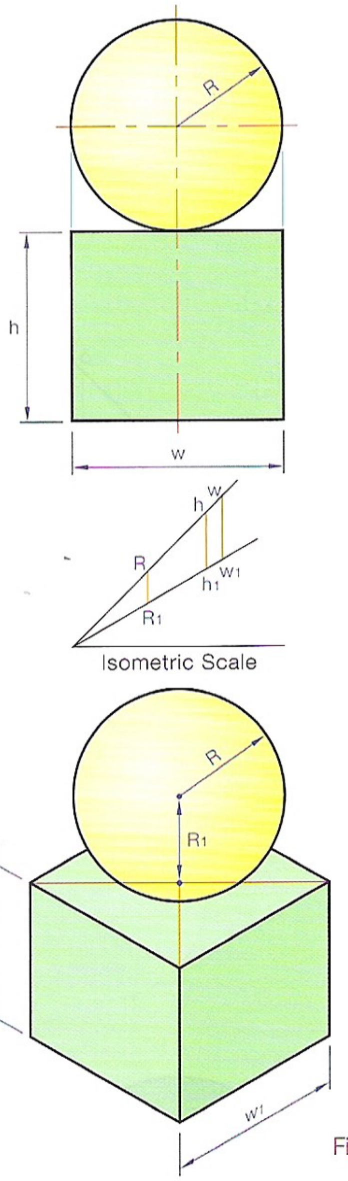


Fig. 6.37

Cone in Isometric

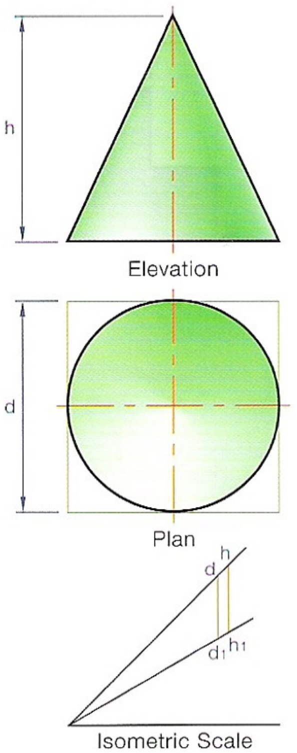


Fig. 6.38a

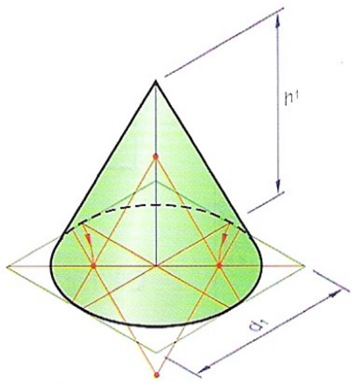


Fig. 6.38b

When drawing a cone we start with the base, Fig. 6.38a. The width d changes to d_1 using the isometric scale. The ellipse is constructed here using the ortho four-centre ellipse. The height h becomes h_1, Fig. 6.38b.

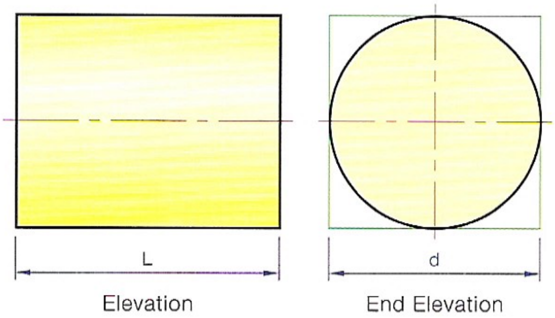


Fig. 6.39a

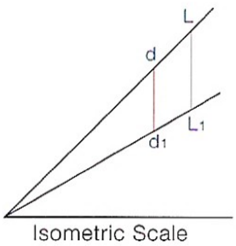


Fig. 6.39b

Cylinder in Isometric

If using ordinates to construct an ellipse the length of each ordinate must be scaled before using it in the isometric.

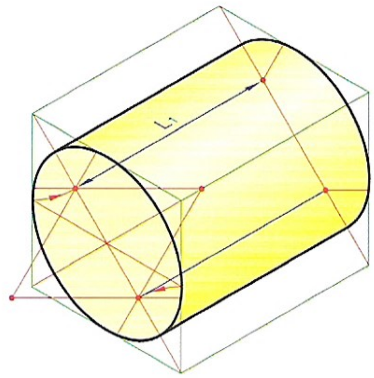


Fig. 6.39c

Activities

Q1. TO Q6. DRAW A TRUE ISOMETRIC OF THE FOLLOWING OBJECTS USING AN ISOMETRIC SCALE.

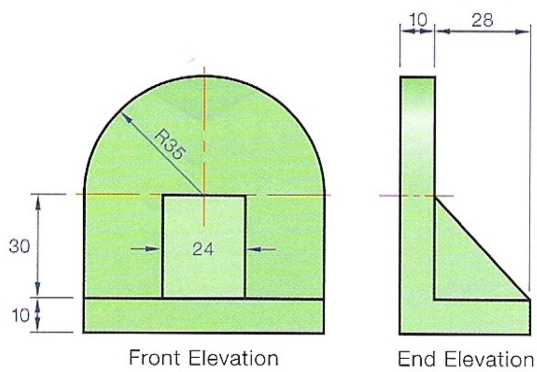


Fig. 6.40

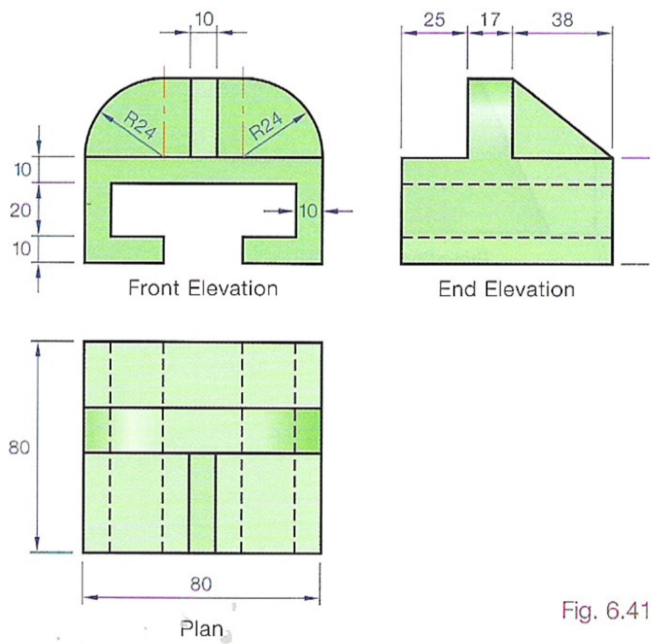


Fig. 6.41

Q1. Fig. 6.40.

Q2. Fig. 6.41.

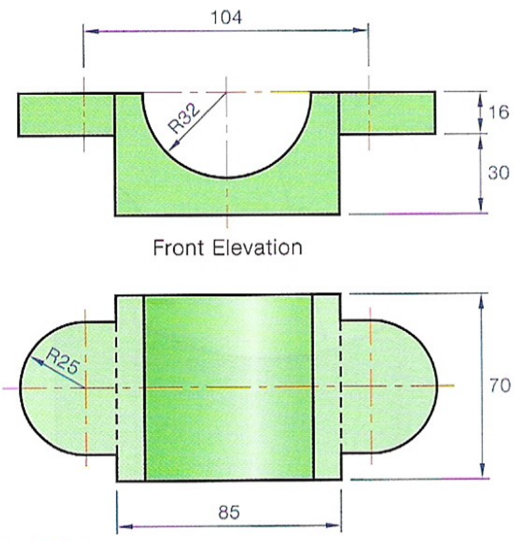


Fig. 6.42

Q3. Fig. 6.42

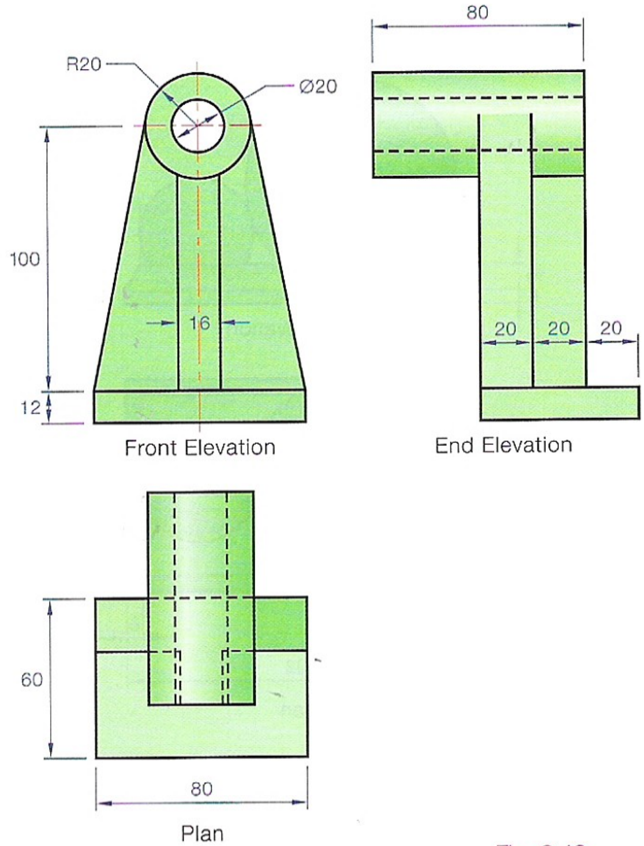


Fig. 6.43

Q4. Fig. 6.43

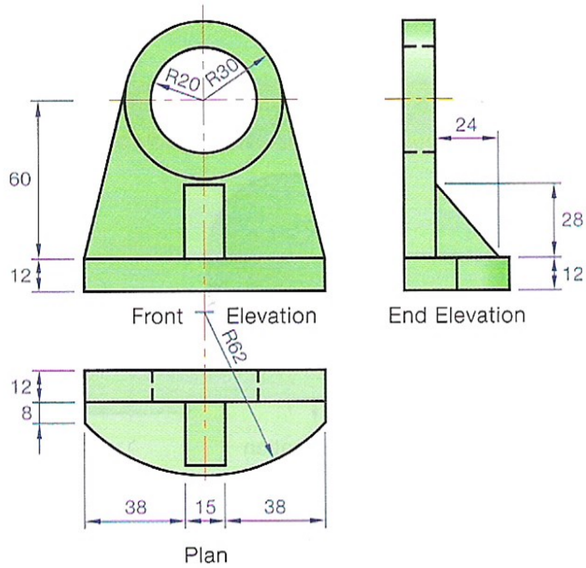


Fig. 6.44

Q5. Fig. 6.44

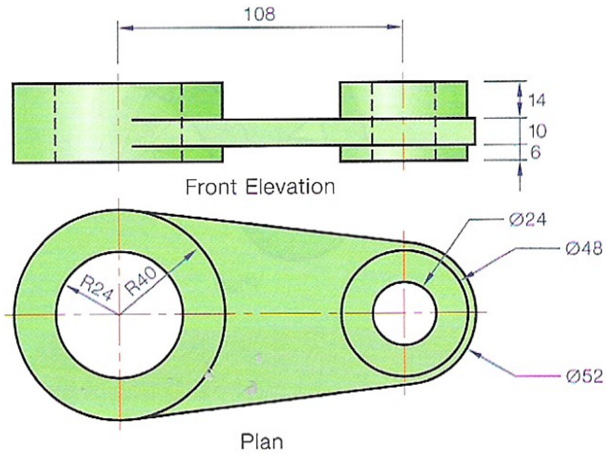


Fig. 6.45

Q6. Fig. 6.45

Q7. TO Q.10. DRAW A TRUE ISOMETRIC OF THE OBJECTS USING THE ISOMETRIC SCALE.

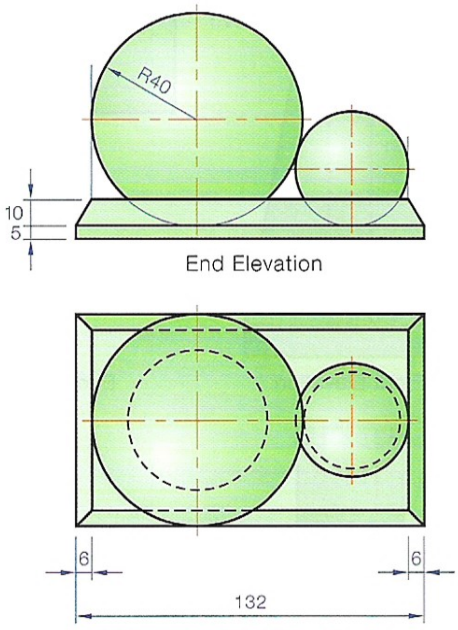


Fig. 6.46

Q7. Fig. 6.46

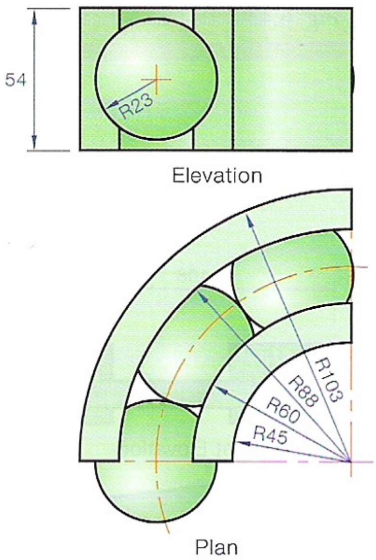


Fig. 6.48

Q9. Fig. 6.48

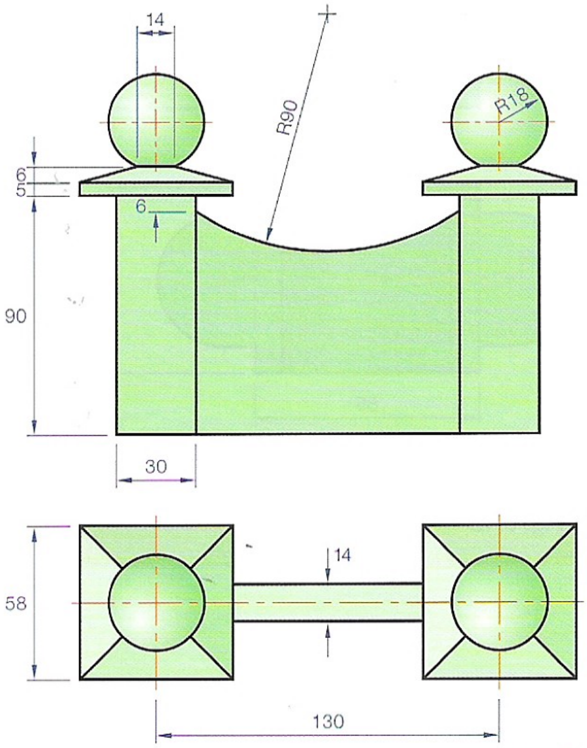


Fig. 6.47

Q8. Fig. 6.47

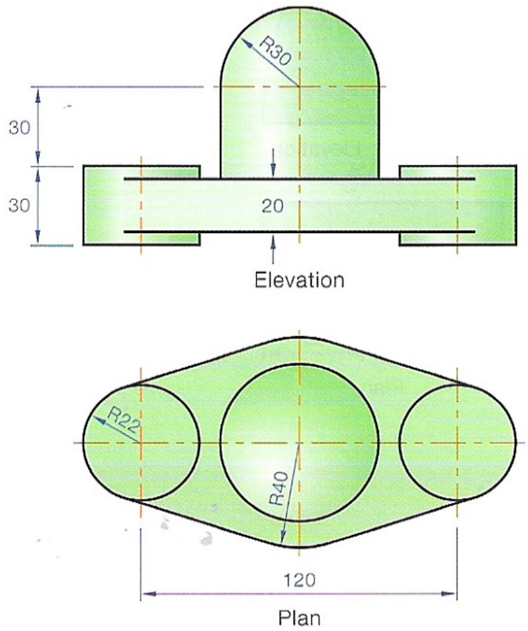


Fig. 6. 49

Q10. Fig. 6.49