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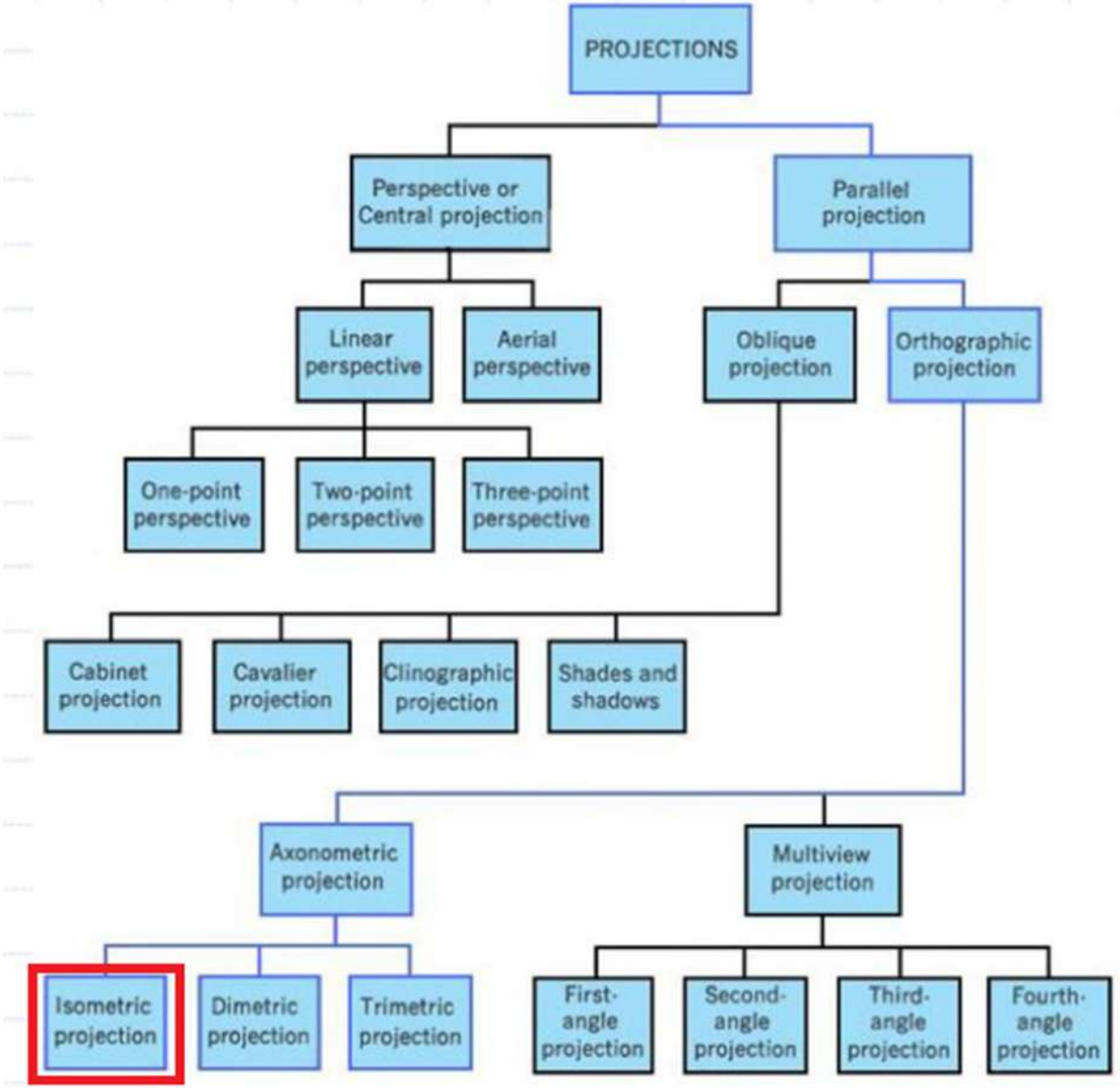
MEC103

ISOMETRIC PROJECTIONS

UNIT-5

Classification of Projections



Isometric Projections

These are three dimensional one plane drawings which can be easily understood by the persons who do not have any formal technical training. There are following methods of pictorial drawing :

(*i*) Axonometric projections,

(*ii*) Oblique projections,

(*iii*) Perspective projections.

Axonometric projections can be further classified as follow :

(*i*) Isometric projections,

(*ii*) Dimetric projections,

(*iii*) Trimetric projections.

Isometric Projections

Isometric projection is a single orthographic projection, in which the object is tilted in such a manner, that all the three axes are equally inclined to the picture plane. Equally inclined lines are equally forshortened by the respective perpendicular projection and thus making the evolution of isometric. In isometric projection, all projection are parallel but inclined at an angle of 30° to plane of projection.

Axonometric Projections

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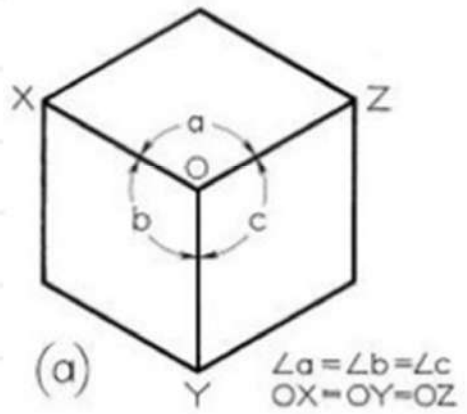
Types of Axonometric Projection

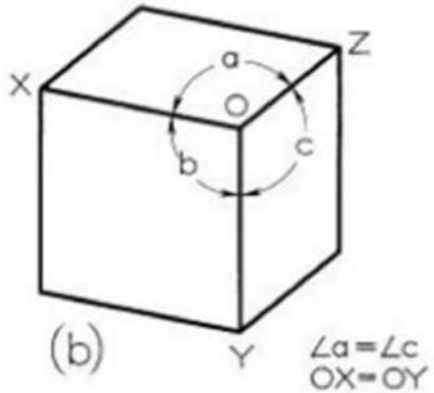
The distinguishing feature of axonometric projection is the inclined position of the object with respect to the plane of projection.

The axonometric axis is the intersection of the three edges of the cube at the corner (O).

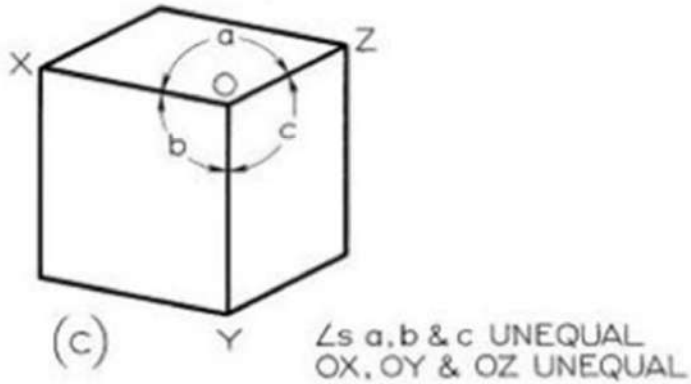
Axonometric projections are classified as isometric projection (a), dimetric projection (b), and trimetric projection (c).



ISOMETRIC



DIMETRIC



TRIMETRIC

Axonometric Projections

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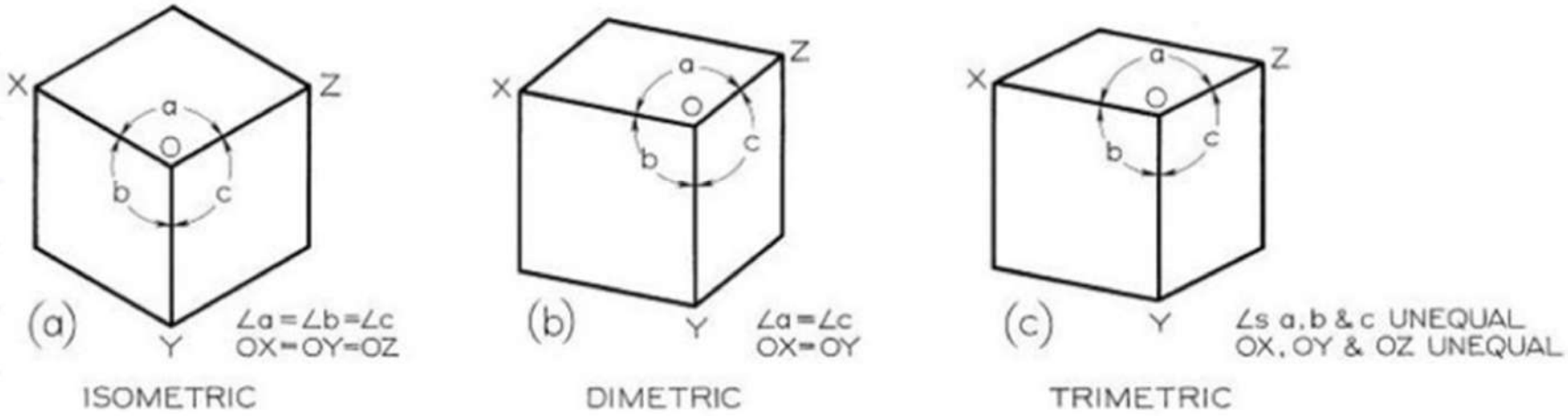
Types of Axonometric Projection

In an Isometric projection all angles between the axonometric axes are equal.

In a dimetric projection two of the axes make equal angles with the plane of projection and the third axis makes either a smaller or greater angle.

In a trimetric projection no two axes make equal angles with the plane of projection.

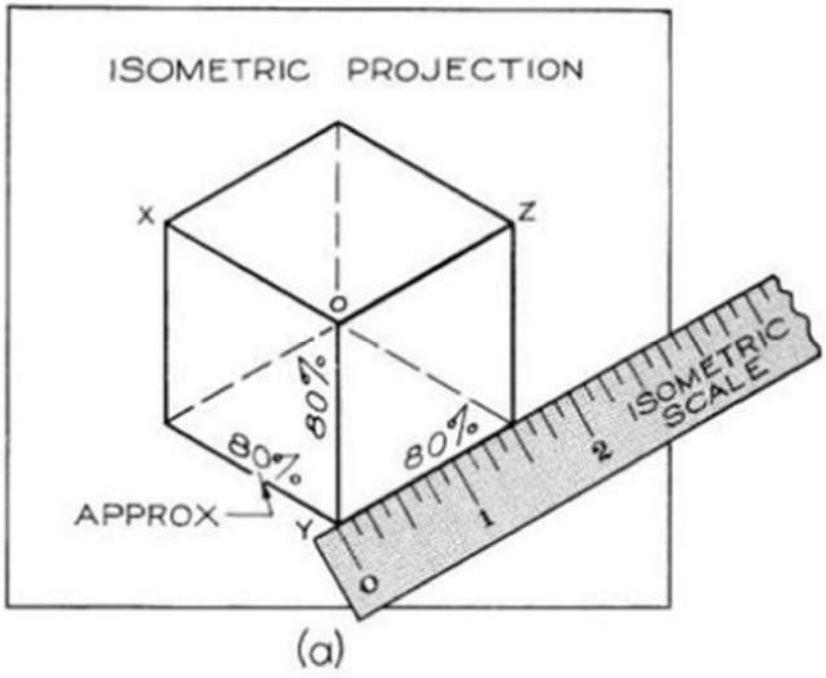


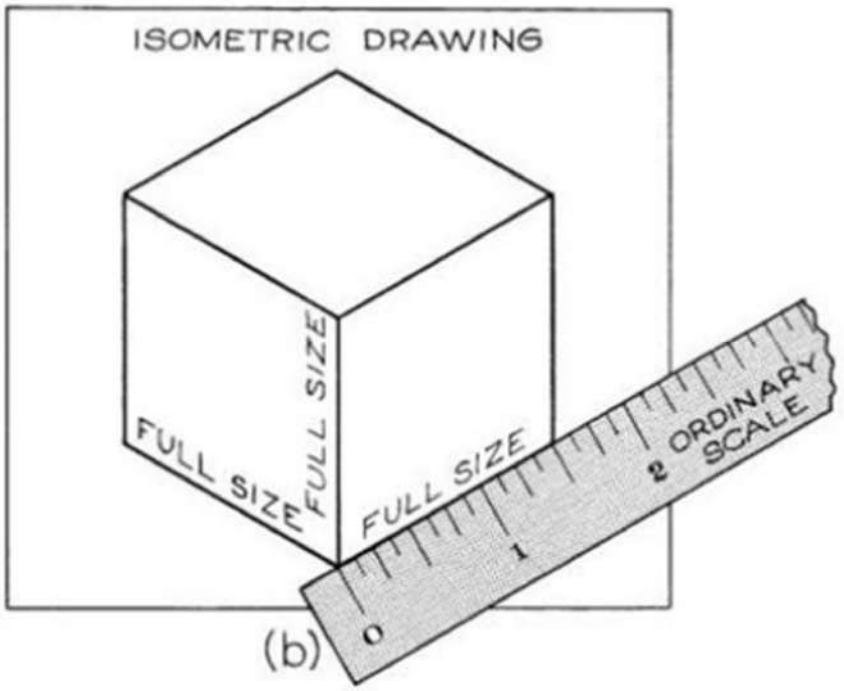
Axonometric Projections

Isometric Drawing

When a drawing is prepared with an isometric scale or when the object is actually projected on a plane of projection it is an isometric projection.

When a drawing is prepared using an ordinary scale it is an isometric drawing. An isometric drawing is drawn full size.





Axonometric Projections

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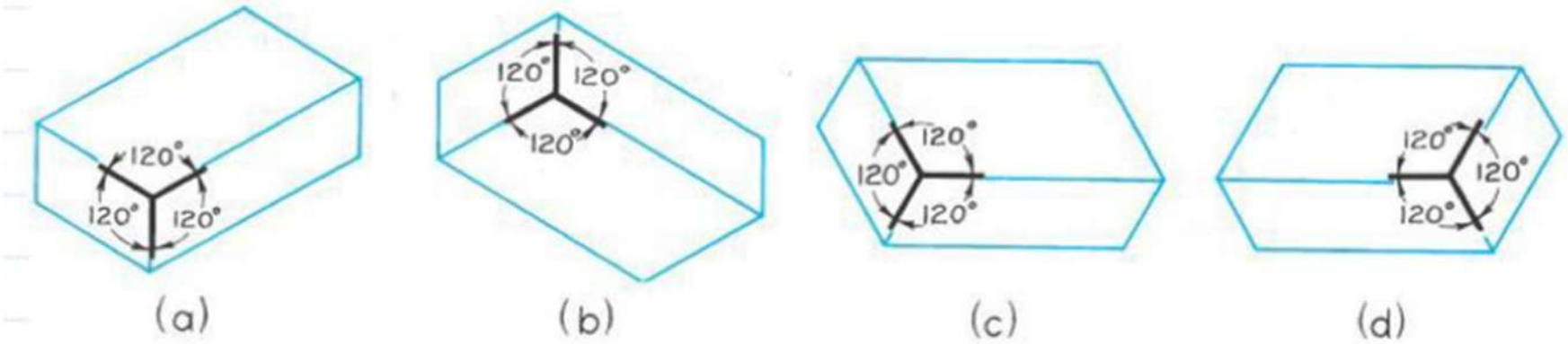
Positions of the Isometric Axes

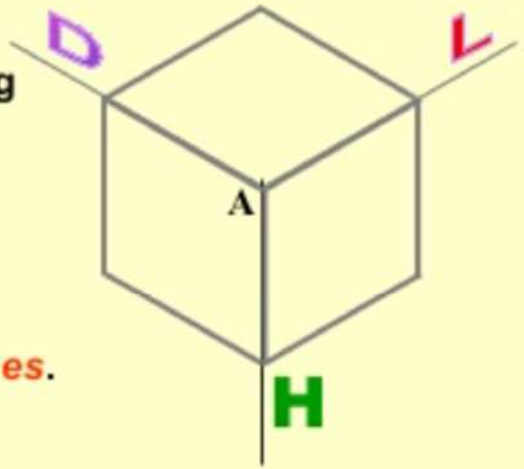
The isometric axes may be placed in any desired position according to the requirement of the drawing but the angle between the axes must remain equal or 120°.

The choice of the directions of the axes is determined by the position from which the object is viewed or by the position that best describes the shape of the object.



Some important terms

ISOMETRIC AXES, LINES AND PLANES:



The three lines AL, AD and AH, meeting at point A and making 120^0 angles with each other are termed *Isometric Axes.*

The lines parallel to these axes are called *Isometric Lines*.

The planes representing the faces of of the cube as well as other planes parallel to these planes are called *Isometric Planes*.

ISOMETRIC SCALE:

When one holds the object in such a way that all three dimensions are visible then in the process all dimensions become proportionally inclined to observer's eye sight and hence appear apparent in lengths.

This reduction is 0.815 or 9 / 11 (approx.) It forms a reducing scale which Is used to draw isometric drawings and is called *Isometric scale.*

In practice, while drawing isometric projection, it is necessary to convert true lengths into isometric lengths for measuring and marking the sizes. This is conveniently done by constructing an isometric scale as described on next page.

ISOMETRIC AXES AND ISOMETRIC LINES

Let us consider a cube with one of its corners resting on the ground. *Three lines from point O make an angle 120° with each other. These lines are called isometric axes. All lines parallel to these lines are called isometric lines.* See Fig. (*a*) and (*b*).

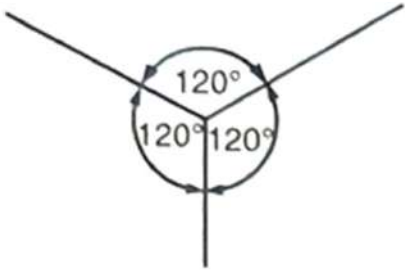


Fig. (a) Isometric Axes

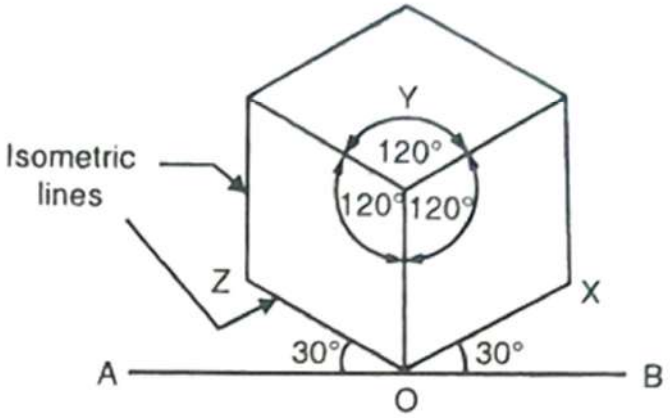
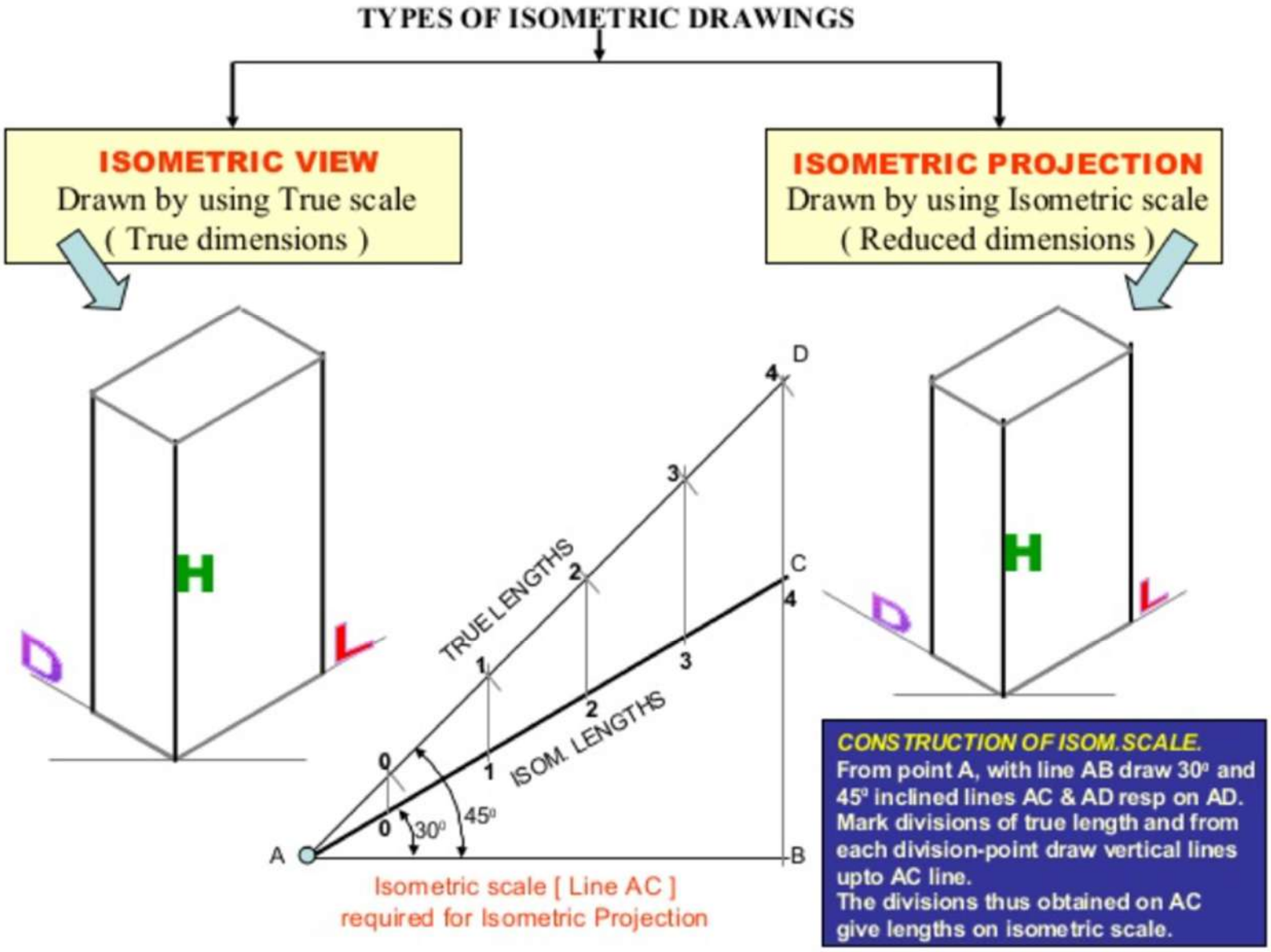


Fig. (*b*) Isometric Lines

ISOMETRIC PROJECTION AND ISOMETRIC VIEW

In isometric projection, the dimensions are reduced by the isometric scale, after that these are used. The dimensions can be reduced by multiplying 0·815. For simplicity, an isometric scale is used that will measure 81·5%. Normally, isometric view drawing is drawn because we are more interested in the shape of the object rather than its size. The measurements of the size of the object are taken with the true scale without reducing dimensions by isometric scale.

Some important terms



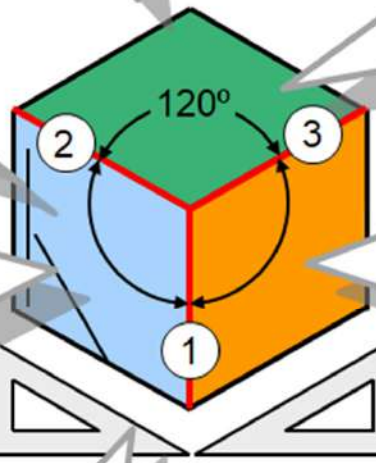
Isometric projections

Characteristics of isometric projections

All lines parallel to axes 1, 2 and 3 are isometric lines.

Axes 1, 2 and 3 form 120° angles between one another.

The projection is isometric (equal measures) because the height of axis 1, the length of axis 2 and the width of axis 3 are all proportionally reduced.



The lines not parallel to axes 1, 2 and 3 are non-isometric lines.

The sides of the cube and all planes parallel to them are isometric planes.

The isometric lines are angled at 30°.

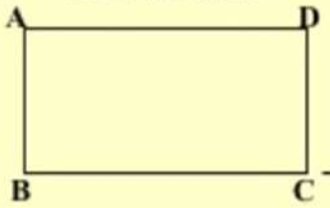
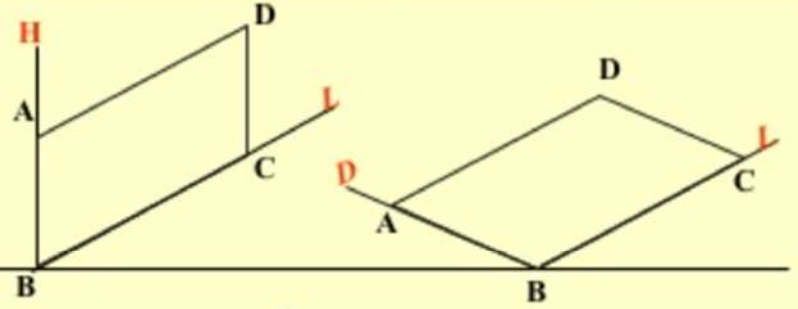
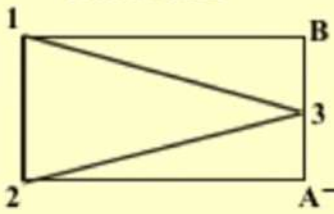
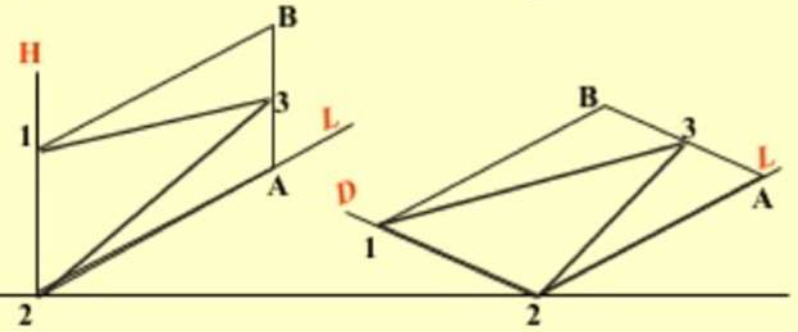
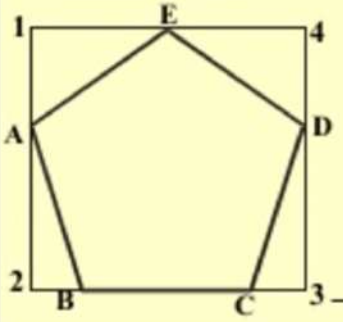
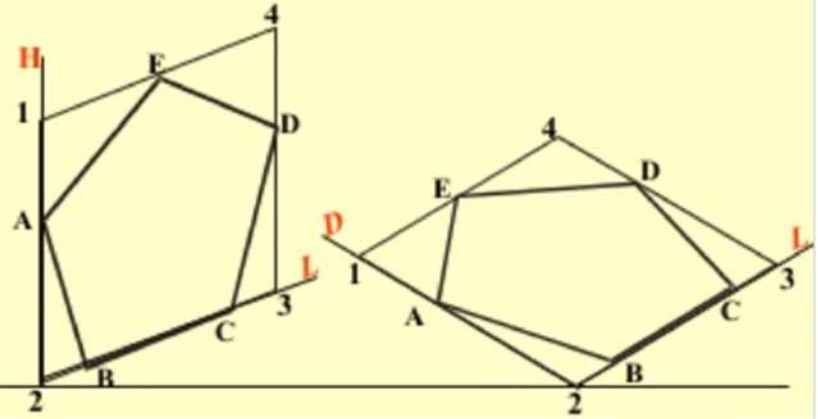
ISOMETRIC OF PLANE FIGURES

AS THESE ALL ARE 2-D FIGURES WE REQUIRE ONLY TWO ISOMETRIC AXES.

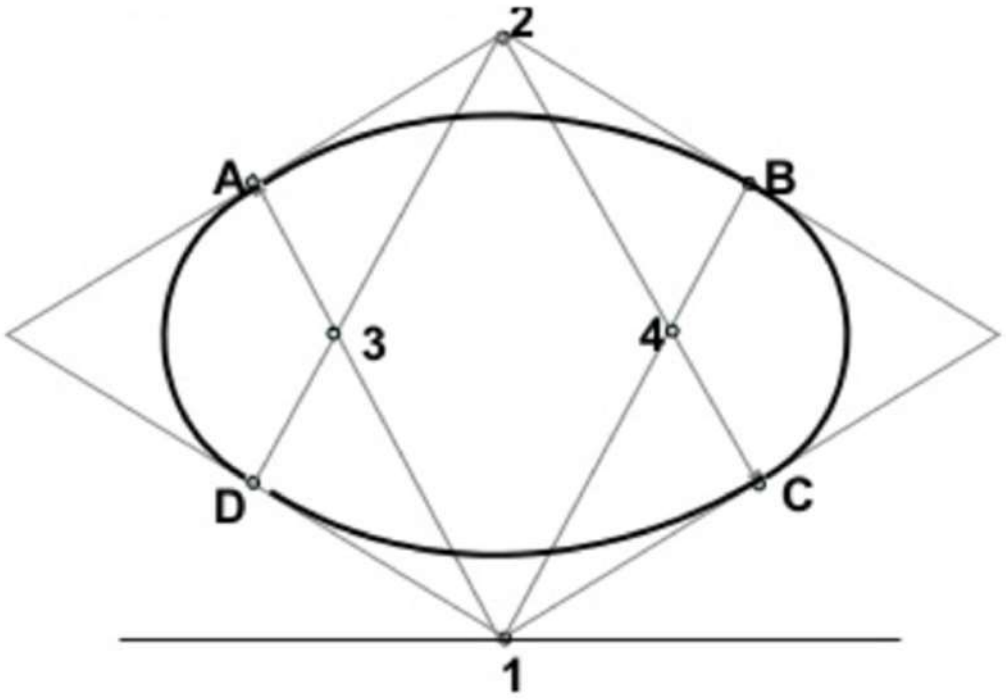
IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

IF THE FIGURE IS TOP VIEW, D & L AXES ARE REQUIRED.

Shapes containing Inclined lines should be enclosed in a rectangle as shown. Then first draw isom. of that rectangle and then inscribe that shape as it is.

SHAPE	Isometric view if the Shape is F.V. or T.V.
RECTANGLE 	
TRIANGLE 	
PENTAGON 	

Four centre method



Standard shapes

ISOMETRIC VIEWS OF STANDARD SHAPES

Square

Consider a square *ABCD* with a 30 mm side as shown in Fig. 1 If the square lies in the vertical plane, it will appear as a rhombus with a 30 mm side in isometric view as shown in either Fig. 1 (a) or (b), depending on its orientation, i.e., right-hand vertical face or left-hand vertical face. If the square lies in the horizontal plane (like the top face of a cube), it will appear as in Fig. 1 (c). The sides *AB* and *AD*, both, are inclined to the horizontal reference line at 30°.

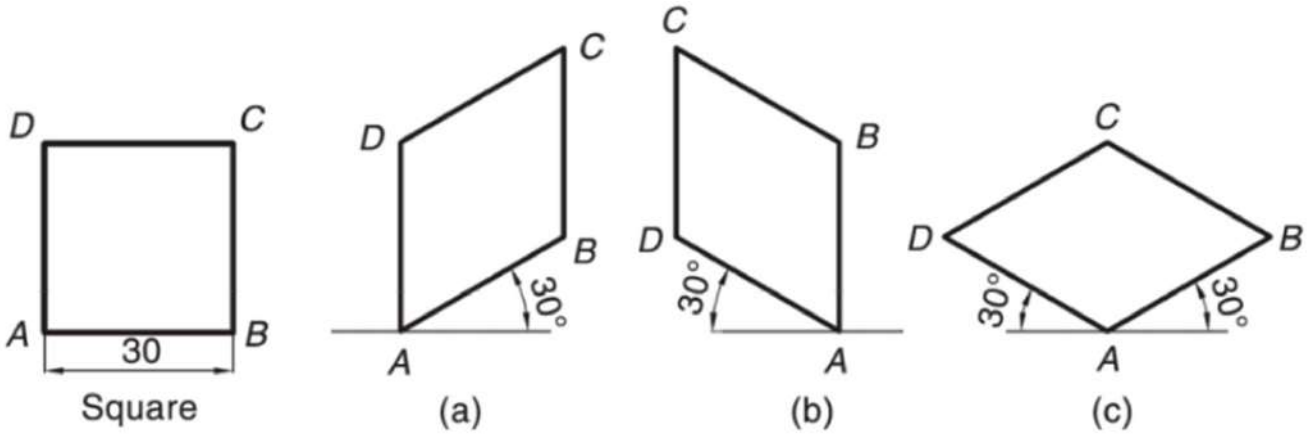


Fig. 1

Standard shapes

Rectangle

A rectangle appears as a parallelogram in isometric view. Three versions are possible depending on the orientation of the rectangle, i.e., right-hand vertical face, left-hand vertical face or horizontal face, as shown in Fig. 2

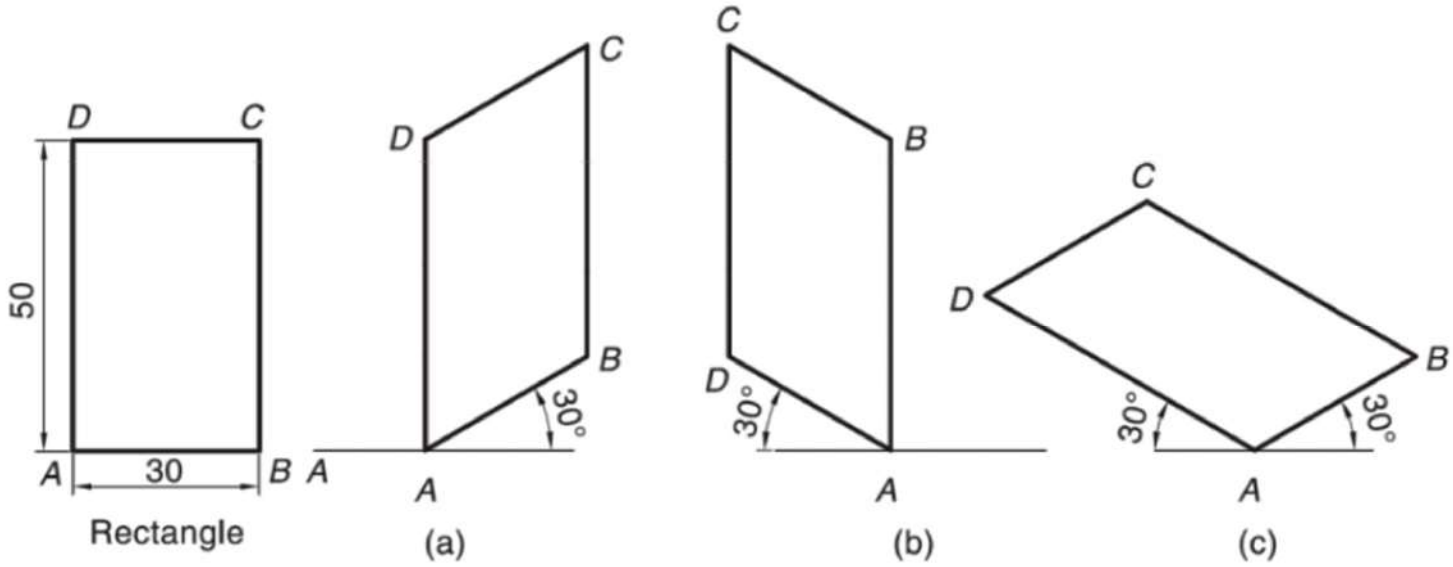


Fig. 2

Standard shapes

Hexagon

The procedure for isometric drawing of a hexagon is the same as that for a pentagon. In Fig. 3 , the lines 2–3, 3–4, 5–6 and 6–1 are non-isolines. Therefore, the points 1, 2, 3, 4, 5, 7 and 6 should be located properly as shown.

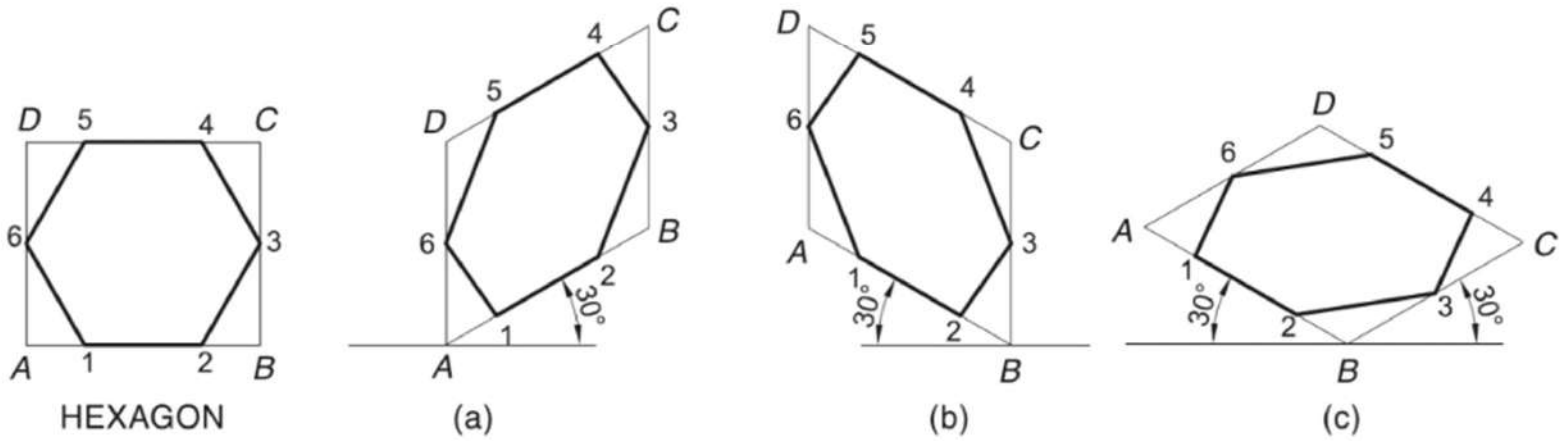
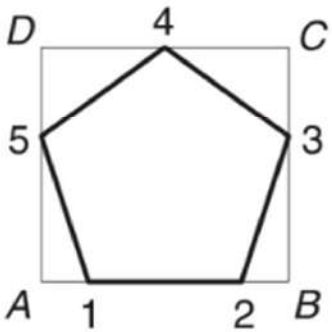


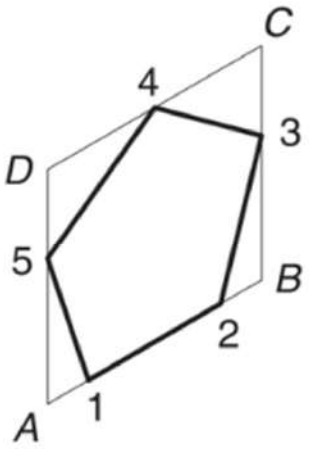
Fig. 3

Standard shapes

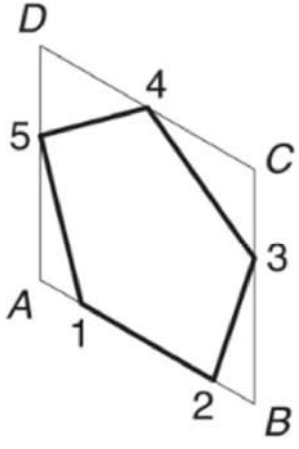
Pentagon



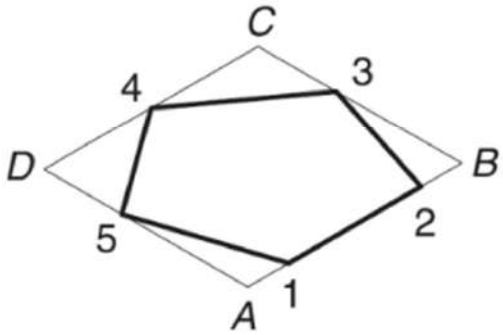
Pentagon



(a)



(b)

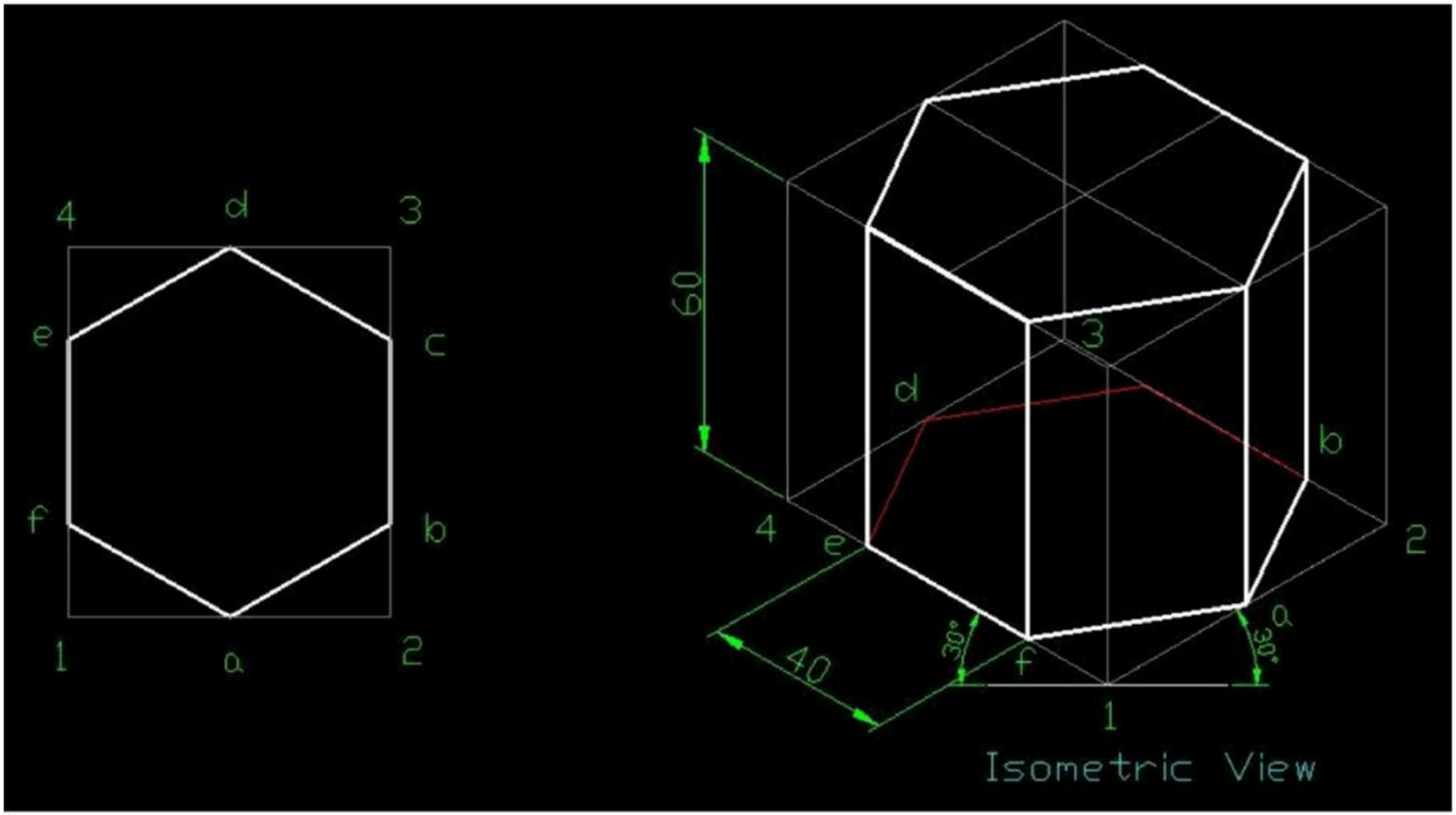


(c)

Fig. 4

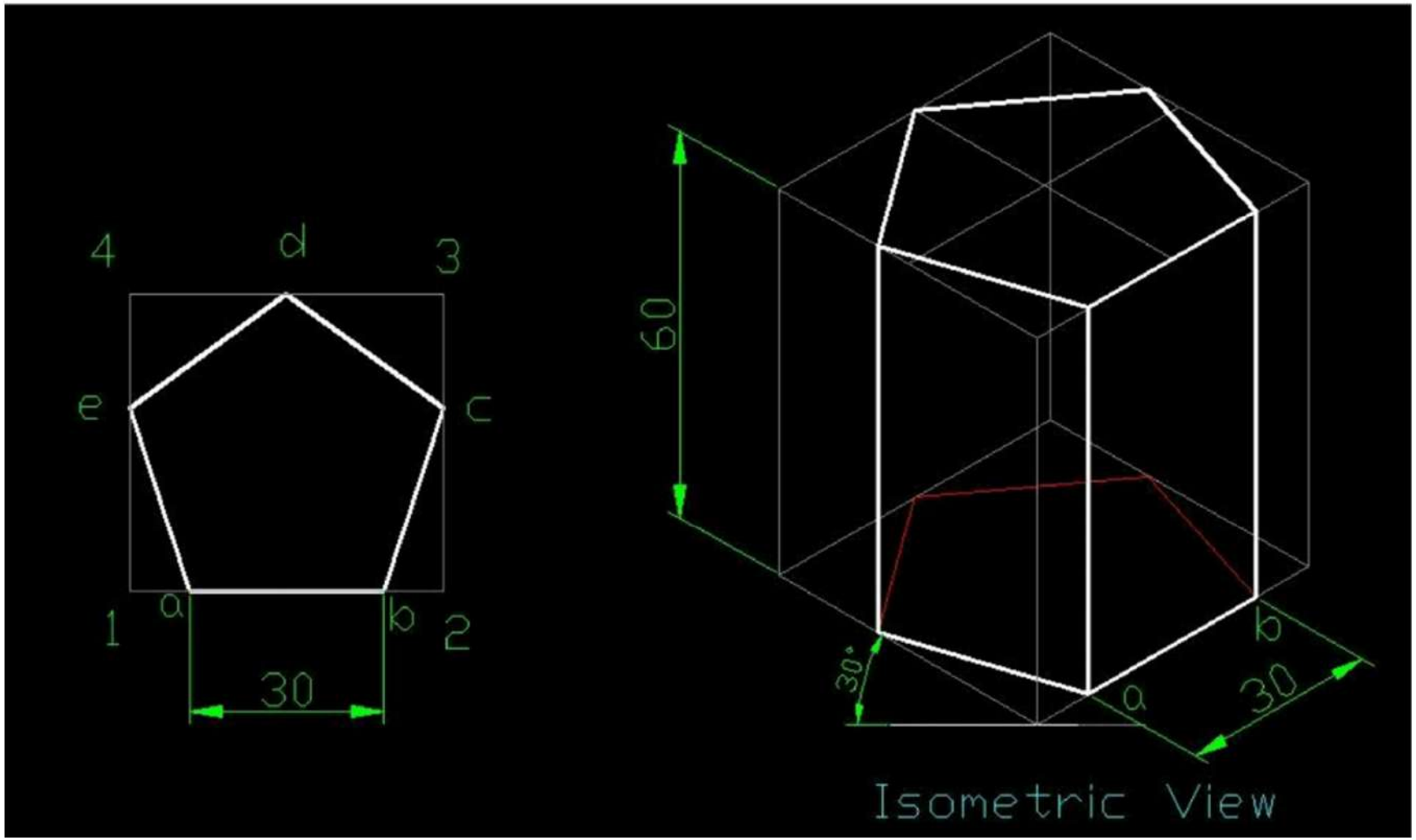
Hexagonal Prism

Draw isometric view of hexagonal prism of side 40 mm and height 60 mm.



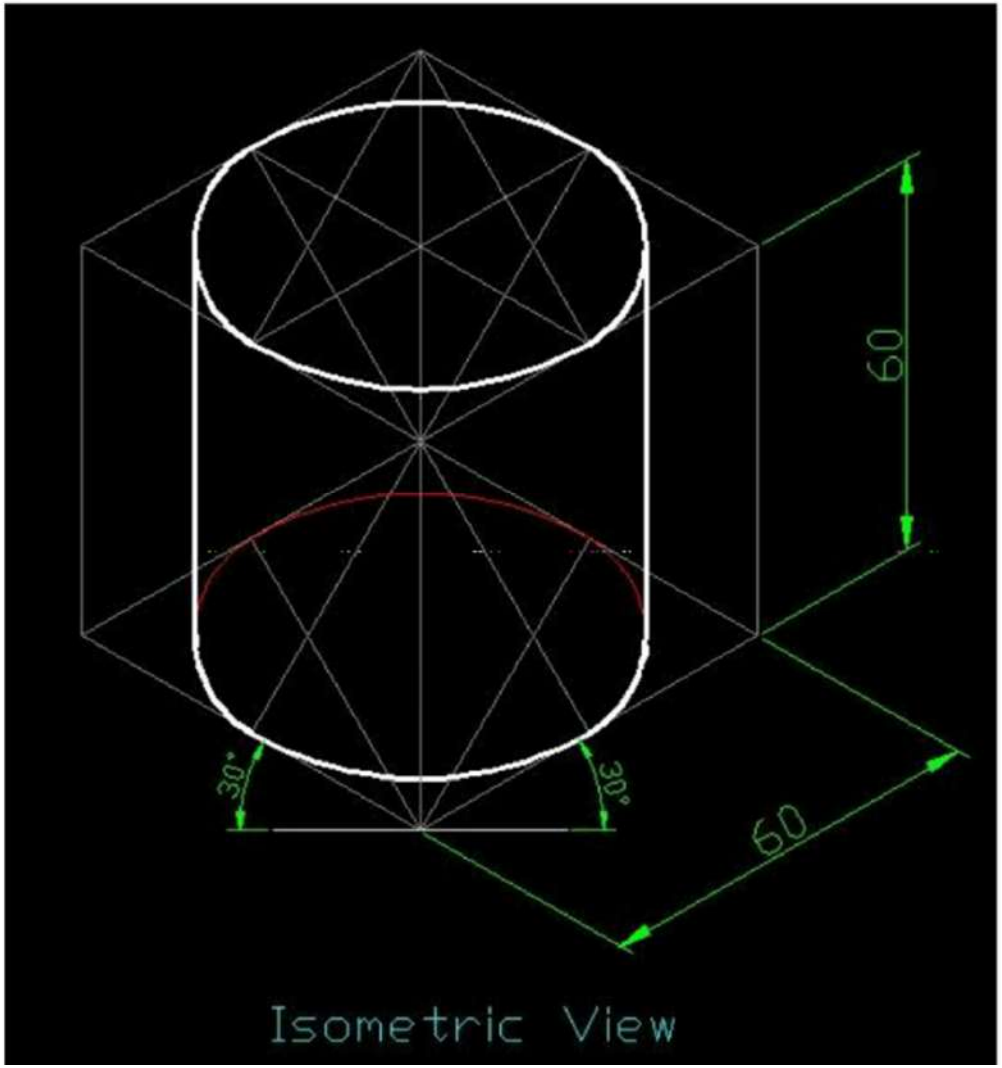
Pentagonal Prism

Draw isometric view of pentagonal prism of side 30 mm and height 60 mm.



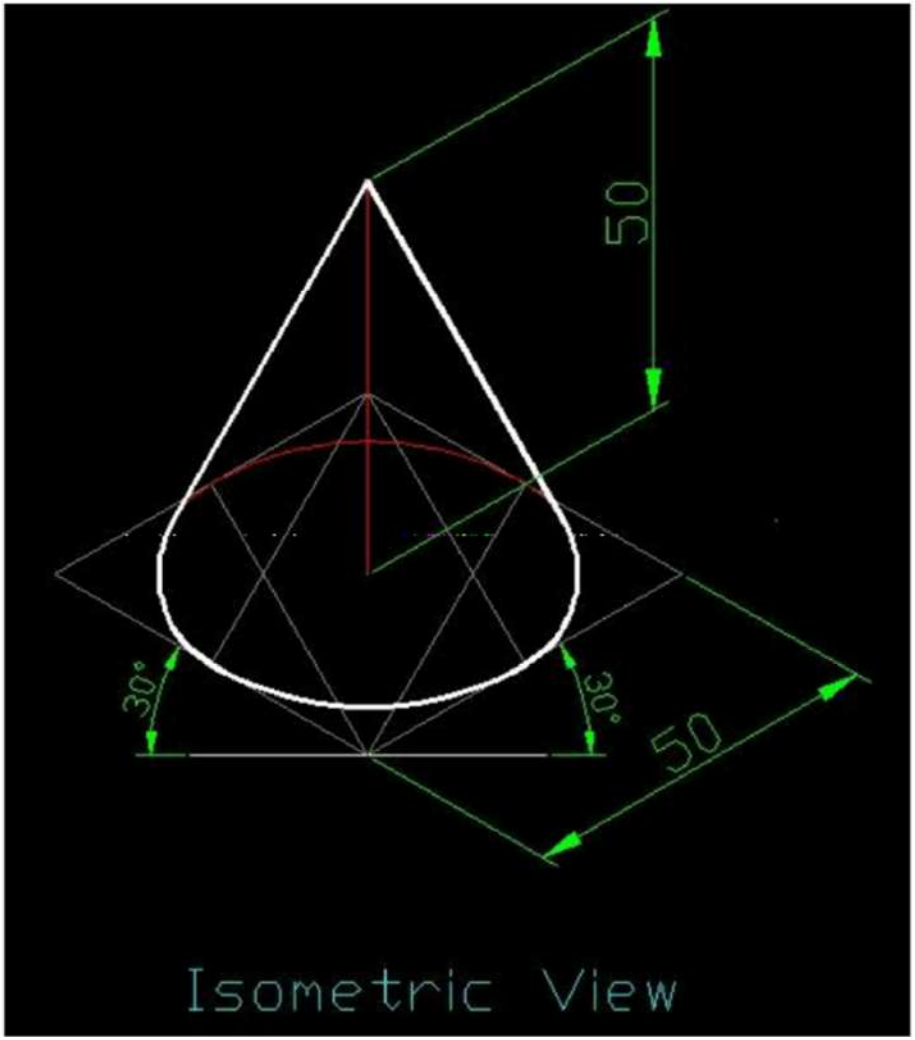
Cylinder

Draw isometric view of cylinder of base diameter 60 mm and height 60 mm.



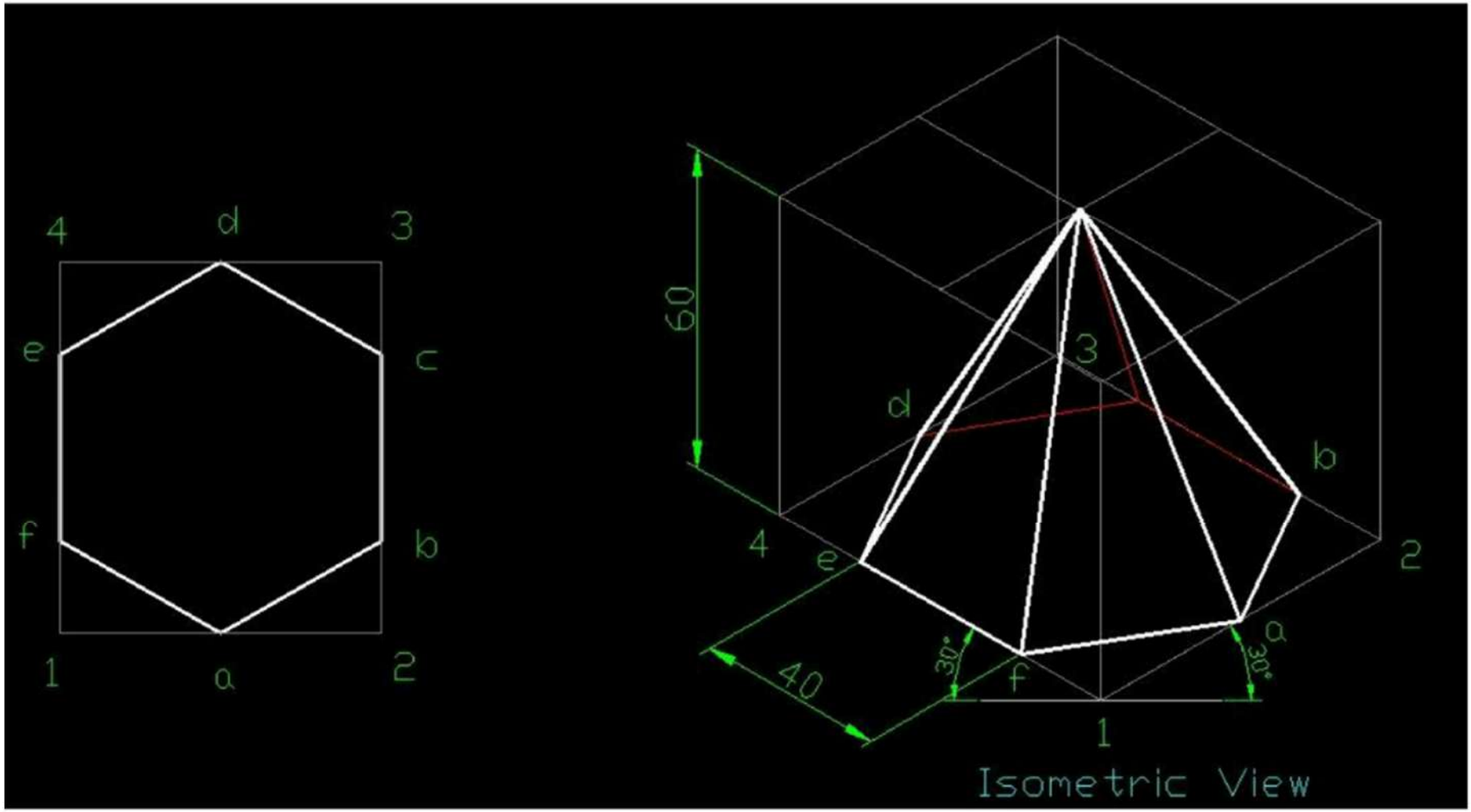
Cone

Draw isometric view of a cone of base diameter 50 mm and height of axis 50 mm.



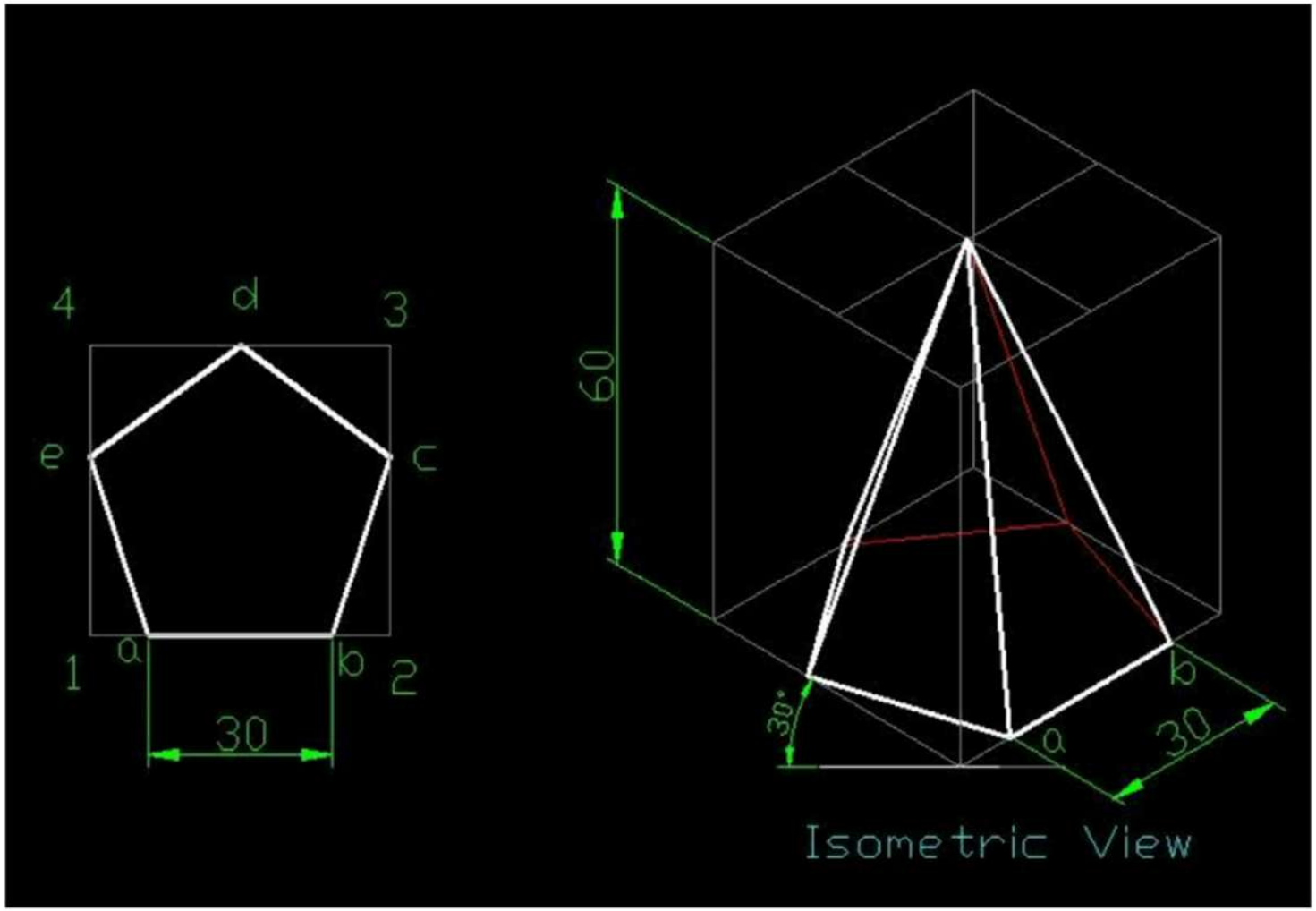
Hexagonal pyramid

Draw isometric view of hexagonal pyramid of side 40 mm and height 60 mm.



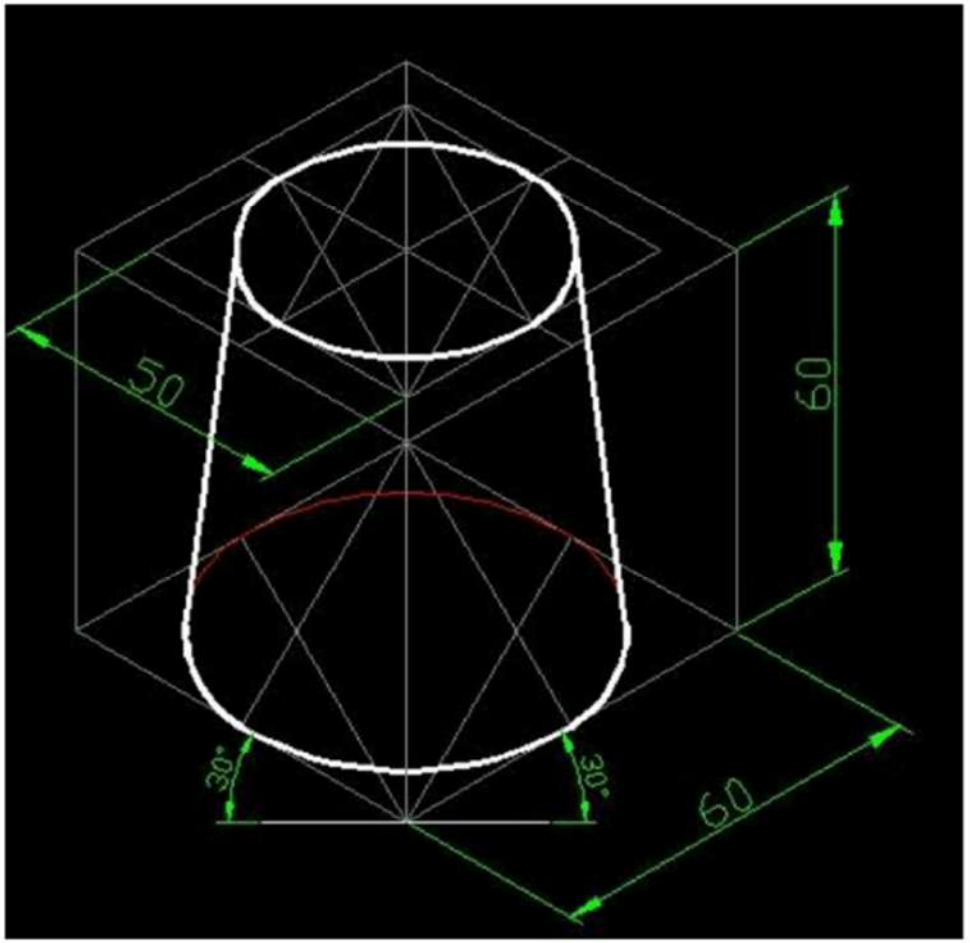
Pentagonal pyramid

Draw isometric view of pentagonal pyramid of base 30 mm and height 60 mm.



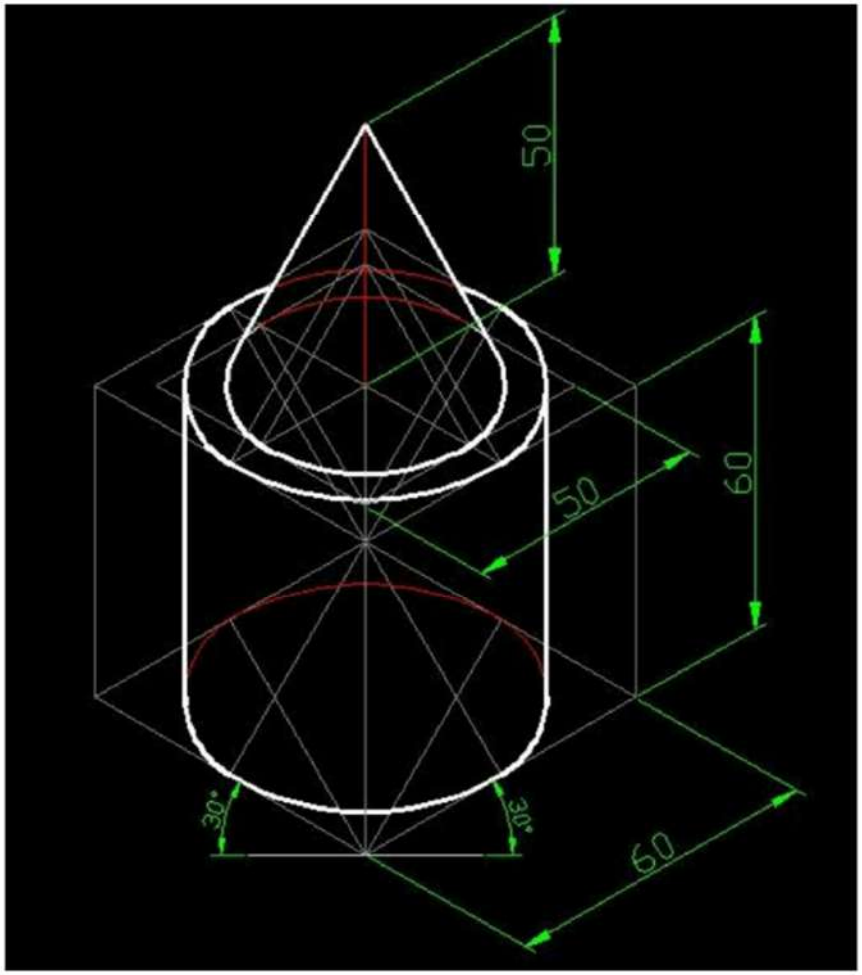
Frustrum of cone

Draw isometric view of frustum of cone whose larger base diameter is 60 mm and smaller diameter is 50 mm. It is resting on its larger base and take height as 60 mm.



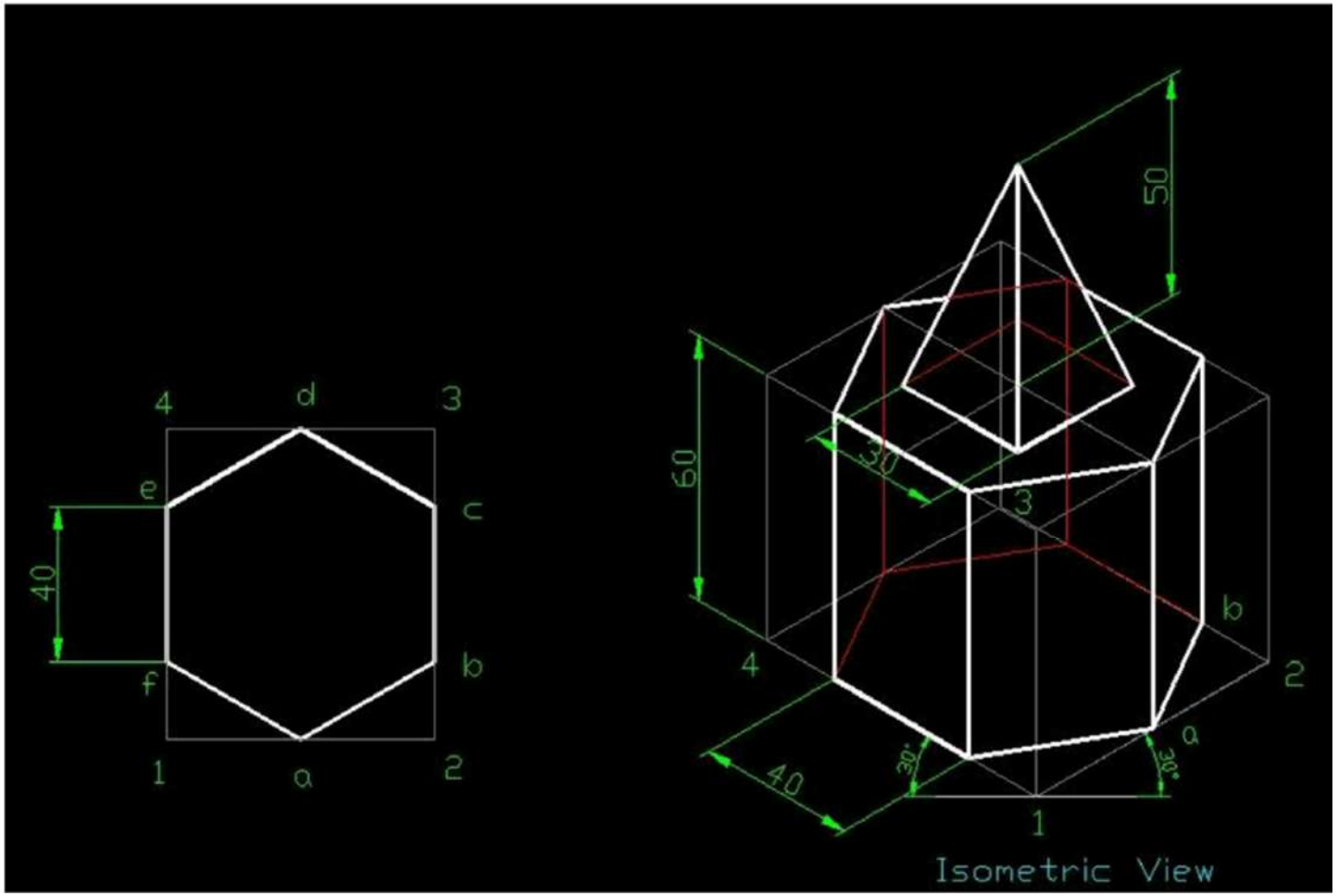
Cone resting on cylinder

A cone of base diameter 50 mm and height 50 mm is resting centrally on top of cylinder whose base diameter is 60 mm and height 60 mm. Draw the isometric view of the two solids.



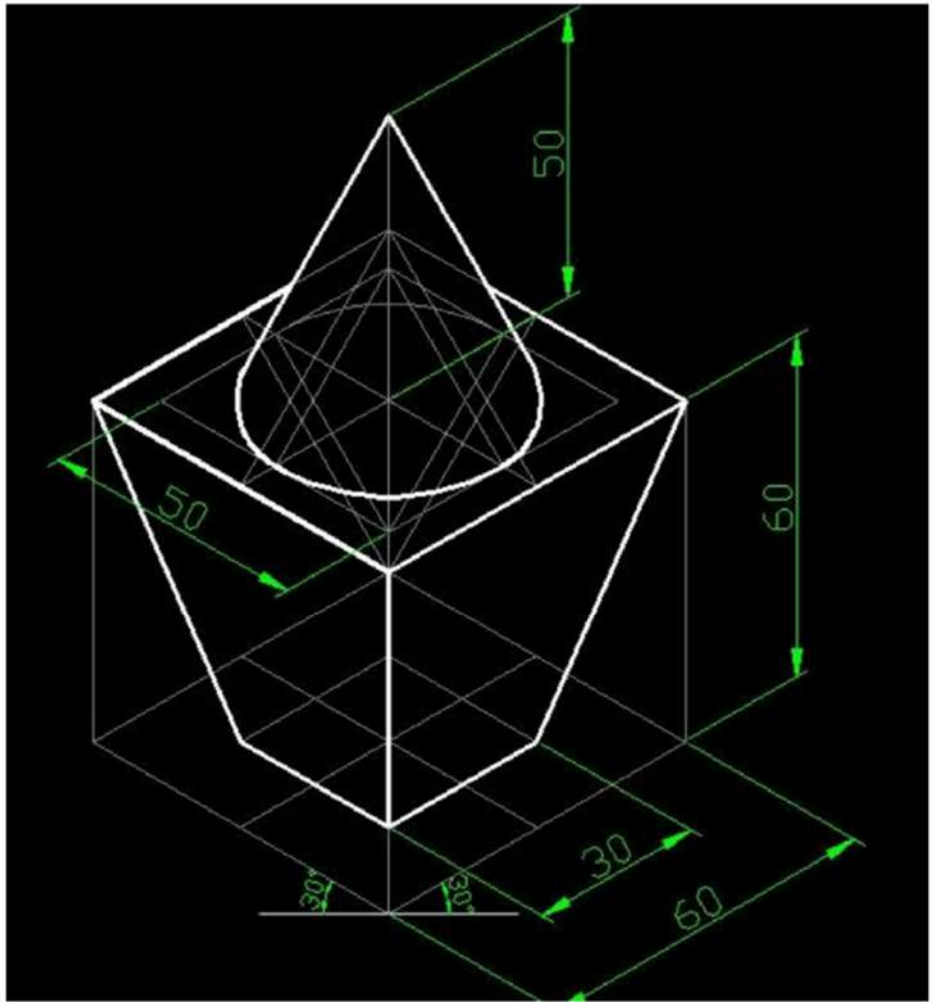
Square pyramid resting on hexagonal prism

A square pyramid of side 30 mm and height 50 mm is resting centrally on top of hexagonal prism whose side is 40 mm and height 60 mm. Draw isometric view of the two solids.



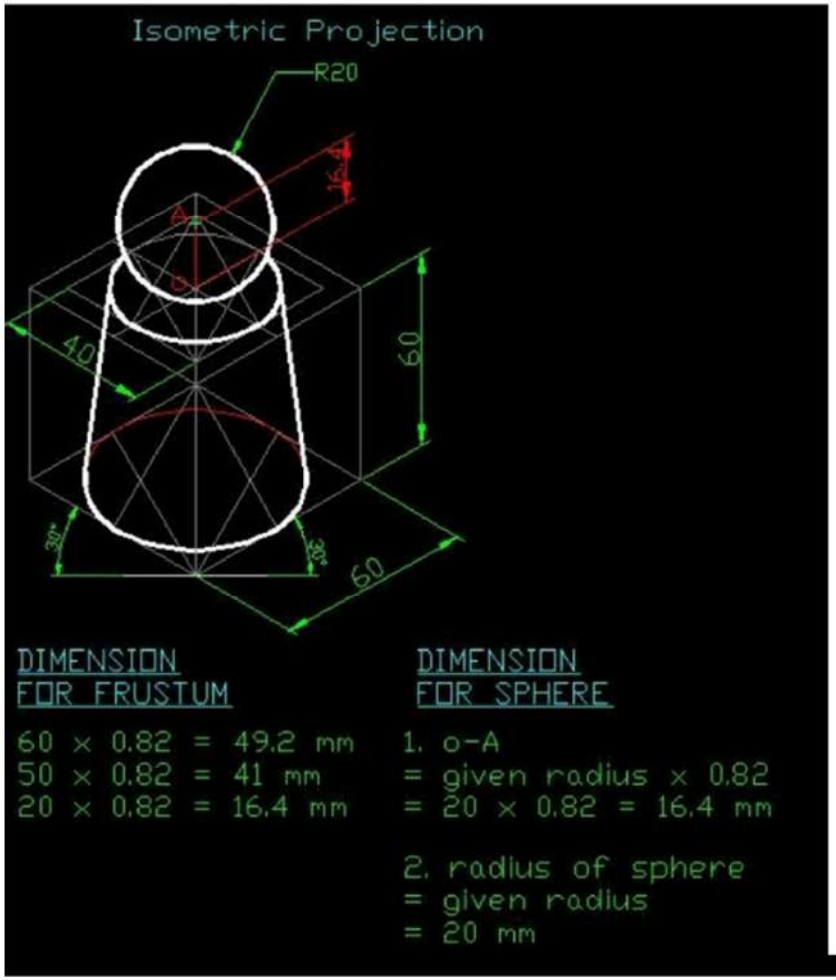
Cone resting on square base frustrum

A cone of base diameter 50 mm and height 50 mm is resting centrally on top of square base frustum whose smaller base is 30 mm, larger base is 50 mm and height 60 mm. The square base frustum is resting on its smaller base. Draw isometric view of the two solids.



Sphere resting on top of cone frustrum

A sphere of diameter 40 mm is resting centrally on top of cone frustum whose larger base diameter is 60 mm and smaller diameter is 40 mm and height 60 mm. Draw a) Isometric Projection of two solids, b) Draw Isometric view of two solids.



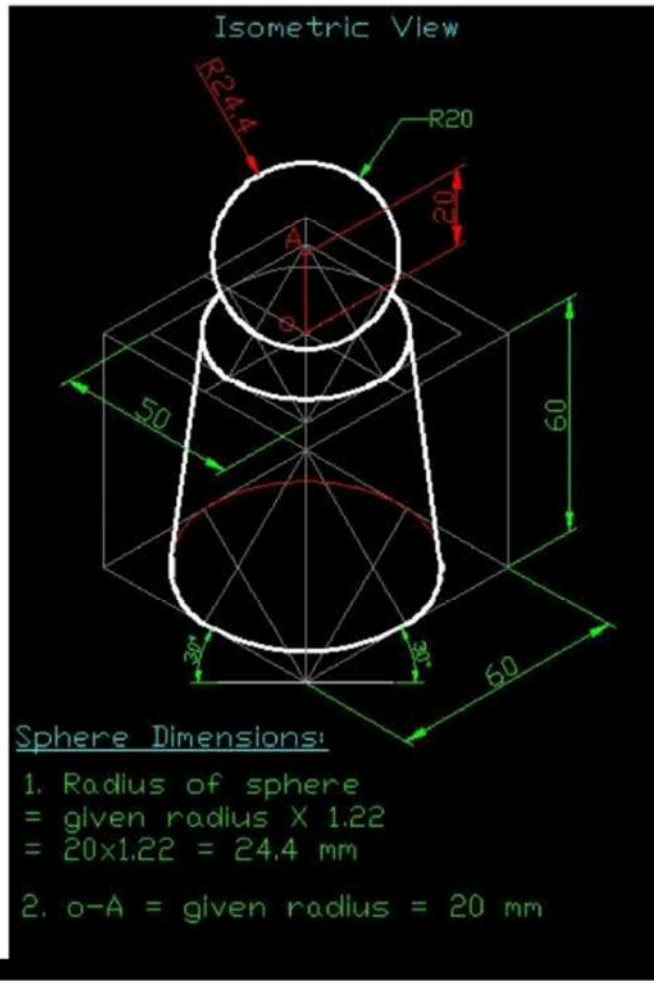
DIMENSION FOR FRUSTUM

60 × 0.82 = 49.2 mm
50 × 0.82 = 41 mm
20 × 0.82 = 16.4 mm

DIMENSION FOR SPHERE

1. o-A
= given radius × 0.82
= 20 × 0.82 = 16.4 mm

2. radius of sphere
= given radius
= 20 mm



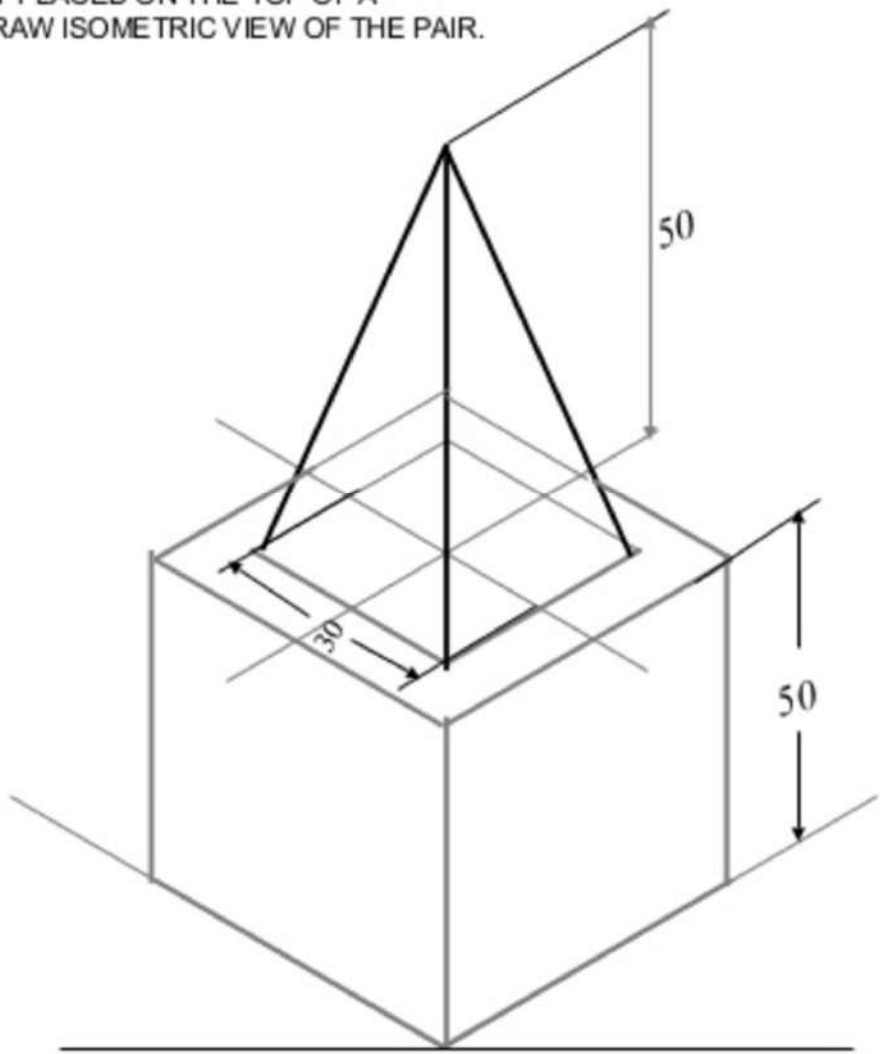
Sphere Dimensions:

1. Radius of sphere
= given radius X 1.22
= 20x1.22 = 24.4 mm

2. o-A = given radius = 20 mm

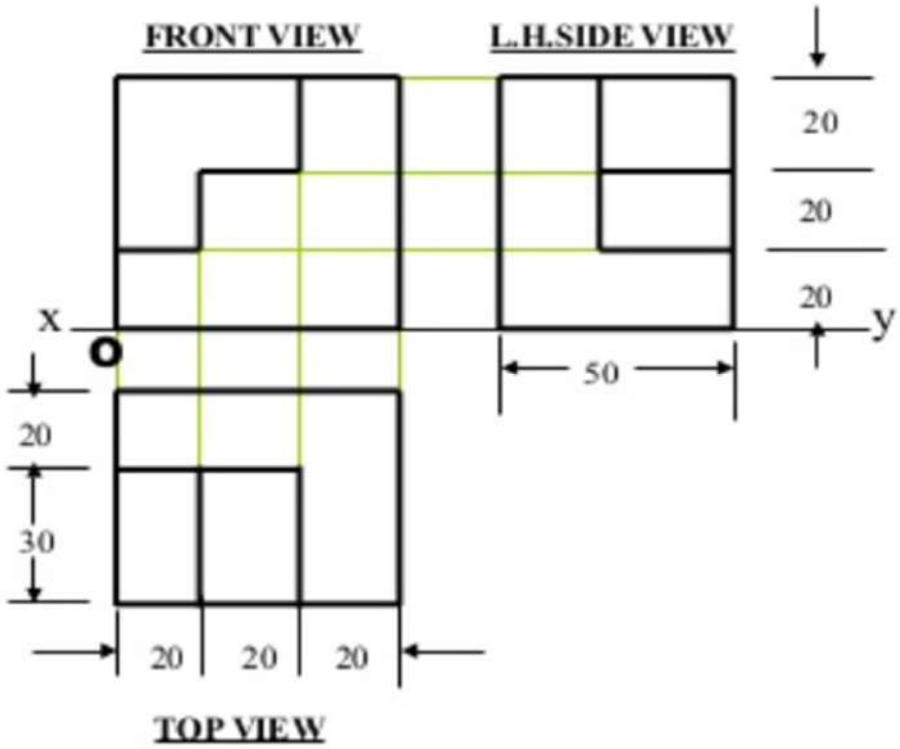
Square pyramid resting on Cube

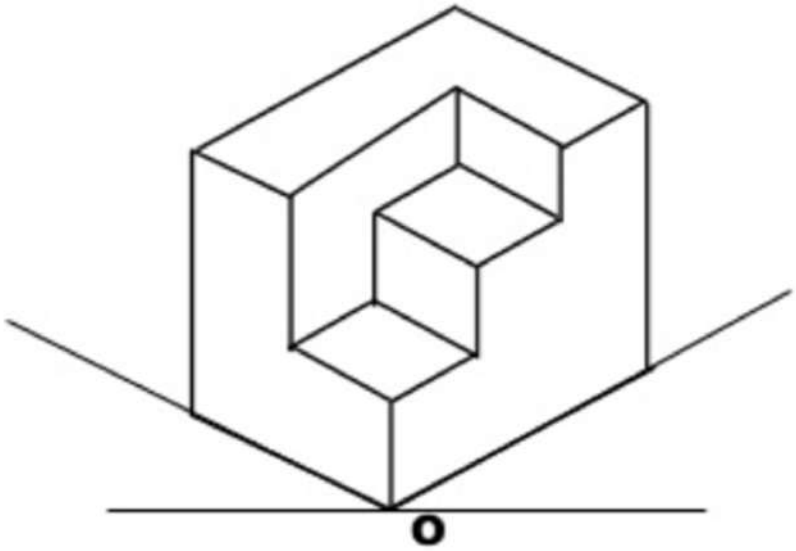
PROBLEM: A SQUARE PYRAMID OF 30 MM BASE SIDES AND 50 MM LONG AXIS, IS CENTRALLY PLACED ON THE TOP OF A CUBE OF 50 MM LONG EDGES.DRAW ISOMETRIC VIEW OF THE PAIR.



F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.

ORTHOGRAPHIC PROJECTIONS





Thanks