SESSION 6

ISOMETRIC PROJECTION

S1 ME 2017

ISOMETRIC DRAWING

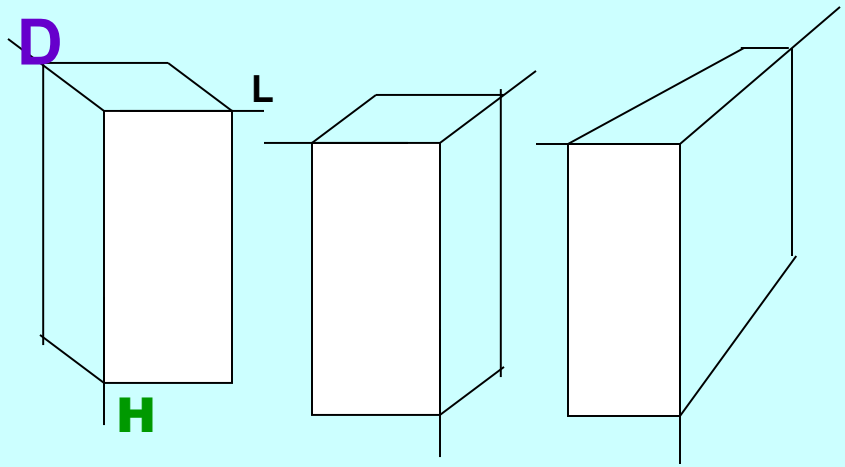
IT IS A TYPE OF PICTORIAL PROJECTION IN WHICH ALL THREE DIMENSIONS OF AN OBJECT ARE SHOWN IN ONE VIEW AND IF REQUIRED, THEIR ACTUAL SIZES CAN BE MEASURED DIRECTLY FROM IT.

TYPICAL CONDITION.

IN THIS 3-D DRAWING OF AN OBJECT, ALL THREE DIMENSIONAL AXES ARE MENTAINED AT EQUAL INCLINATIONS WITH EACH OTHER.(120^0)

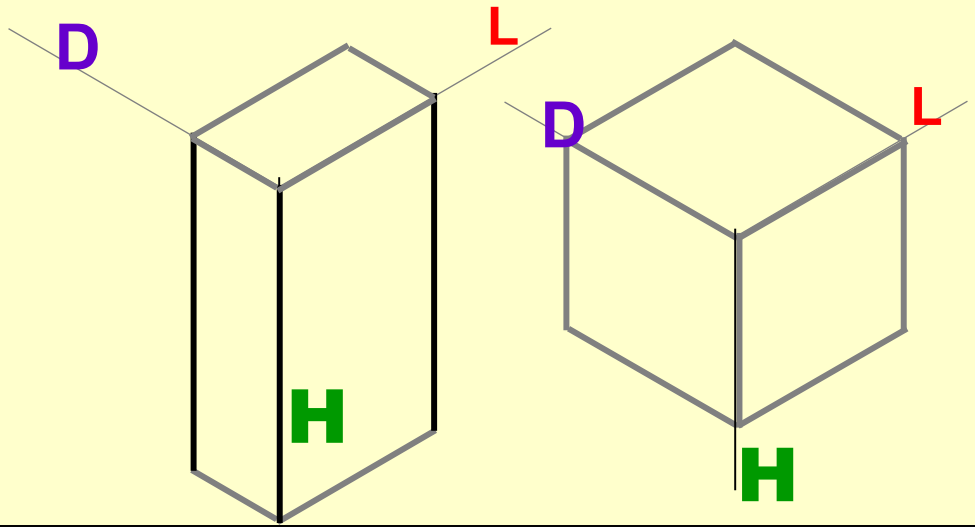
3-D DRAWINGS CAN BE DRAWN IN NUMEROUS WAYS AS SHOWN BELOW. ALL THESE DRAWINGS MAY BE CALLED 3-DIMENSIONAL DRAWINGS, OR PHOTOGRAPHIC OR PICTORIAL DRAWINGS.

HERE NO SPECIFIC RELATION AMONG H, L & D AXES IS MENTAINED.



NOW OBSERVE BELOW GIVEN DRAWINGS. ONE CAN NOTE SPECIFIC INCLINATION AMONG H, L & D AXES. ISO MEANS SAME, SIMILAR OR EQUAL.

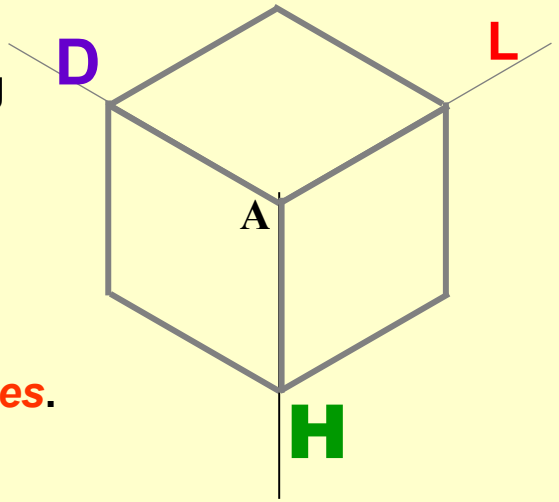
HERE ONE CAN FIND EDUAL INCLINATION AMONG H, L & D AXES. EACH IS 120^0 INCLINED WITH OTHER TWO. HENCE IT IS CALLED ISOMETRIC DRAWING



PURPOSE OF ISOMETRIC DRAWING IS TO UNDERSTAND OVERALL SHAPE, SIZE & APPEARANCE OF AN OBJECT PRIOR TO IT'S PRODUCTION.

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.

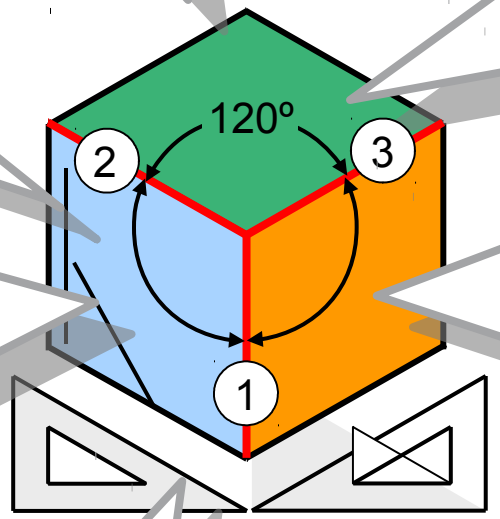
Isometric projections

Characteristics of isometric projections

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

Axes 1, 2 and 3 form 120º 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.

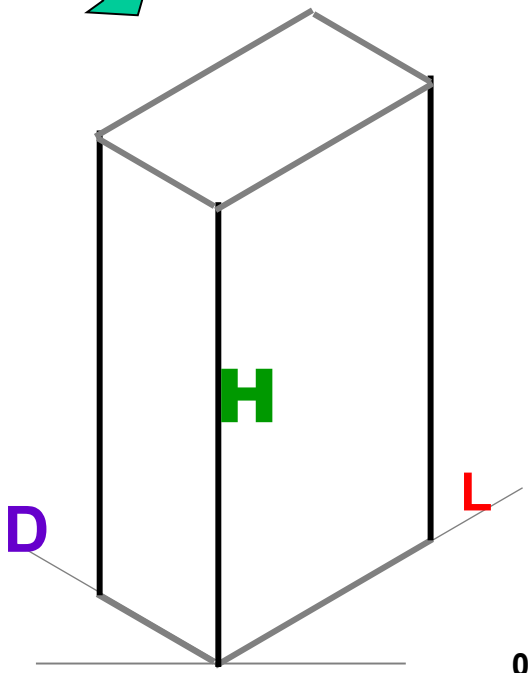
The sides of the cube and all planes parallel to them are isometric planes.

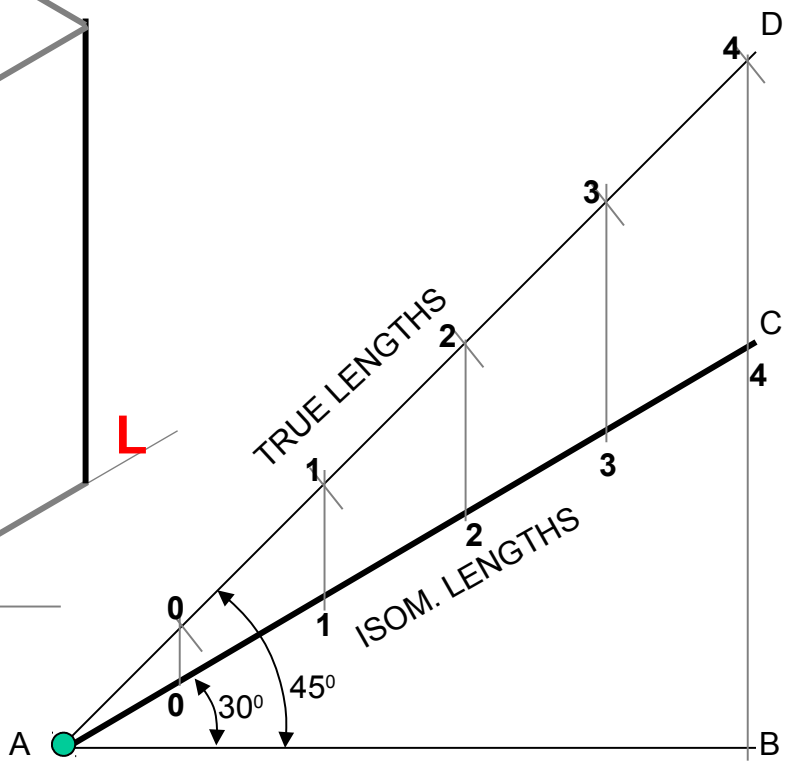
The isometric lines are angled at 30º.

TYPES OF ISOMETRIC DRAWINGS

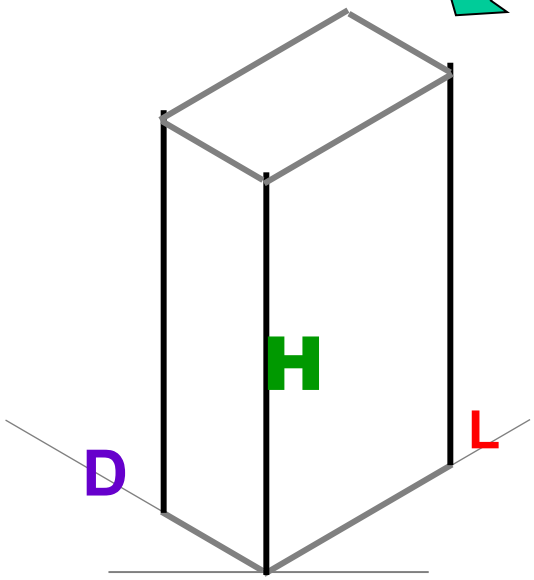
ISOMETRIC VIEW
Drawn by using True scale
(True dimensions)

ISOMETRIC PROJECTION
Drawn by using Isometric scale
(Reduced dimensions)





Isometric scale [Line AC]
required for Isometric Projection

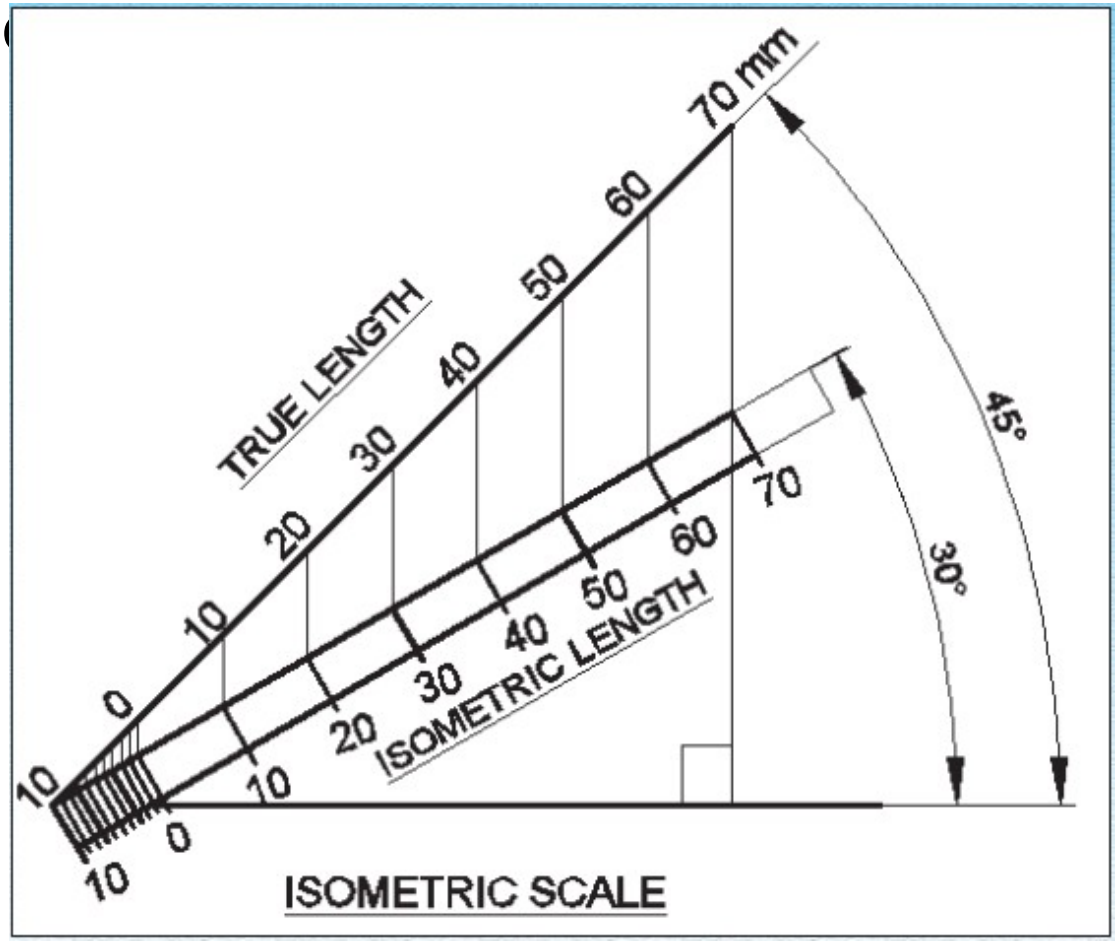


CONSTRUCTION OF ISOM.SCALE.
From point A, with line AB draw 30⁰ and 45⁰ inclined lines AC & AD resp on AD. Mark divisions of true length and from each division-point draw vertical lines upto AC line.
The divisions thus obtained on AC give lengths on isometric scale.

ISOMETRIC SCALE

DEFINITION;-

Scale used to measure the isometric length is called **“ISOMETRI**



1

ISOMETRIC OF PLANE FIGURES

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

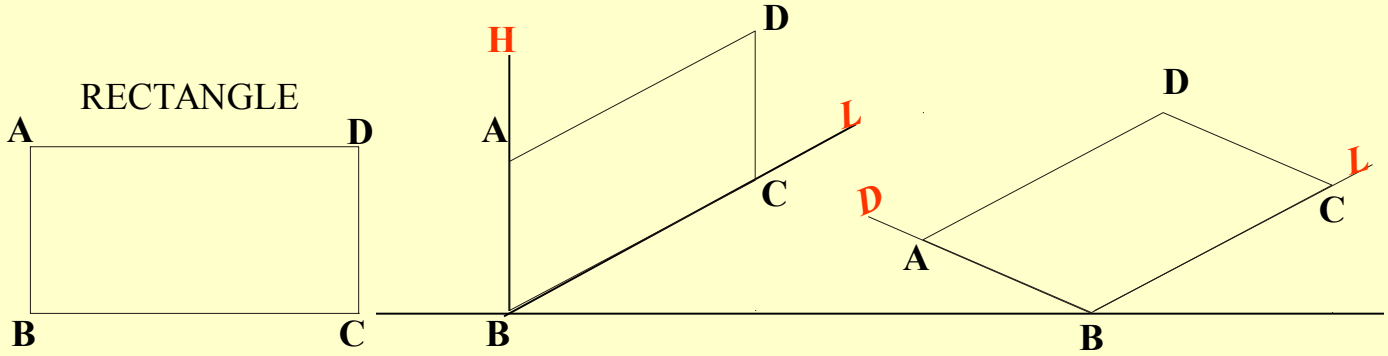
IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

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

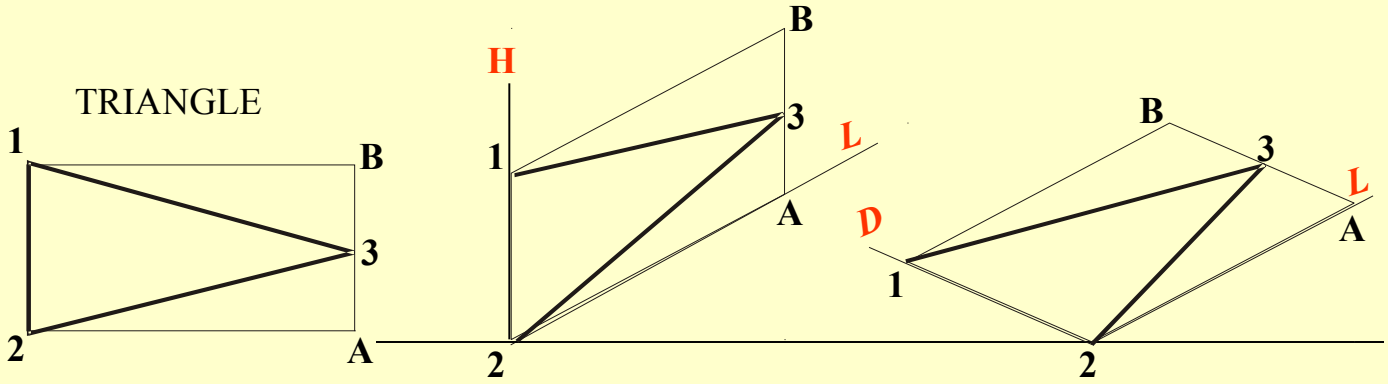
Shapes containing Inclined lines should be enclosed in a rectangle as shown.
Then first draw isom. of that rectangle and then inscribe that shape

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

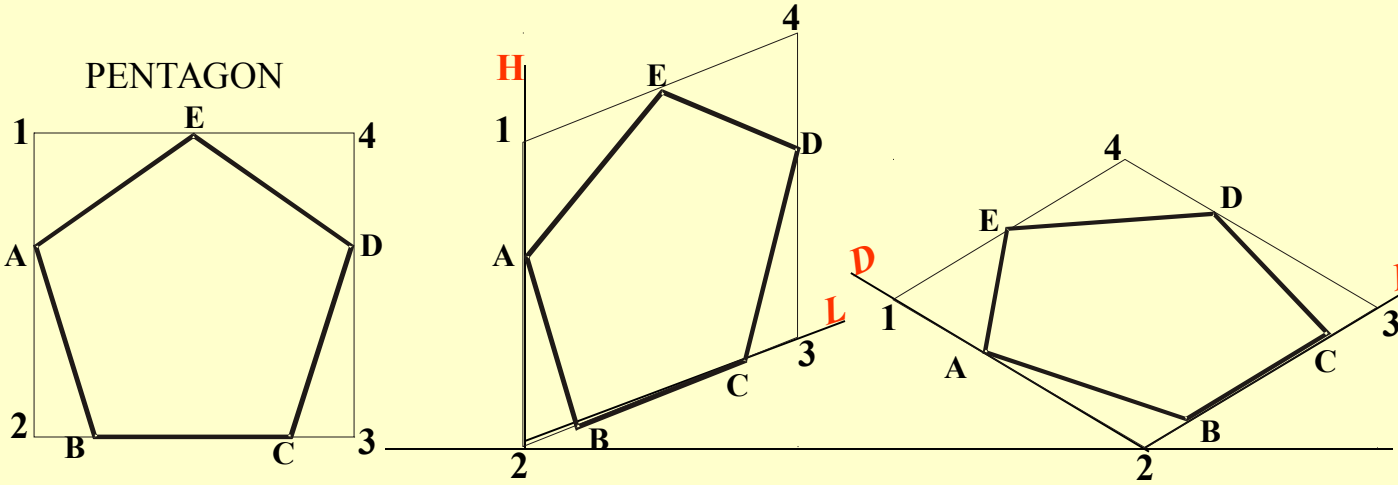
RECTANGLE



TRIANGLE

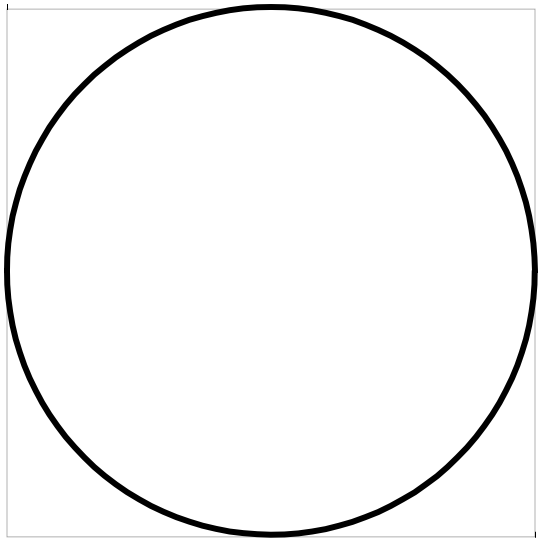


PENTAGON

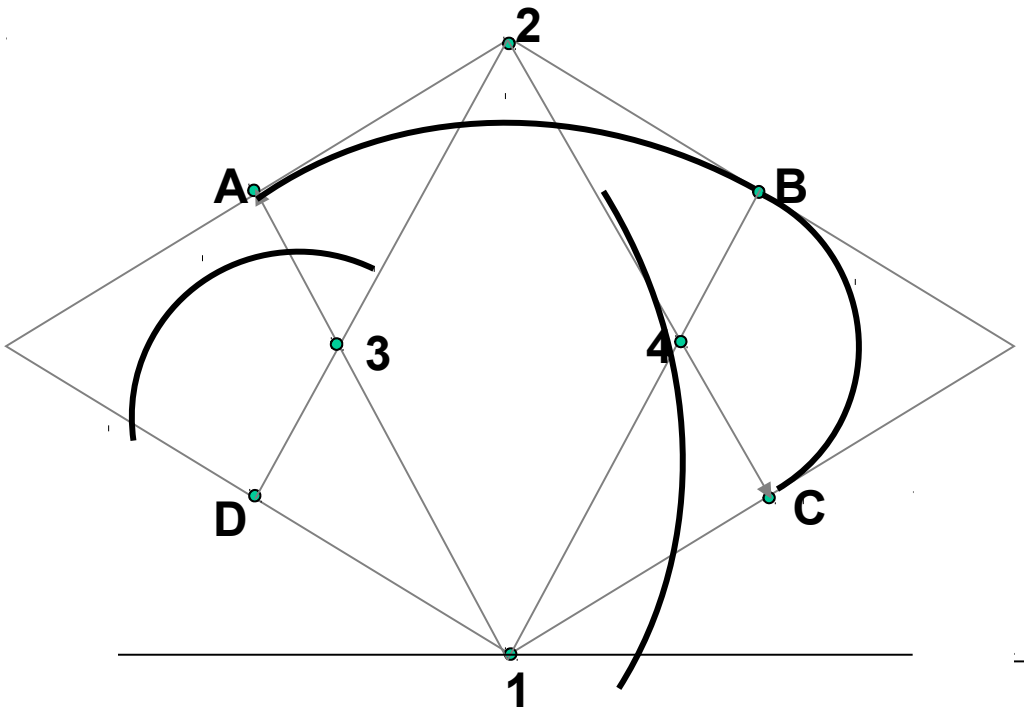


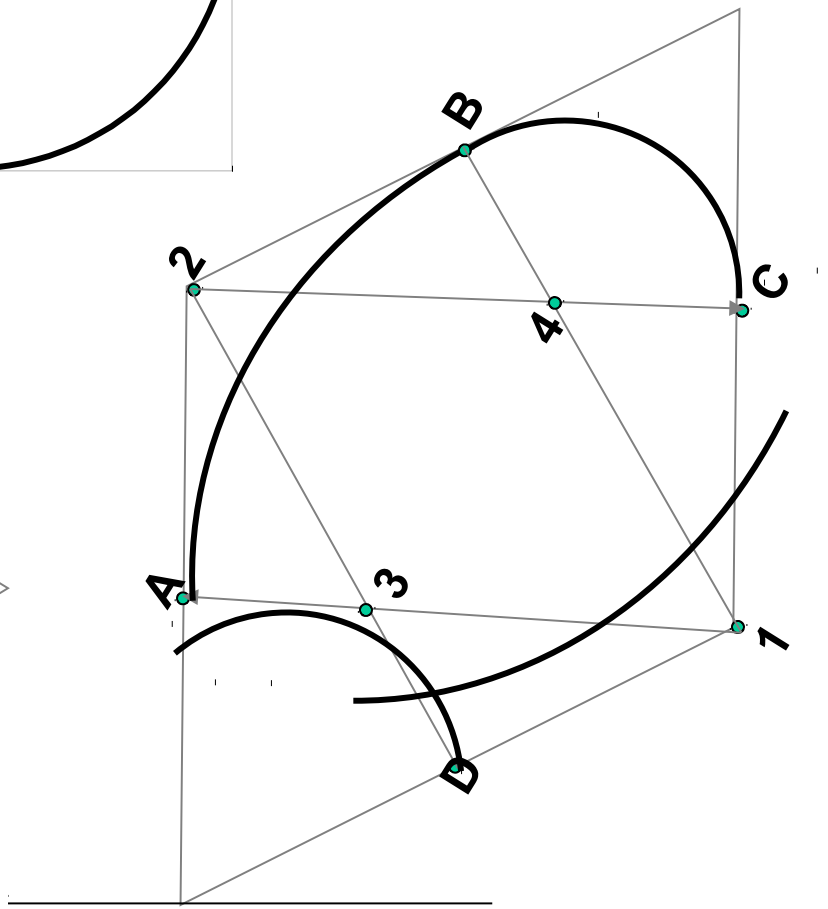
STUDY ILLUSTRATIONS

DRAW ISOMETRIC VIEW OF A CIRCLE IF IT IS A TV OR FV.



FIRST ENCLOSE IT IN A SQUARE.
IT'S ISOMETRIC IS A RHOMBUS WITH D & L AXES FOR TOP VIEW.
THEN USE H & L AXES FOR ISOMETRIC WHEN IT IS FRONT VIEW.
FOR CONSTRUCTION USE RHOMBUS METHOD SHOWN HERE. STUDY IT.



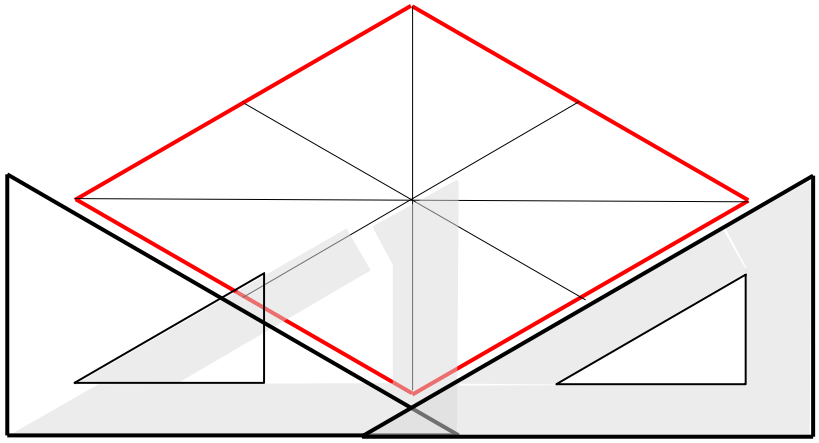


Isometric drawing

How to draw an ellipse composed of four arcs using a compass

1- Trace an isometric square.

2- Find the center of the square using diagonals, then trace the axis lines.



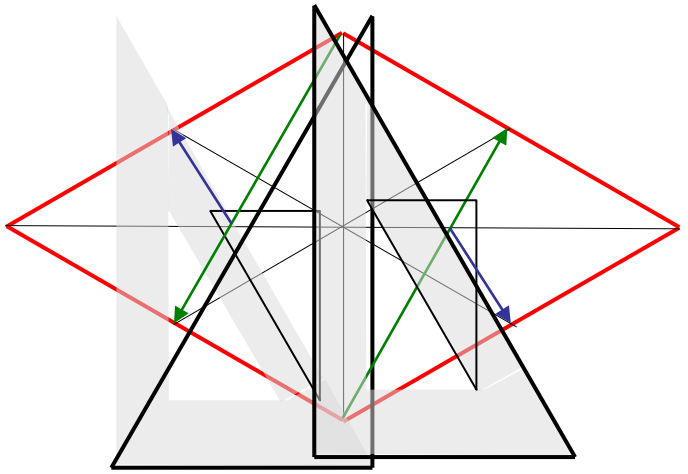
Isometric drawing

How to draw an ellipse composed of four arcs using a compass

1- Trace an isometric square.

2- Find the center of the square using diagonals, then trace the axis lines.

3- Finally, trace the median lines.



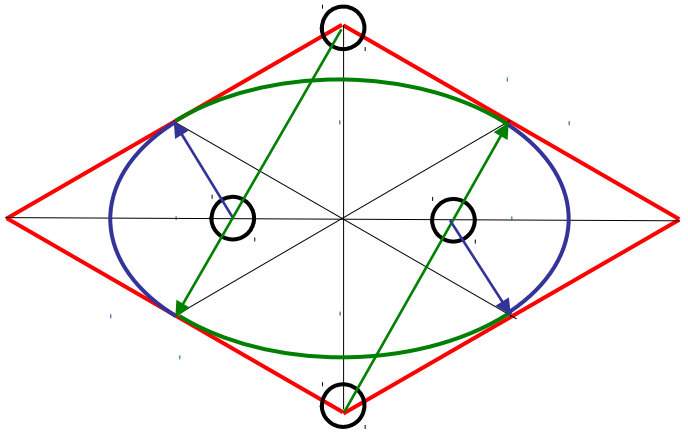
Isometric drawing

How to draw an ellipse composed of four arcs using a compass

1- Trace an isometric square.

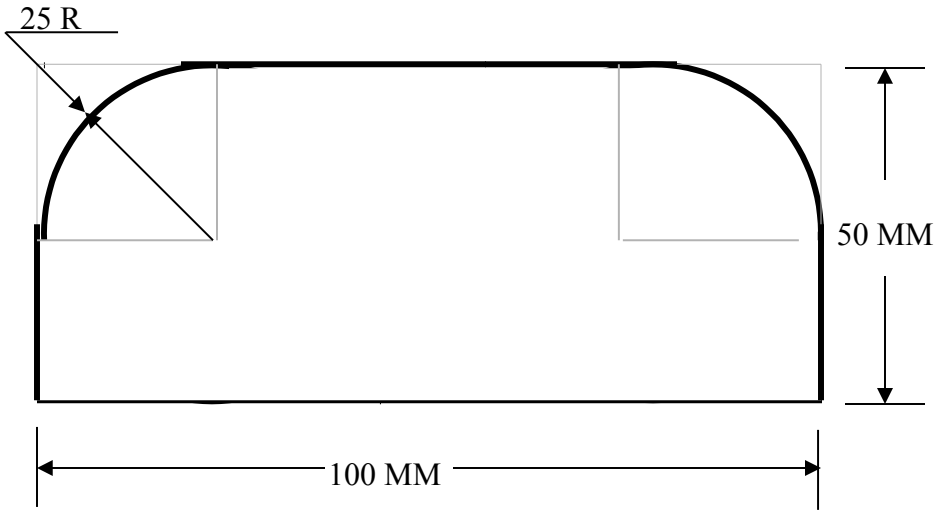
2- Find the center of the square using diagonals, then trace the axis lines.

3- Finally, trace the median lines. The meeting point of the medians shows the center of the four arcs of the circle.

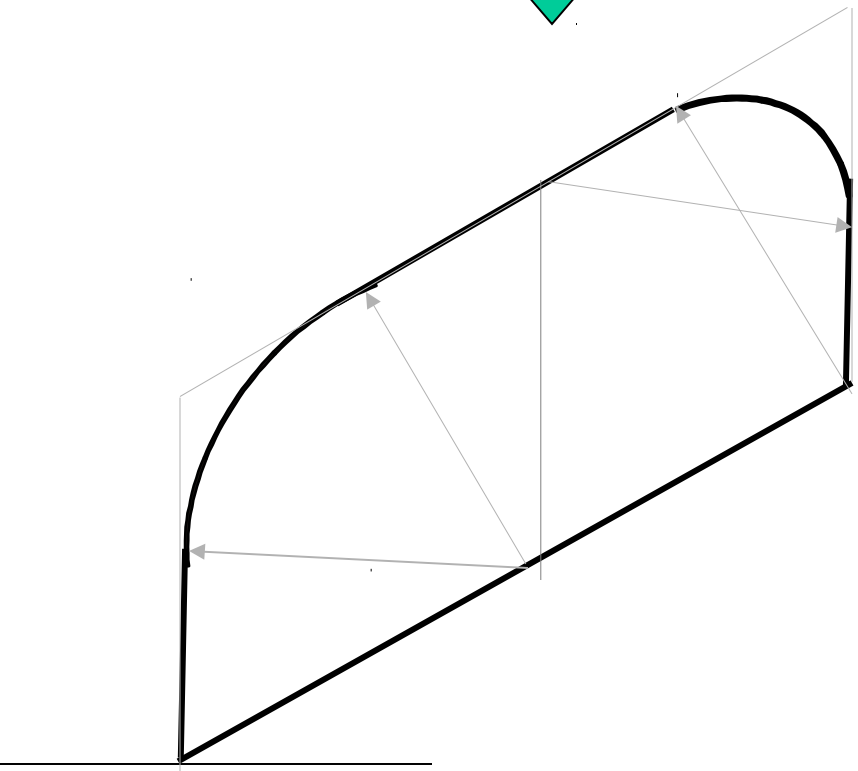


STUDY ILLUSTRATIONS

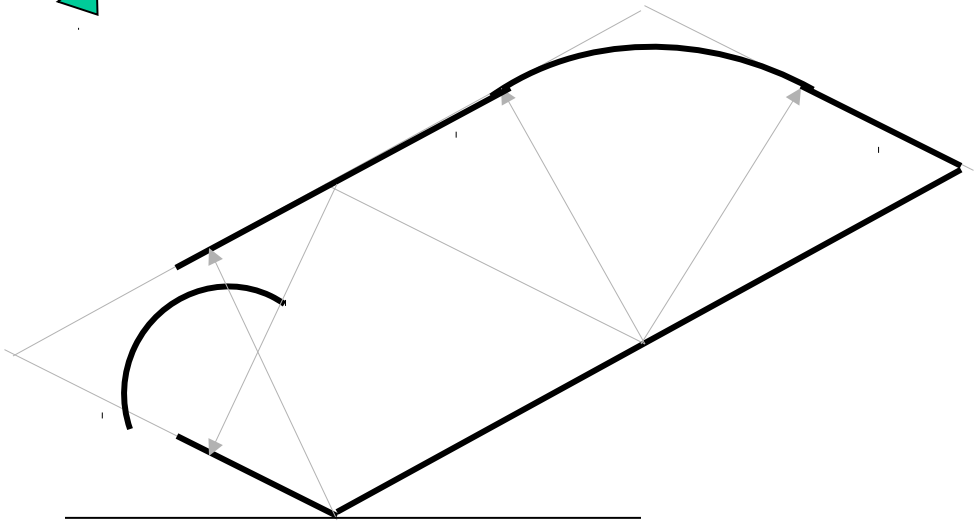
DRAW ISOMETRIC VIEW OF THE FIGURE SHOWN WITH DIMENTIONS (ON RIGHT SIDE) CONSIDERING IT FIRST AS F.V. AND THEN T.V.



IF FRONT VIEW



IF TOP VIEW



ISOMETRIC OF PLANE FIGURES

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

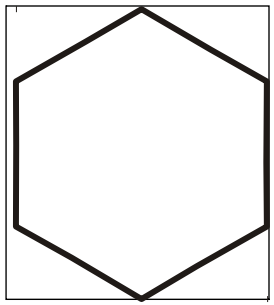
IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

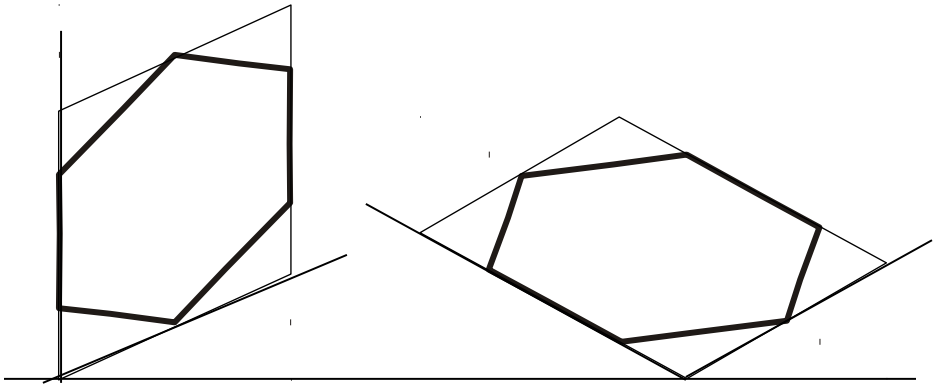
IF THE FIGURE IS TOP VIEW, D & L AXES ARE REQUIRED.

For Isometric of Circle/Semicircle use Rhombus method. Construct it of sides equal to diameter of circle always. (Ref. Previous two pages.)

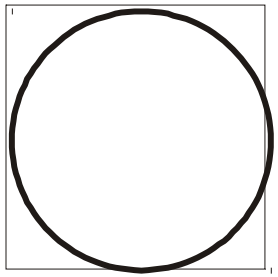
SHAPE	IF F.V.	IF T.V.

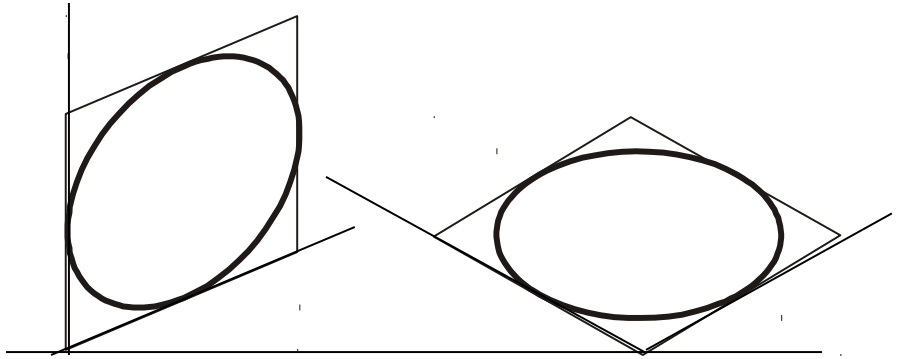
HEXAGON





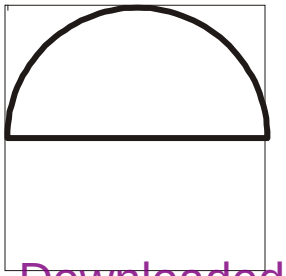
CIRCLE

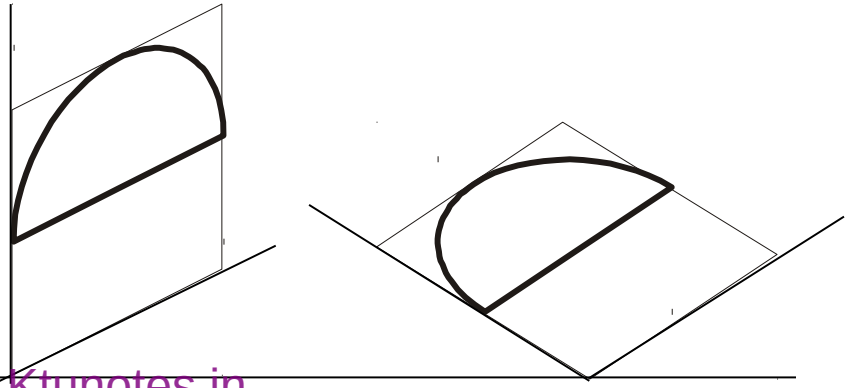




For Isometric of Circle/Semicircle use **Rhombus method.** *Construct Rhombus of sides equal to Diameter of circle always.* **(Ref. topic ENGG. CURVES.)**

SEMI CIRCLE

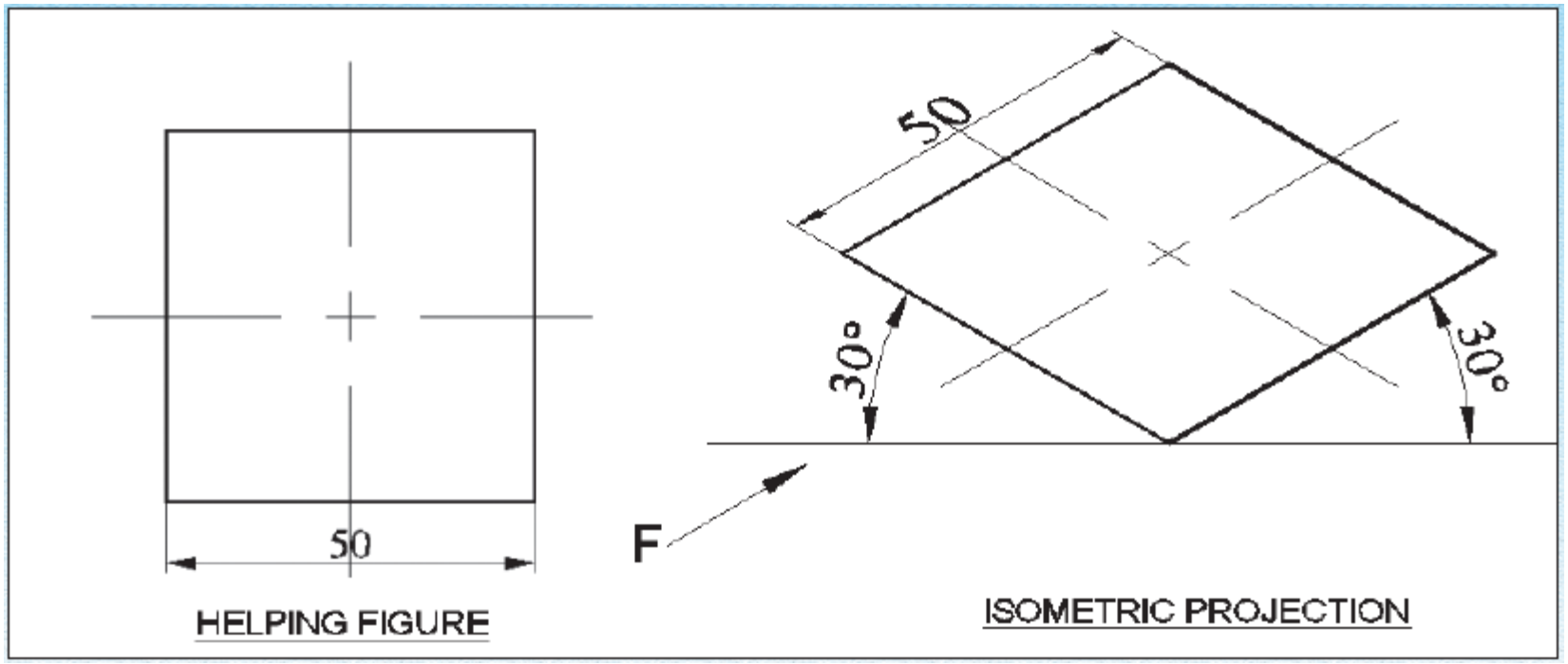




ISOMETRIC PROJECTION

PROBLEM:-

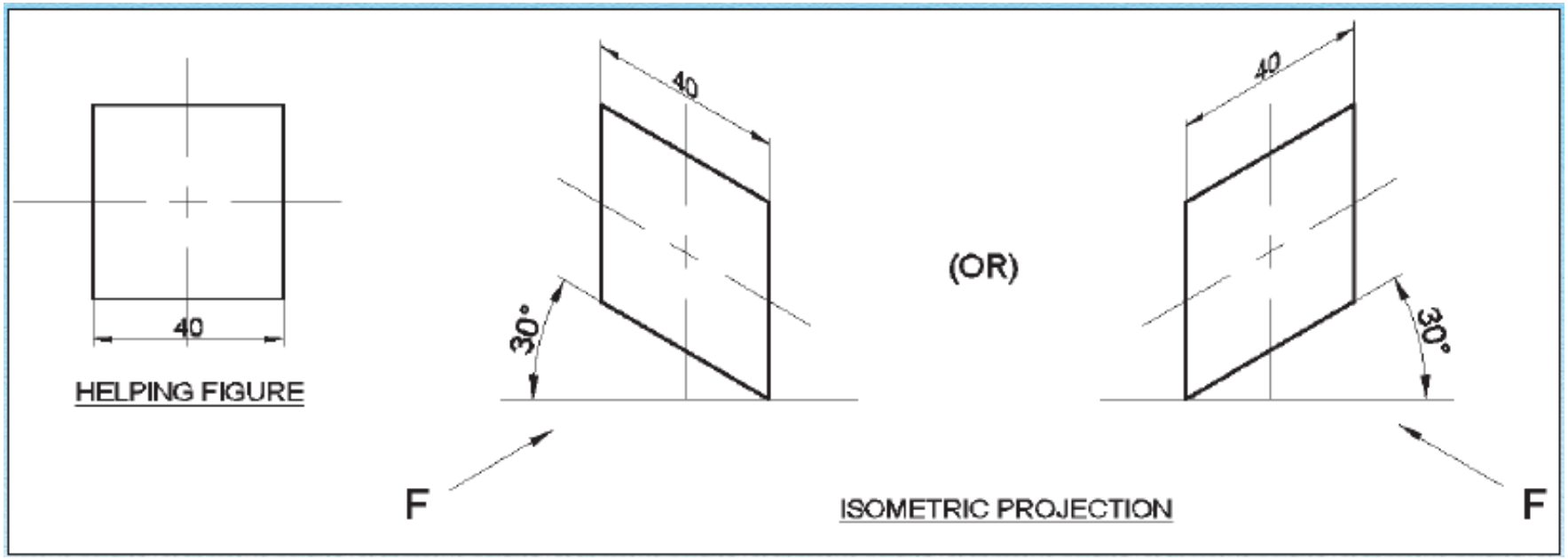
Draw the isometricprojection of a square lamina having side 50 mm and its surface parallel to H.P



ISOMETRIC PROJECTION

PROBLEM:-

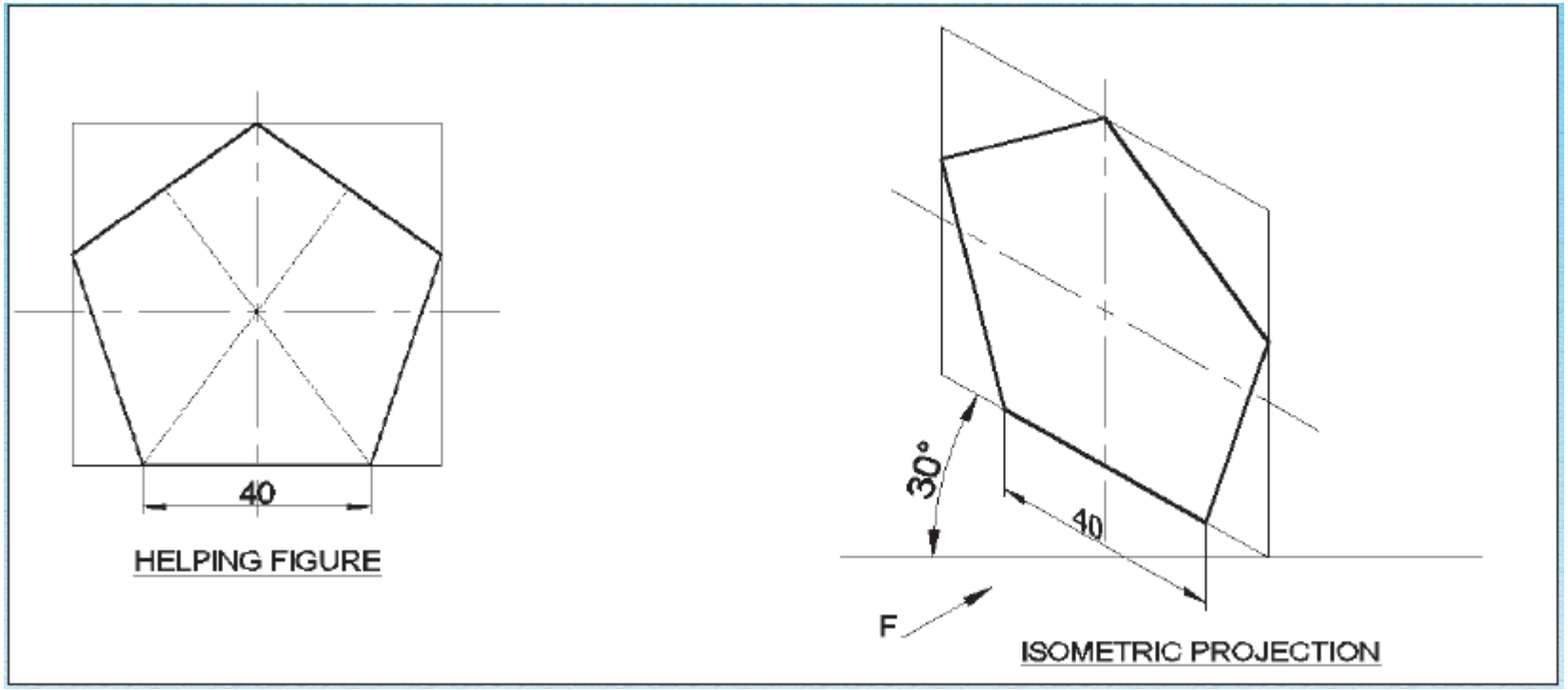
Draw the isometricprojection of a square lamina having side 40 mm and kept in V.P



ISOMETRIC PROJECTION

PROBLEM:-

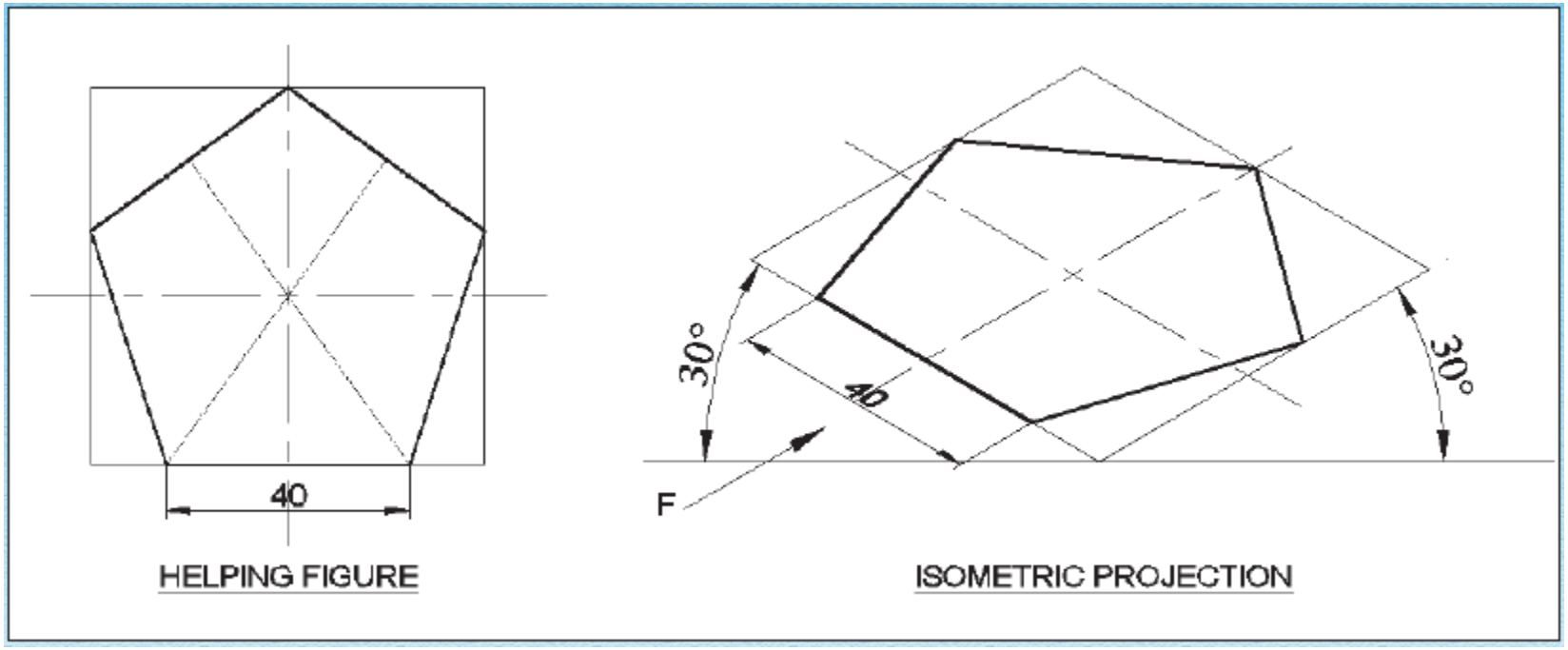
Draw the isometricprojection of a regular pentagon of base side 40 mm in V.P



ISOMETRIC PROJECTION

PROBLEM:-

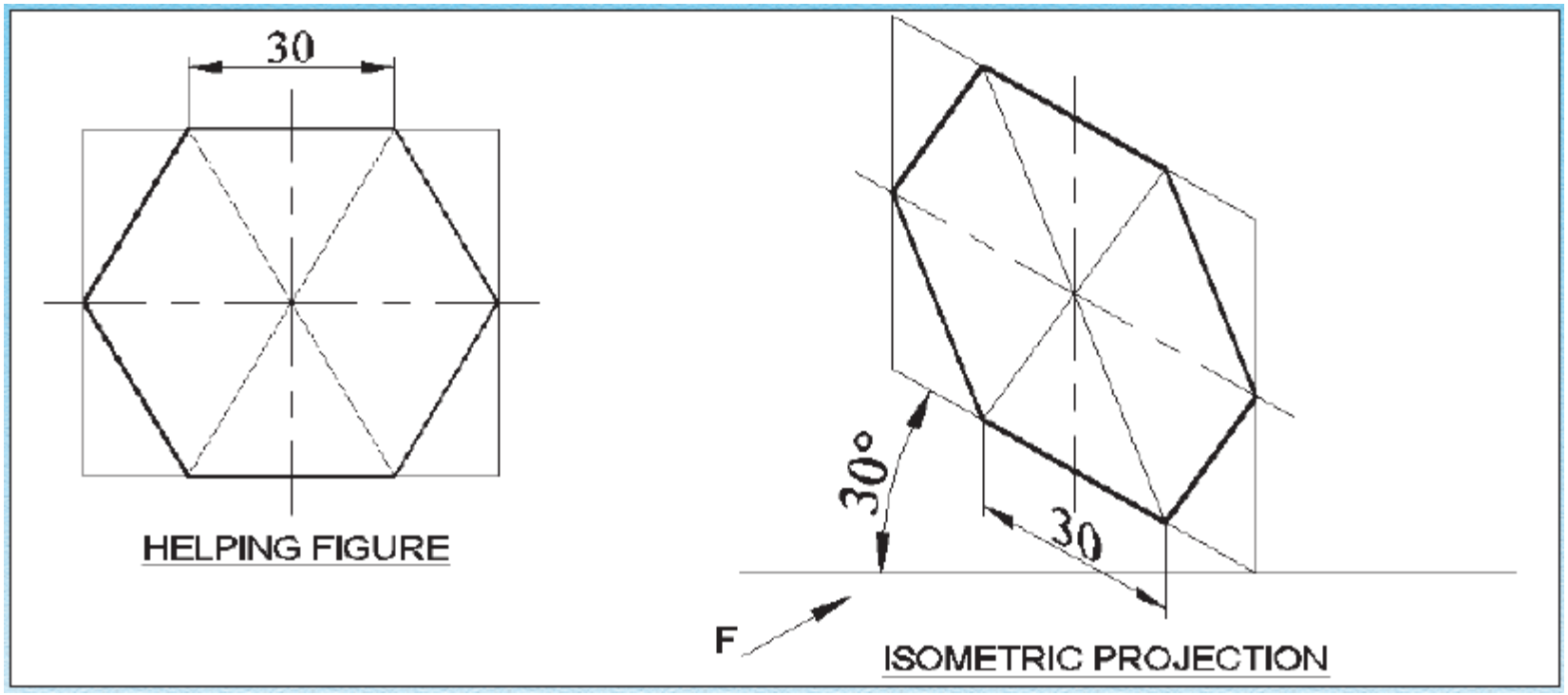
Draw the isometricprojection of a regular pentagon of base side 40 mm in H.P



ISOMETRIC PROJECTION

PROBLEM:-

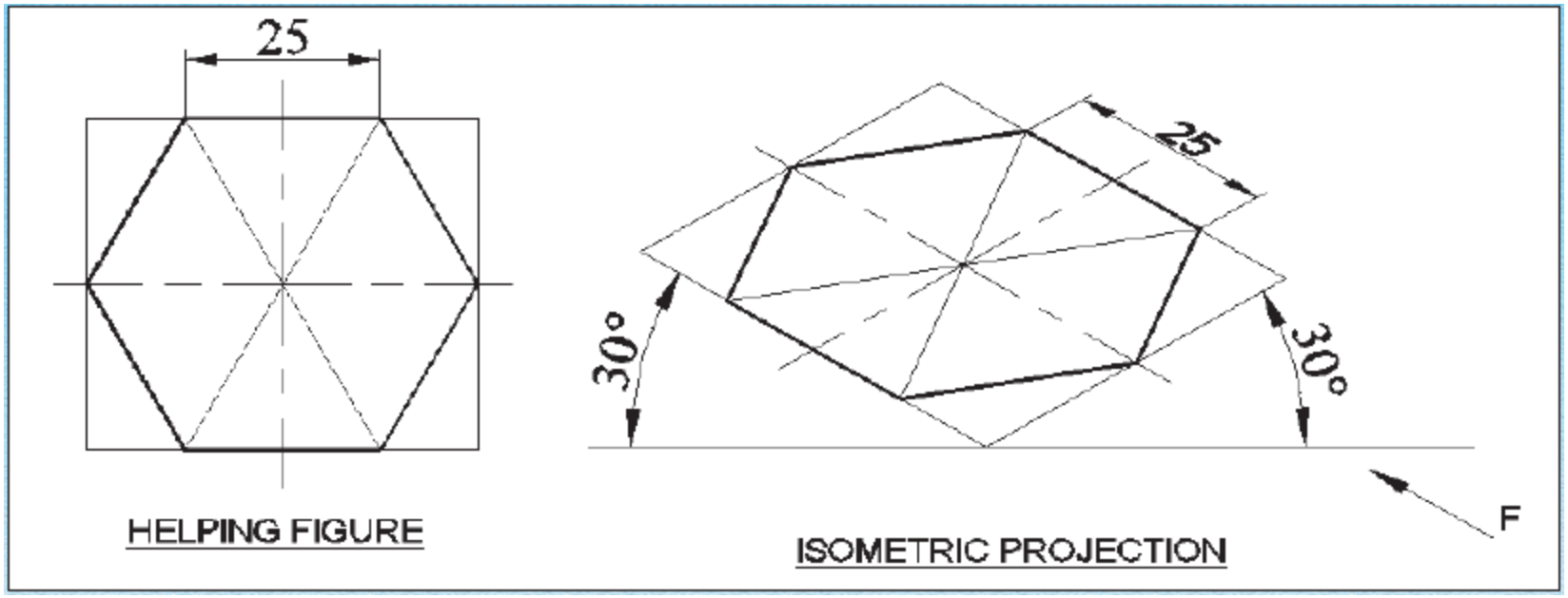
Draw the isometricprojection of a regular hexagon of base side 30 mm in V.P, keeping two of its bases parallel to H.P



ISOMETRIC PROJECTION

PROBLEM:-

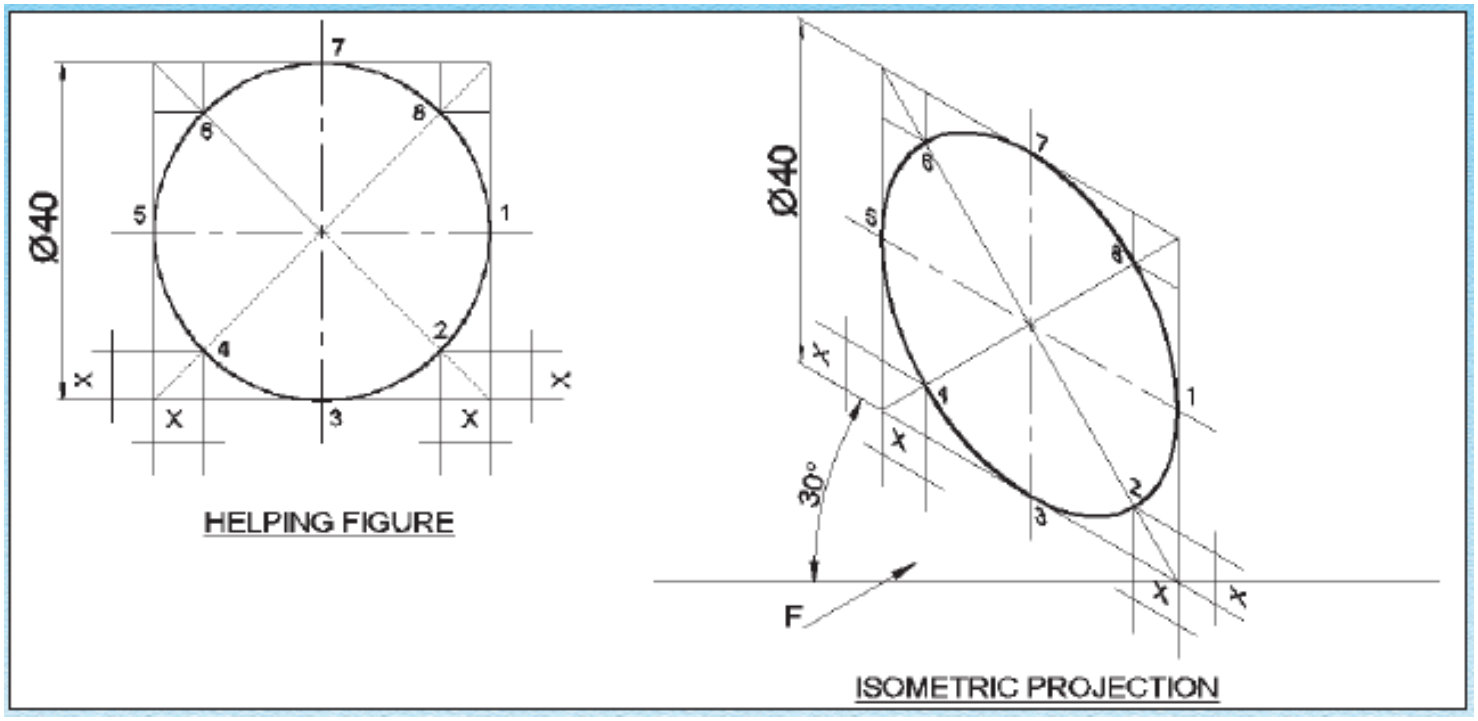
Draw the isometricprojection of a regular hexagon of base side 25 mm in H.P, keeping two of its bases perpendicular to V.P



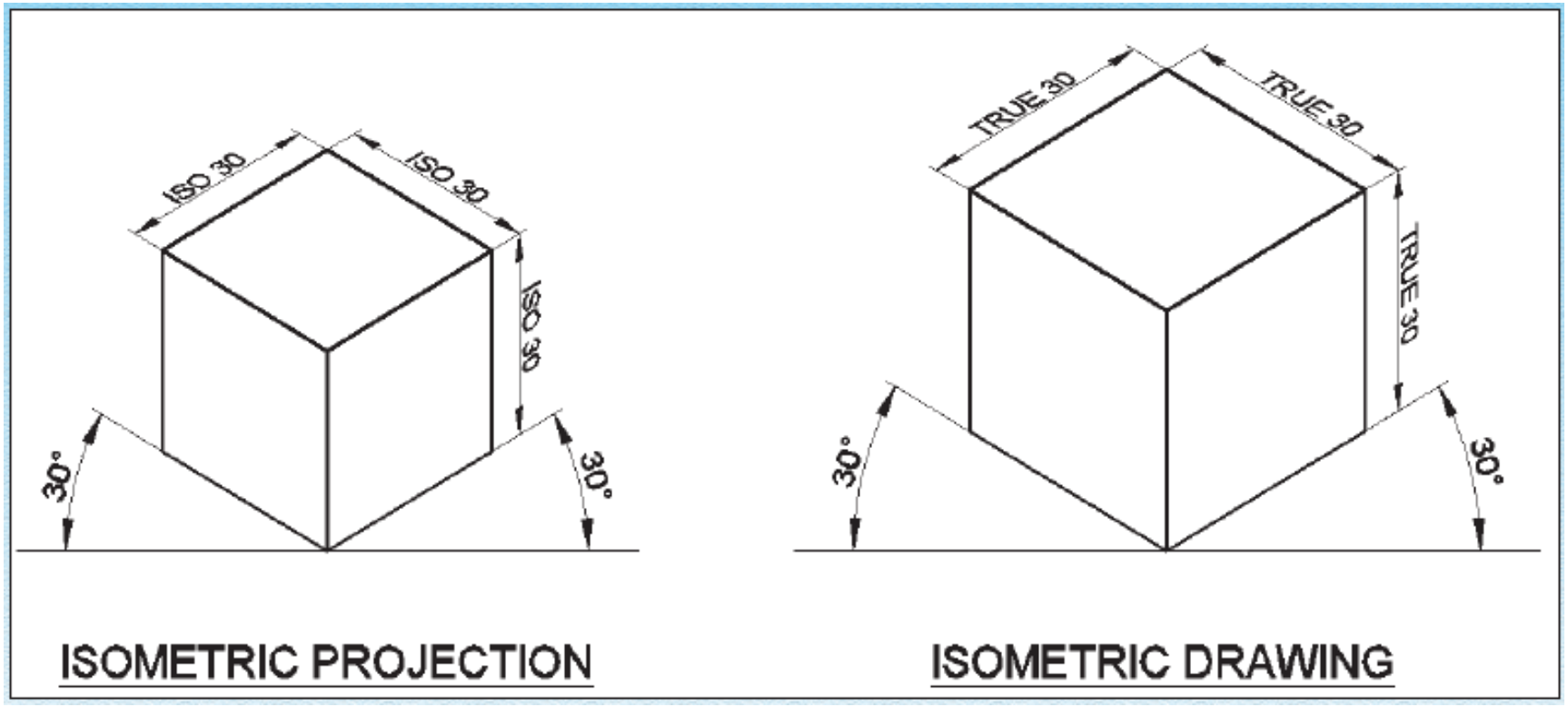
ISOMETRIC PROJECTION

PROBLEM:-

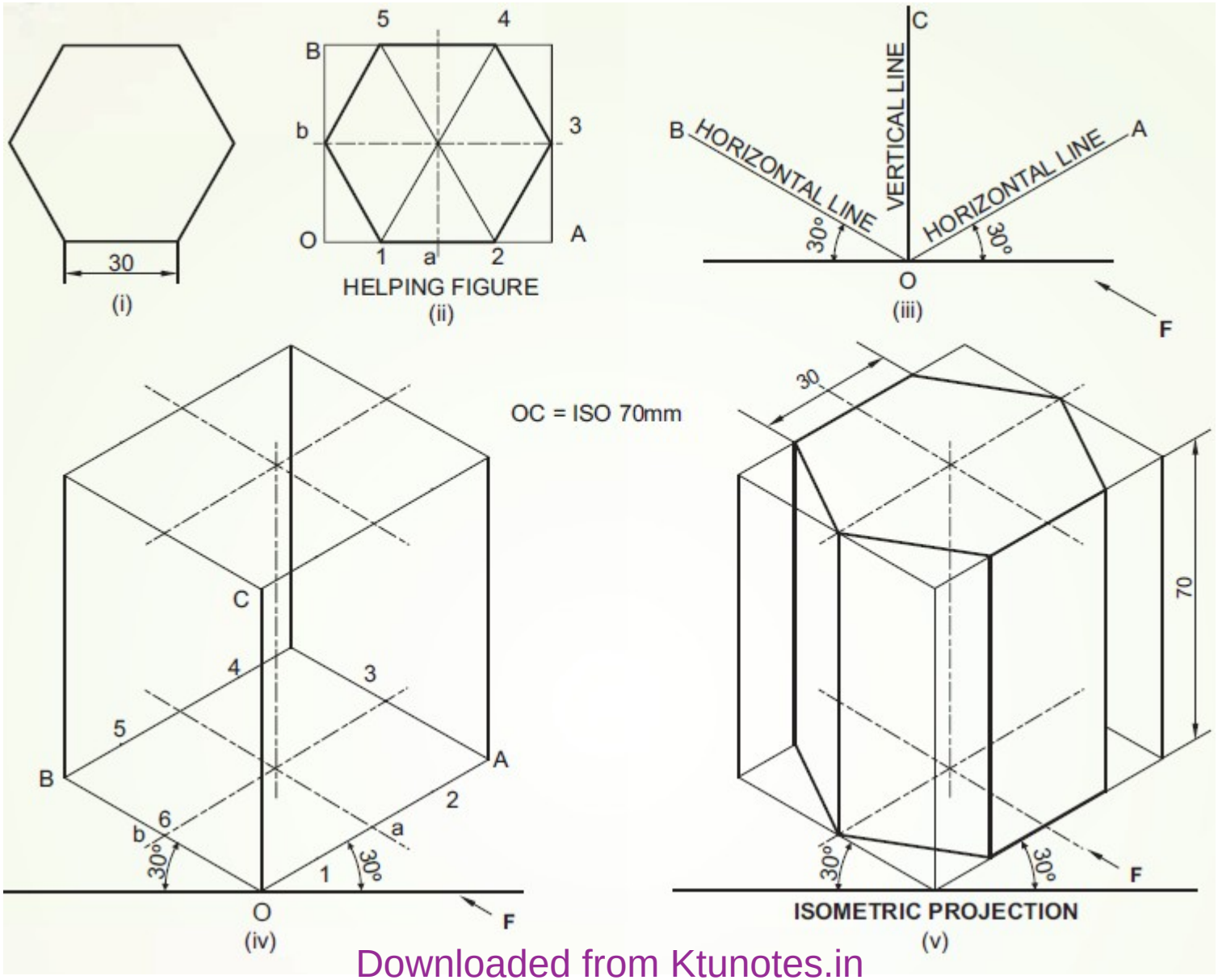
Draw the isometricprojection of a circle of dia 40 mm in V.P



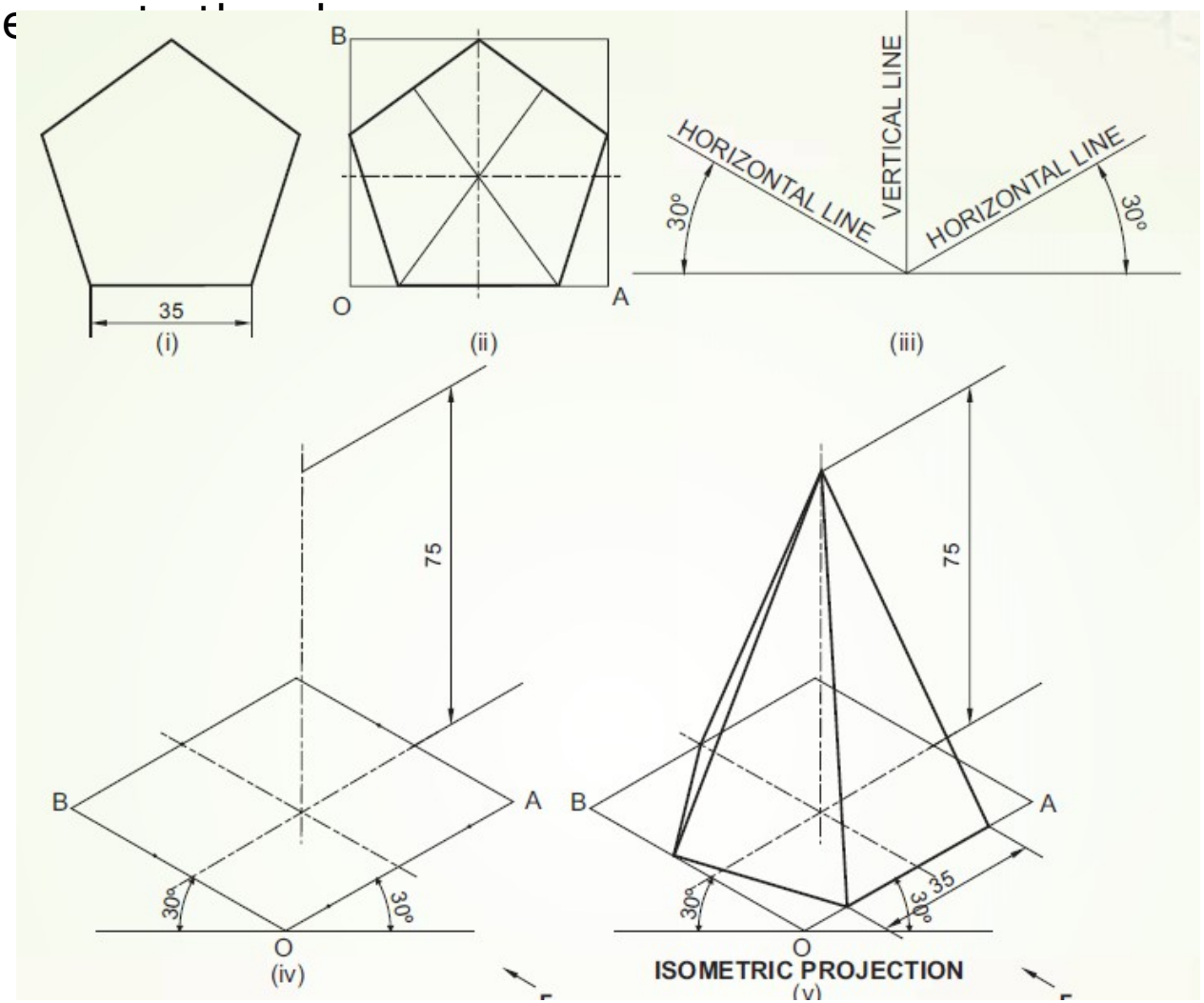
ISOMETRIC DRAWING (ISOMETRIC VIEW)



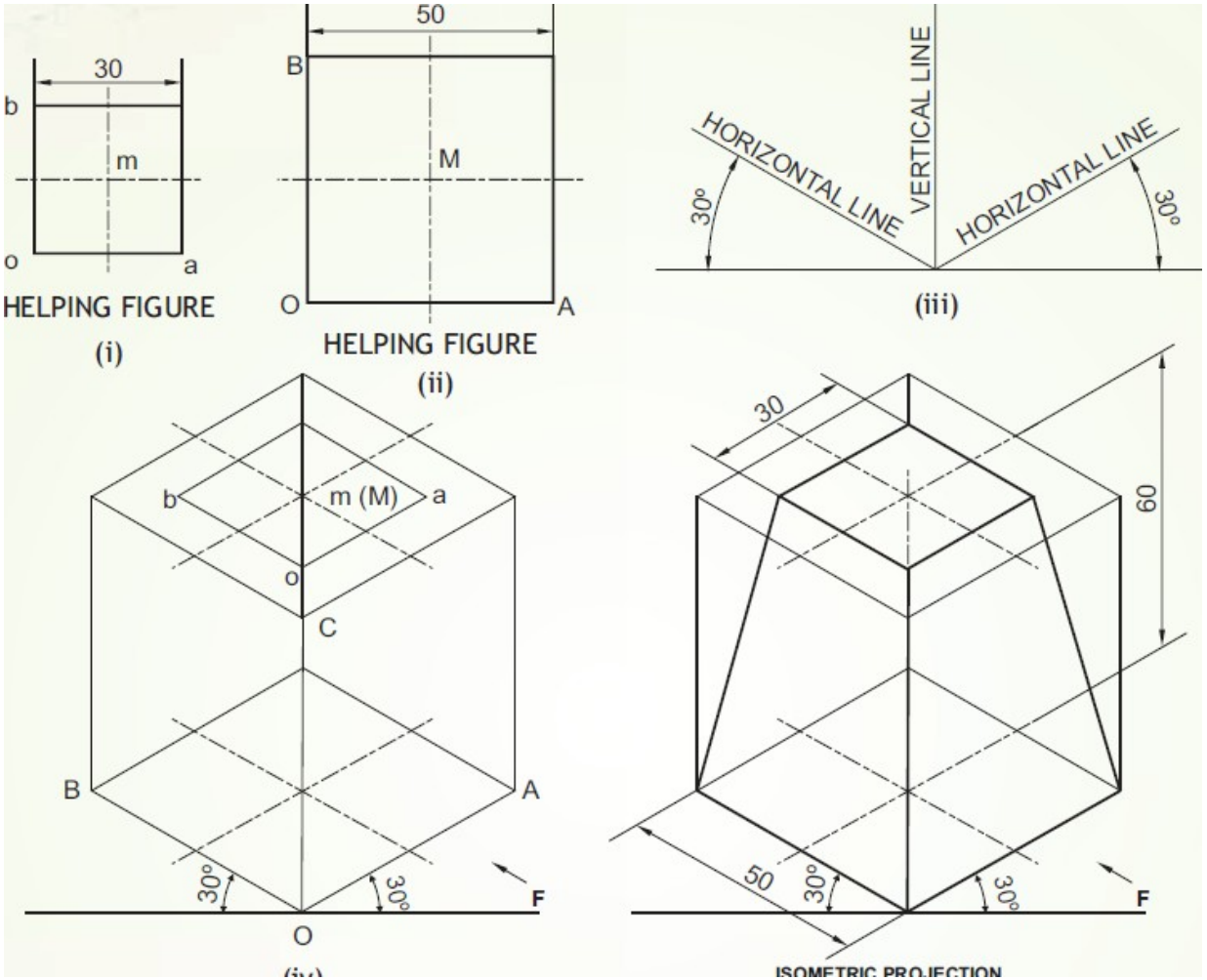
Draw the isometric projection of a hexagonal prism of base side 30 mm and height of 70 mm resting on its base on H.P with two of its base side parallel to V.P



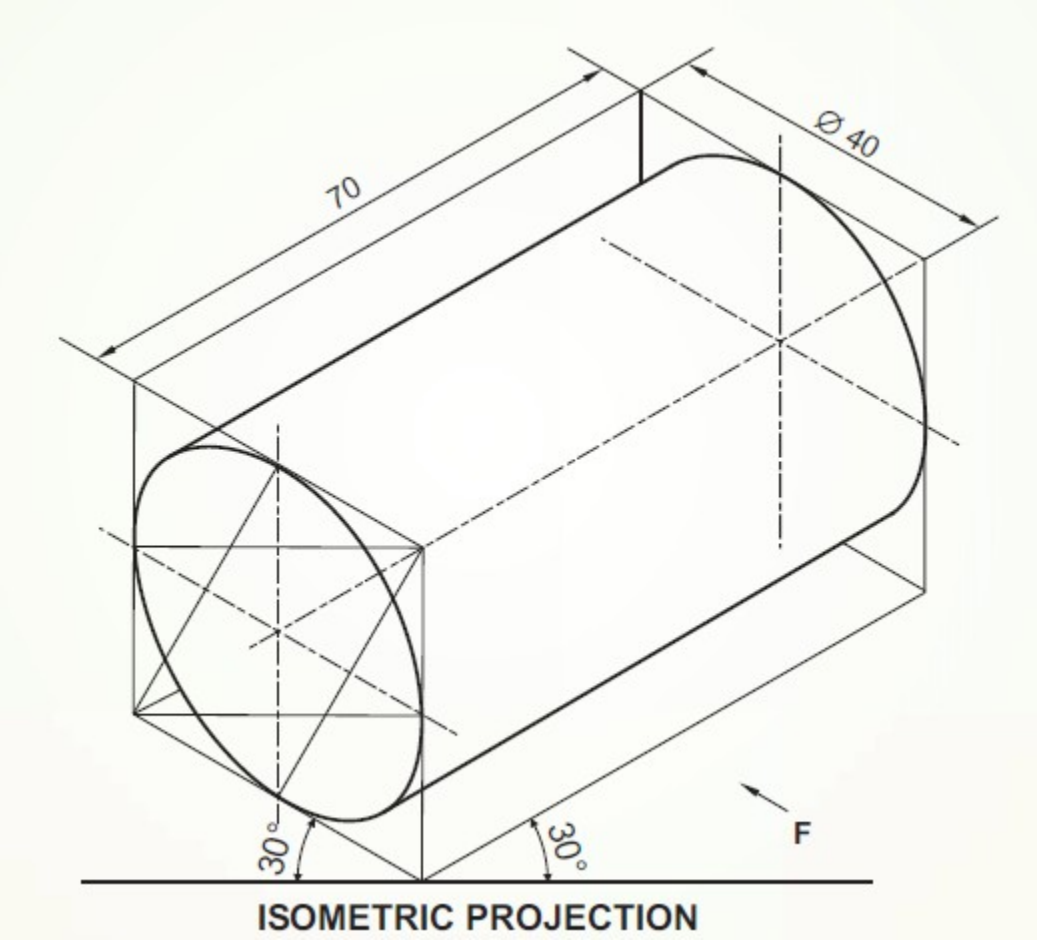
Draw the isometric projection of a pentagonal pyramid of base side 30 mm and axis of 60 mm resting on its base on H.P with one of its base side parallel to V.P and ne



Draw the isometric projection of a frustum of square pyramid of shorter base edge 30 mm and longer base edge 50 mm with the axial height of 60 mm, kept on H.P on its longer end and two of its base edges are parallel to V.P

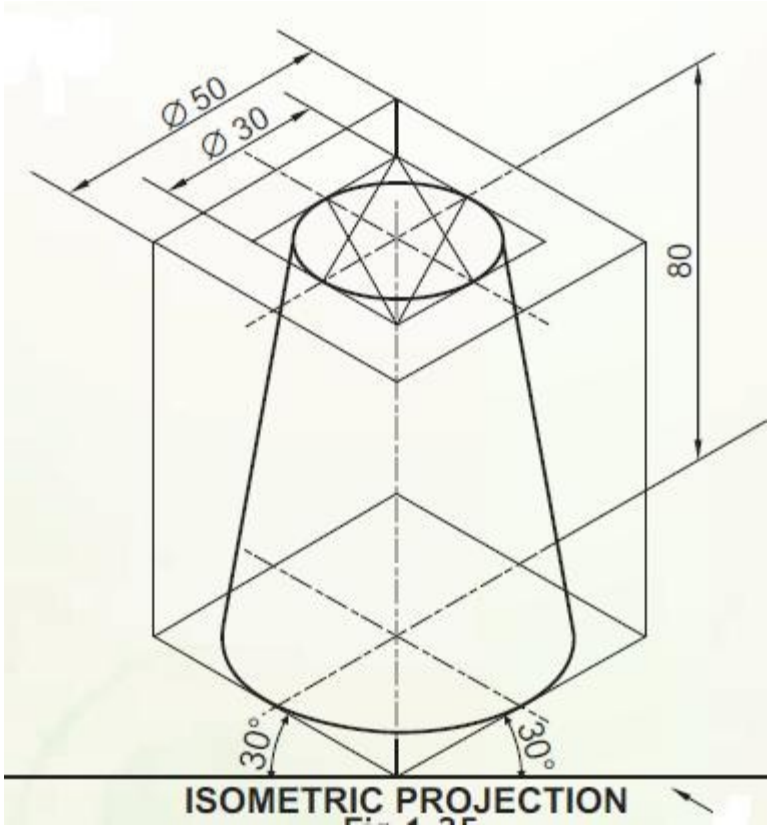


Draw the isometric projection of a cylinder of diameter 40 mm and axial length of 70 mm lying on the H.P keeping its axis parallel to H.P and V.P both



ISOMETRIC PROJECTION

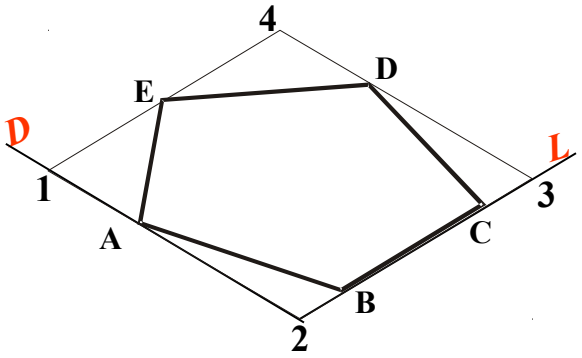
Draw the isometric projection of a frustum of a cone of diameter 30 mm at smaller end, diameter 50 mm at bigger end and the axial height is 70 mm. It is resting on its bigger end on H.P, keeping its axis vertical



ISOMETRIC PROJECTION

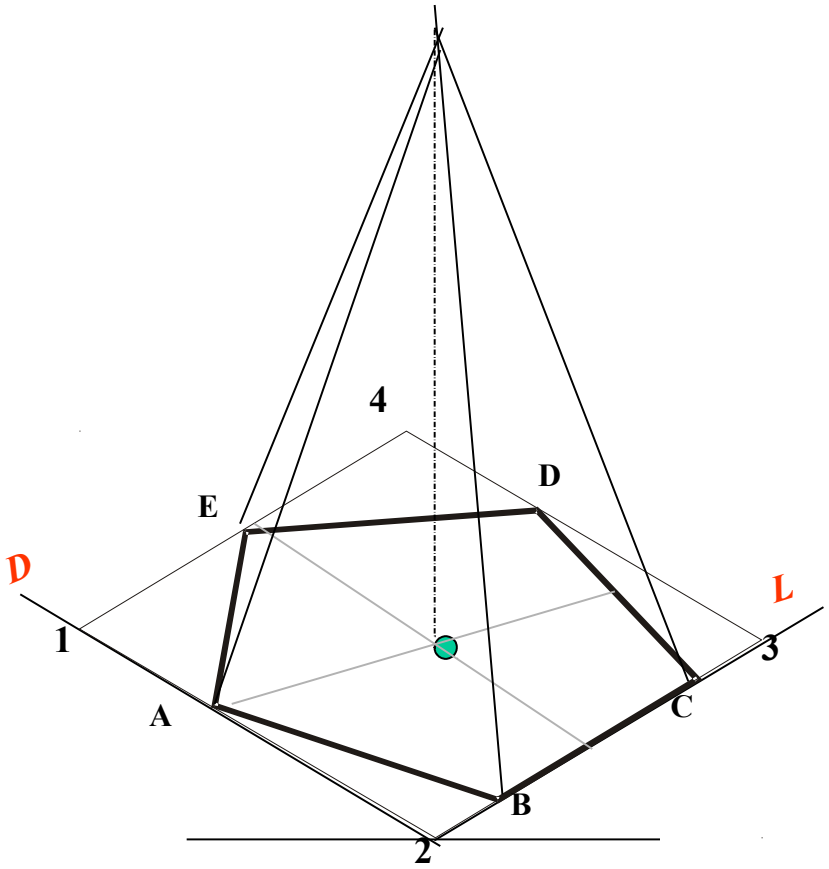
STUDY ILLUSTRATIONS

ISOMETRIC VIEW OF BASE OF PENTAGONAL PYRAMID STANDING ON H.P.

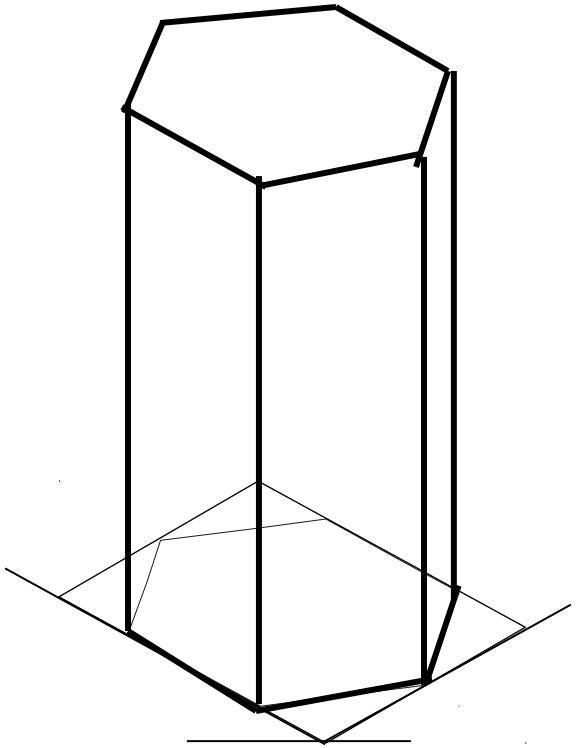


ISOMETRIC VIEW OF PENTAGONAL PYRAMID STANDING ON H.P.

(Height is added from center of pentagon)

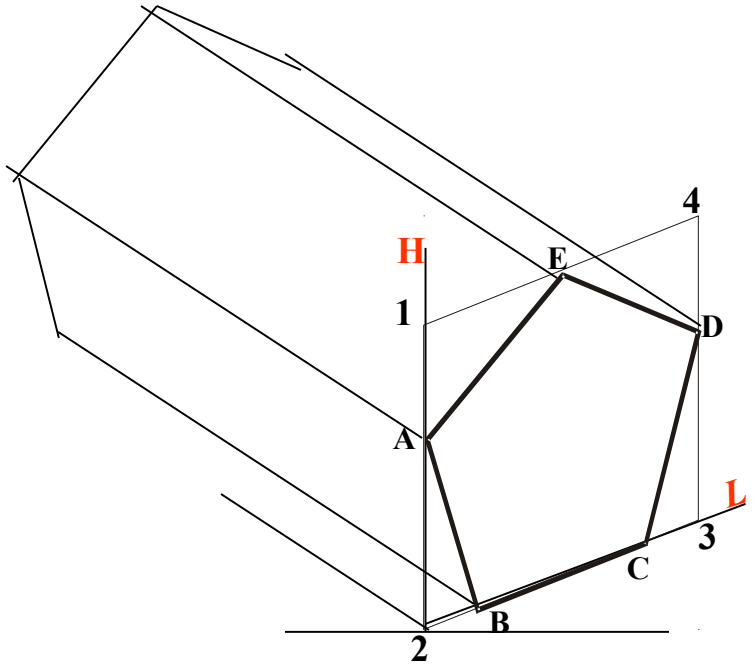


STUDY ILLUSTRATIONS



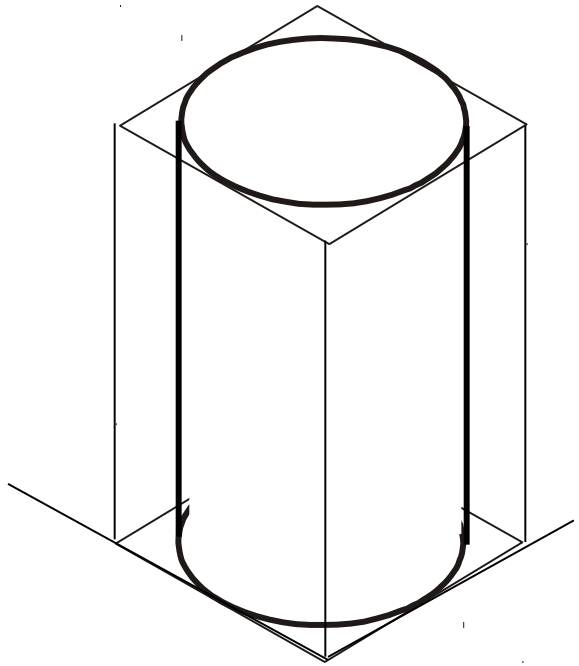
ISOMETRIC VIEW OF
HEXAGONAL PRISM
STANDING ON H.P.

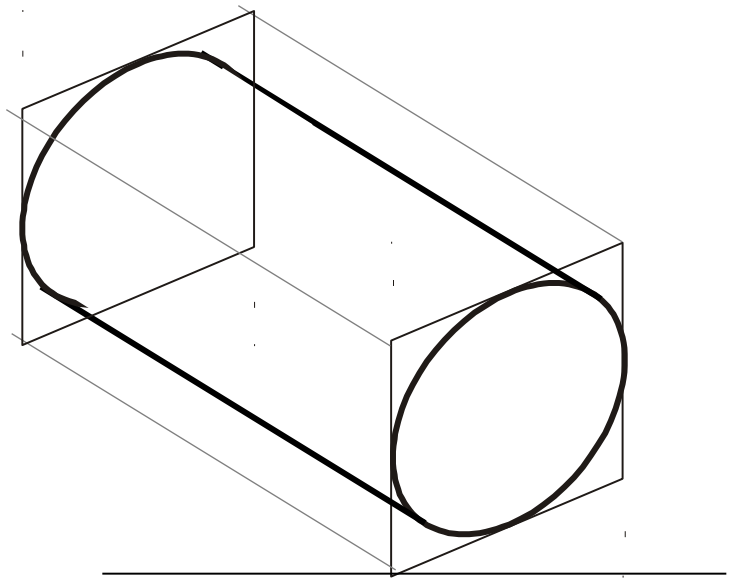
ISOMETRIC VIEW OF
PENTAGONALL PRISM
LYING ON H.P.



STUDY ILLUSTRATIONS

CYLINDER STANDING ON H.P.

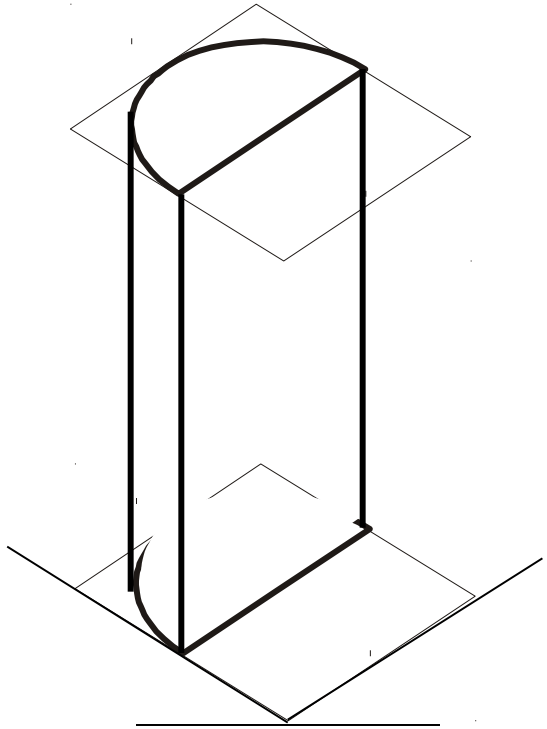


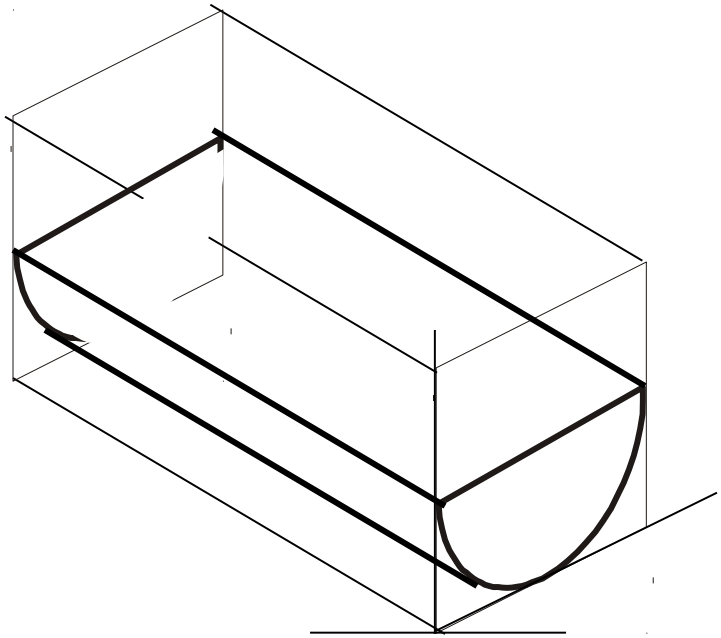


CYLINDER LYING ON H.P.

STUDY ILLUSTRATIONS

HALF CYLINDER STANDING ON H.P.
(ON IT'S SEMICIRCULAR BASE)

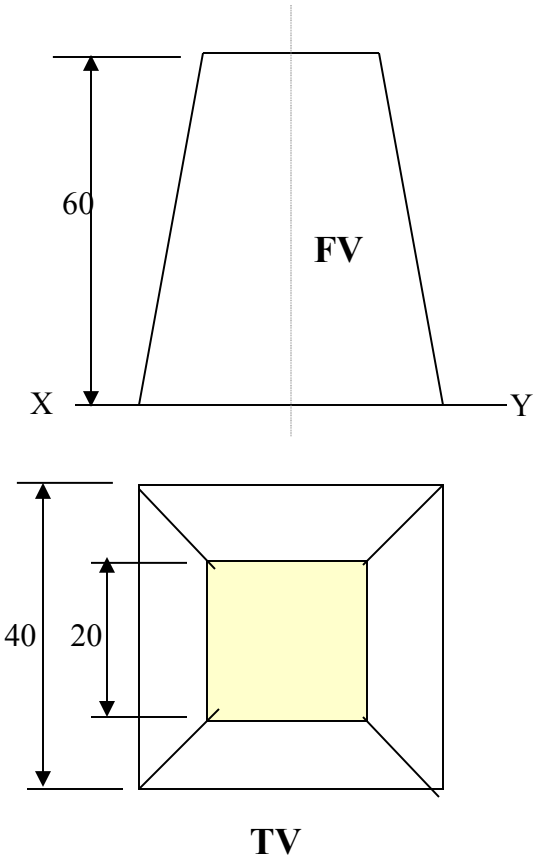


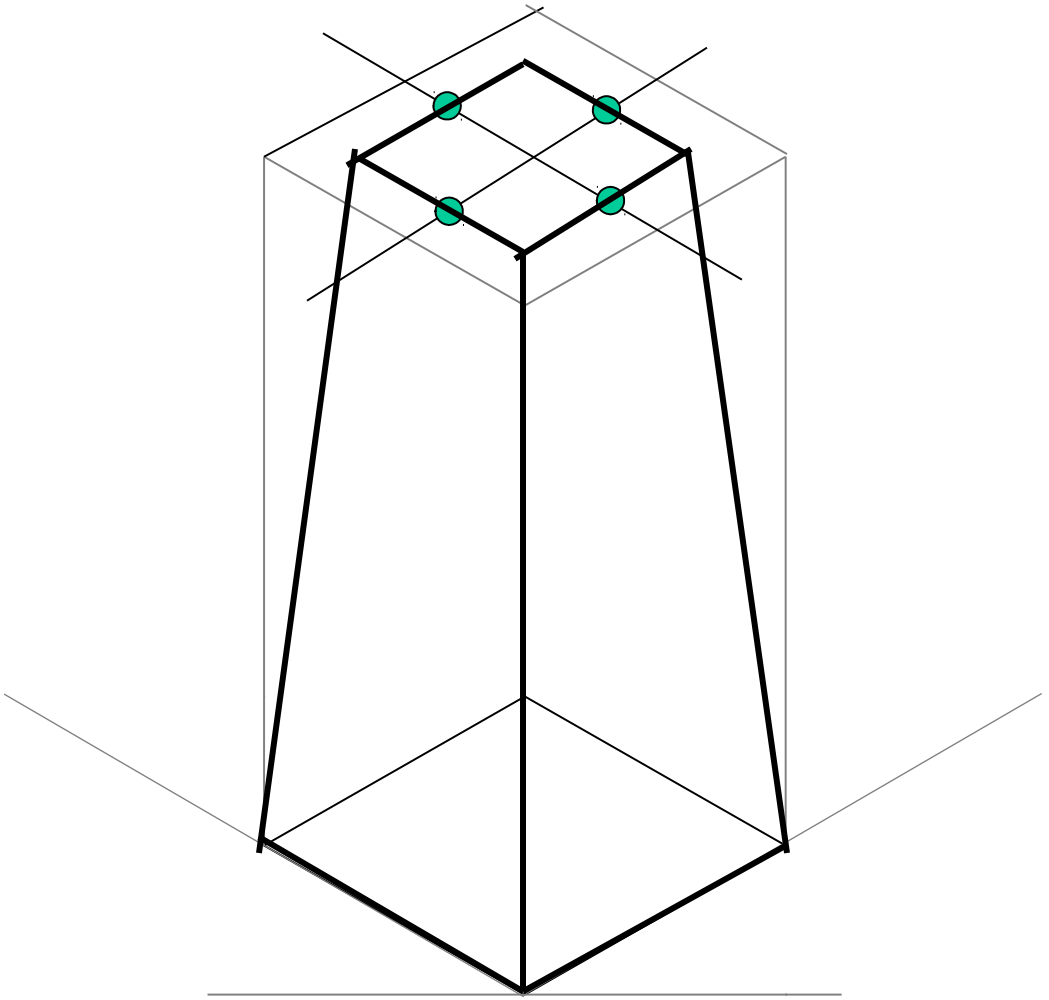


HALF CYLINDER LYING ON H.P.
(with flat face // to H.P.)

STUDY ILLUSTRATIONS

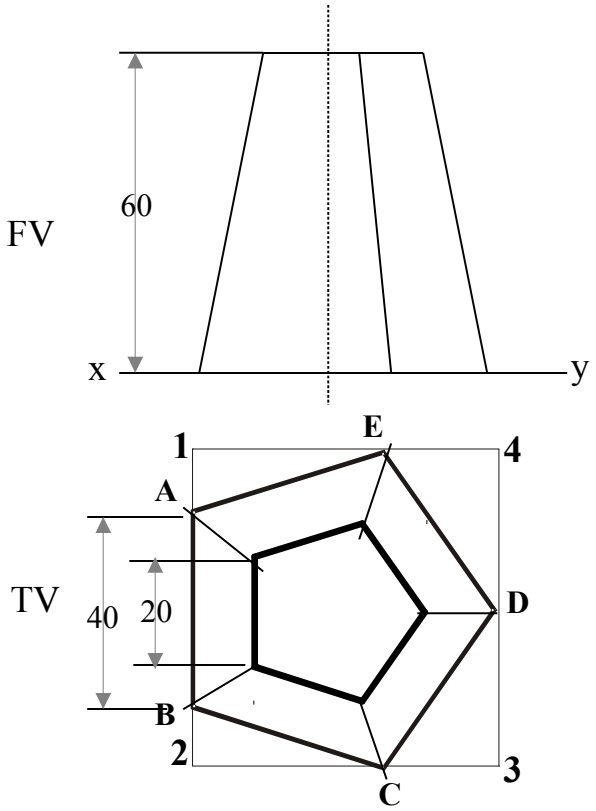
ISOMETRIC VIEW OF
A FRUSTOM OF SQUARE PYRAMID
STANDING ON H.P. ON IT'S LARGER BASE.





STUDY ILLUSTRATION

PROJECTIONS OF FRUSTOM OF PENTAGONAL PYRAMID ARE GIVEN. DRAW IT'S ISOMETRIC VIEW.



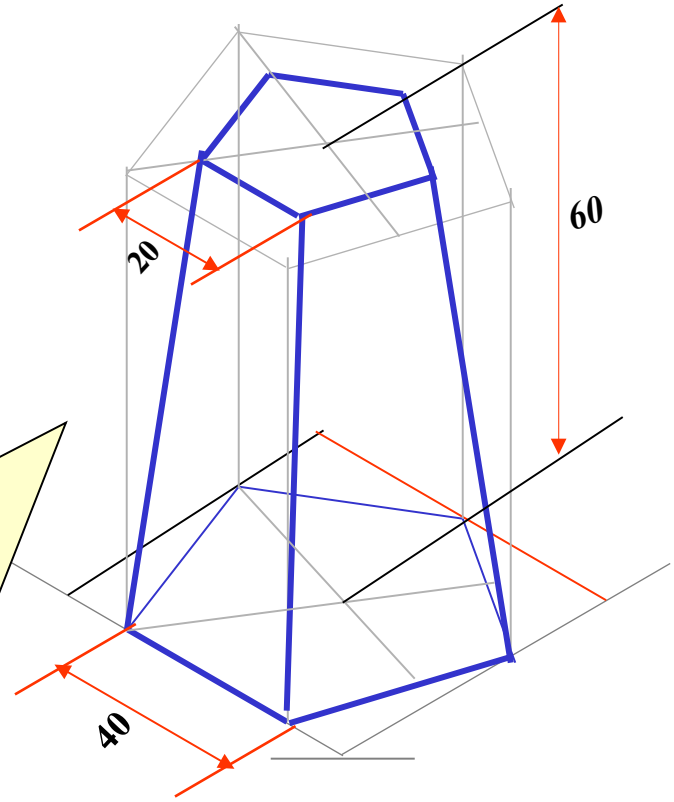
SOLUTION STEPS:

FIRST DRAW ISOMETRIC OF IT'S BASE.

THEN DRAWSAME SHAPE AS TOP, 60 MM ABOVE THE BASE PENTAGON CENTER.

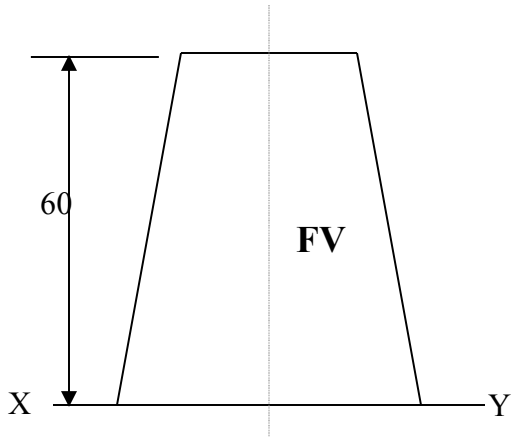
THEN REDUCE THE TOP TO 20 MM SIDES AND JOIN WITH THE PROPER BASE CORNERS.

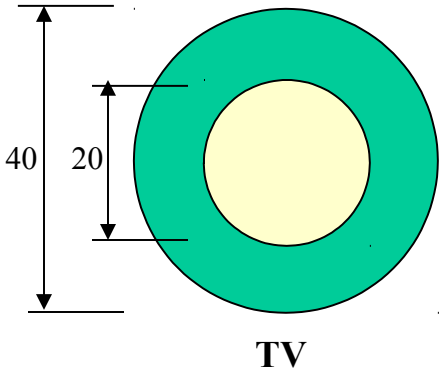
ISOMETRIC VIEW OF FRUSTOM OF PENTAGONAL PYRAMID

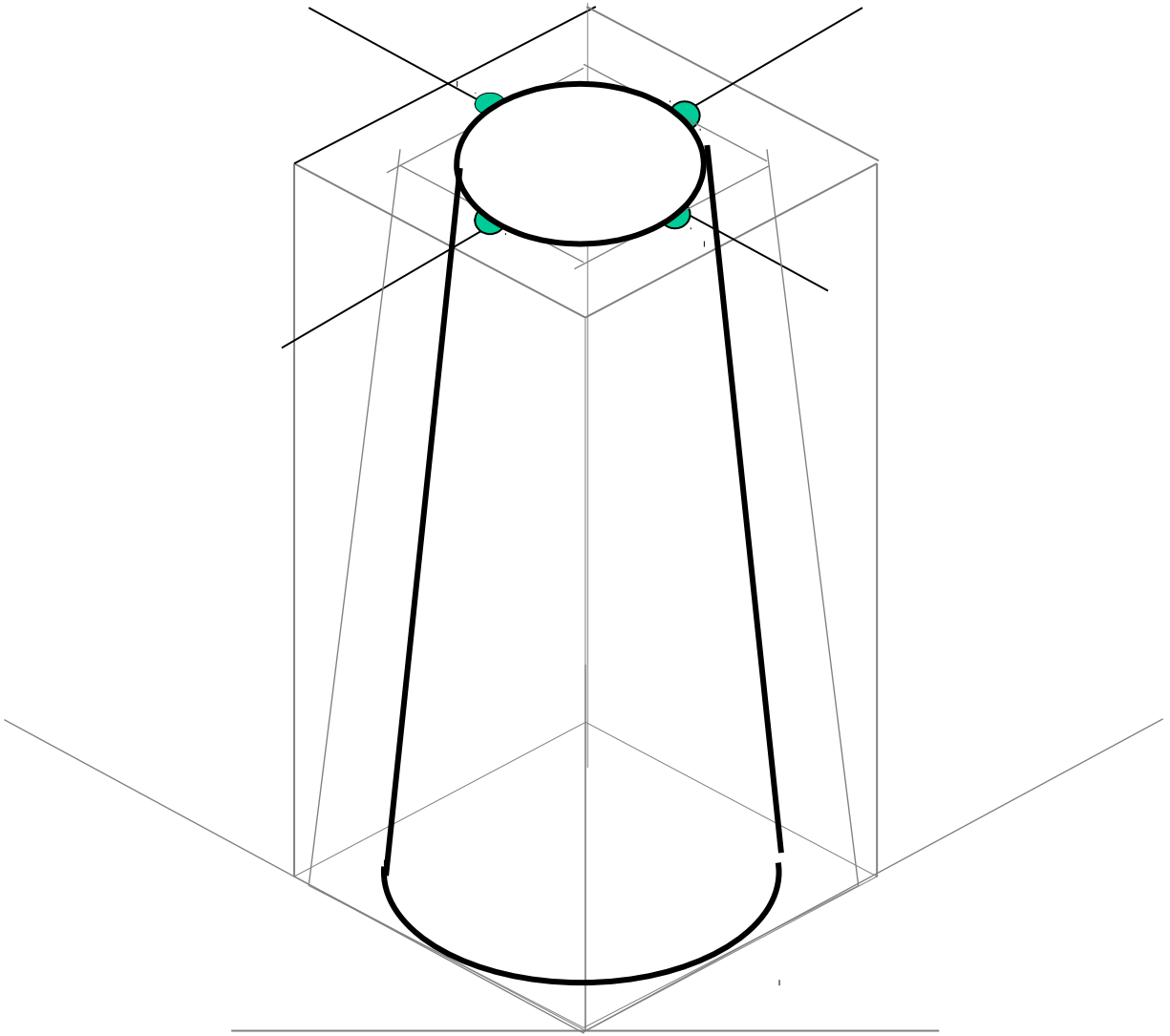


STUDY ILLUSTRATIONS

ISOMETRIC VIEW OF A FRUSTOM OF CONE STANDING ON H.P. ON IT'S LARGER BASE.

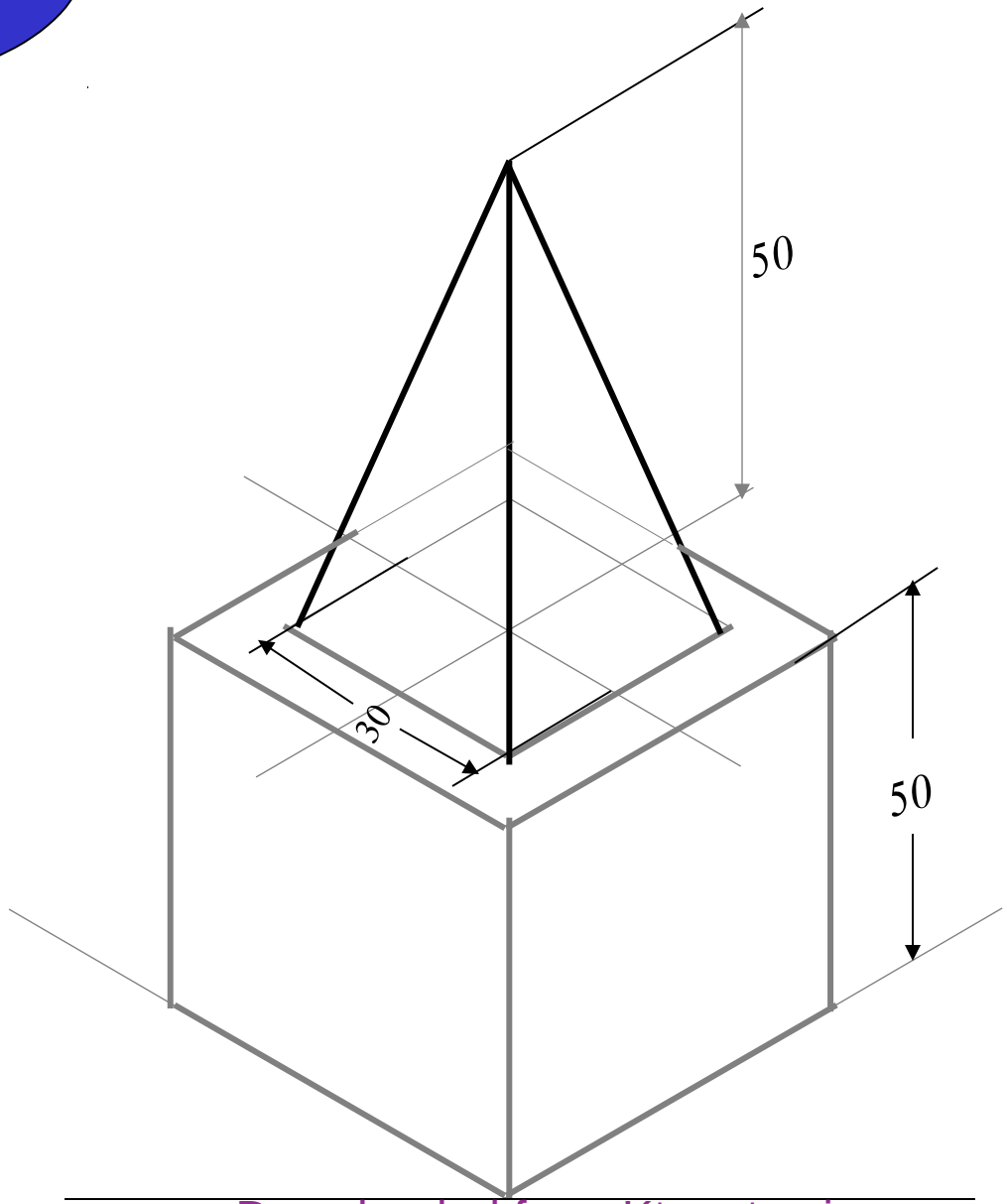






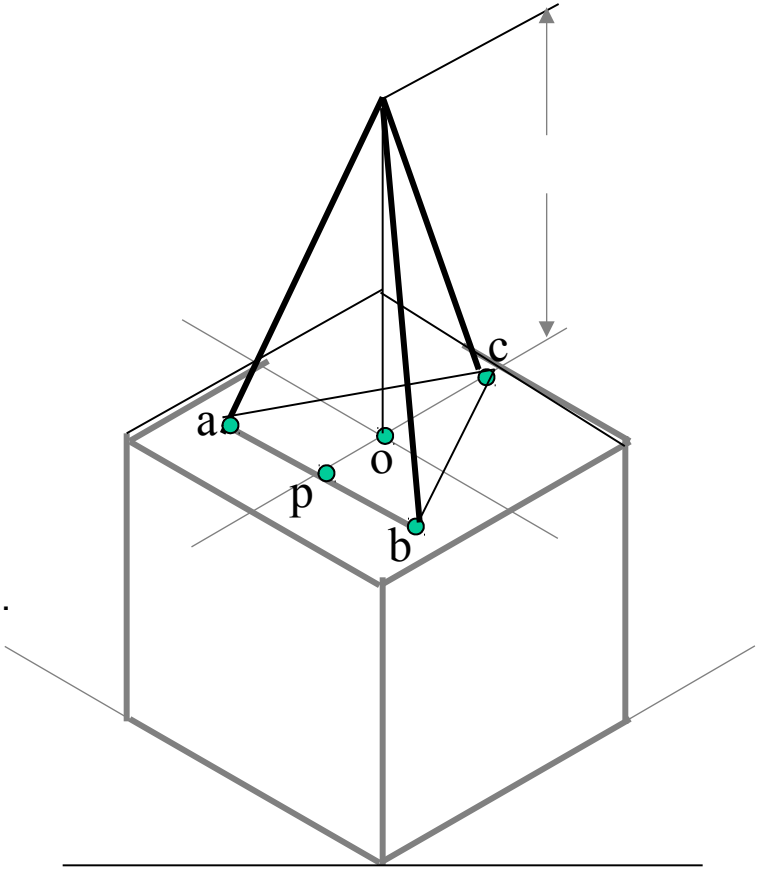
STUDY ILLUSTRATIONS

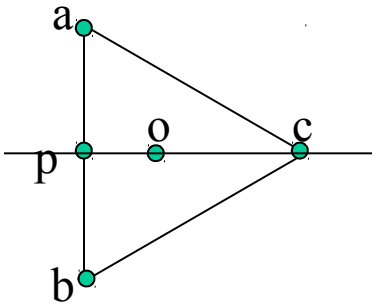
PROBLEM: A SQUARE PYRAMID OF 30 MM BASE SIDES AND 50 MM LONG AXIS, IS CENTRALLY PLACED ON THE TOP OF A CUBE OF 50 MM LONG EDGES.DRAW ISOMETRIC VIEW OF THE PAIR.



STUDY ILLUSTRATIONS

PROBLEM: A TRIANGULAR 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.





SOLUTION HINTS.

TO DRAW ISOMETRIC OF A CUBE IS SIMPLE. DRAW IT AS USUAL.

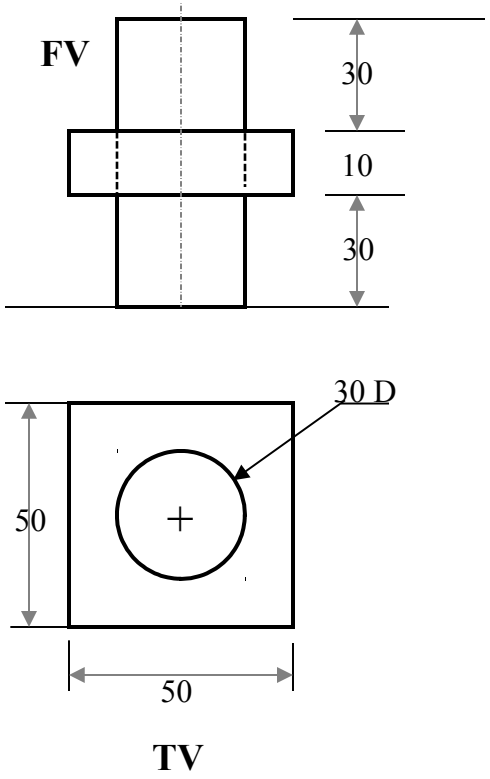
BUT FOR PYRAMID AS IT'S BASE IS AN EQUILATERAL TRIANGLE, IT CAN NOT BE DRAWN DIRECTLY.SUPPORT OF IT'S TV IS REQUIRED.

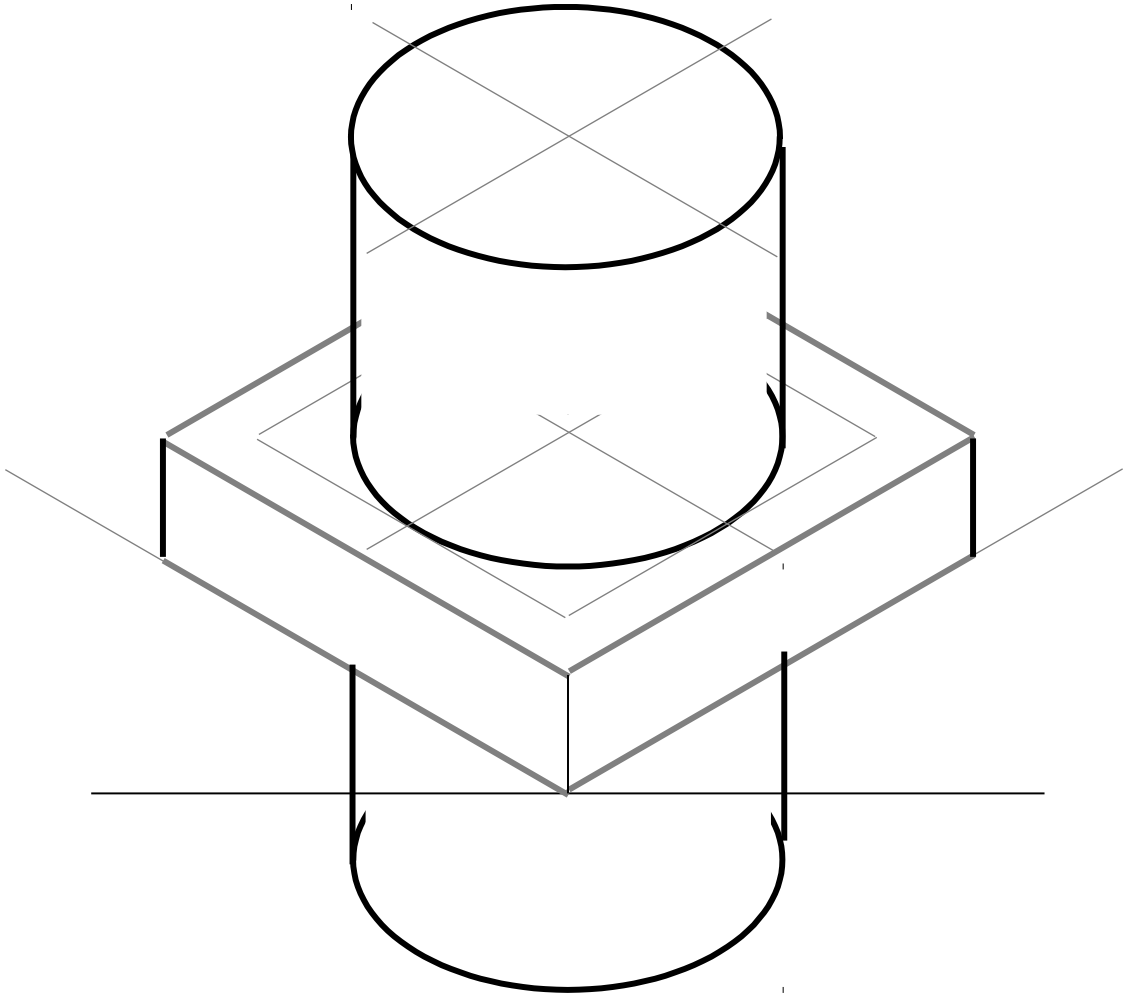
SO DRAW TRIANGLE AS A TV, SEPARATELY AND NAME VARIOUS POINTS AS SHOWN.
AFTER THIS PLACE IT ON THE TOP OF CUBE AS SHOWN.
THEN ADD HEIGHT FROM IT'S CENTER AND COMPLETE IT'S ISOMETRIC AS SHOWN.

STUDY ILLUSTRATIONS

PROBLEM:

A SQUARE PLATE IS PIERCED THROUGH CENTRALLY BY A CYLINDER WHICH COMES OUT EQUALLY FROM BOTH FACES OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC VIEW.

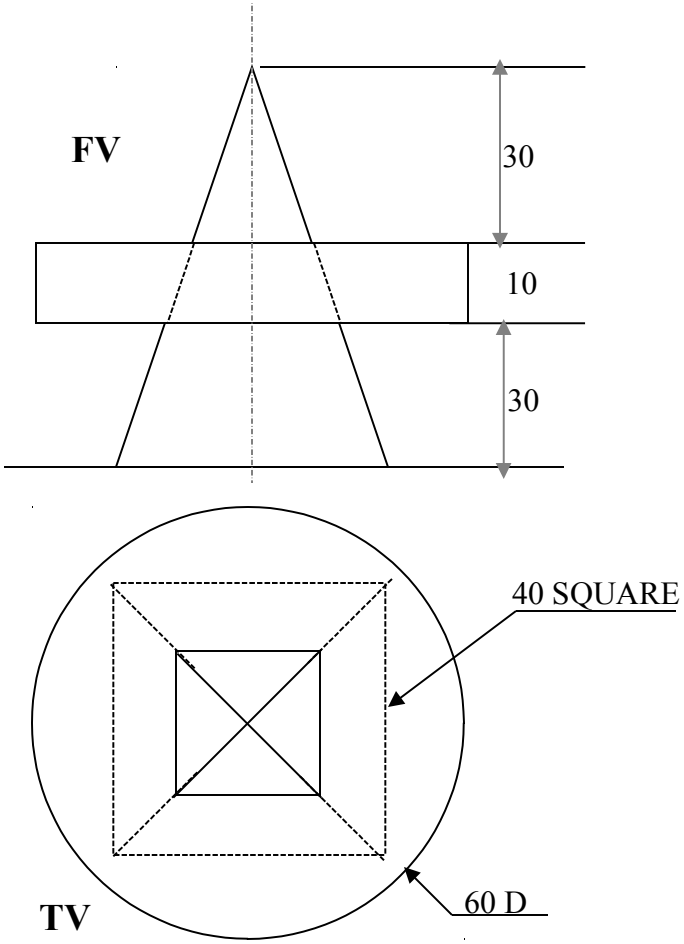


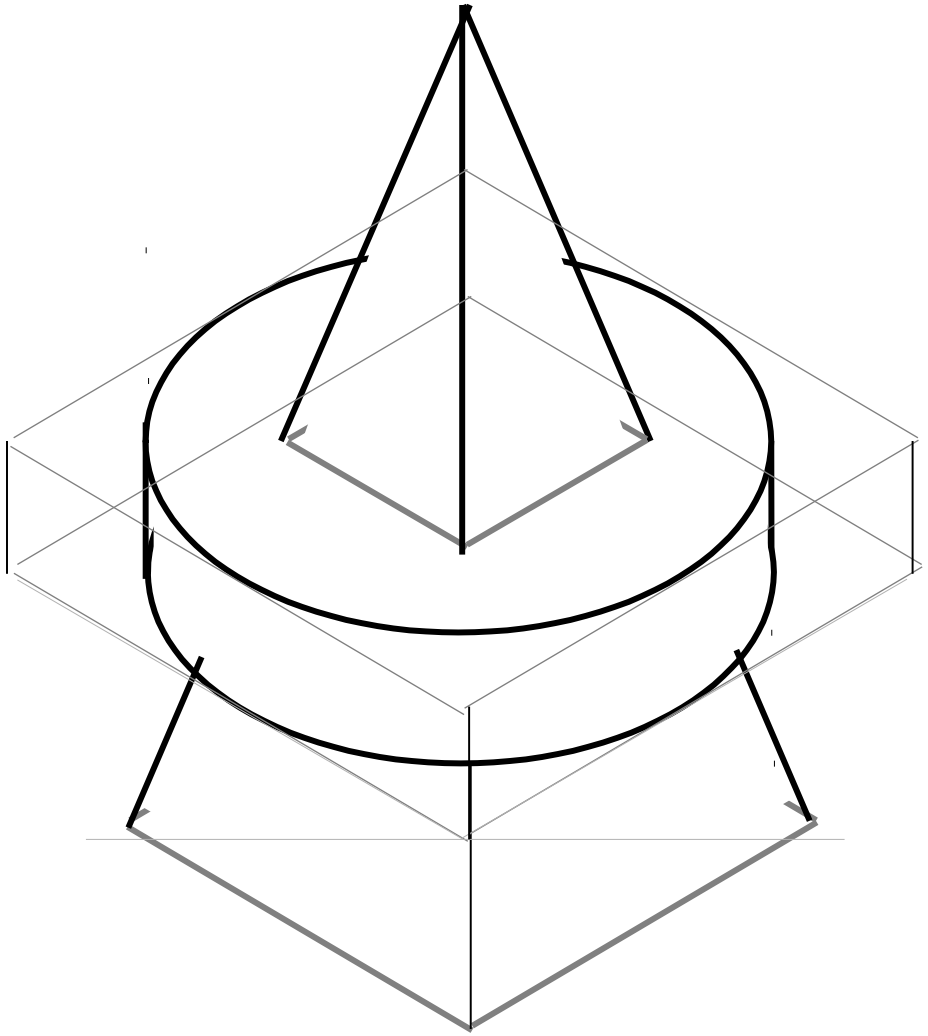


STUDY ILLUSTRATIONS

PROBLEM:

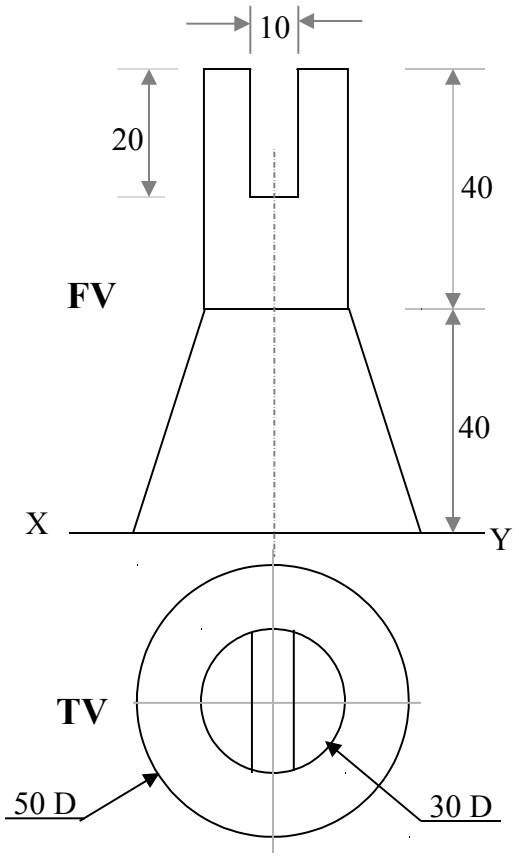
A CIRCULAR PLATE IS PIERCED THROUGH CENTRALLY BY A SQUARE PYRAMID WHICH COMES OUT EQUALLY FROM BOTH FACES OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC VIEW.

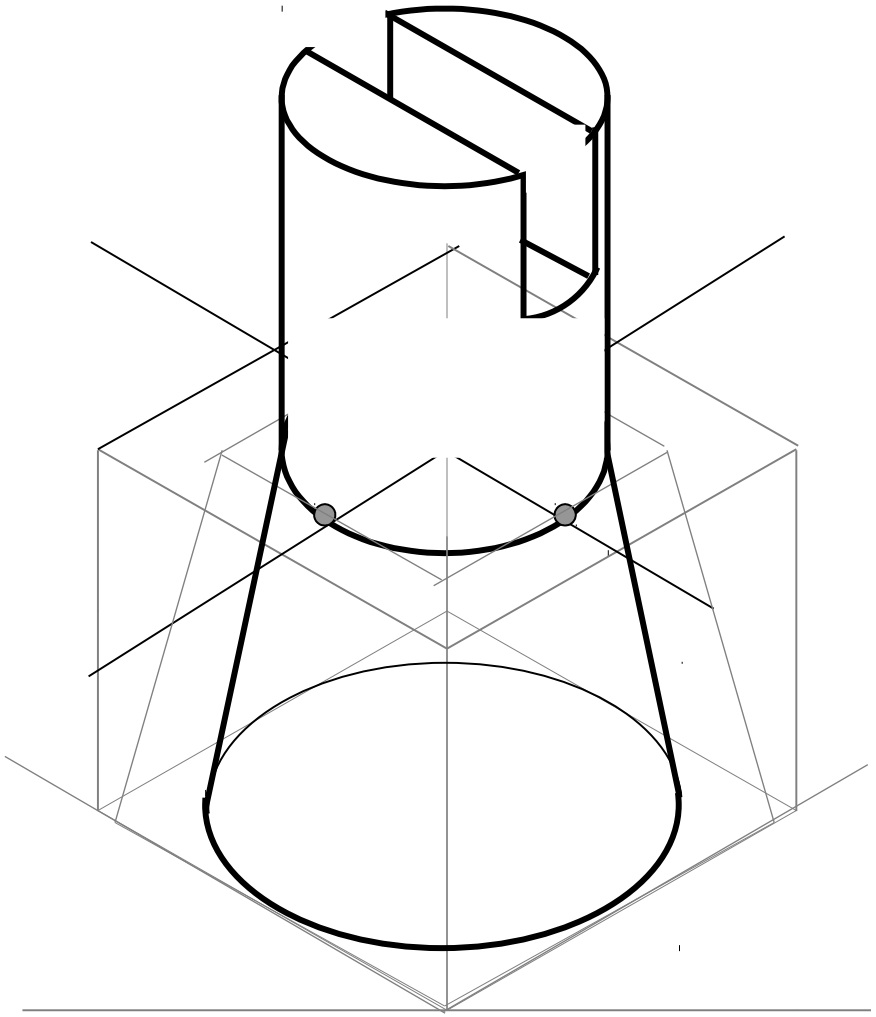




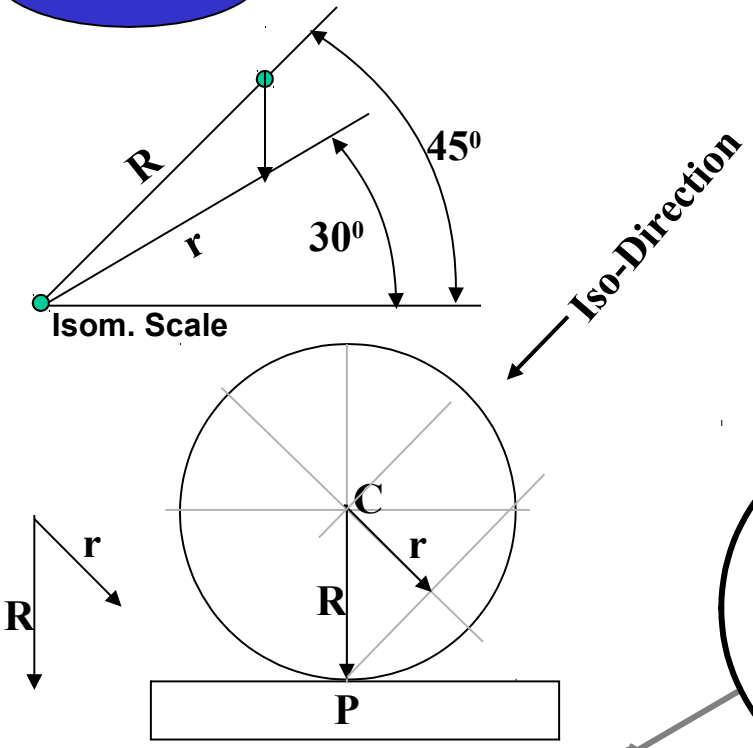
STUDY ILLUSTRATIONS

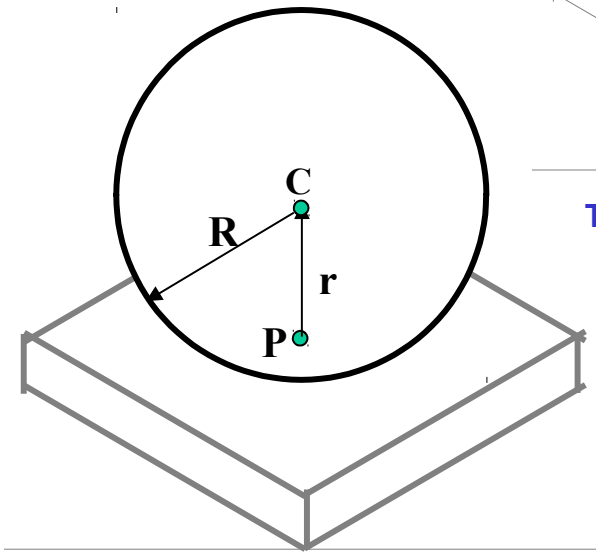
F.V. & T.V. of an object are given. Draw it's isometric view.

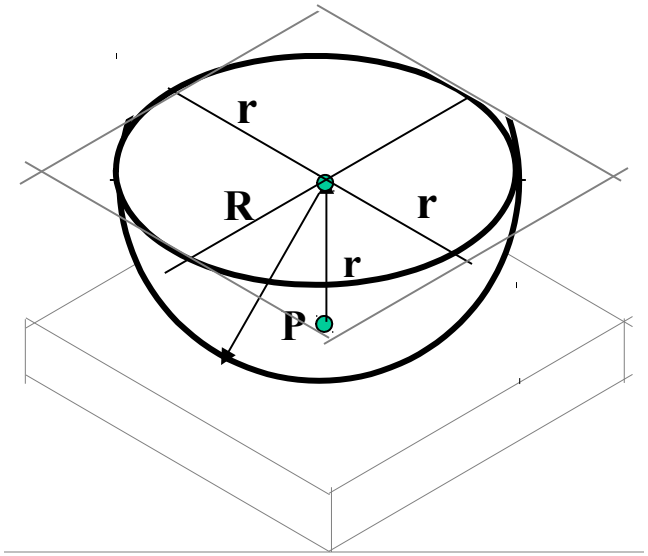




ISOMETRIC PROJECTIONS OF SPHERE & HEMISPHERE







C = Center of Sphere.
P = Point of contact
R = True Radius of Sphere
r = Isometric Radius.

TO DRAW ISOMETRIC PROJECTION OF A HEMISPHERE

Adopt same procedure. Draw lower semicircle only. Then around 'C' construct Rhombus of Sides equal to Isometric Diameter. For this use iso-scale. Then construct ellipse in this Rhombus as usual And Complete Isometric-Projection of Hemi-sphere.

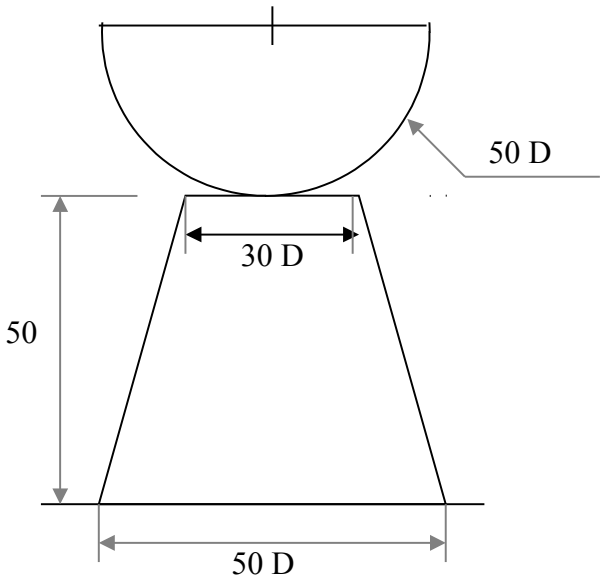
TO DRAW ISOMETRIC PROJECTION OF A SPHERE

1. FIRST DRAW ISOMETRIC OF SQUARE PLATE.
2. LOCATE IT'S CENTER. NAME IT P.
3. FROM PDRAW VERTICAL LINE UPWARD, LENGTH ' r mm' AND LOCATE CENTER OF SPHERE "C"
4. 'C' AS CENTER, WITH RADIUS 'R' DRAW CIRCLE.
   THIS IS ISOMETRIC PROJECTION OF A SPHERE.

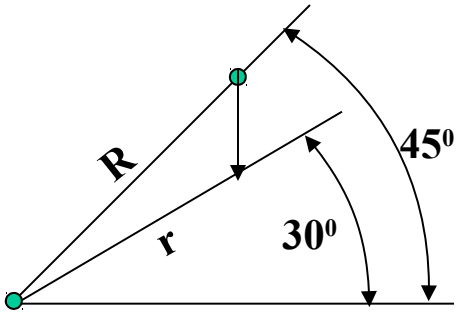
STUDY ILLUSTRATIONS

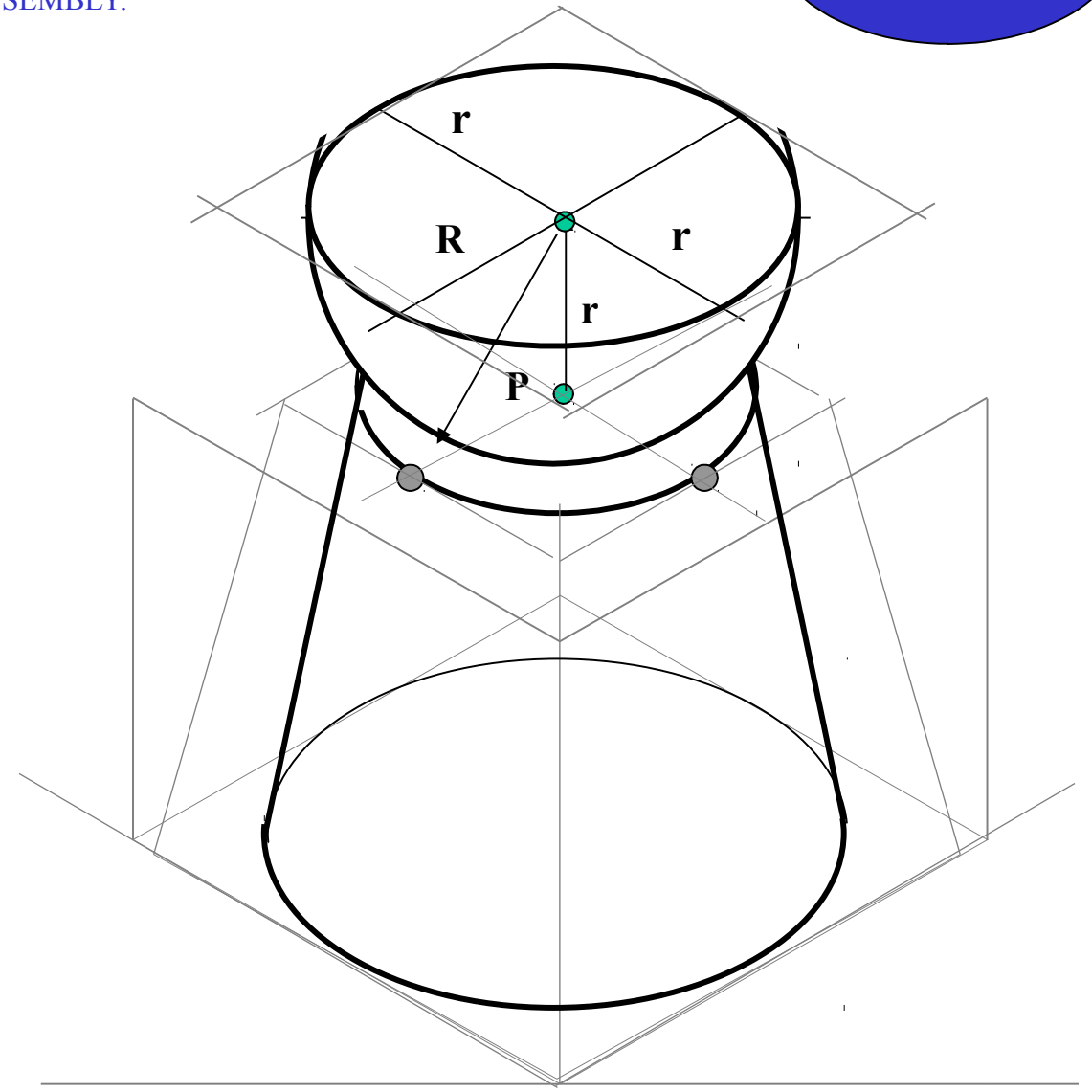
PROBLEM:

A HEMI-SPHERE IS CENTRALLY PLACED ON THE TOP OF A FRUSTOM OF CONE. DRAW ISOMETRIC PROJECTIONS OF THE ASSEMBLY.



FIRST CONSTRUCT ISOMETRIC SCALE. USE THIS SCALE FOR ALL DIMENSIONS IN THIS PROBLEM.

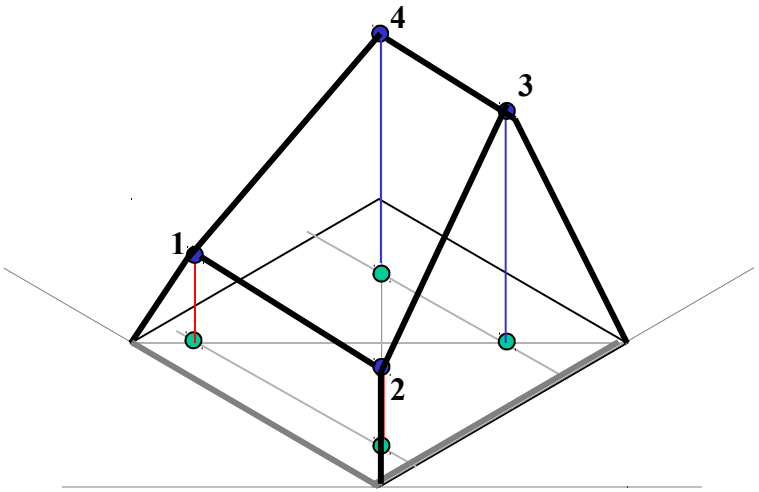


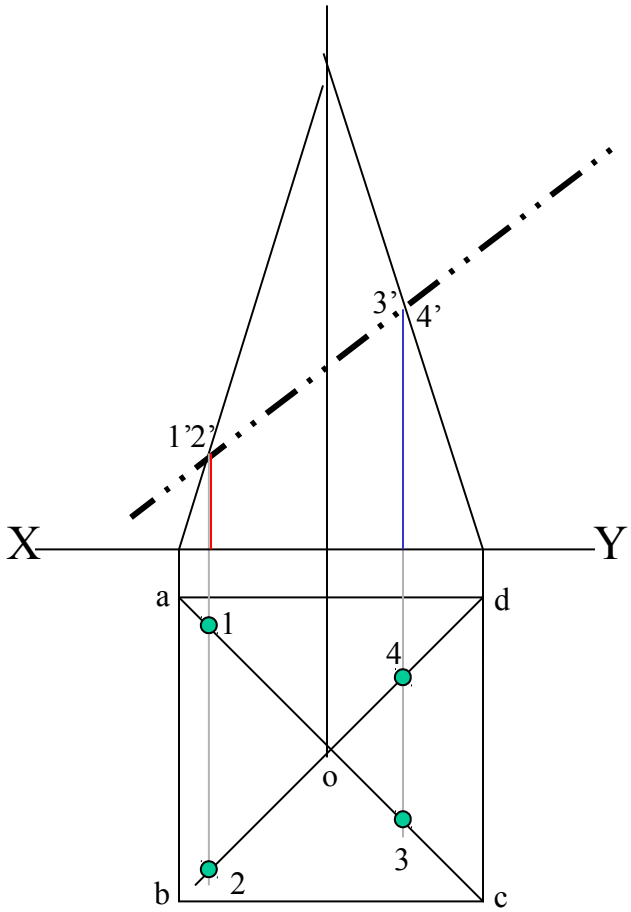


STUDY ILLUSTRATIONS

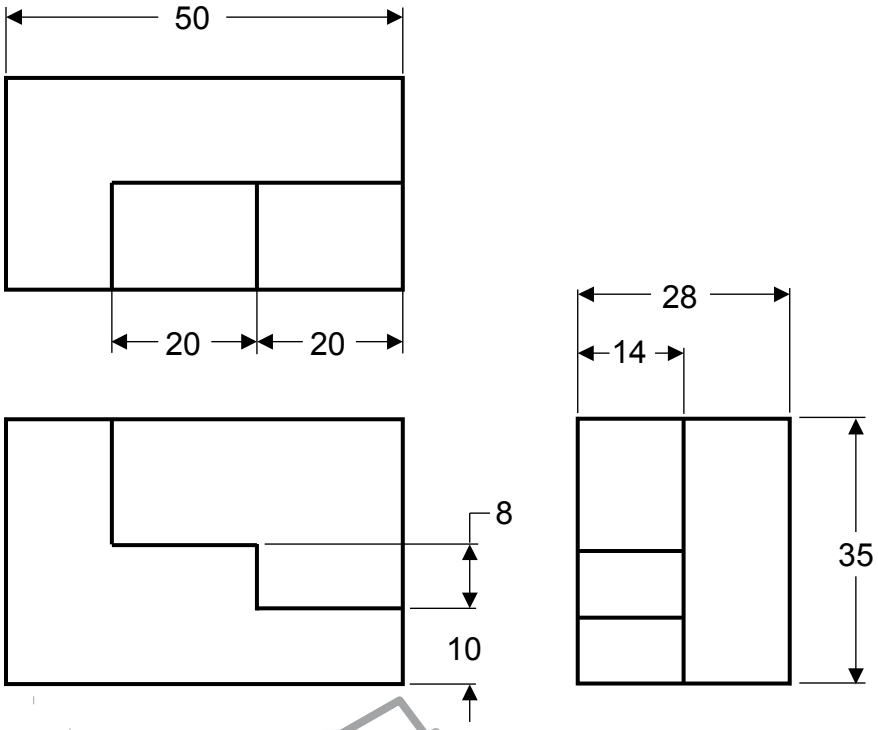
7

A SQUARE PYRAMID OF 40 MM BASE SIDES AND 60 MM AXIS IS CUT BY AN INCLINED SECTION PLANE THROUGH THE MID POINT OF AXIS AS SHOWN.DRAW ISOMETRIC VIEW OF SECTION OF PYRAMID.



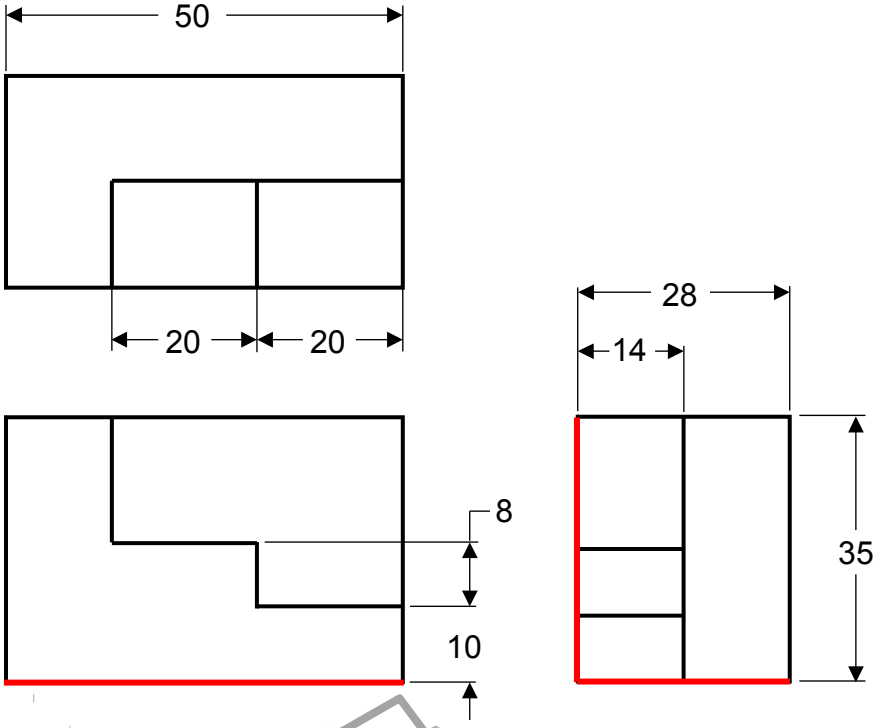


Isometric drawing

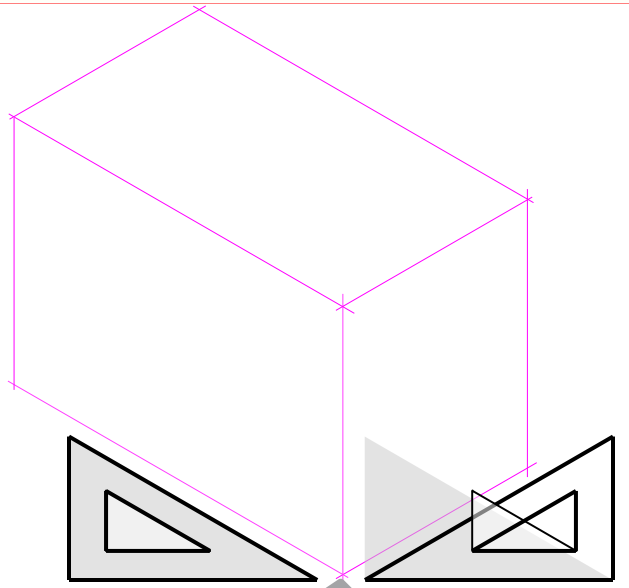


Draw the isometric view of the object, the multi view projection of which is shown above.

Isometric drawing



We will illustrate the main stages of isometric drawing of the object shown above in multi-view.
We will use a method called box construction.

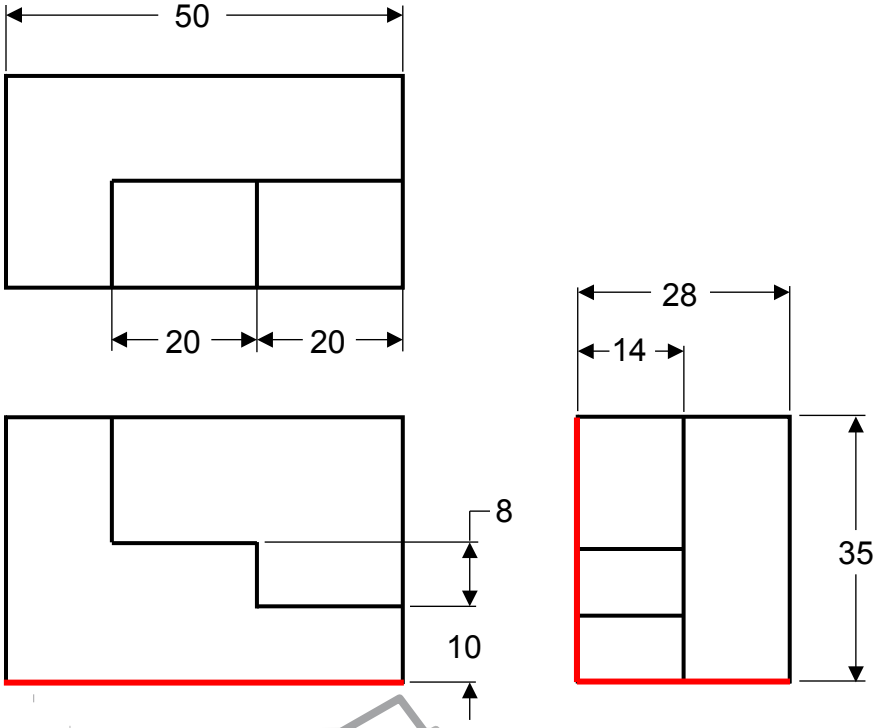


To create the box, use construction lines to outline an isometric box as large as the overall object to be drawn.

The vertical axis is equal to the real height.

The two other axes, drawn at 30° to horizontal, correspond to the actual width and length of the object.

Isometric drawing



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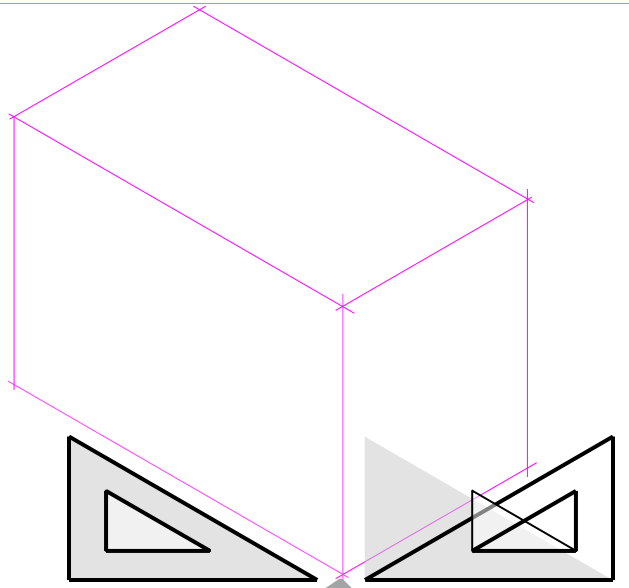

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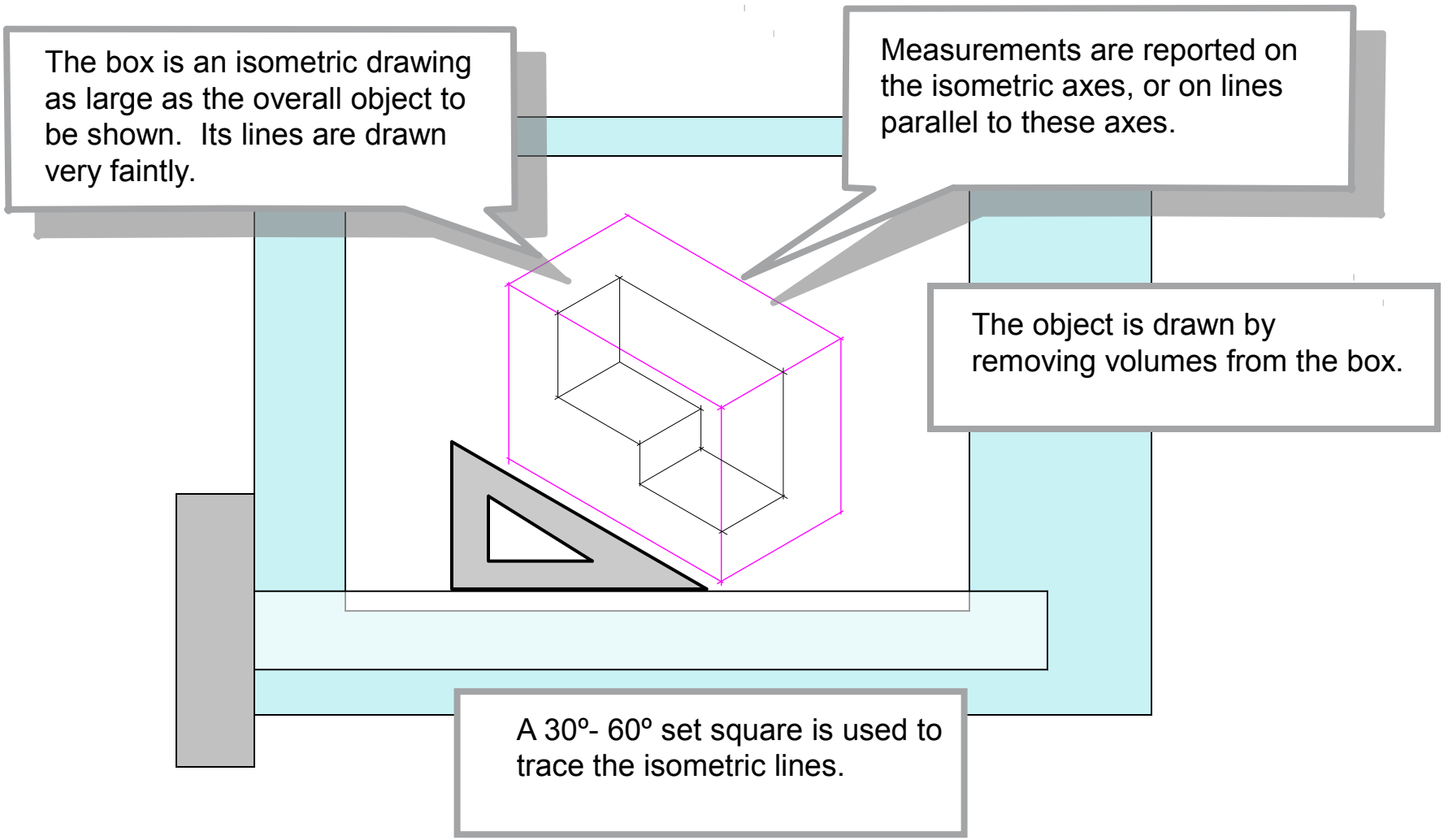
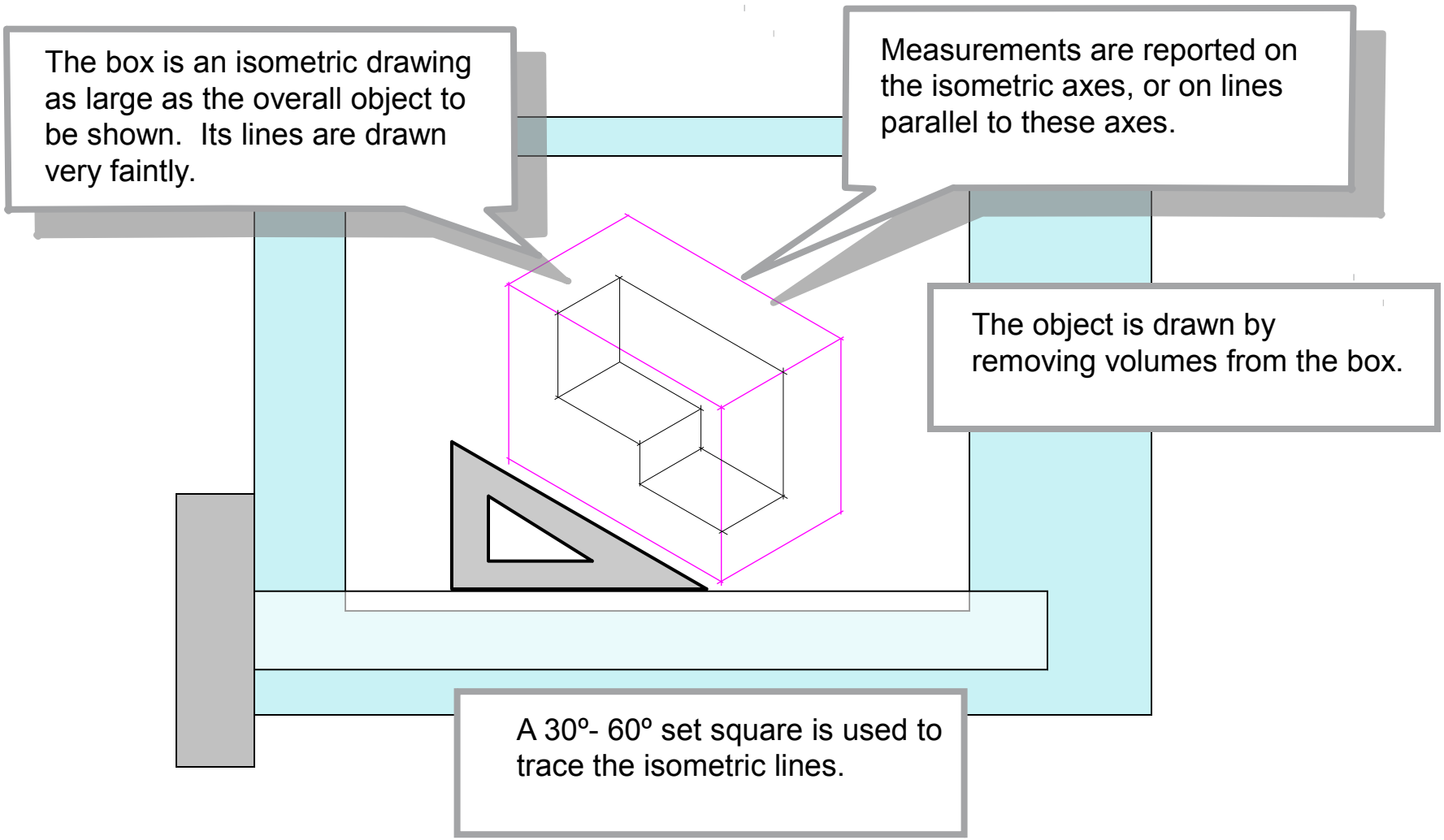
Isometric drawing



Isometric drawing



Isometric drawing

STAGES OF DRAWING IN ISOMETRIC PERSPECTIVE

STAGE 1

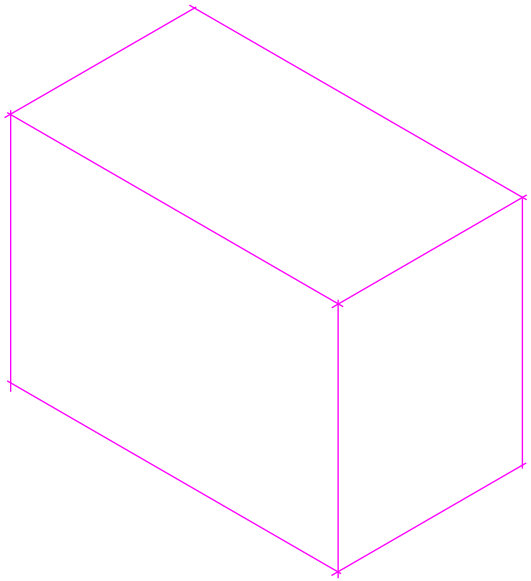
Sketch the box.

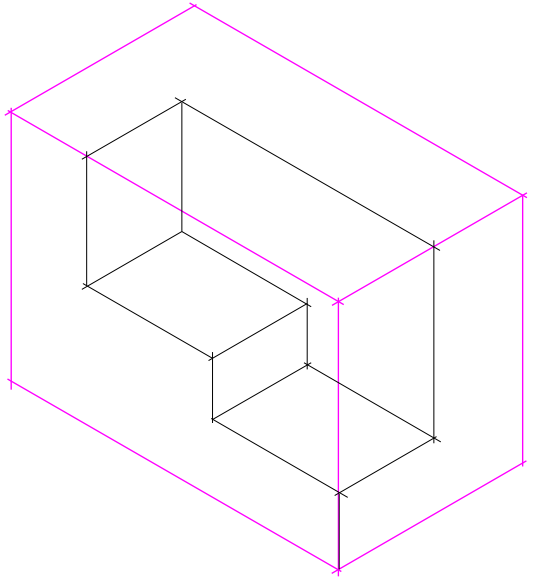
STAGE 2

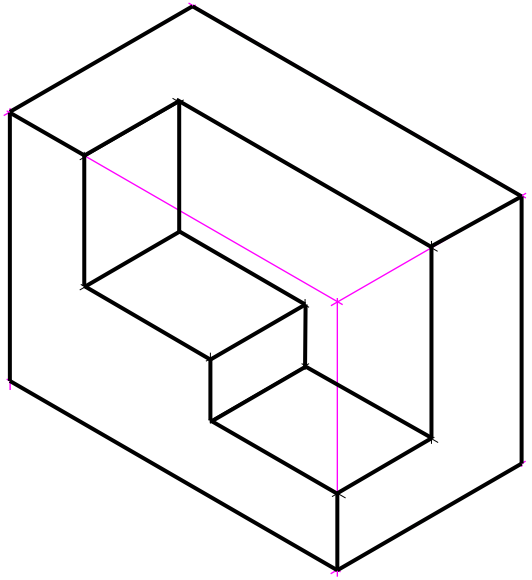
Measure on the axes and trace the details in construction lines.

STAGE 3

Carry out the final layout.







Isometric drawing

STAGES OF DRAWING IN ISOMETRIC PERSPECTIVE

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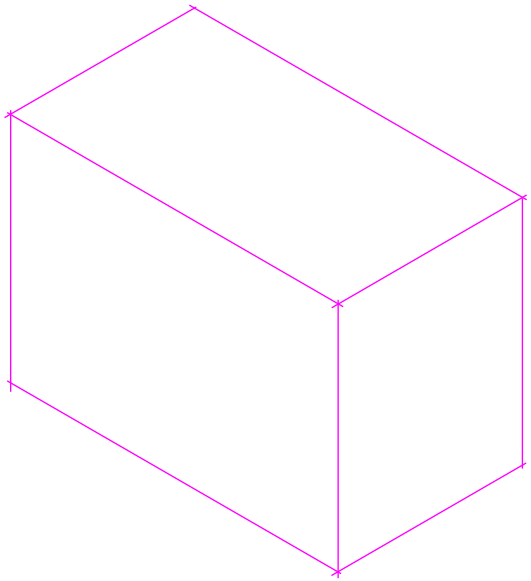

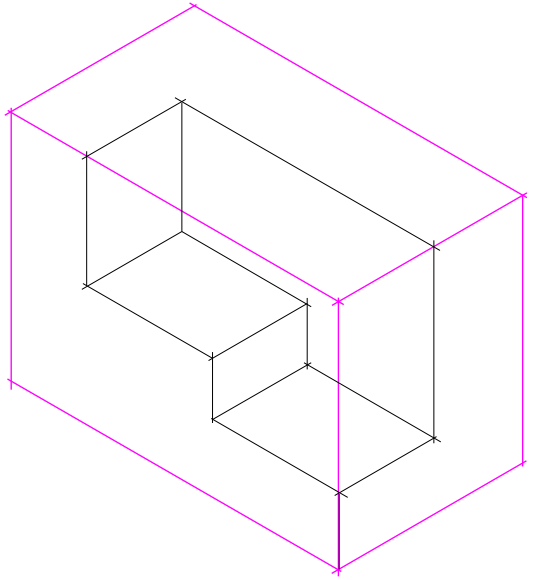

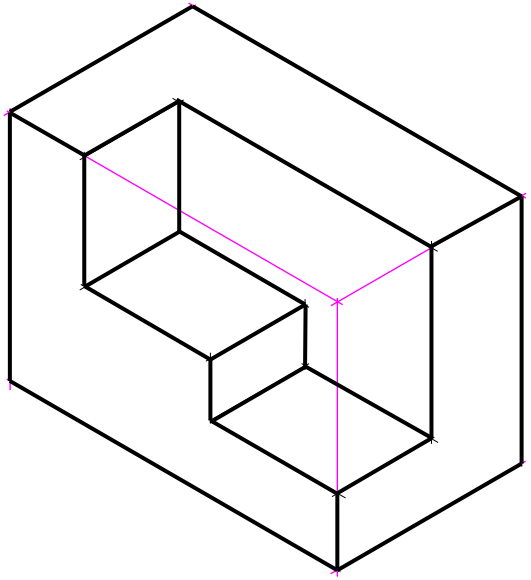

END OF SESSION 6

SESSION 7
PERSPECTIVE PROJECTION