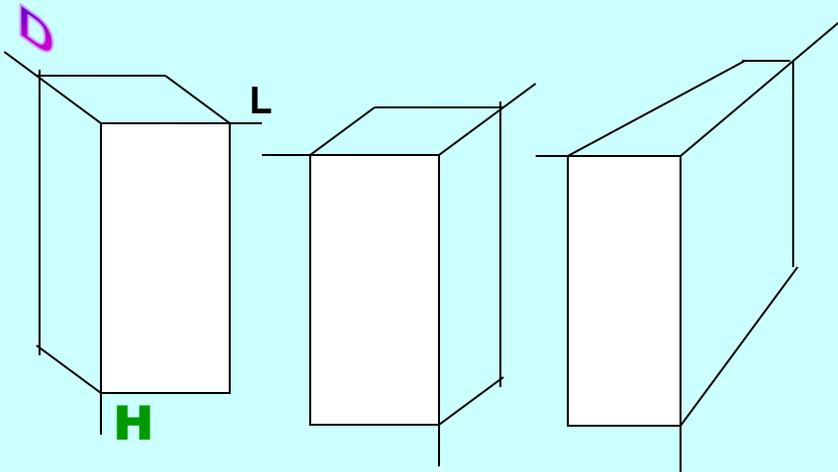# ISOMETRIC PROJECTIONS

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.**

ISOMETRIC PROJECTIONS

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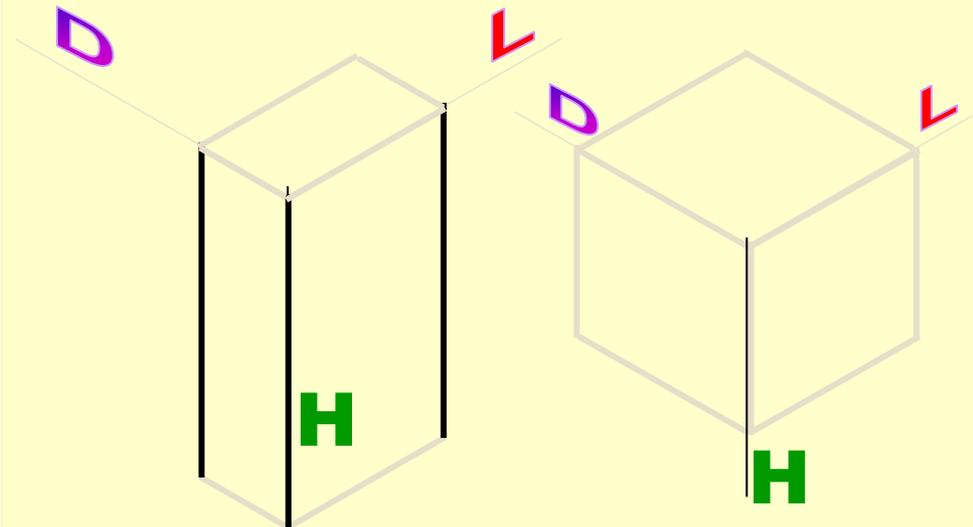
**PURPOSE OF ISOMETRIC DRAWING IS TO UNDERSTAND
OVERALL SHAPE, SIZE & APPEARANCE OF AN OBJECT PRIOR TO IT'S PRODUCTION.**

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*.
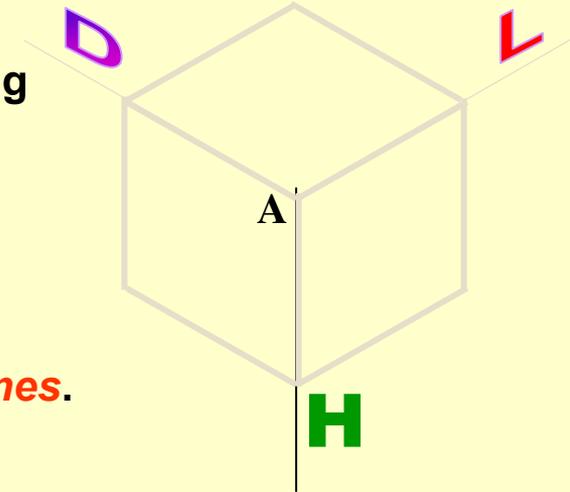
ISOMETRIC SCALE:

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.
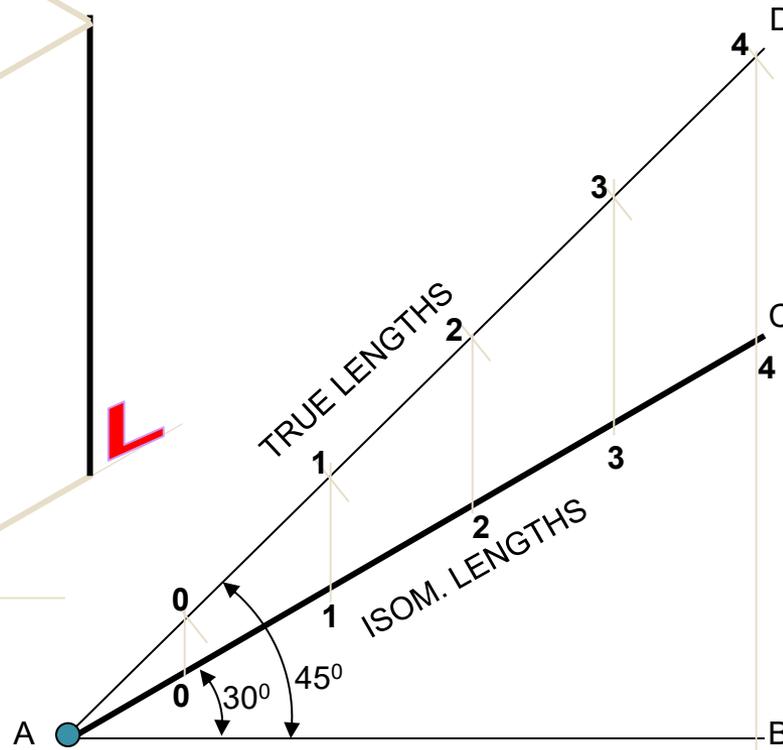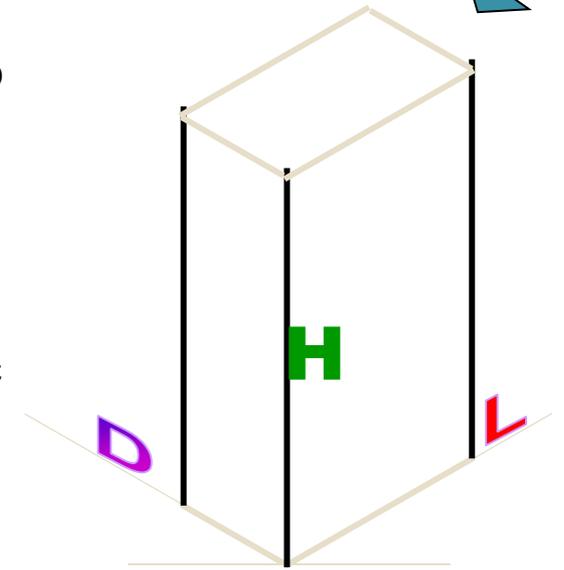
D   L

A

H

TYPES OF ISOMETRIC DRAWINGS

ISOMETRIC VIEW/DRAWING
Drawn by using True scale
(True dimensions)
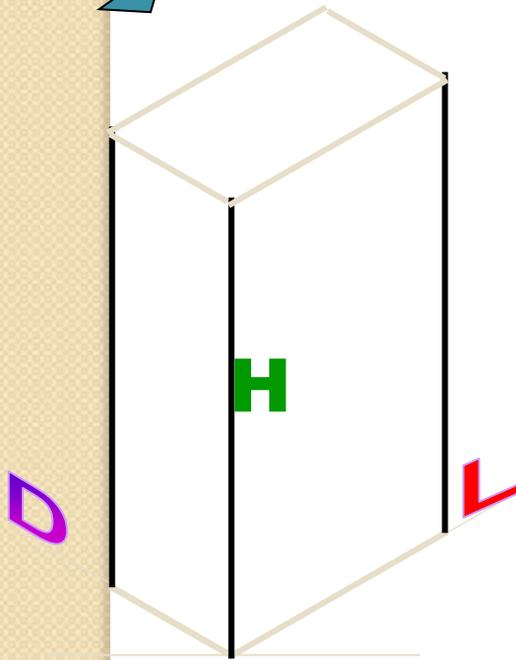
ISOMETRIC PROJECTION
Drawn by using Isometric scale
(Reduced dimensions)

H

D

L

TRUE LENGTHS

ISOM. LENGTHS

D

4

3

2

1

0

C

4

3

2

1

0

30^0 45^0

A   B

Isometric scale [Line AC]
required for Isometric Projection

H

D

L

CONSTRUCTION OF ISOM.SCALE.
From point A, with line AB draw 30^0 and 45^0 inclined lines AC & AD resp on AD.
Mark divisions of true length and from each division-point draw vertical lines upto AC line.
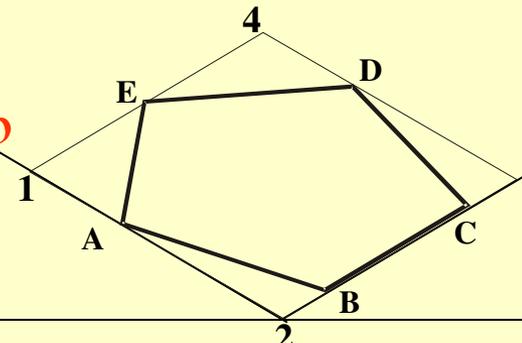The divisions thus obtained on AC give lengths on isometric scale.

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

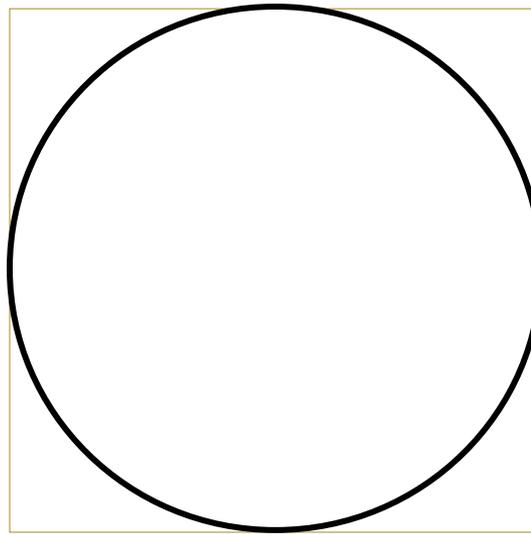**IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.**

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.
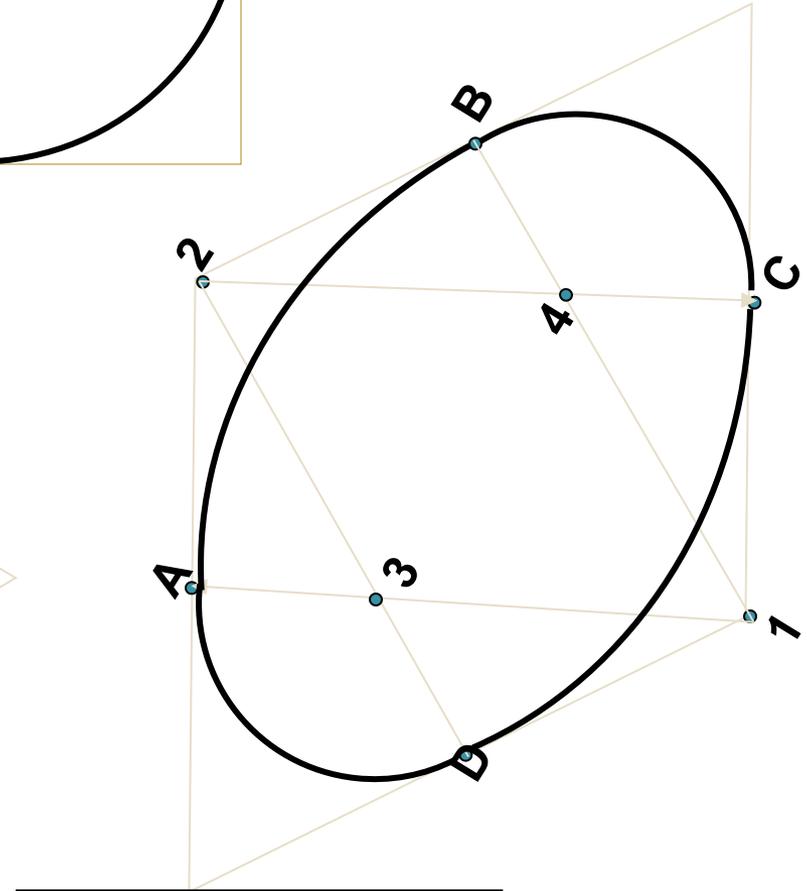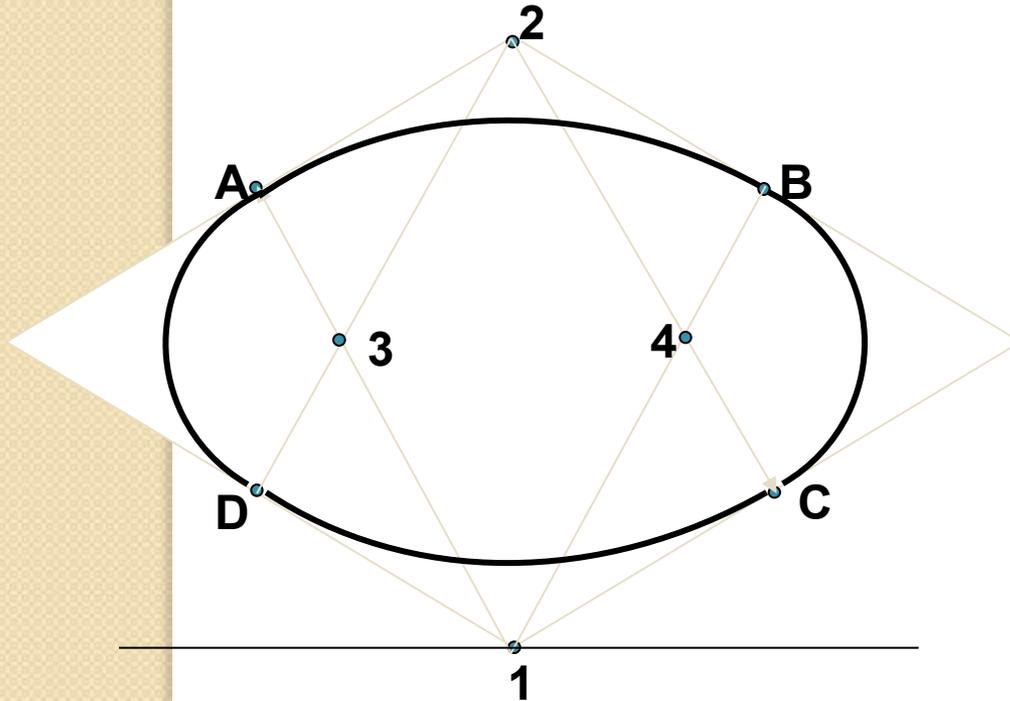
RECTANGLE
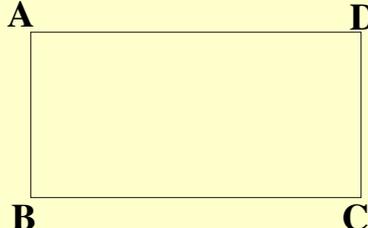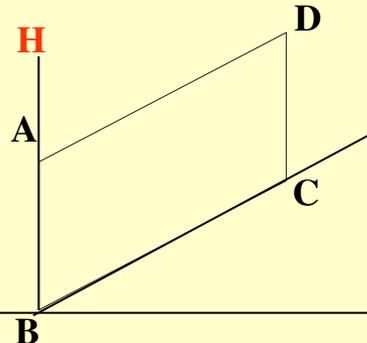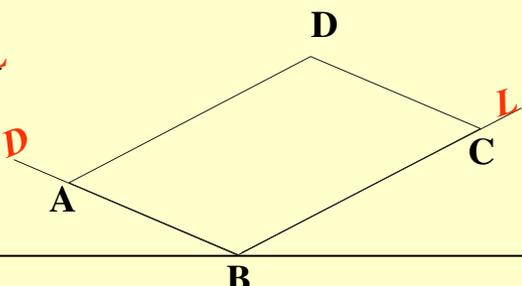
TRIANGLE
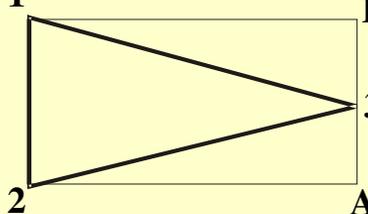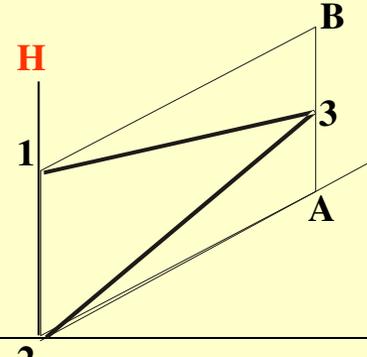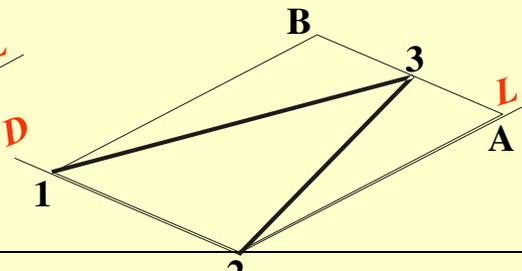
PENTAGON
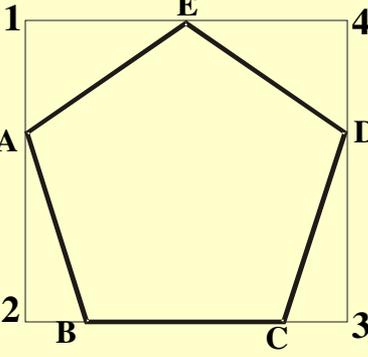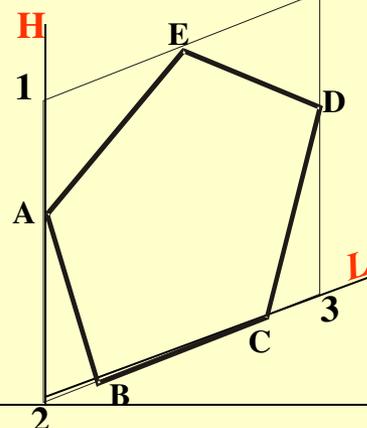
**DRAW ISOMETRIC VIEW OF A
CIRCLE IF IT IS A TV OR FV.**

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.
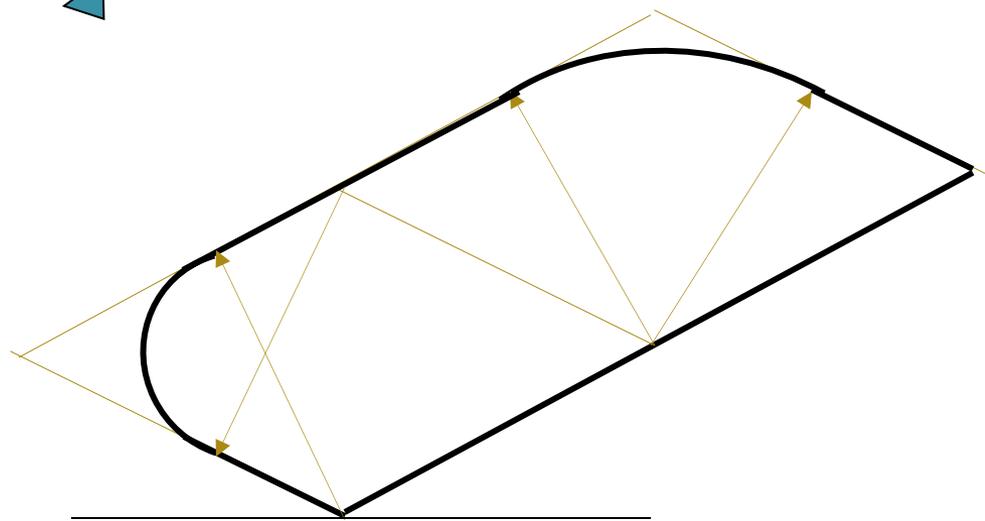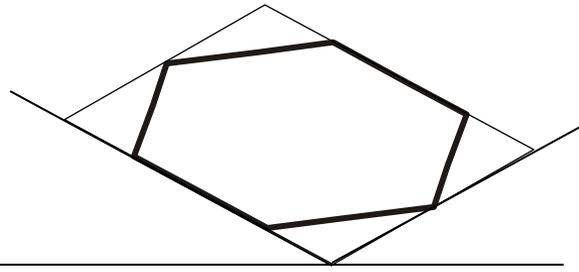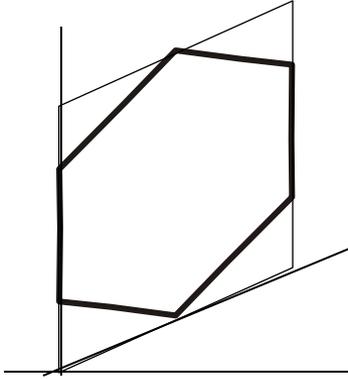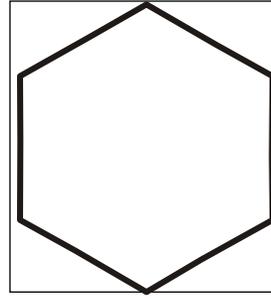FOR CONSTRUCTION USE RHOMBUS
METHOD SHOWN HERE. STUDY IT.

STUDY ILLUSTRATIONS

2

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

25 R

50 MM

100 MM
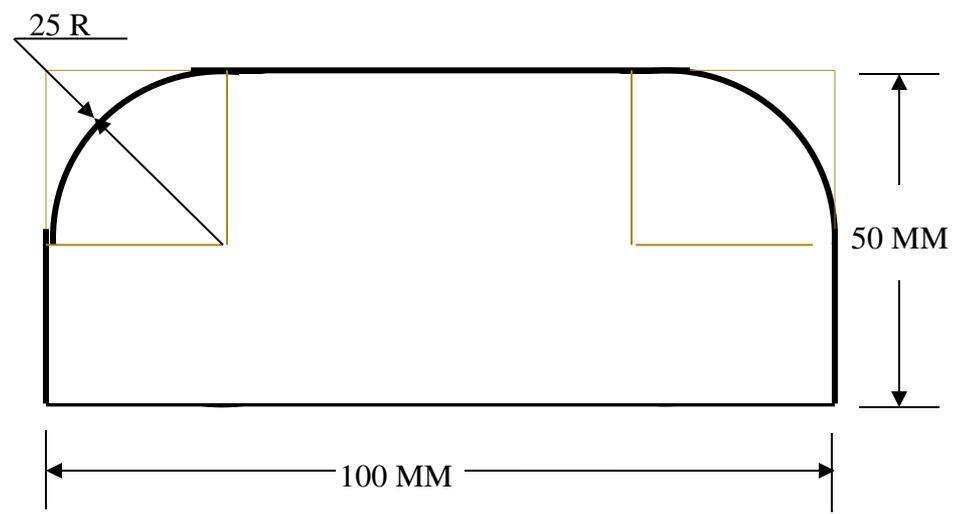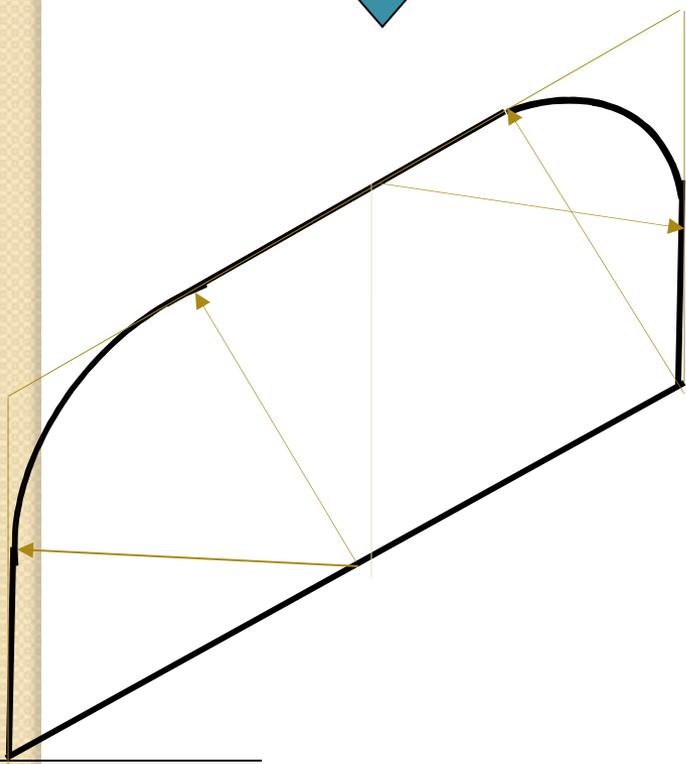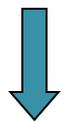
IF FRONT VIEW

IF TOP VIEW

ISOMETRIC OF PLANE FIGURES

SHAPE	IF F.V.	IF T.V.

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.)
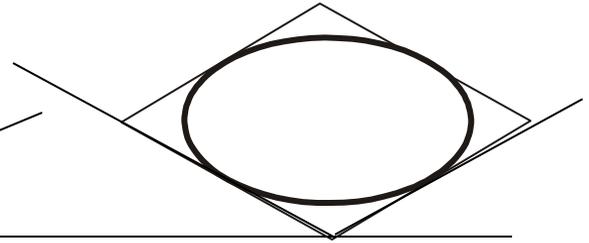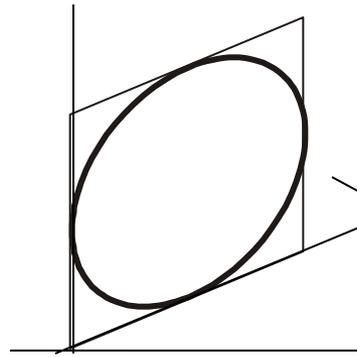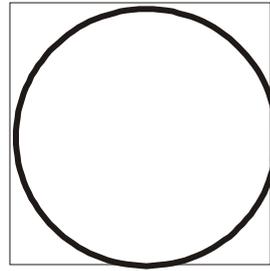
HEXAGON

CIRCLE

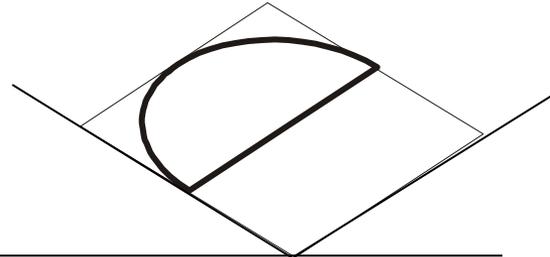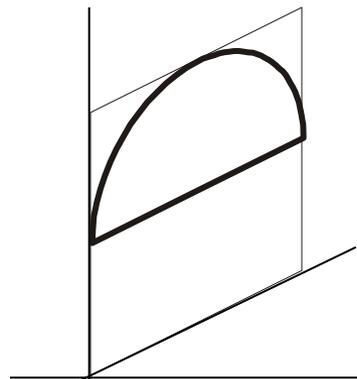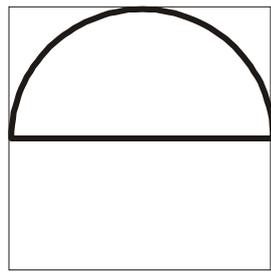*For Isometric of Circle/Semicircle use* Rhombus method. *Construct Rhombus of sides equal to Diameter of circle always.* (Ref. topic ENGG. CURVES.)
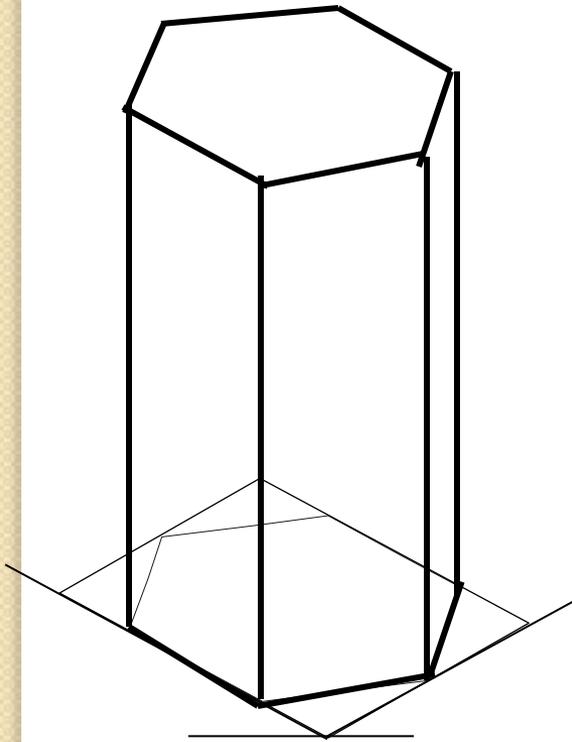
SEMI CIRCLE

STUDY ILLUSTRATIONS

Z

ISOMETRIC VIEW OF
PENTAGONAL PYRAMID
STANDING ON H.P.
(Height is added from center of pentagon)

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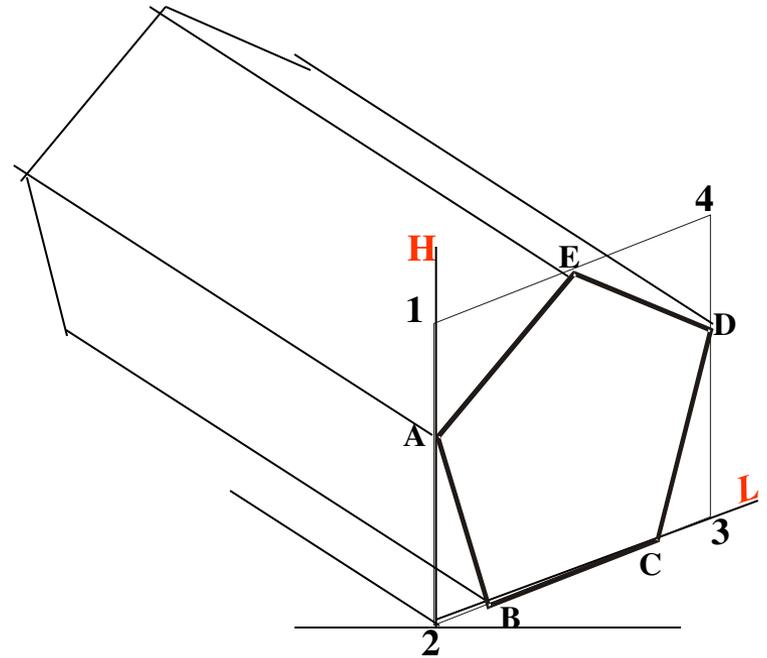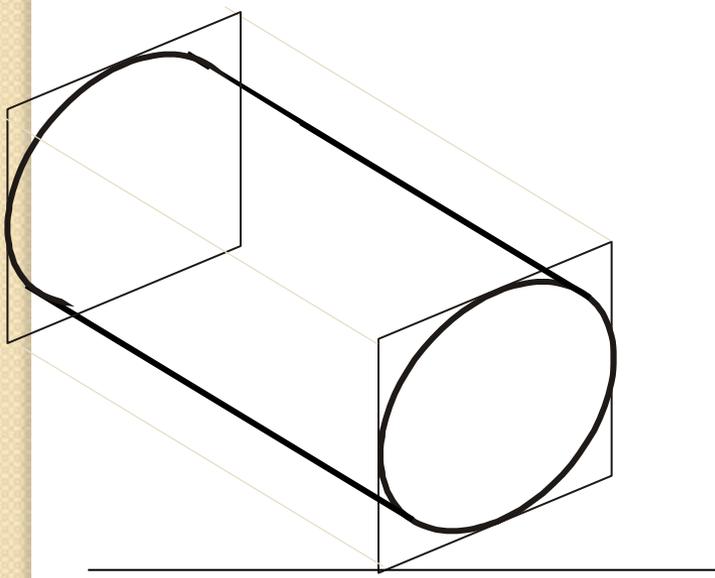**PENTAGONAL PYRAMID**
STANDING ON H.P.

STUDY ILLUSTRATIONS

Z

ISOMETRIC VIEW OF
PENTAGONALL PRISM
LYING ON H.P.

H

1

4

E

A

D

L

B

C

3

2
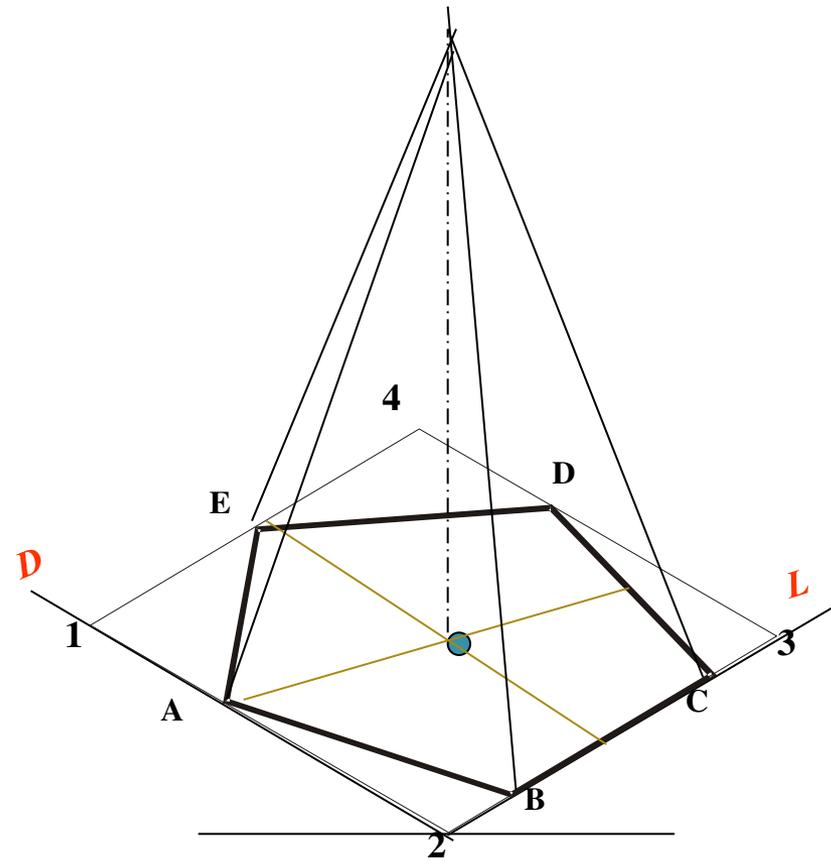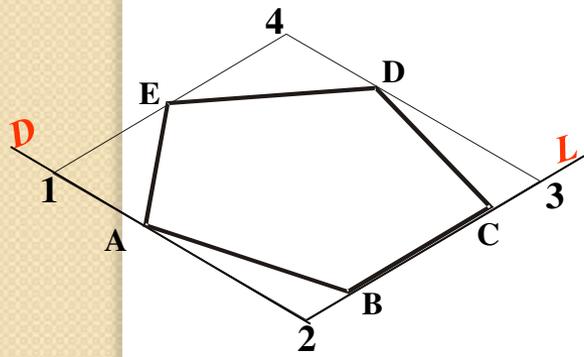
ISOMETRIC VIEW OF
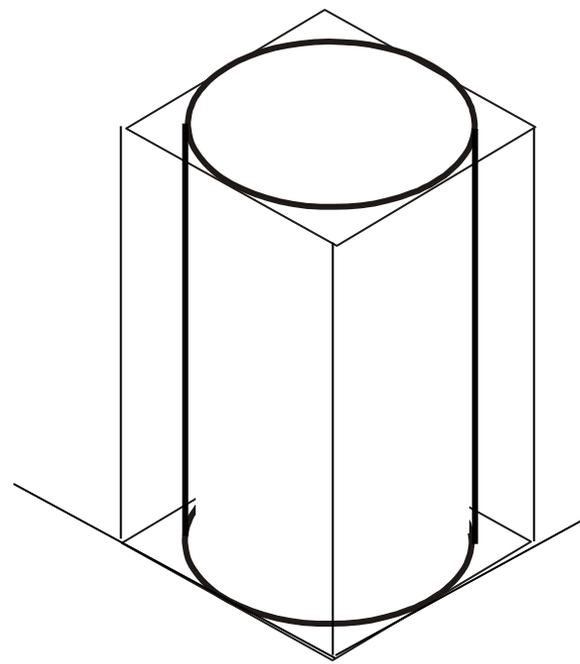**HEXAGONAL PRISM**
STANDING ON H.P.
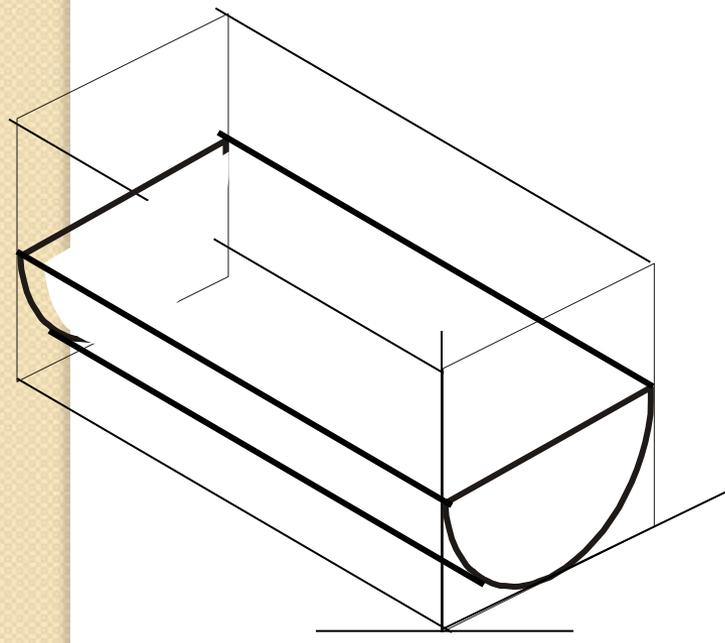
STUDY
ILLUSTRATIONS
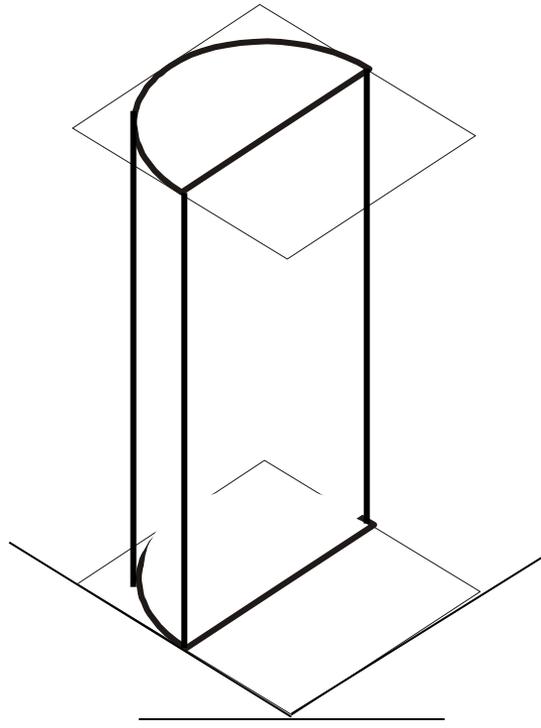
CYLINDER STANDING ON H.P.

CYLINDER LYING ON H.P.

STUDY ILLUSTRATIONS

Z

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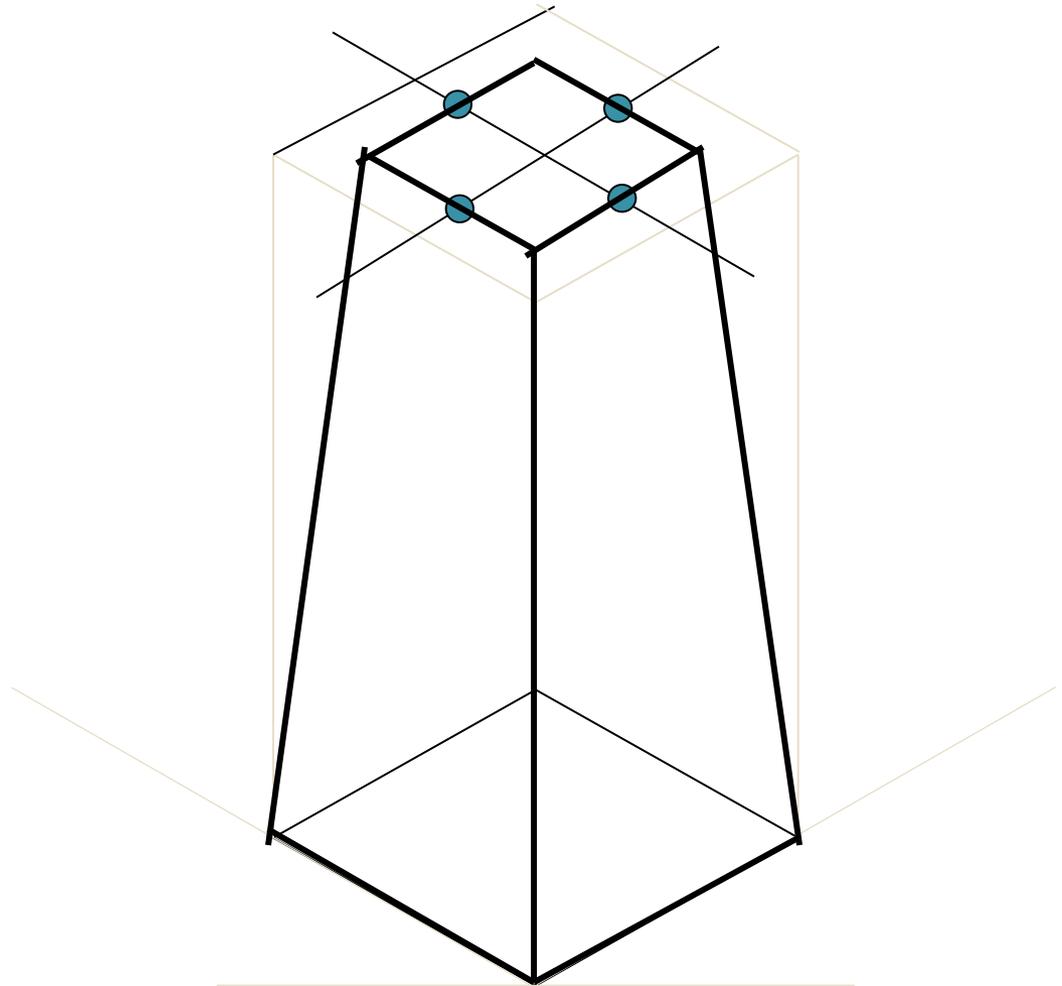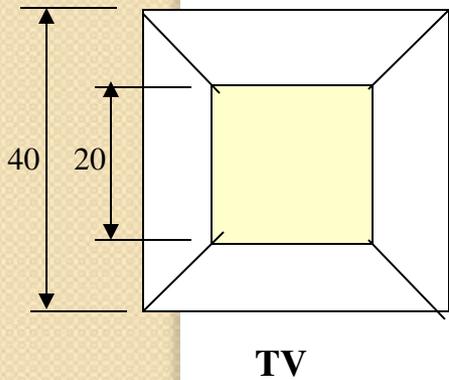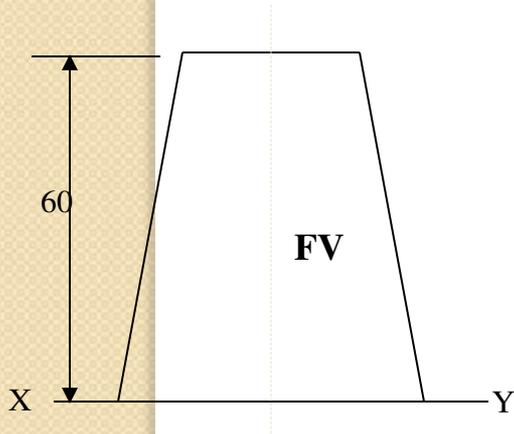(ON IT'S SEMICIRCULAR BASE)

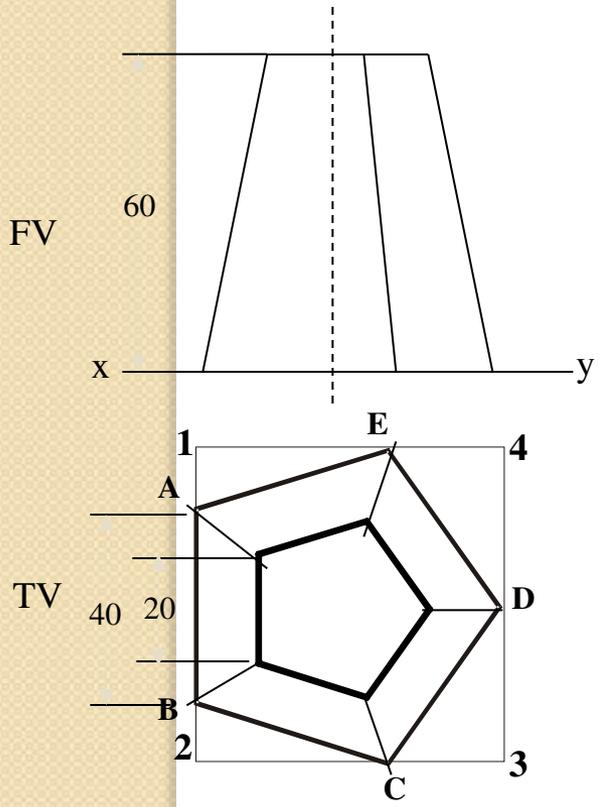**HALF CYLINDER LYING ON H.P.**
(with flat face // to H.P.)

STUDY ILLUSTRATIONS

Z

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

60

FV

X ———————— Y

40 20

TV

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

ISOMETRIC VIEW
OF
FRUSTOM OF PENTAGONAL PYRAMID

FV

60

x ——————————————————————— y

TV
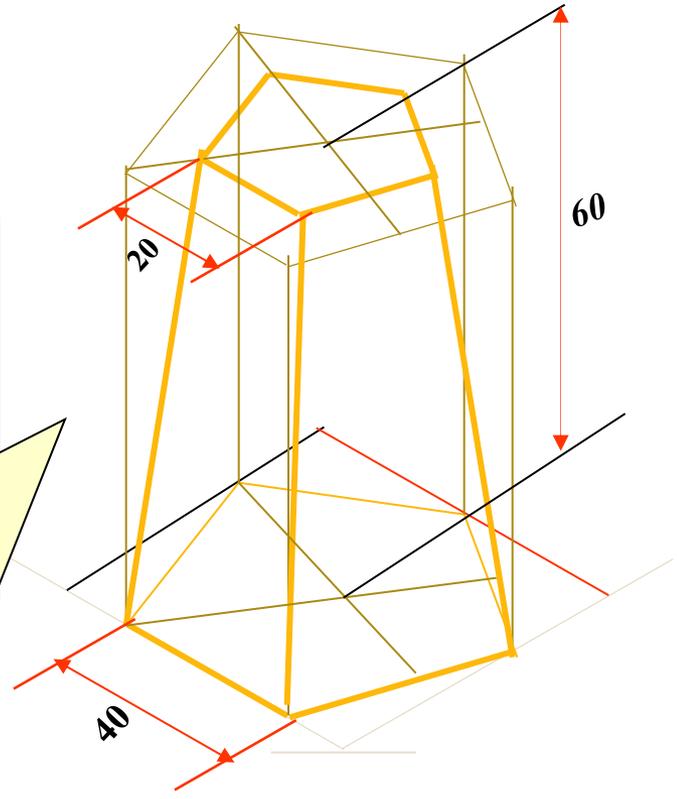
40   20

E

1   4

A

D

B

2   3

C

SOLUTION STEPS:

FIRST DRAW ISOMETRIC
OF IT'S BASE.

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

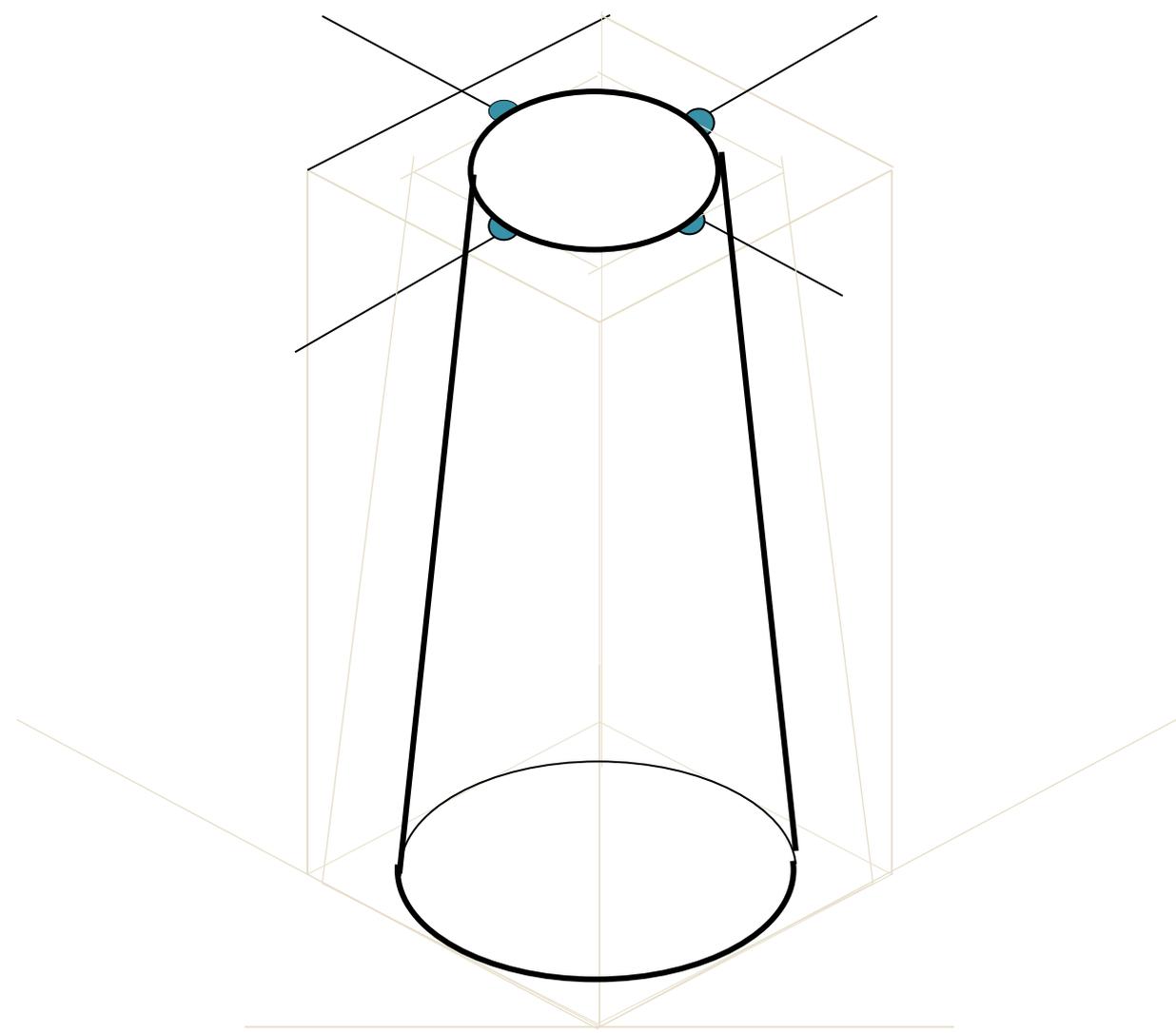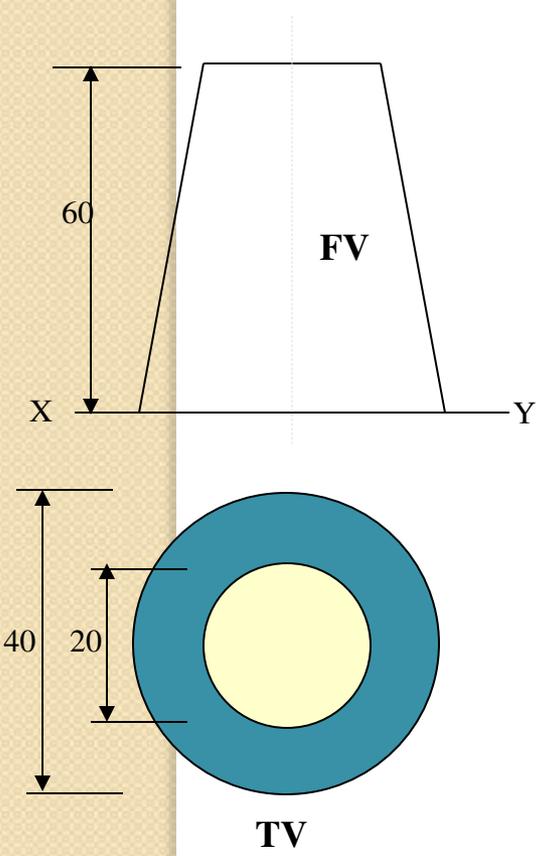THEN REDUCE THE TOP TO
20 MM SIDES AND JOIN WITH
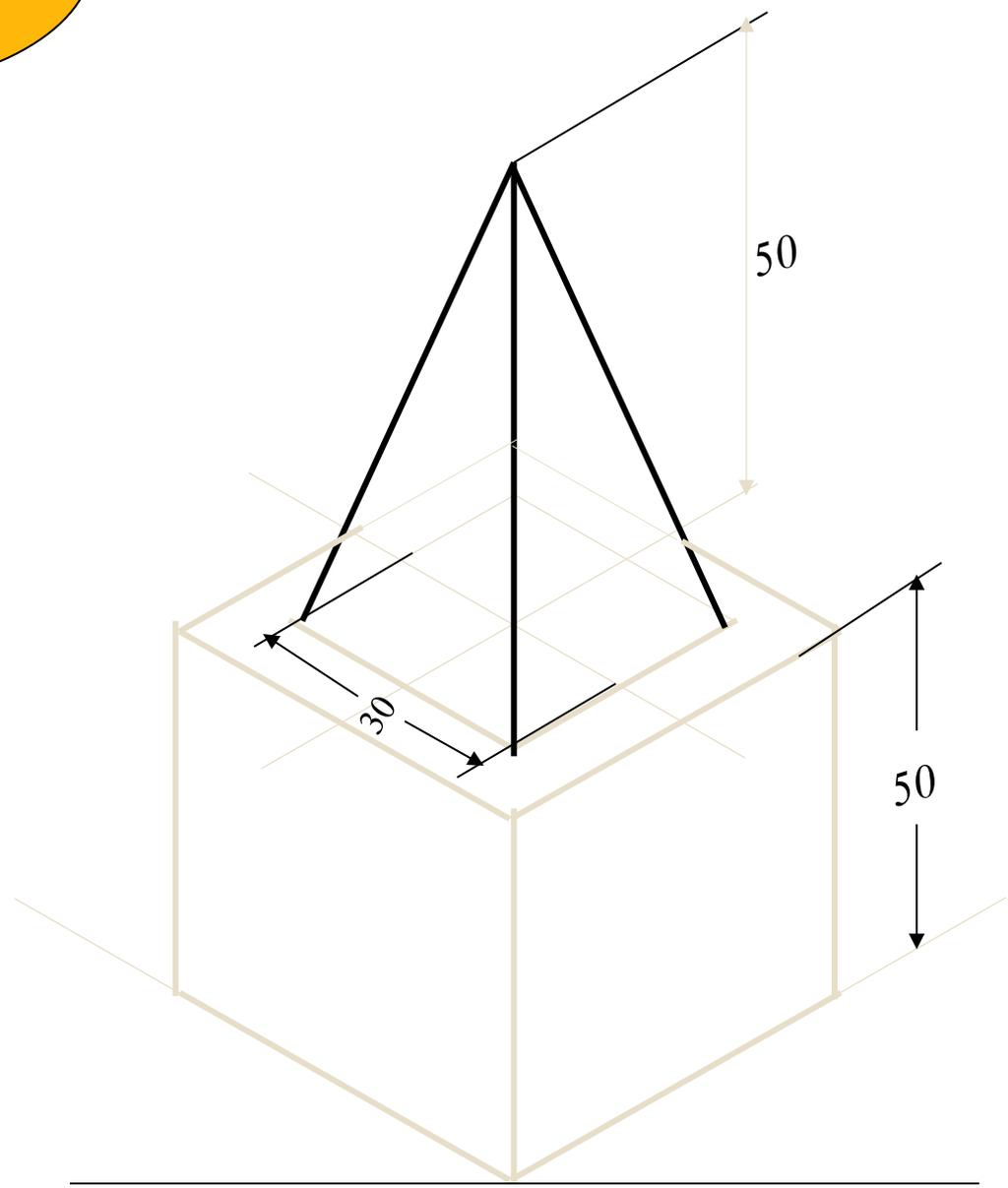THE PROPER BASE CORNERS.

60

20

40

A FRUSTOM OF CONE

STANDING ON H.P. ON IT'S LARGER BASE.

**STUDY ILLUSTRATIONS**

Z

60

FV

X ——————— Y

40 20

TV

Z

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.
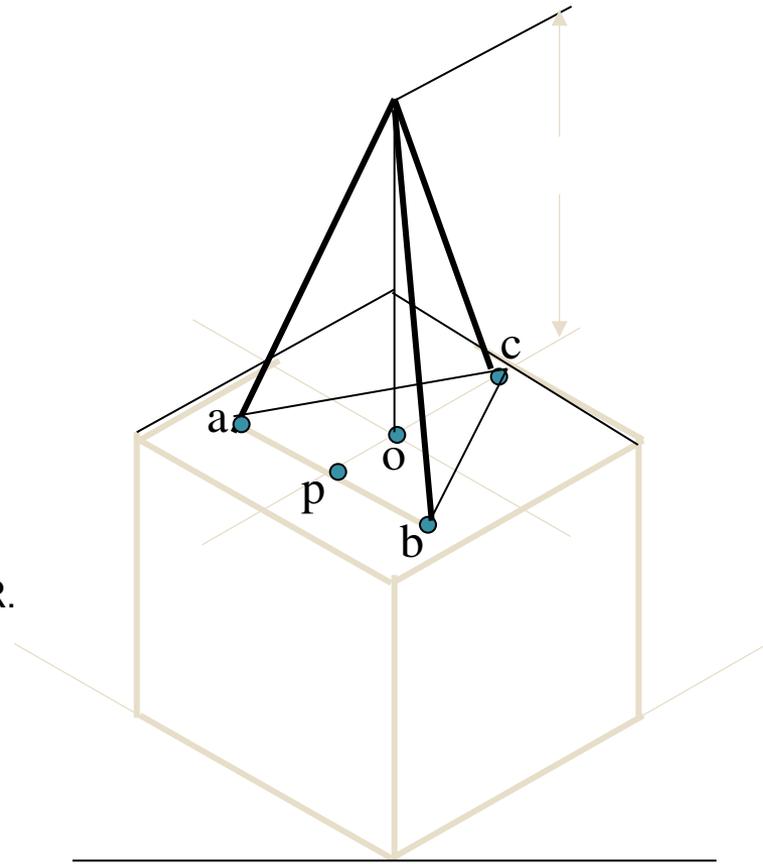
50

30

50

STUDY ILLUSTRATIONS

Z

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.
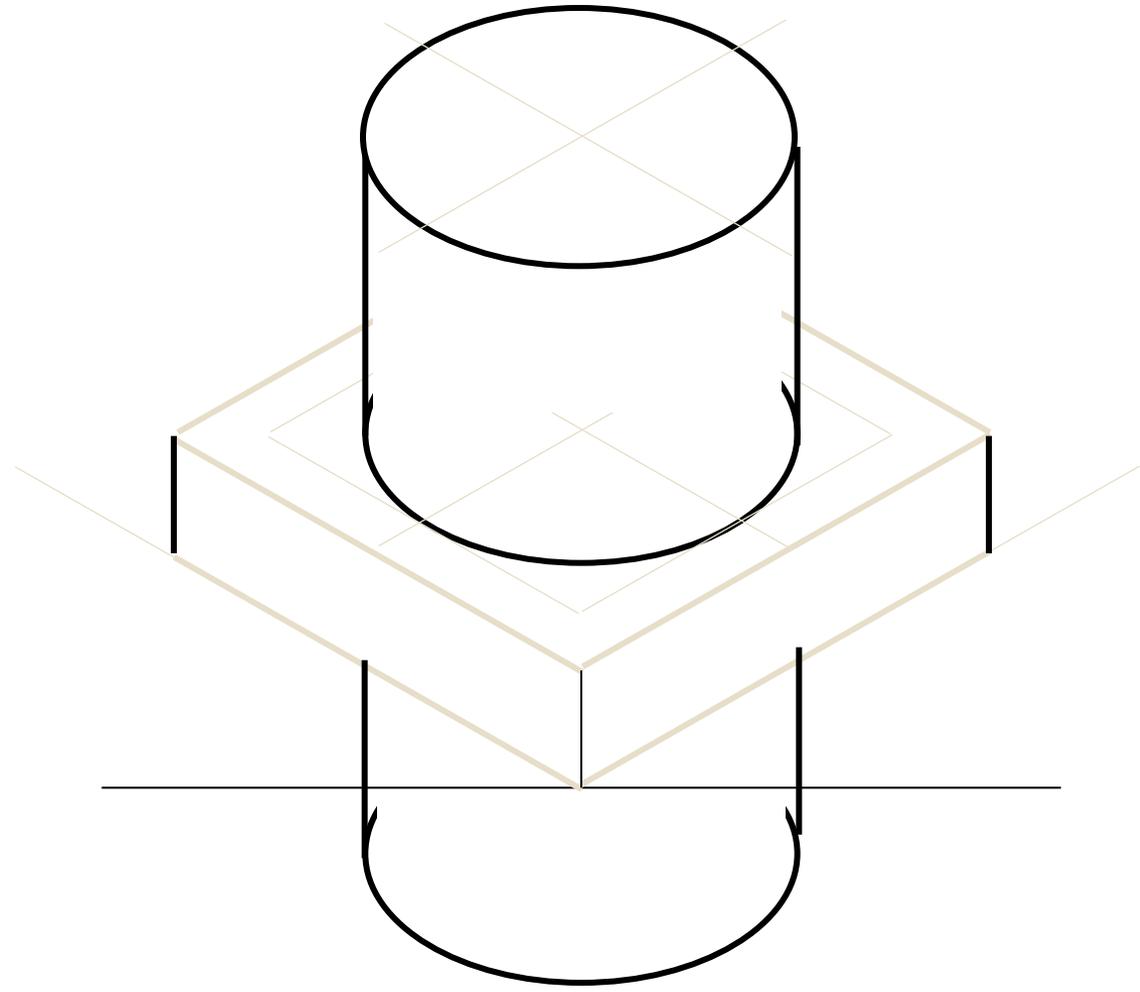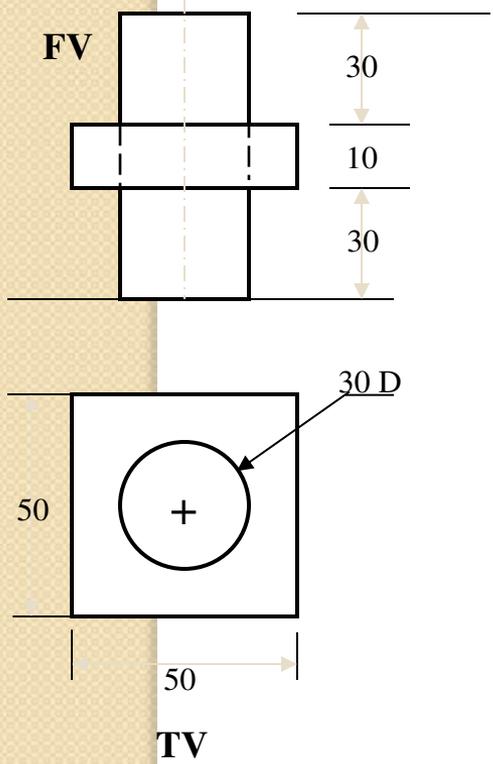DRAW ISOMETRIC VIEW OF THE PAIR.
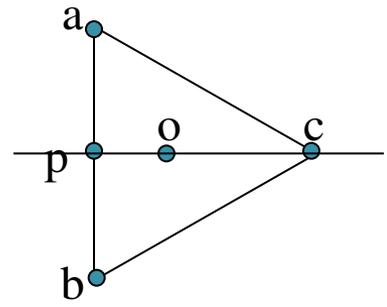
SOLUTION HINTS.
TO DRAW ISOMETRIC OF A CUBE IS SIMPLE. DRAW IT AS USUAL.

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.

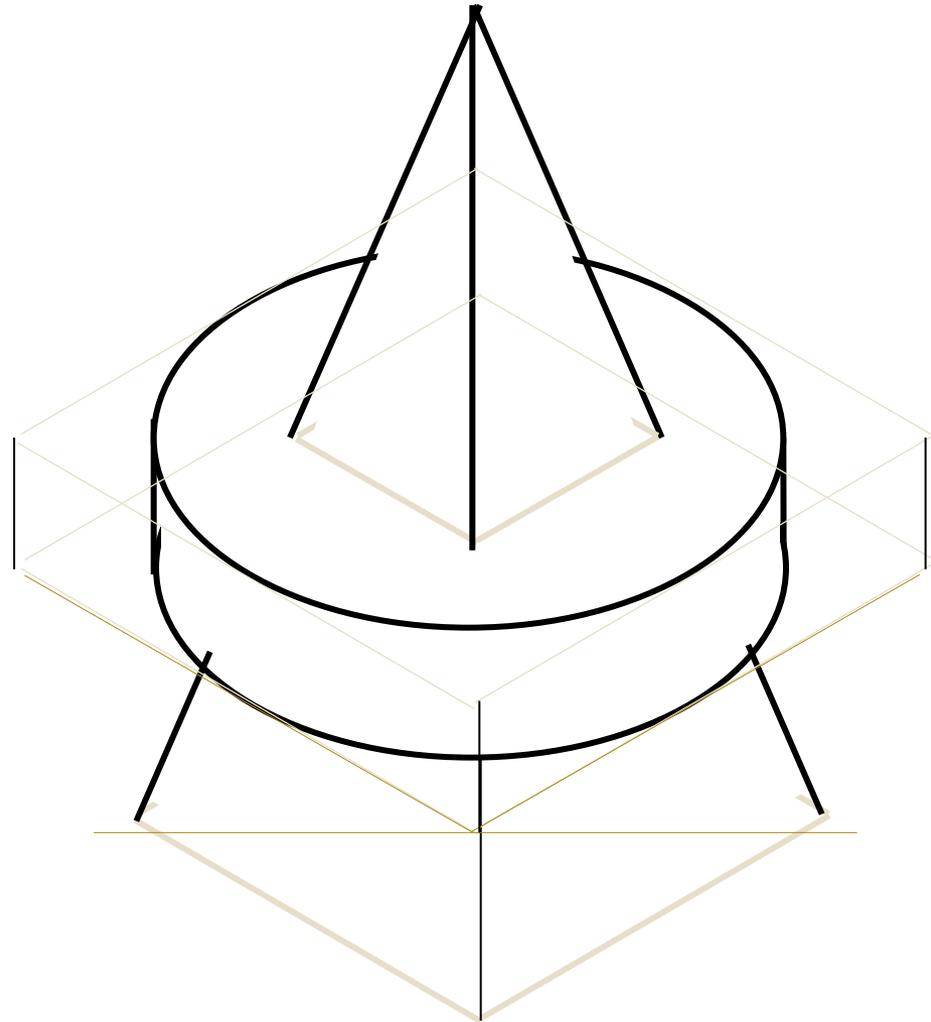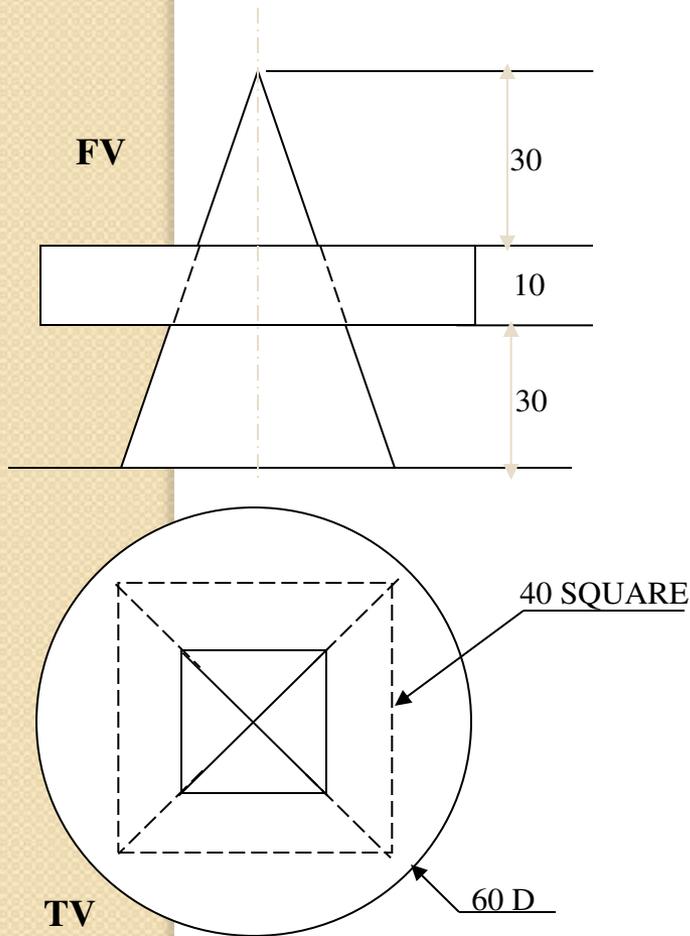# STUDY ILLUSTRATIONS

Z

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.

FV

30

10

30

30 D

50

50

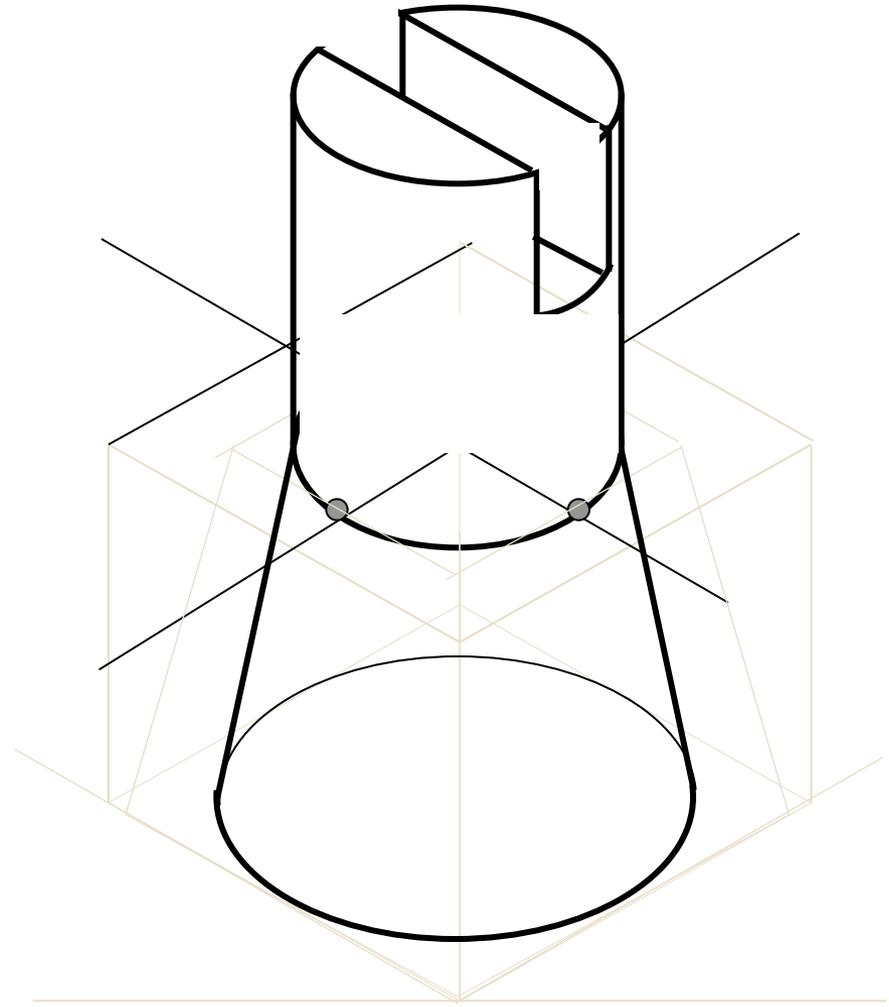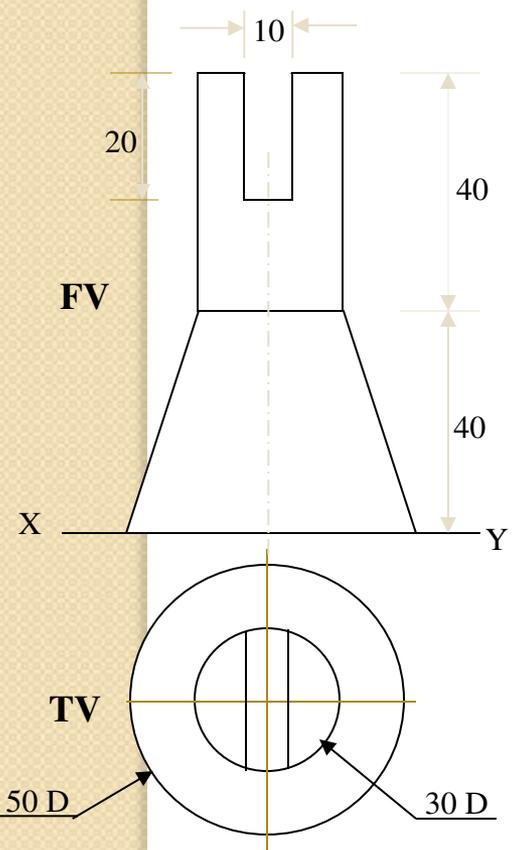**TV**

STUDY ILLUSTRATIONS

Z

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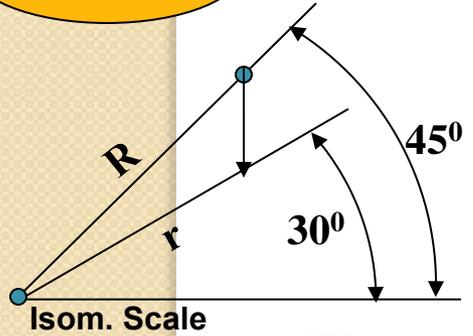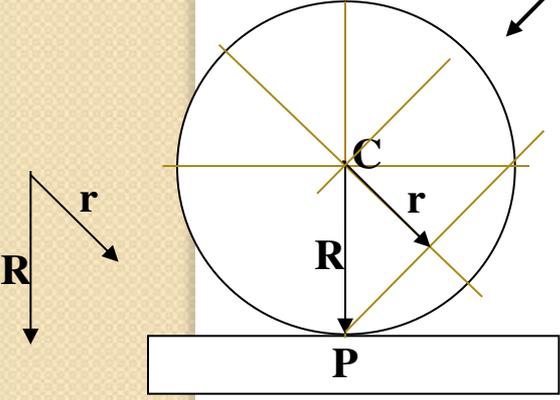OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC VIEW.

FV

30

10

30

40 SQUARE

60 D

TV

STUDY ILLUSTRATIONS

Z

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

10

20

40

40

FV

X ———— Y

TV

50 D

30 D

ISOMETRIC PROJECTIONS OF SPHERE & HEMISPHERE

R

r

45^0

30^0

Iso-Direction

Isom. Scale

r

R

C

r

R

P

r

R

r

P

r

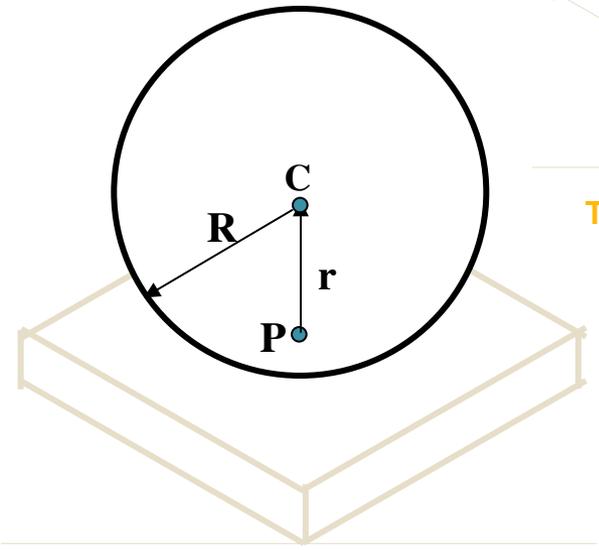**TO DRAW ISOMETRIC PROJECTION OF A HEMISPHERE**

C

R

r

P

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

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.
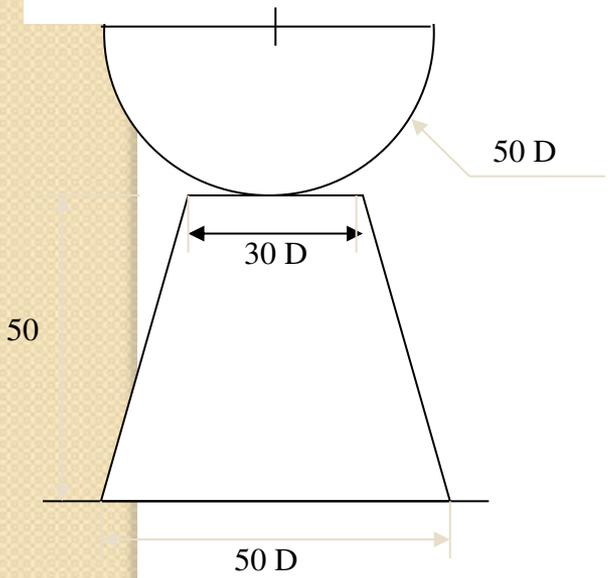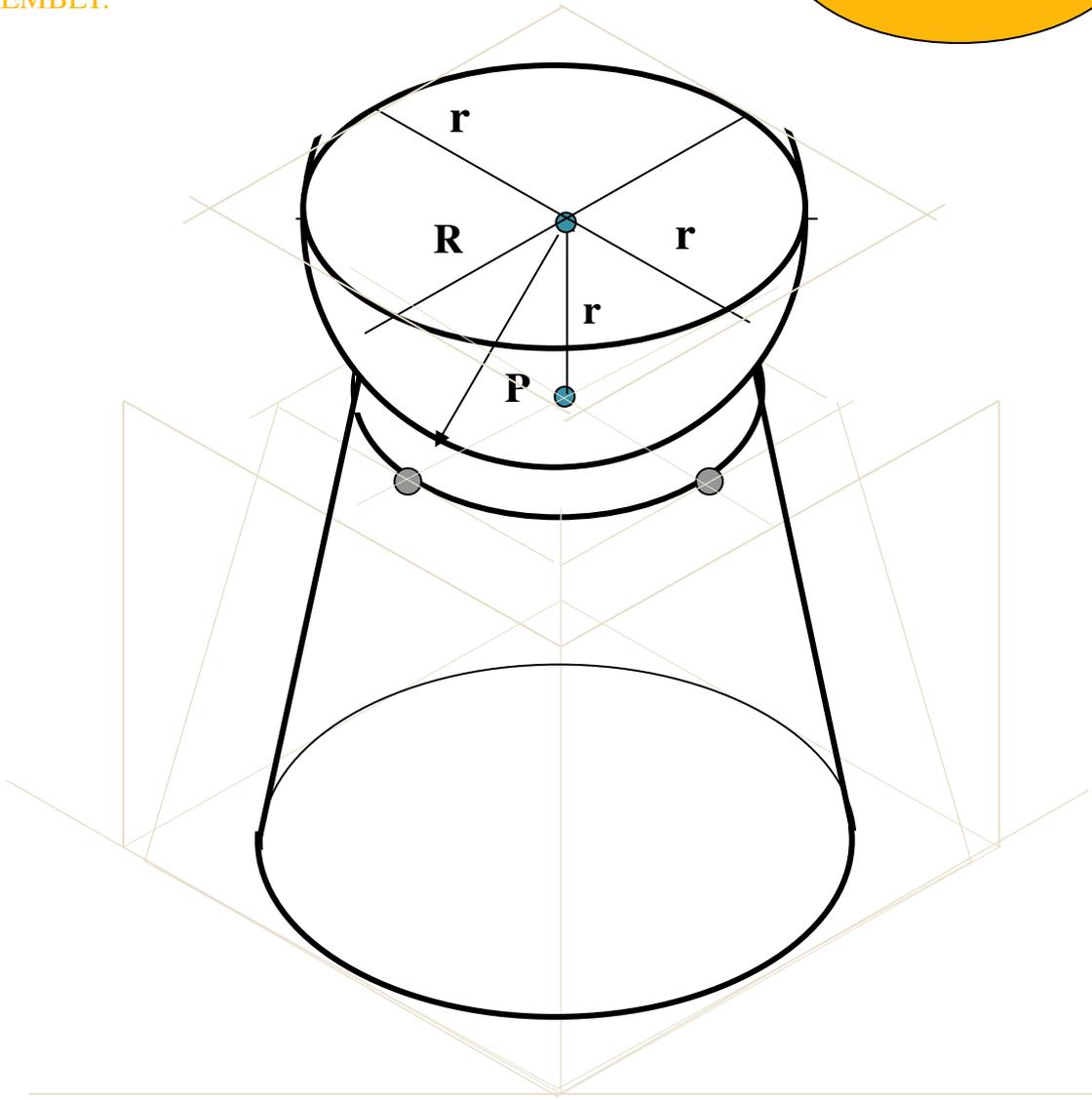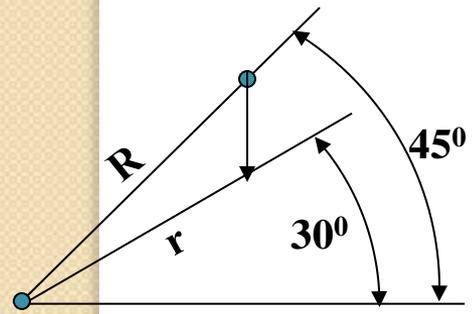   THIS IS ISOMETRIC PROJECTION OF A SPHERE.

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

50 D

30 D

50

50 D

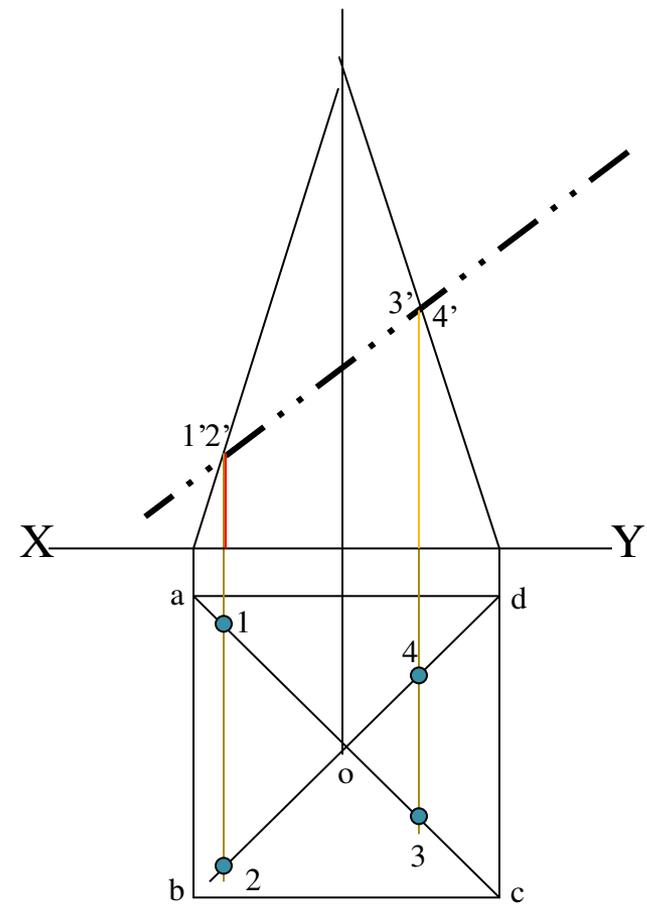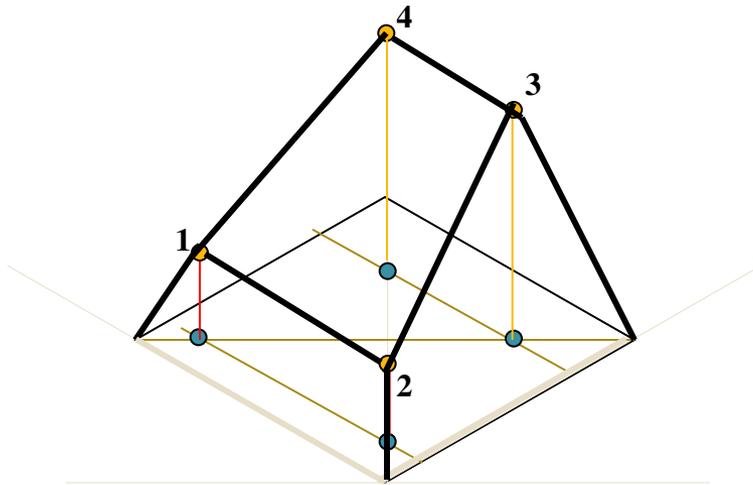**FIRST CONSTRUCT ISOMETRIC SCALE.
USE THIS SCALE FOR ALL DIMENSIONS
IN THIS PROBLEM.**

R

r
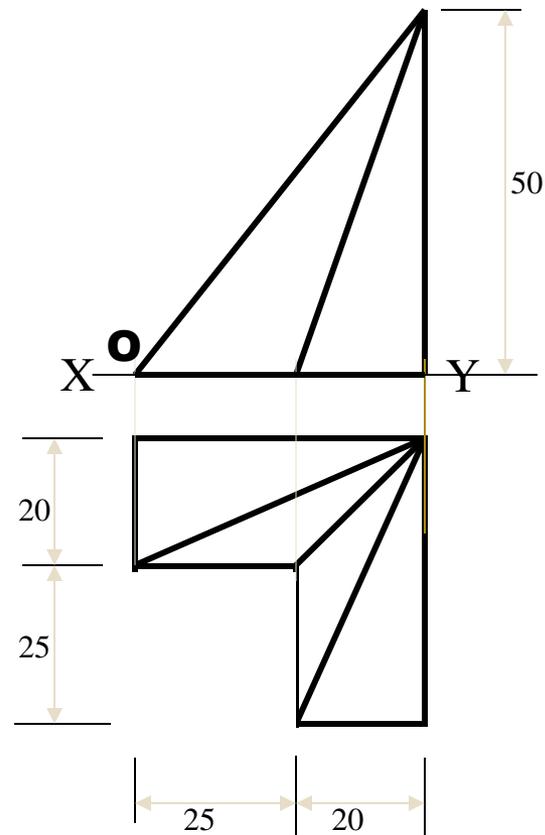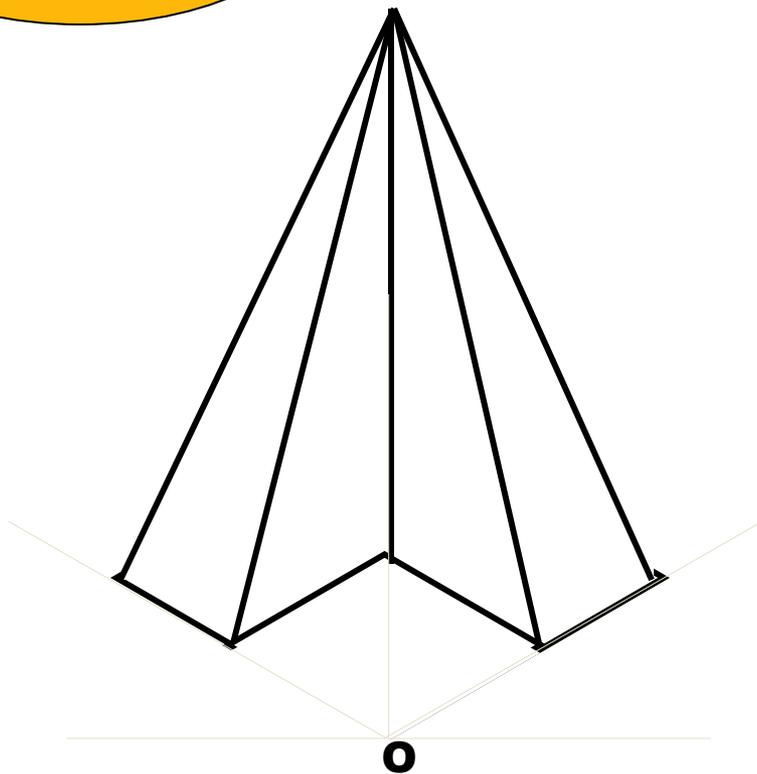
45^0

30^0

r

R

r

r

P

STUDY ILLUSTRATIONS

Z

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.
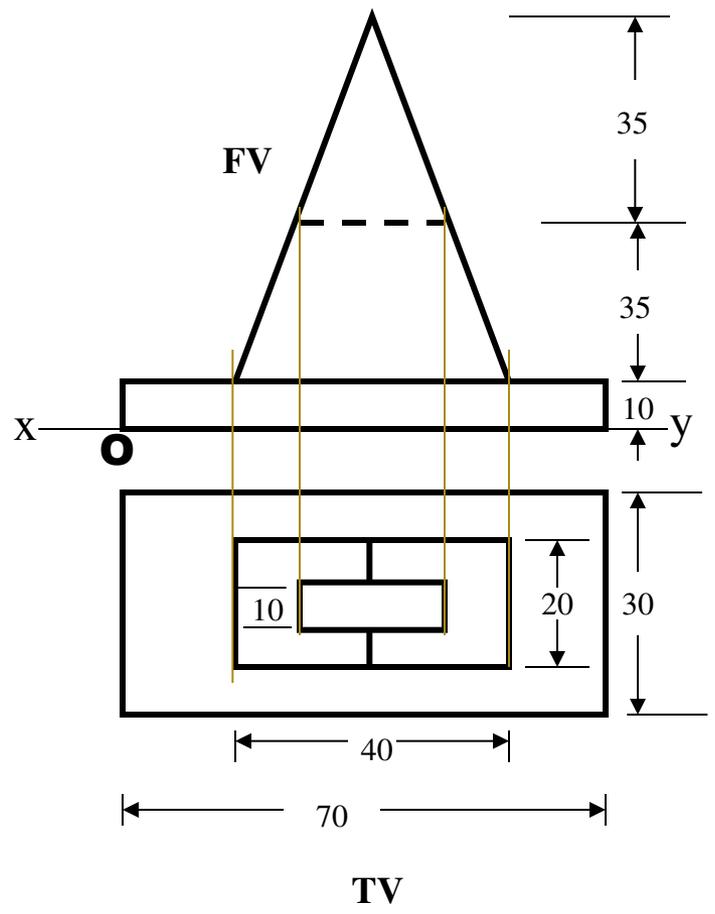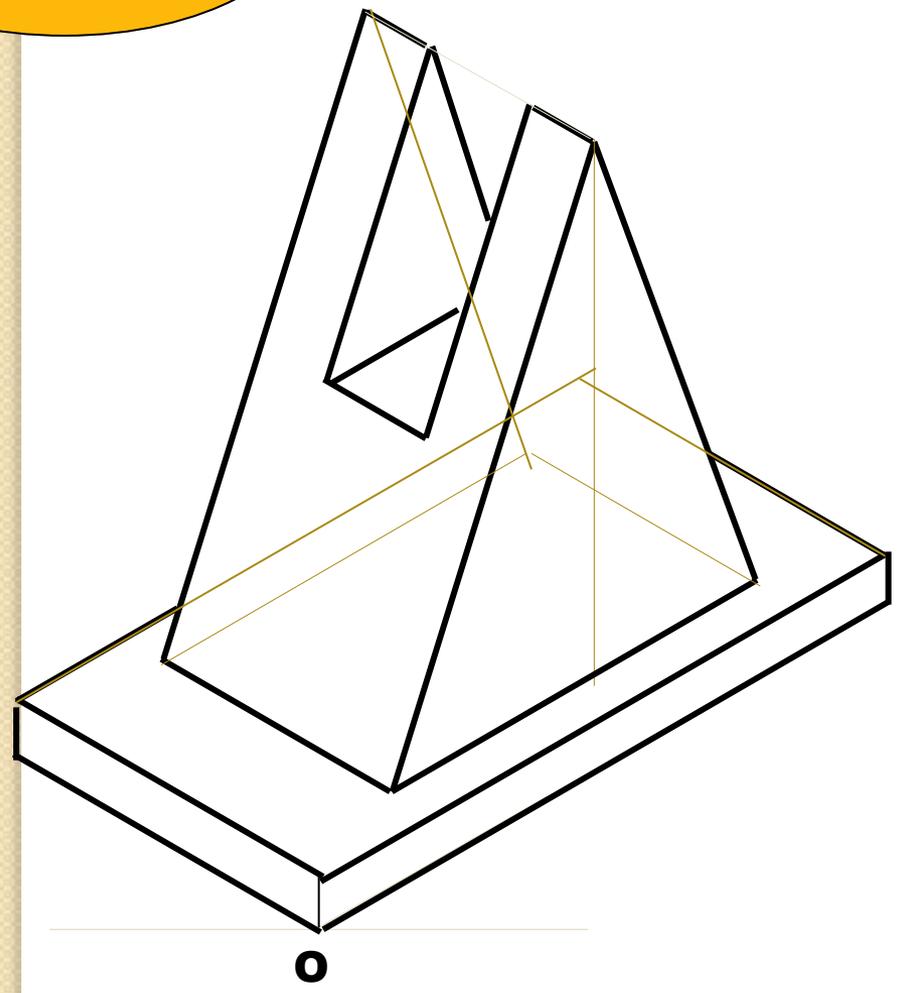
STUDY ILLUSTRATIONS

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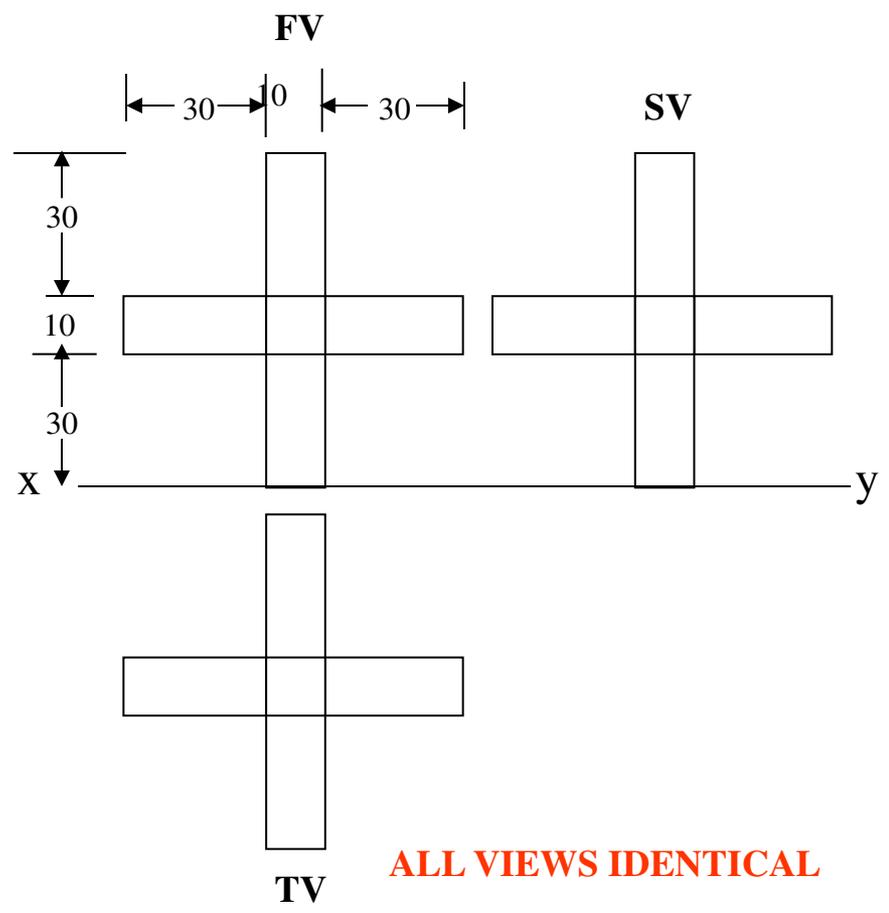
F.V. & T.V. of an object are given. Draw it's isometric view.

X —— O —— Y

50

20

25

25   20

O

STUDY ILLUSTRATIONS

Z

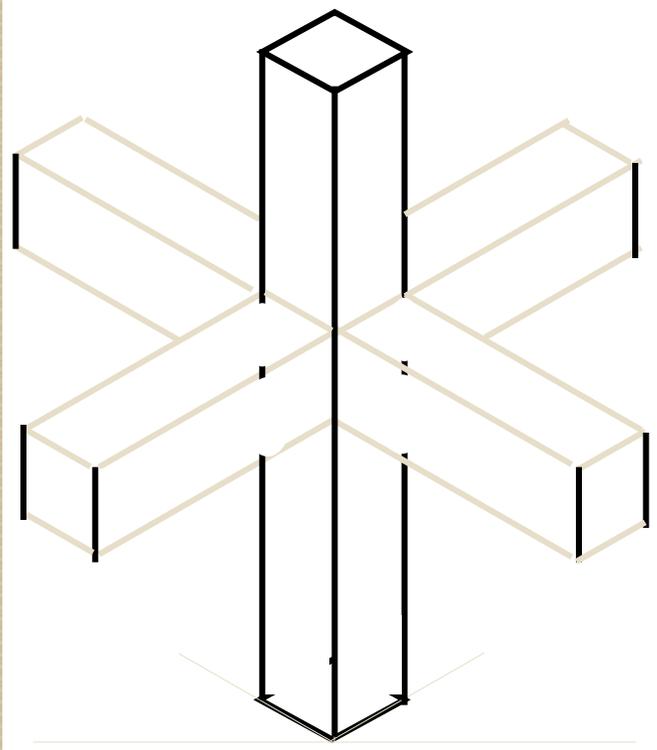F.V. & T.V. of an object are given. Draw it's isometric view.

FV

35

35

X

O

10

y

20

10

30

40

70

TV

O

STUDY ILLUSTRATIONS

Z

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

FV

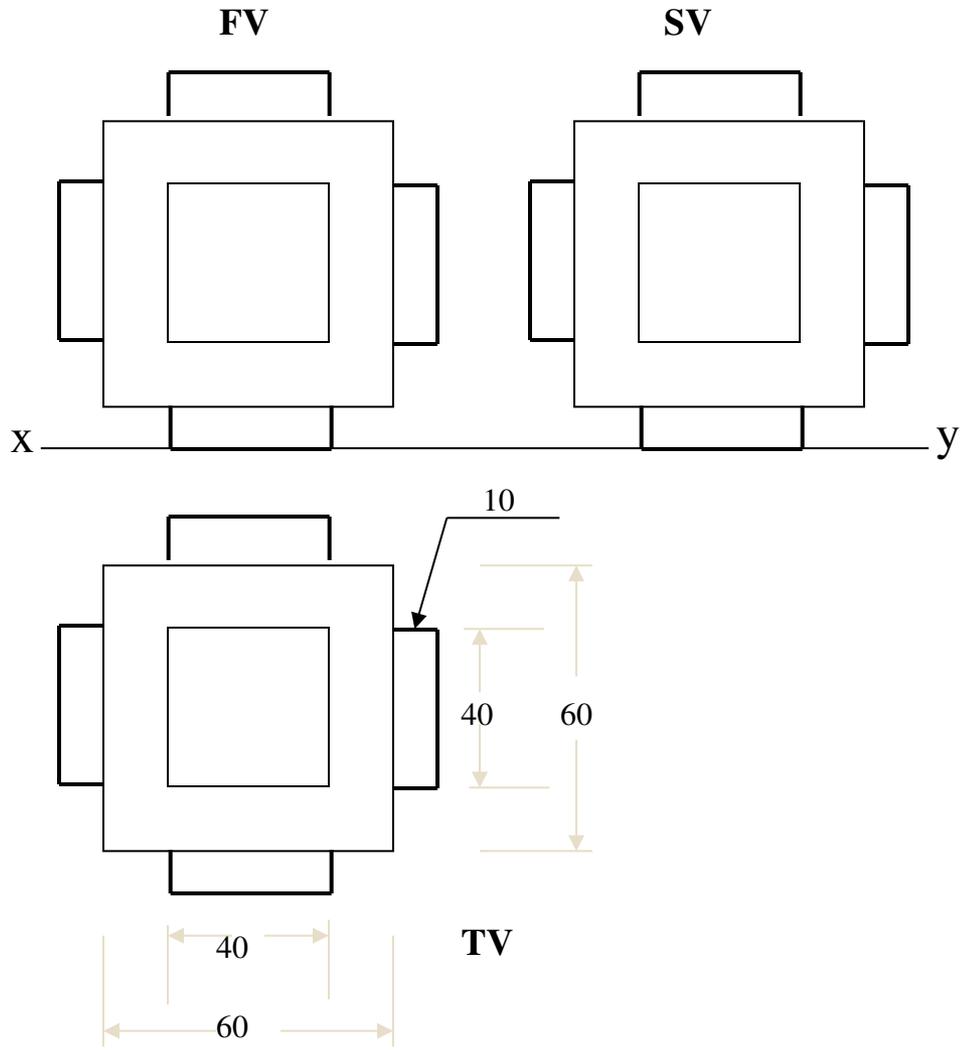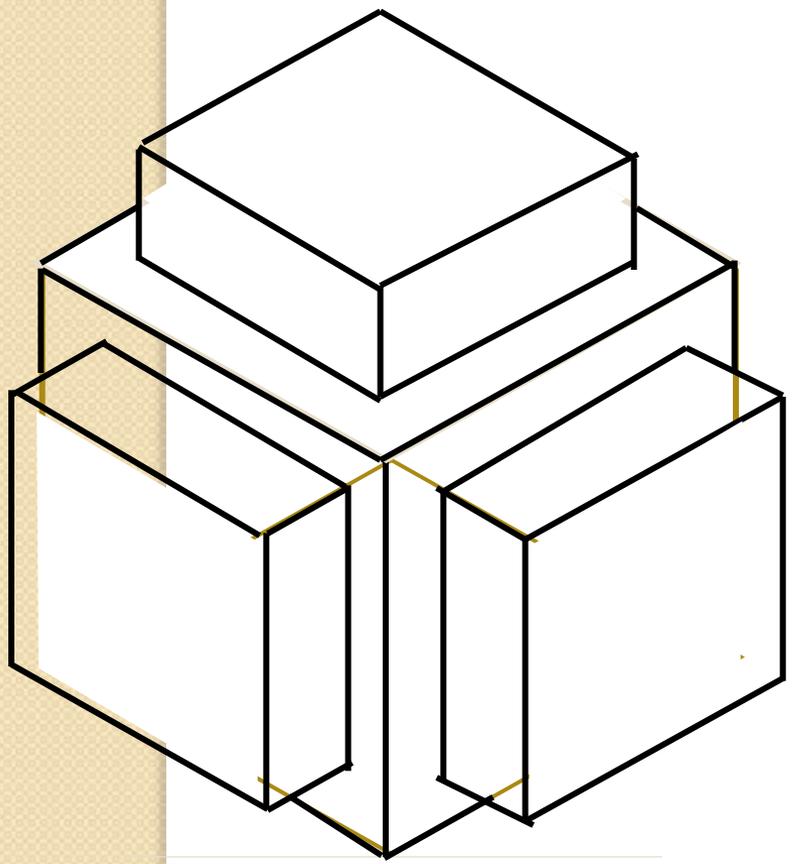30 | 0 | 30

SV

30

10

30

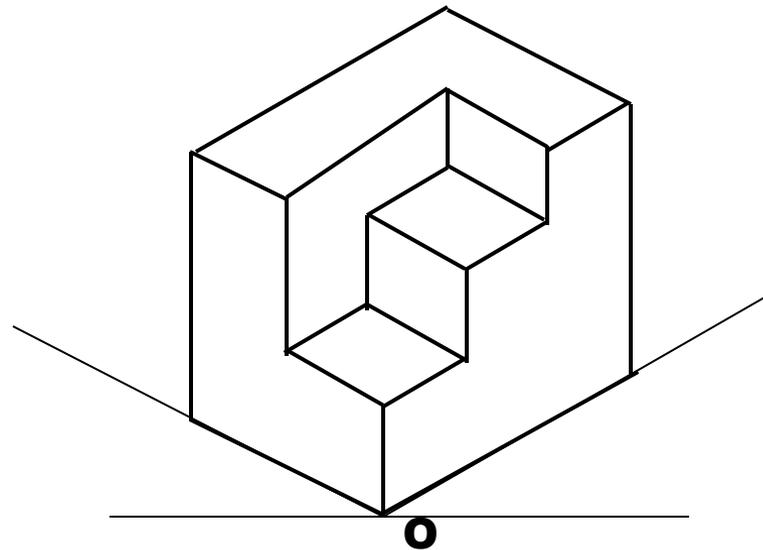x ———————————————————————— y

TV

ALL VIEWS IDENTICAL

Z

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

ALL VIEWS IDENTICAL

FV   SV

x ———————————————————— y

10

40   60

40

TV

60

STUDY ILLUSTRATIONS 2

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

ALL VIEWS IDENTICAL

FV

SV

x ———————————————————————————————— y

10

40   60

40

60

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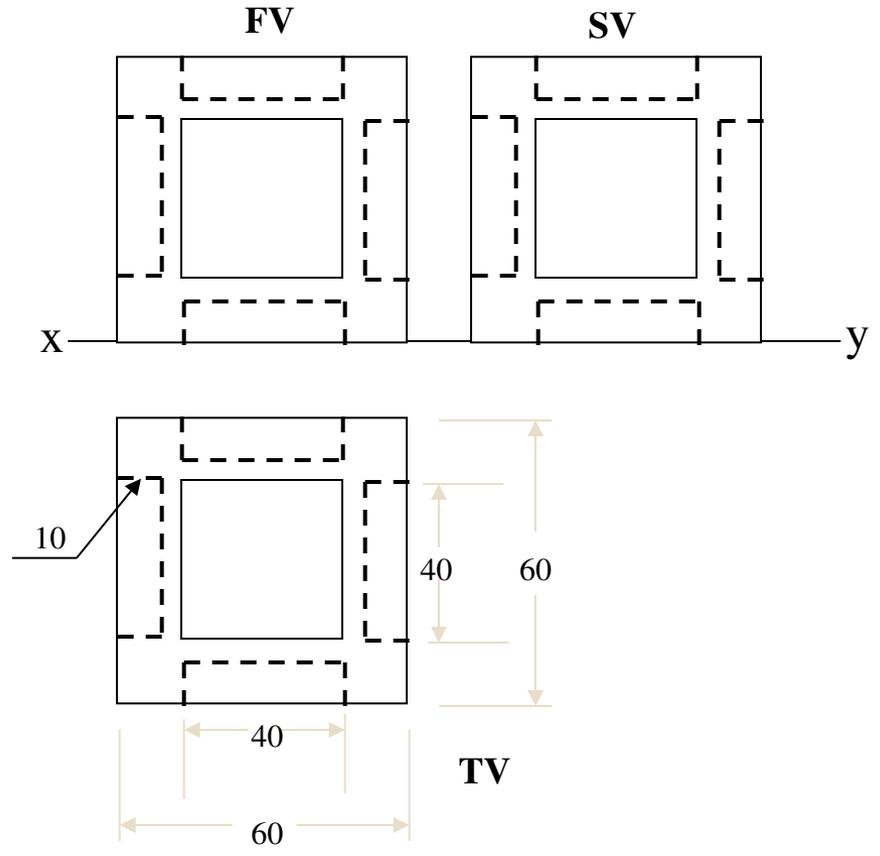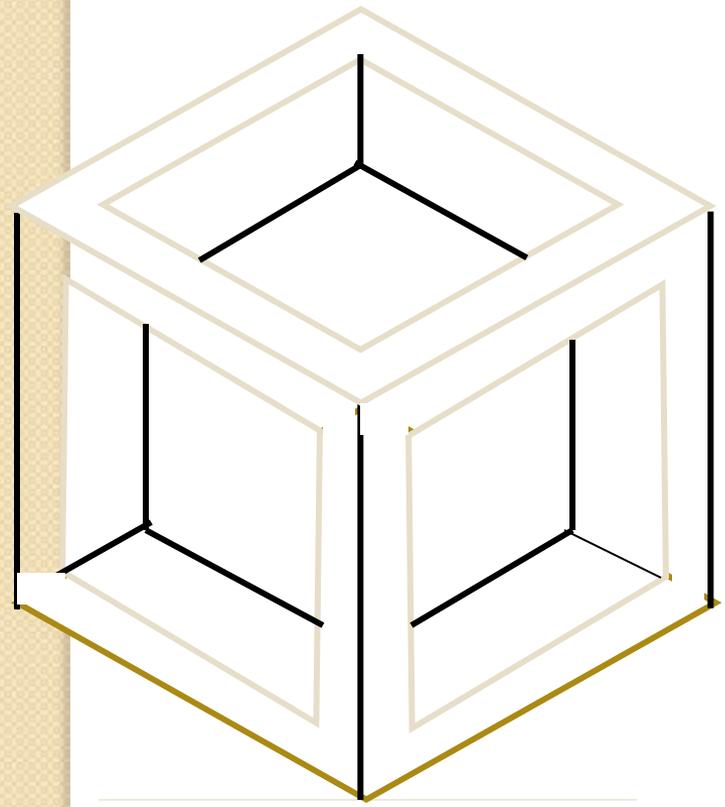
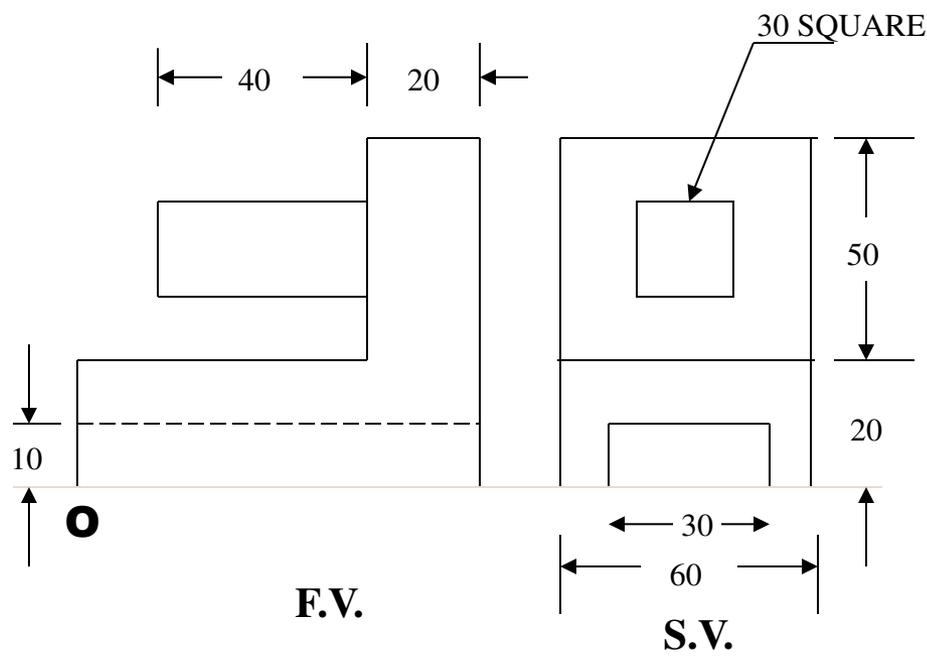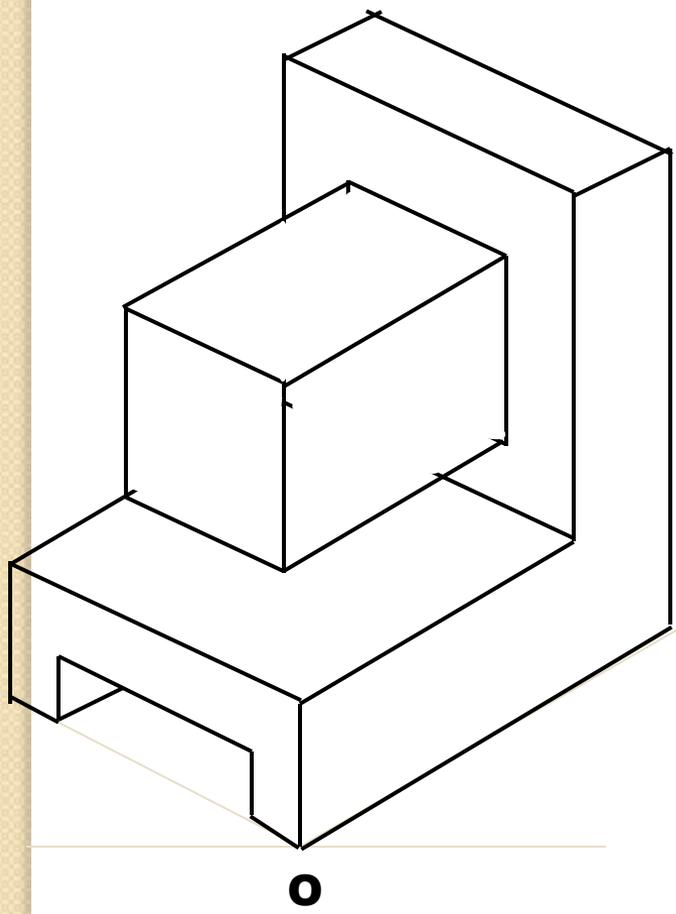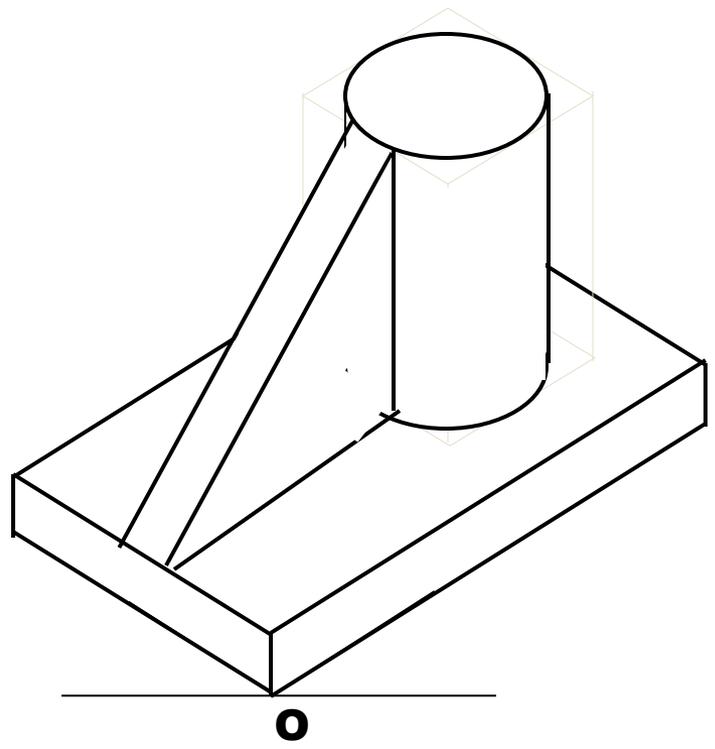**F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.**
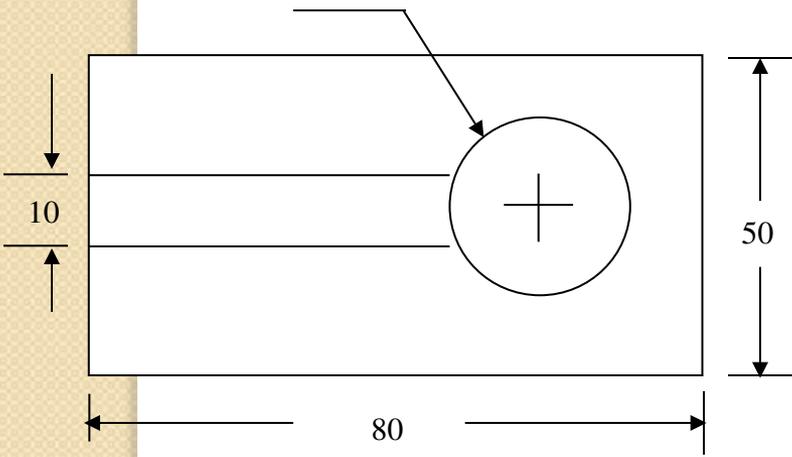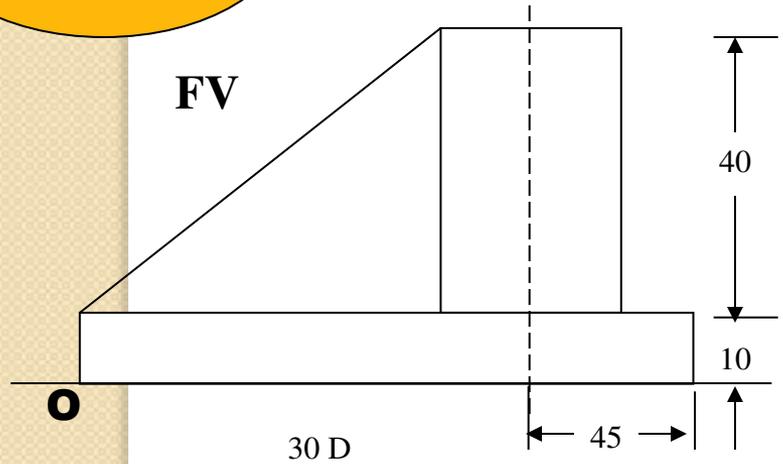
ORTHOGRAPHIC PROJECTIONS

FRONT VIEW

L.H.SIDE VIEW

20

20

20

x

O

y

50

20

30

20   20   20

TOP VIEW

O

Z

F.V. and S.V.of an object are given.
Draw it's isometric view.

30 SQUARE

40   20

50

20

10

O

30

60

F.V.

S.V.

O

Z

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

FV

40

10

45

O

30 D

10

50

80

TV

O

Z

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

FV

40

10

X —— O ————————— Y

100

10

TV

25

10 | 30 | 10

25

30 R

20 D

O

STUDY ILLUSTRATIONS

Z

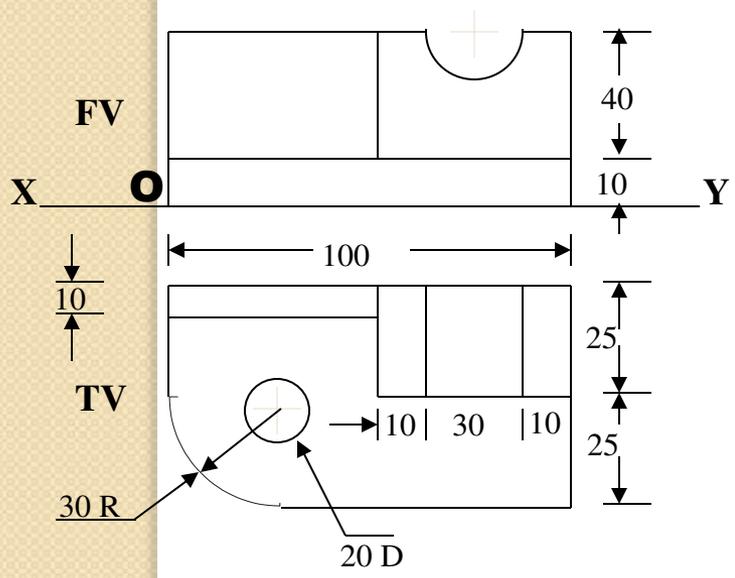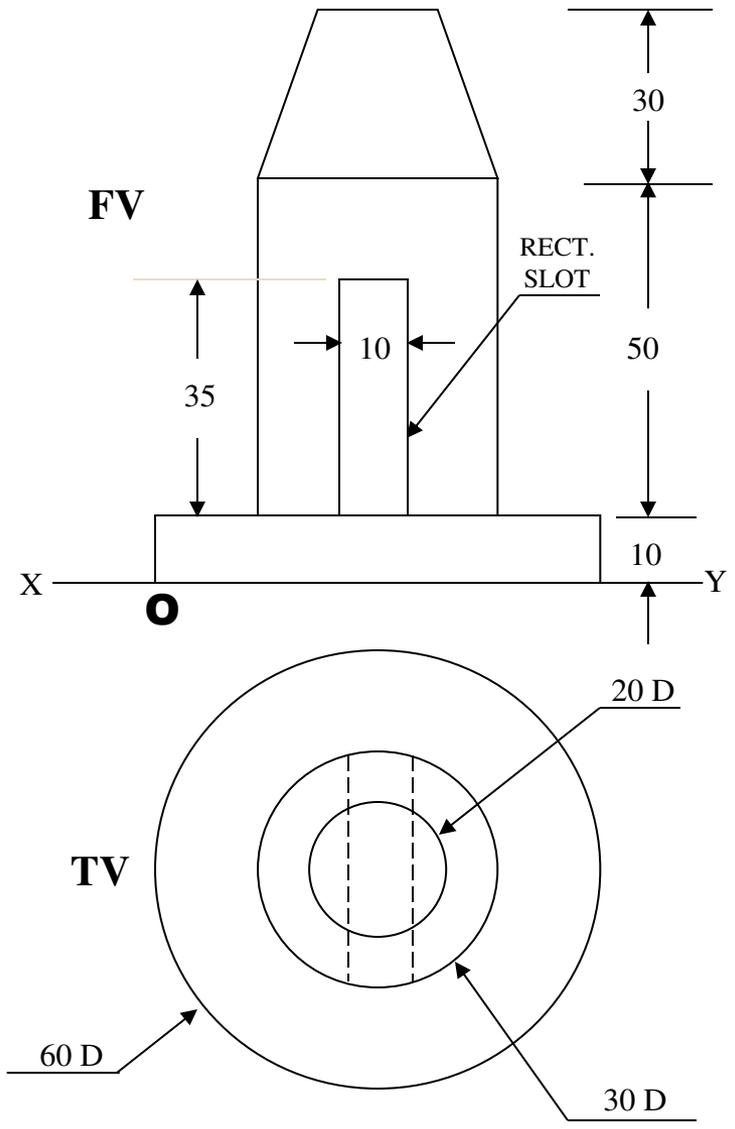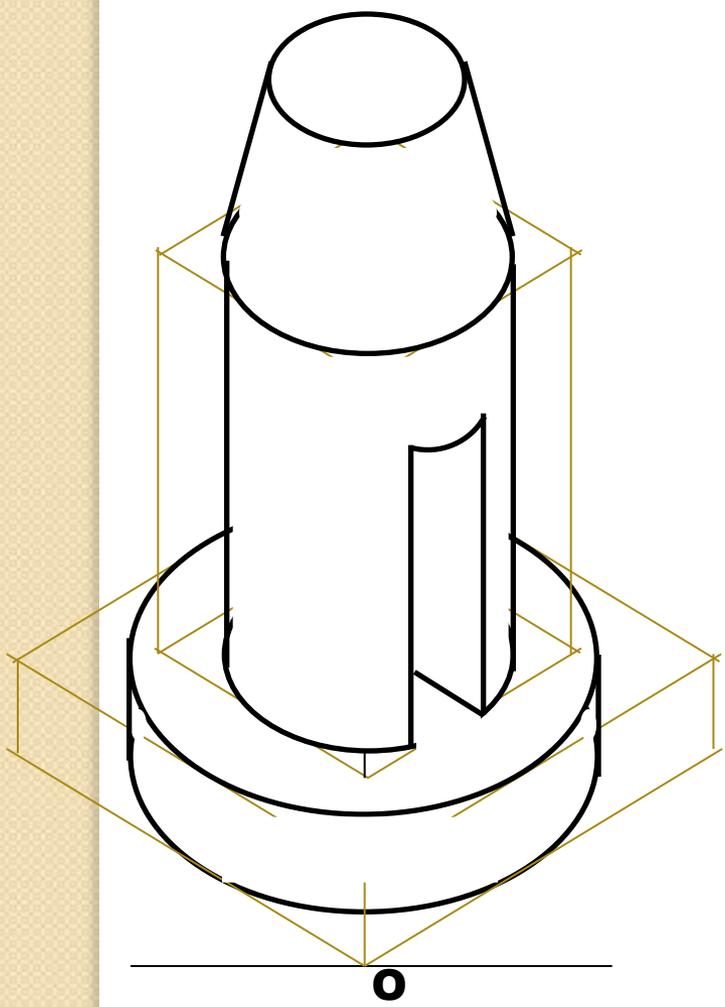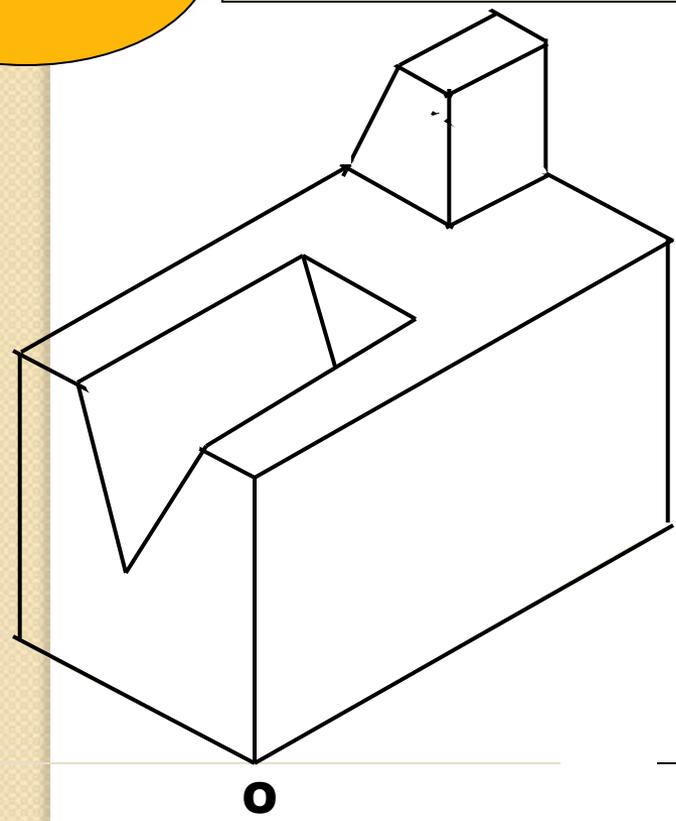**F.V. & T.V. of an object are given. Draw it's isometric view.**

FV

30

RECT. SLOT

10

50

35

X ——————————— O ——————————— Y

10

TV

20 D

60 D

30 D

O

STUDY ILLUSTRATIONS

2

F.V. and S.V.of an object are given. Draw it's isometric view.

10

25

15

40

25

25

10

25

25

O

80

25

O

F.V.

S.V.

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

45⁰

30

FV

40

X

O

Y

30 D

40

TV

15

40

O

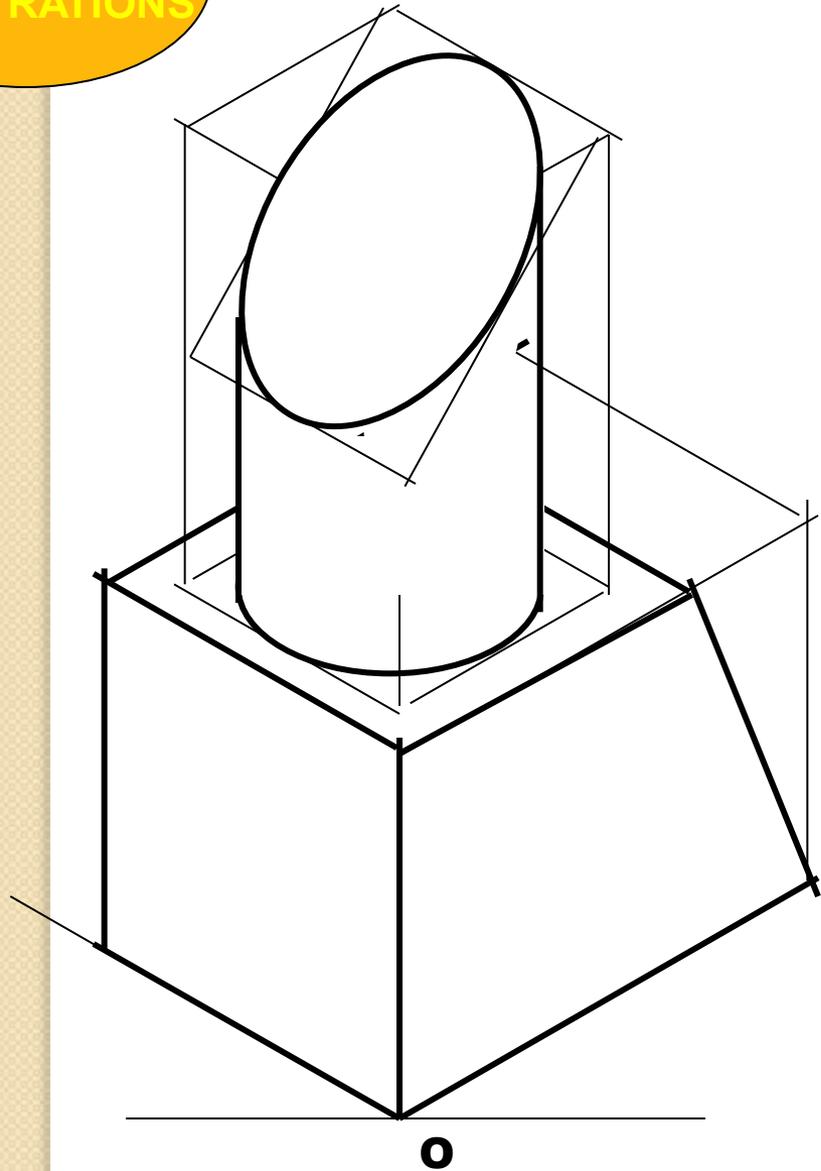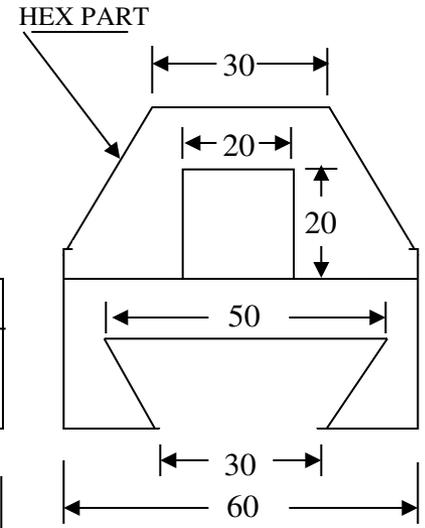**F.V. and S.V.of an object are given.**
Draw it's isometric view.

O

20

40

HEX PART

30

20

20

20

15

O

50

30

100

60

STUDY
ILLUSTRATIONS
Z

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

20   40

F.V.

30

10

X ———————————————————— Y

O

10

10

30

30

10

30

80

T.V.

O

F.V. and S.V.of an object are given.
Draw it's isometric view.

Z

10 | 10 | 15

25

25

X .... Y

O

50 | 10

FV

LSV

36

NOTE THE SMALL CHZNGE IN 2ND FV & SV.
DRAW ISOMETRIC ACCORDINGLY.

10

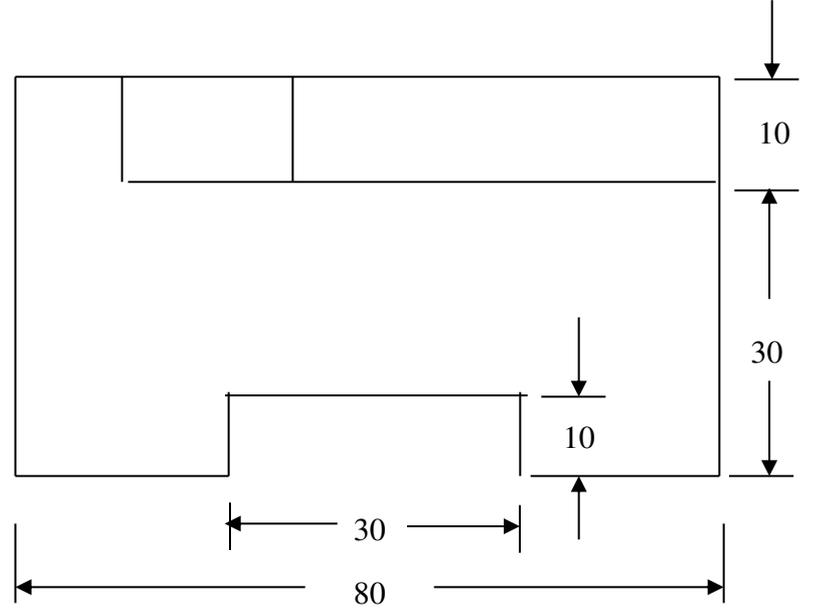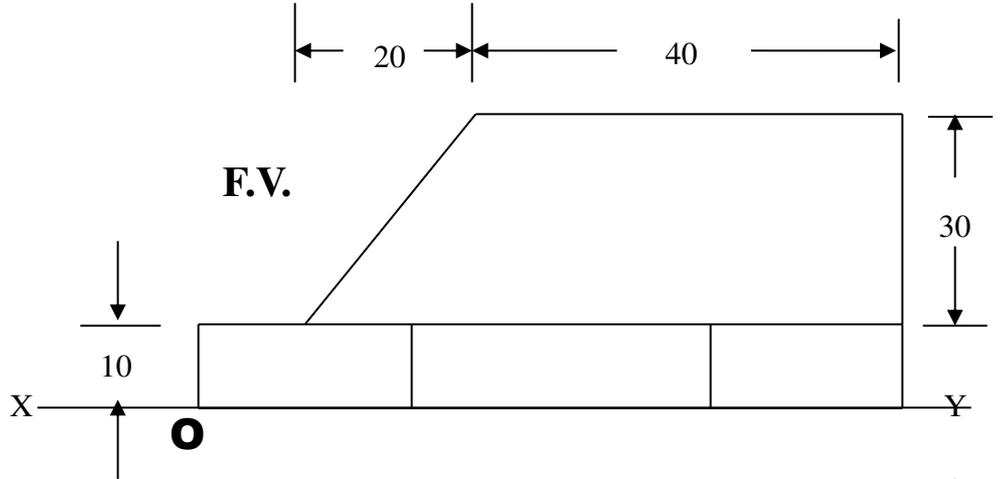X .... Y

O

FV

LSV
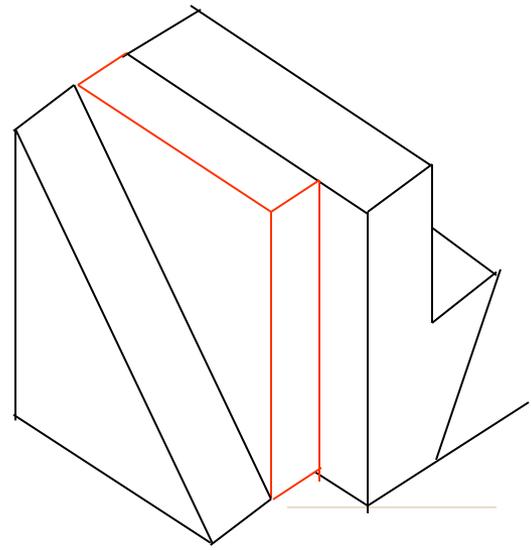
STUDY
Z
ILLUSTRATIONS

F.V. and S.V.of an object are given.
Draw it's isometric view.

O

30

20   10   20

10

15

15

15

30

15

15

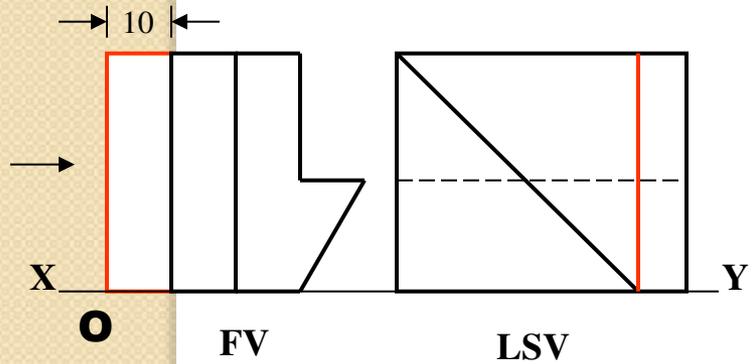X   Y

O

50

F.V.

LEFT S.V.

**F.V. and S.V.of an object are given.
Draw it's isometric view.**

30

60

30

O | 40 |

F.V.

10

40

S.V.