Unit 1

Conics & Cycloids

1. What do you mean by engineering drawing?

   Engineering drawings are used to communicate design ideas and technical information to engineers and other professionals throughout the design process.

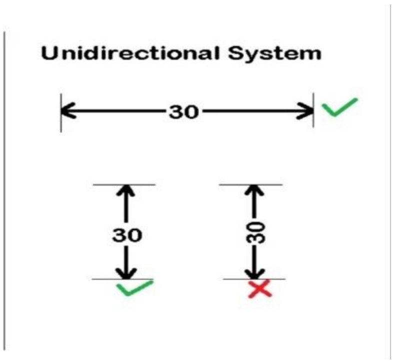
2. How engineering drawing is different from artistic drawing?

   Engineering drawing is a form of representation of objects that follows a set of standards.

   Artistic drawing is the free representation of ideas without any particular rules.

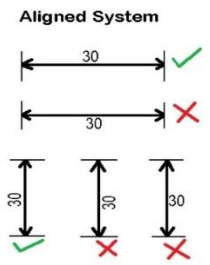
3. Explain unidirectional dimensioning system with example.

   In this system, the dimensions are placed by breaking the dimension line in the middle.



4. Explain aligned dimensioning system with an example.

   In this system, the dimensions are placed at the middle and above the dimension lines which are drawn without any break and written parallel to them.



5. What is a conic section? Explain its various types.

   Conic section is any curve produced by cutting right circular cone with cutting plane. Depending upon the angle made by the cutting plane with axis of the cone, different shapes can be formed. They are- circle, parabola, hyperbola and ellipse etc.

6. Give two applications for parabola, hyperbola and ellipse.

Applications of

- Parabola: Parabolic trajectory and bridge designs, Antenna etc.
- Hyperbola: Cooling tower of a thermal plants and reflecting telescopes etc.
- Ellipse: Concrete arches, orbit of planets and movement of electrons etc.

7. Define eccentricity. Write its value for parabola, hyperbola and ellipse.

Eccentricity is defined as the ratio of distance between moving(locus) point and focus (fixed point) to the distance between moving(locus) point and directrix (fixed straight line). It is denoted as "e".

- For parabola: $e=1$
- For hyperbola: $e>1$
- For ellipse: $e<1$

8. What is the inclination of the cutting plane in order to obtain parabola, ellipse and hyperbola from a cone?

If θ = Inclination of cutting plane with the axis of the cone

α = Half of the apex angle of the cone

If $\theta = \alpha$, obtained conic is parabola.

If $\theta > \alpha$, obtained conic is ellipse.

If $\theta < \alpha$, obtained conic is Hyperbola.

9. Explain how lines of different types are represented.

Type of Line	Application
Continuous narrow lines	Dimension line, Projection Lines, Hatching, Extension line, Construction line
Continuous wide line	Visible lines
Dashed narrow line	Hidden lines
Long-dashed dotted narrow line	Axis line, Lines of Symmetry
THICK THIN THICK	Cutting Plane

10. Define Cycloid.

A cycloid is a curve traced by a point on the circumference of a circle which rolls along a fixed straight line without slipping.

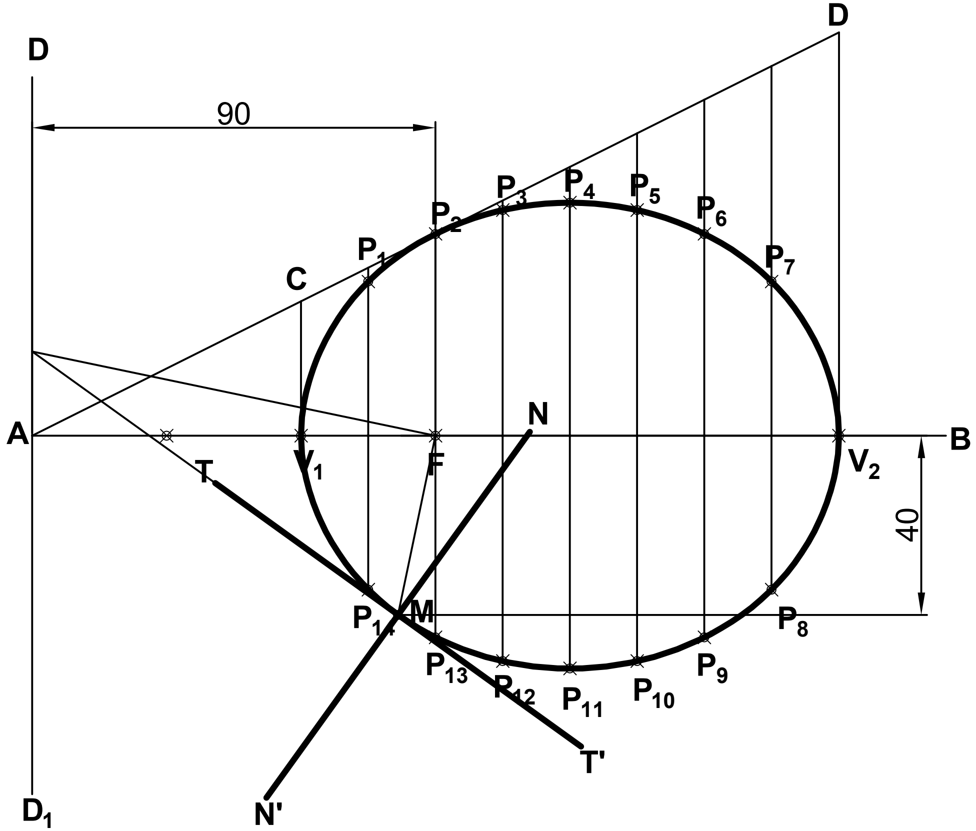
11. Define Epicycloid.

An epicycloid is a curve traced by a point on the circumference of a circle which rolls along another circle outside it, without slipping.

12. Define Hypocycloid.

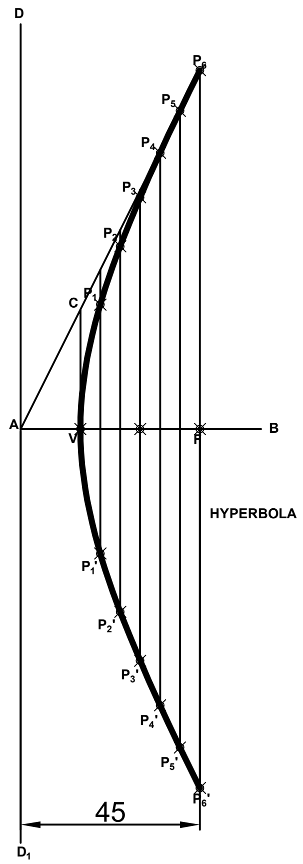
A hypocycloid is a curve traced by a point on the circumference of a circle which rolls along another circle and inside it, without slipping.

1. A fixed point is 90 mm from a fixed straight line. Draw the locus of a point P moving in such a way that its distance from the fixed straight line is twice its distance from the fixed point. Name the curve. Draw a tangent and a normal at a point 40 mm away from the fixed point.



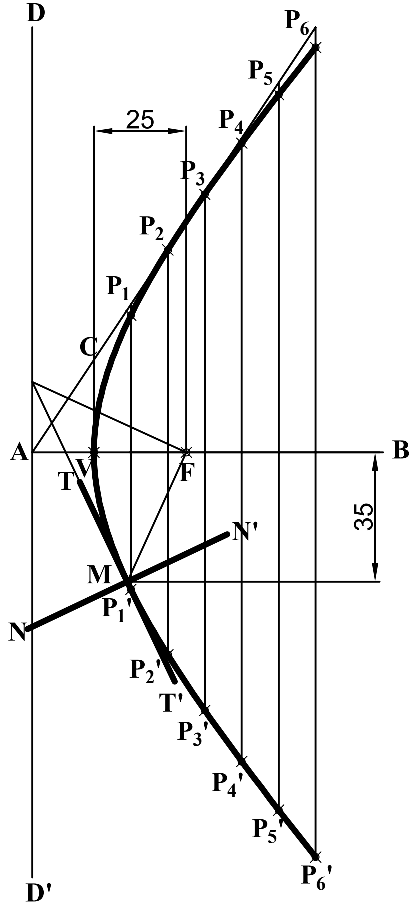
Lava Kumar P	Ellipse	07.12.2022	

2. A fixed point is 90 mm from a fixed straight line. Draw the locus of a point P moving in such a way that its distance from the fixed point is twice its distance from the fixed straight line. Name the curve.



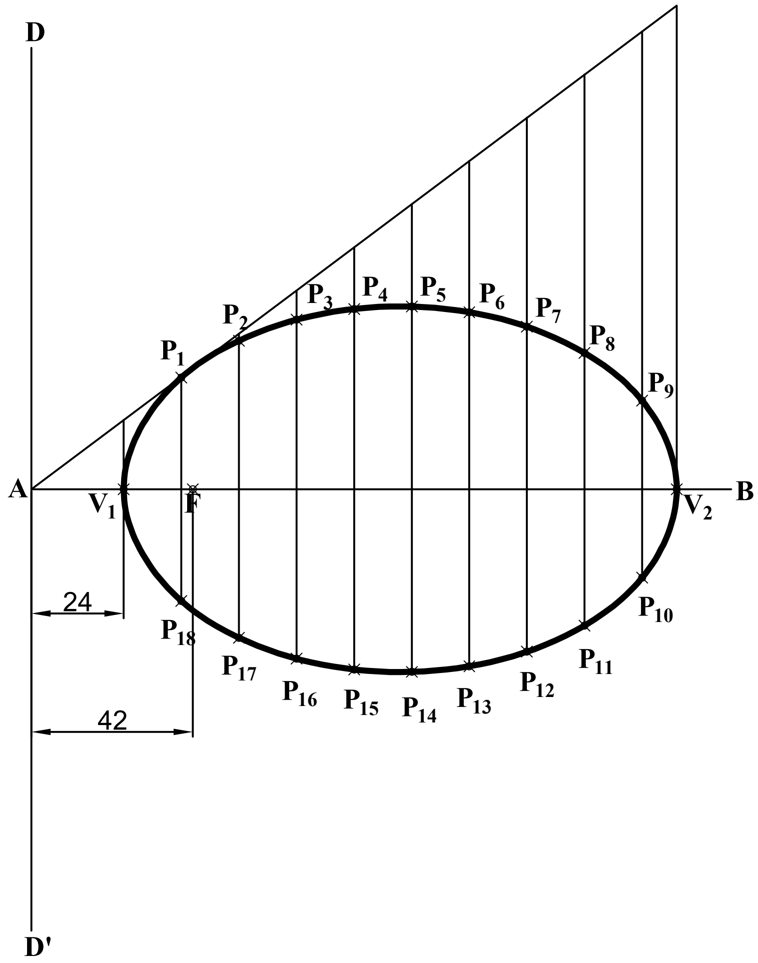
Lava Kumar P	Hyperbola	07.12.2022	

3. Draw the hyperbola when the focus and the vertex are 25 mm apart. Consider eccentricity as 3/2. Draw a tangent and a normal to the curve at a point 35 mm from the focus.



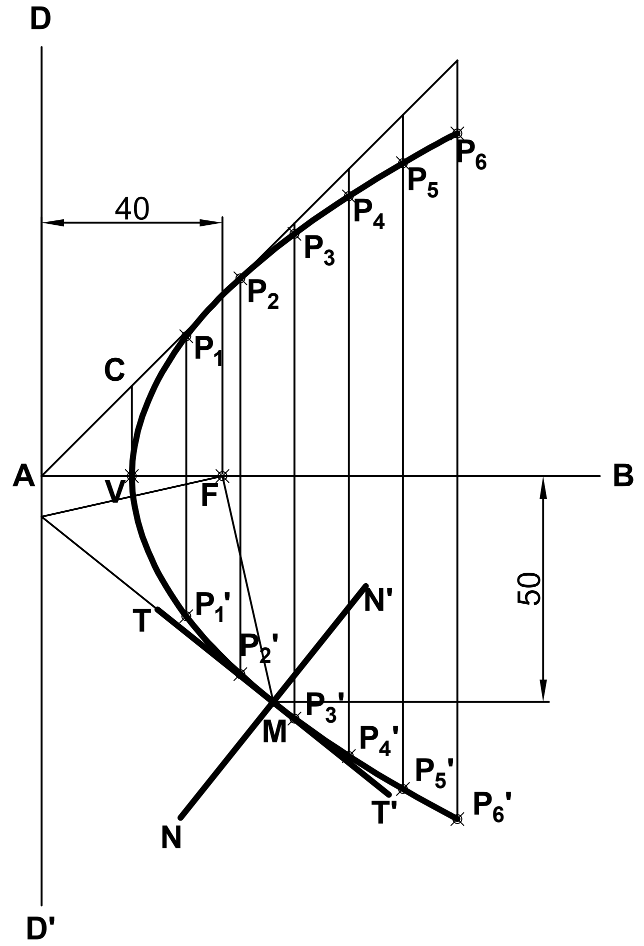
Lava Kumar P	Hyperbola	07.12.2022	

4. Draw an ellipse when the distance of its vertex from its directrix is 24 mm and distance of its focus from directrix is 42 mm.



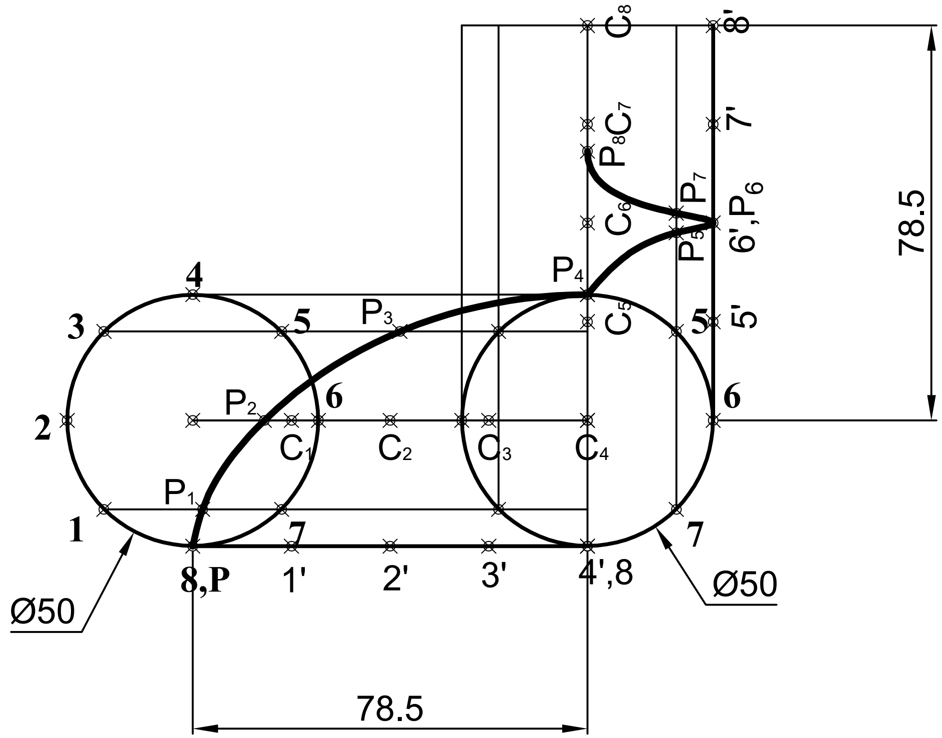
Lava Kumar P	Ellipse	07.12.2022	

5. Construct a parabola whose focus is at a distance of 40 mm from the directrix. Draw a tangent and a normal to the parabola at a point 50 mm away from the axis.



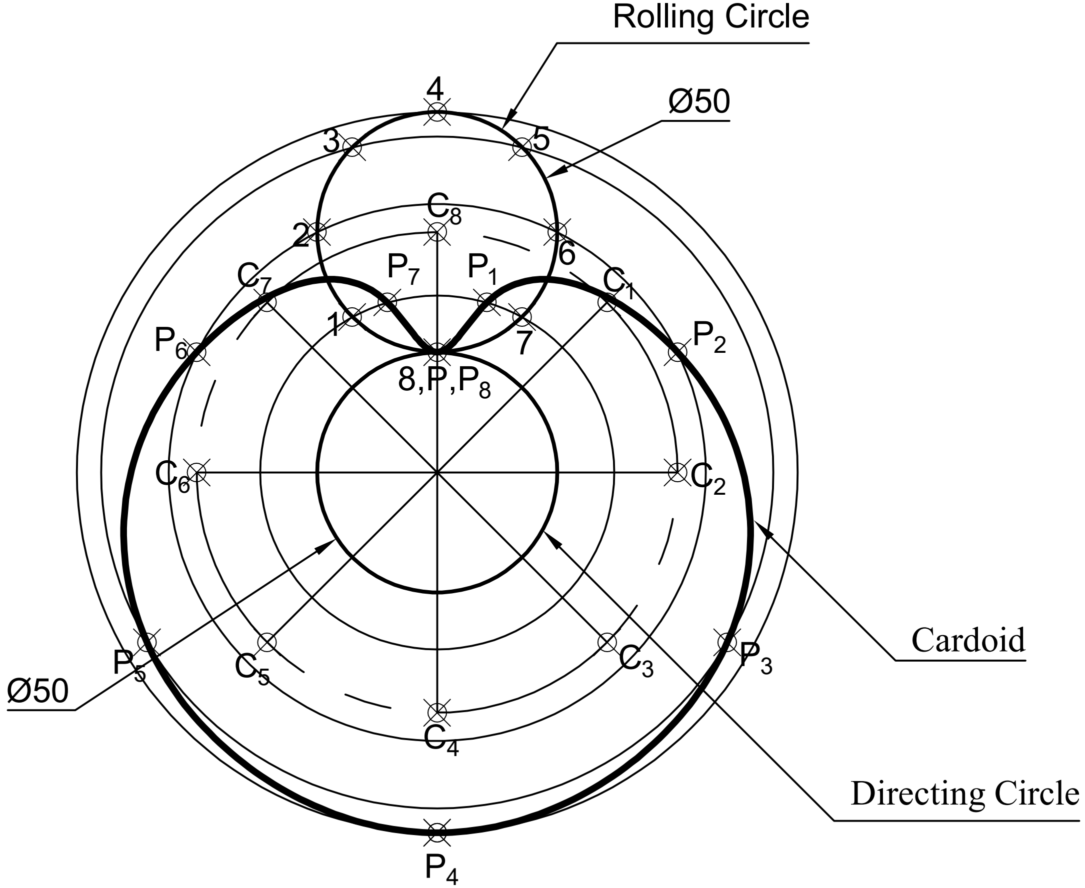
Lava Kumar P	**Parabola**	**07.12.2022**	

1. **A circle of diameter 50 mm rolls on a horizontal line for a half revolution and then on a vertical line upwards for another half revolution. Draw the curve traced out by a point lying on the circumference of the circle and touching the ground initially.**



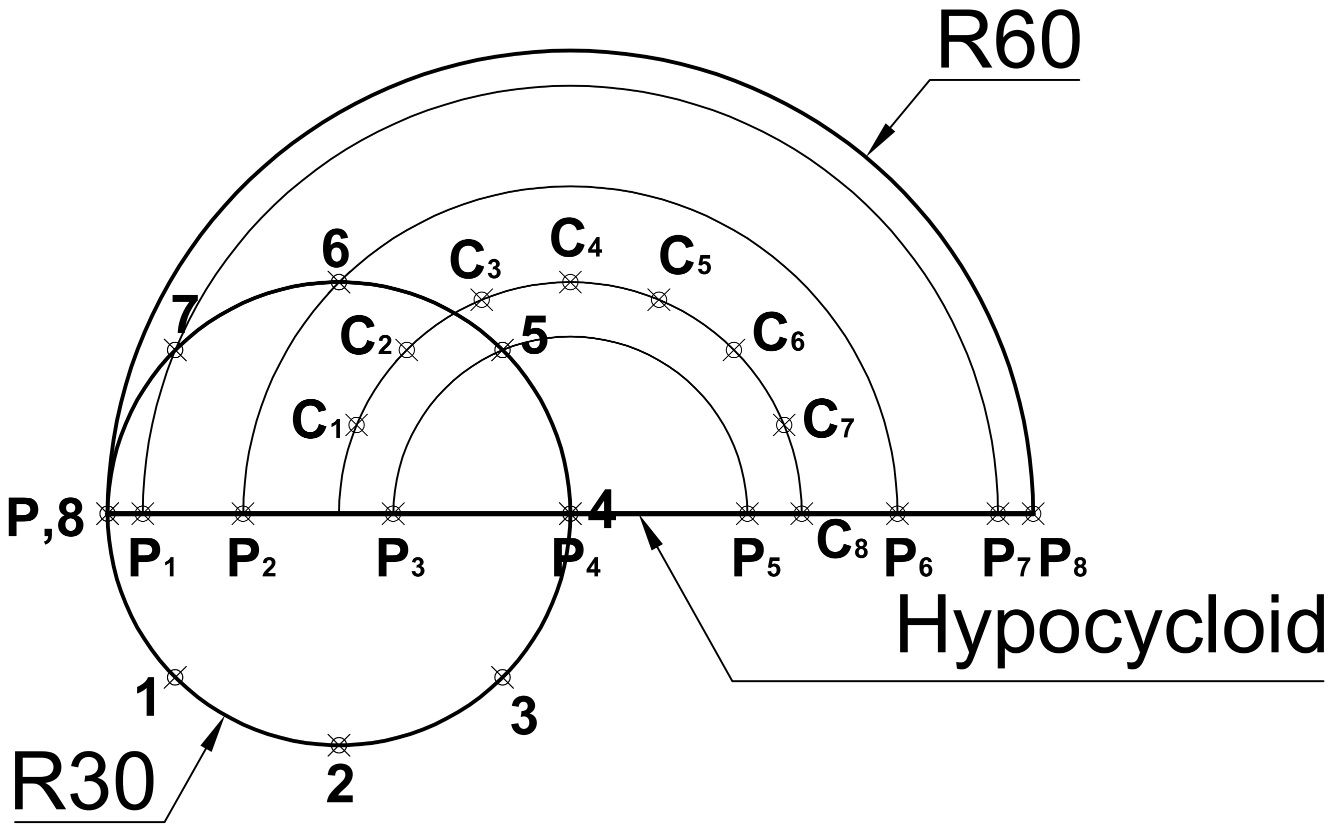
Lava Kumar P	Cycloids	07.12.2022	

2. Draw an epicycloid, when the diameters of the rolling and the directing circles are 50 mm. Suggest an alternative name for this curve.



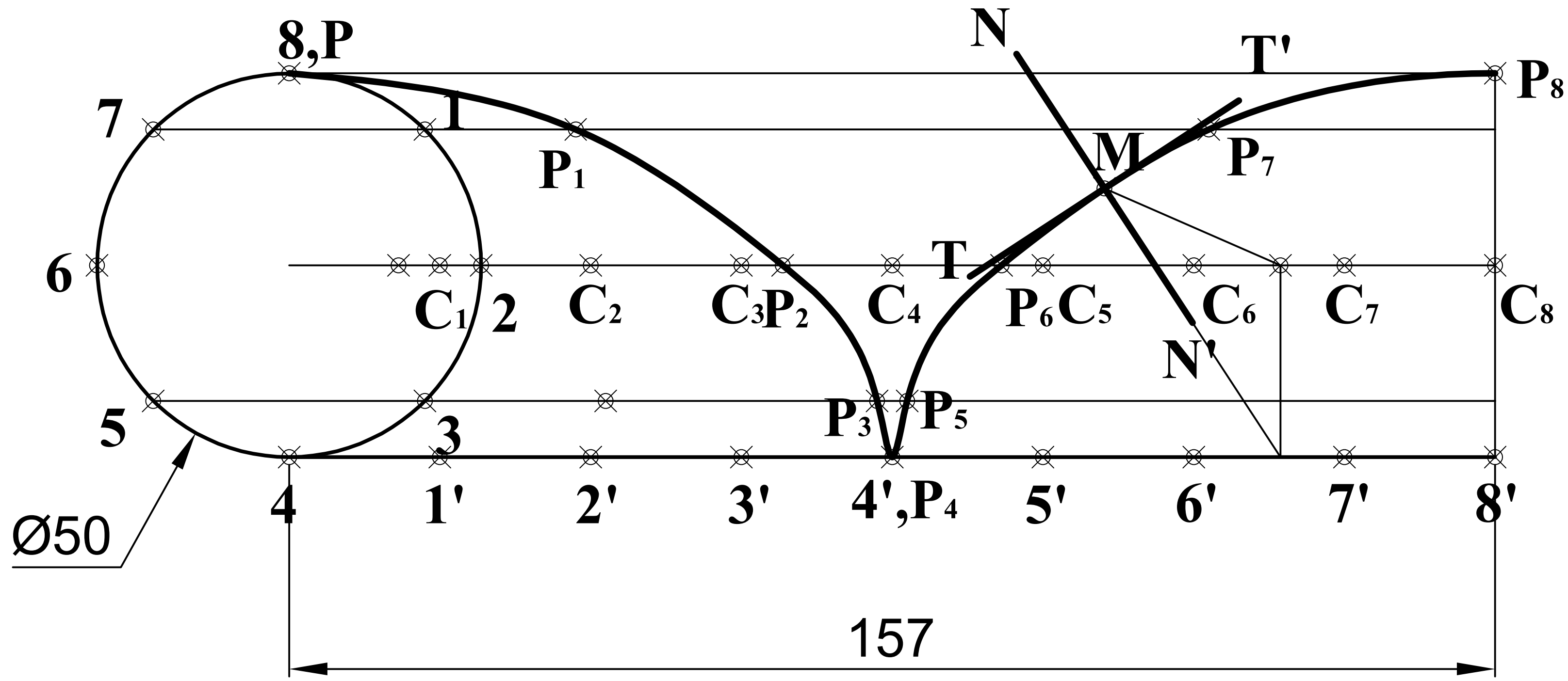
Lava Kumar P	**Cycloids**	**07.12.2022**	

3. Construct a hypocycloid taking the diameter of the generating circle and radius of directing circle as 60 mm.



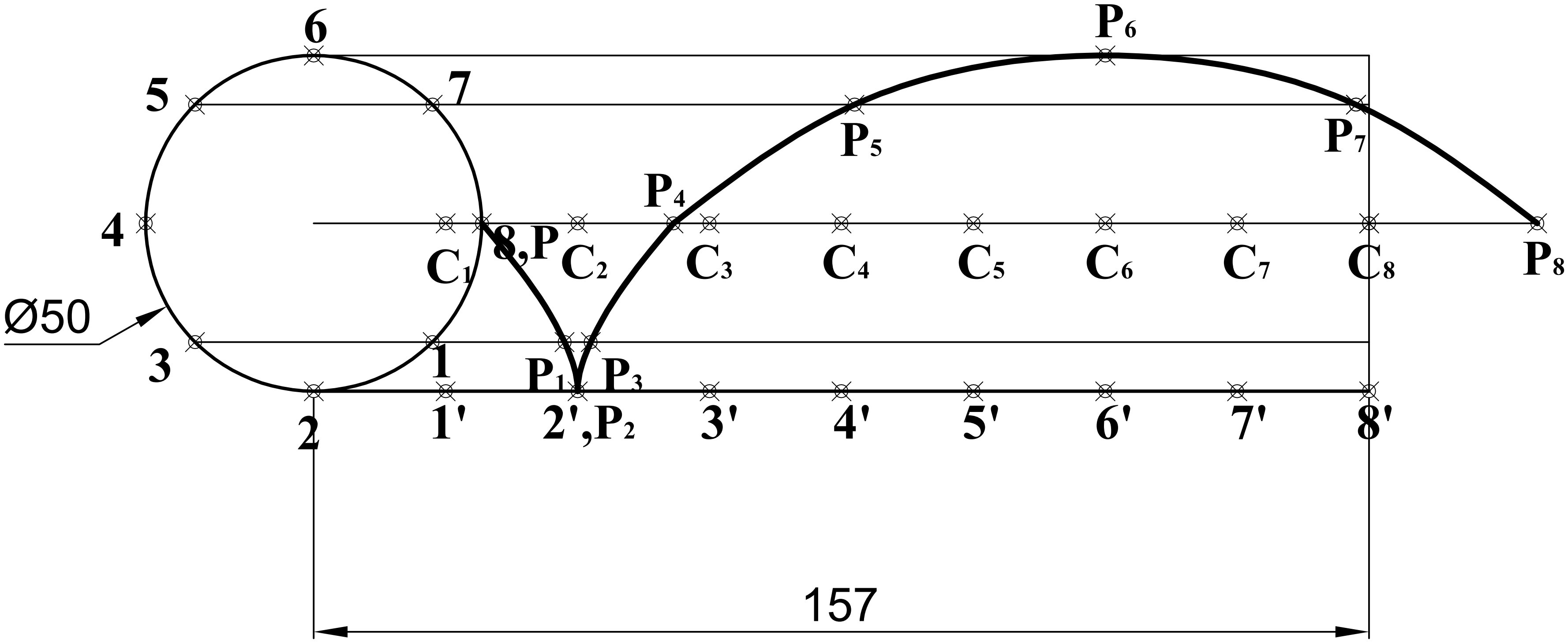
Lava Kumar P	Cycloids	07.12.2022	

4. A circle of diameter 50 mm rolls on a horizontal line for one revolution. Draw the curve traced out by a point lying on the circumference of the circle and at the top end of the vertical diameter line initially.



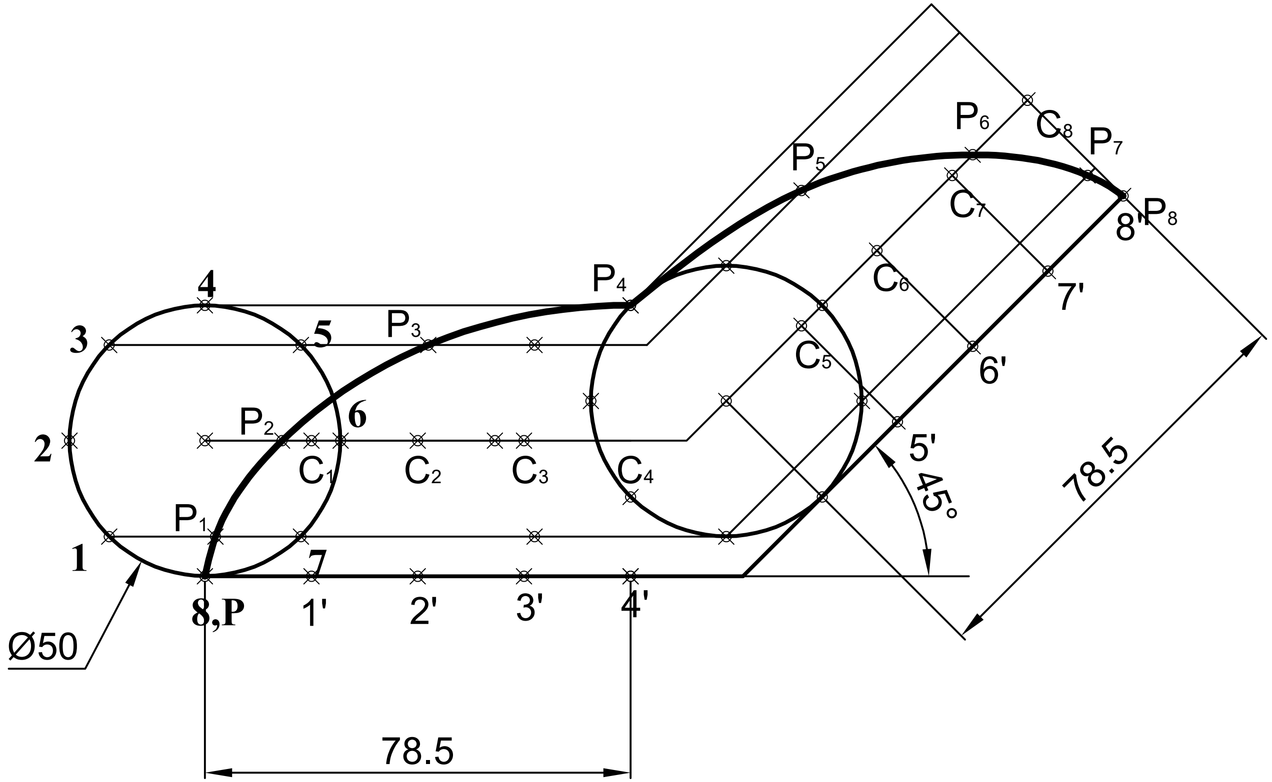
Lava Kumar P	**Cycloids**	**07.12.2022**	

5. A circle of diameter 50 mm rolls on a horizontal line for one revolution. Draw the curve traced out by a point lying on the circumference of the circle and at the right end of the horizontal diameter line initially.



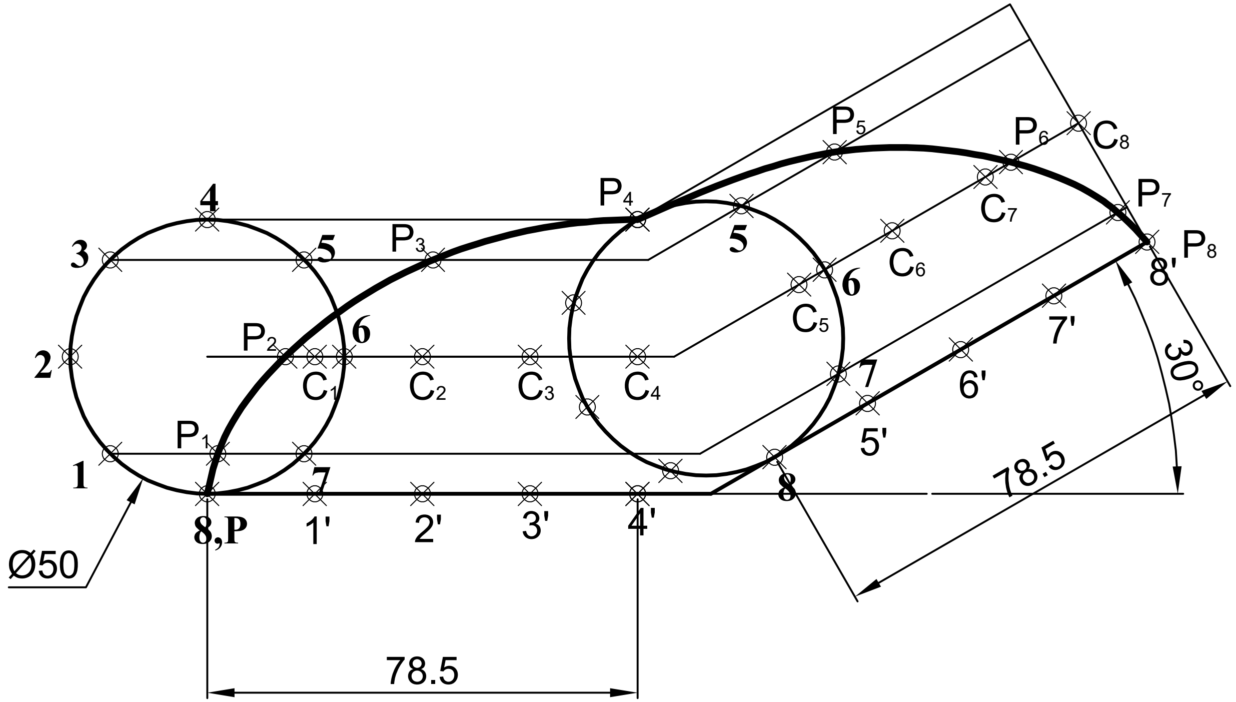
Lava Kumar P	Cycloids	07.12.2022	

6. A circle of diameter 50 mm rolls on a horizontal line for a half revolution and then on a line which inclined at an angle 45^0 with the horizontal upwards for another half revolution. Draw the curve traced out by a point lying on the circumference of the circle and touching the ground initially.



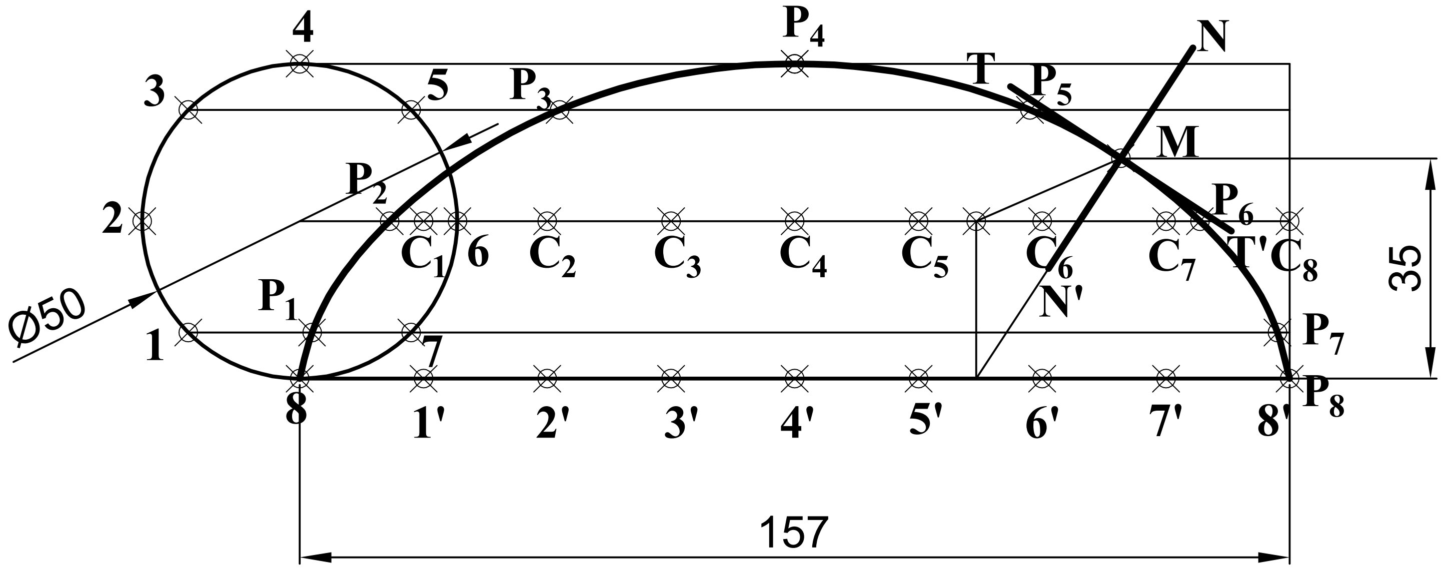
Lava Kumar P	**Cycloids**	**07.12.2022**	

8. A circle of diameter 50 mm rolls on a horizontal line for a half revolution and then on a line which inclined at an angle 30^0 with the horizontal upwards for another half revolution. Draw the curve traced out by a point lying on the circumference of the circle and touching the ground initially.



Lava Kumar P	**Cycloid**	**01.01.2023**	

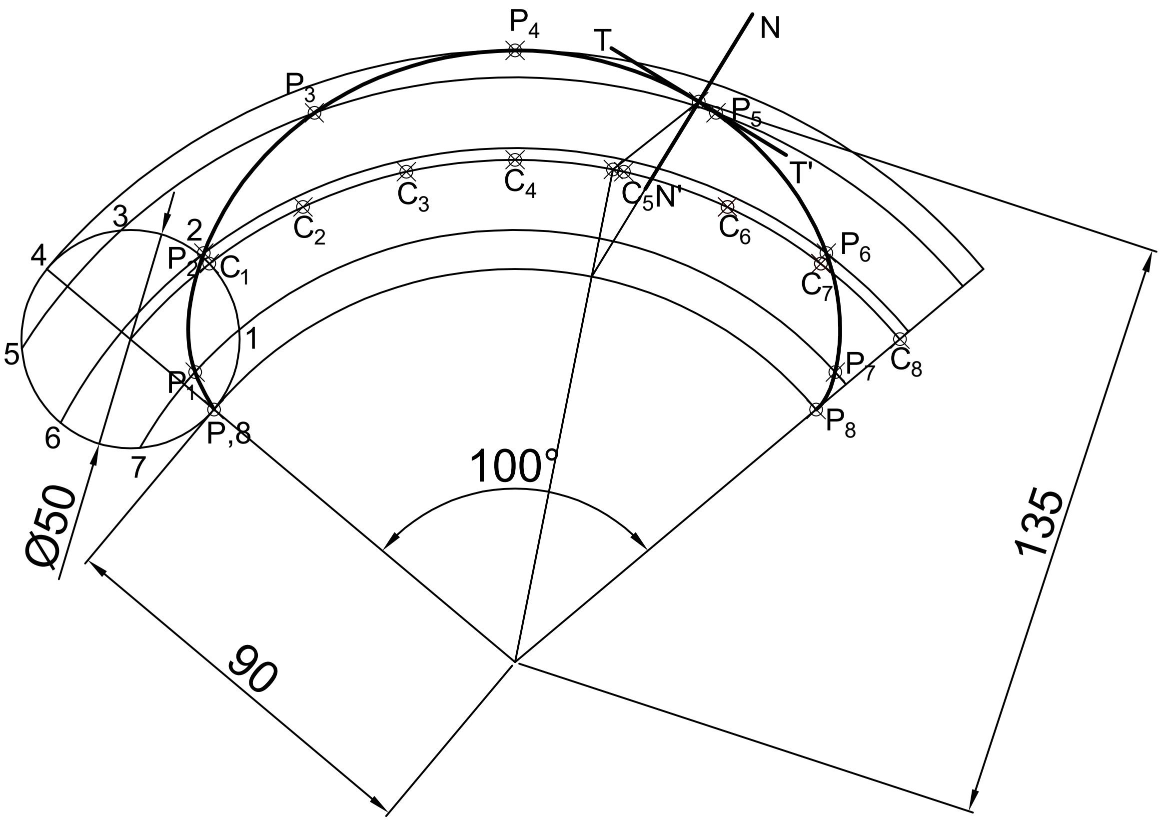
9. Draw a cycloid of a circle of diameter 50 mm for one revolution. Also, draw a tangent and a normal to the curve at a point 35 mm above the base line.



Lava Kumar P	Cycloid	01.01.2023	

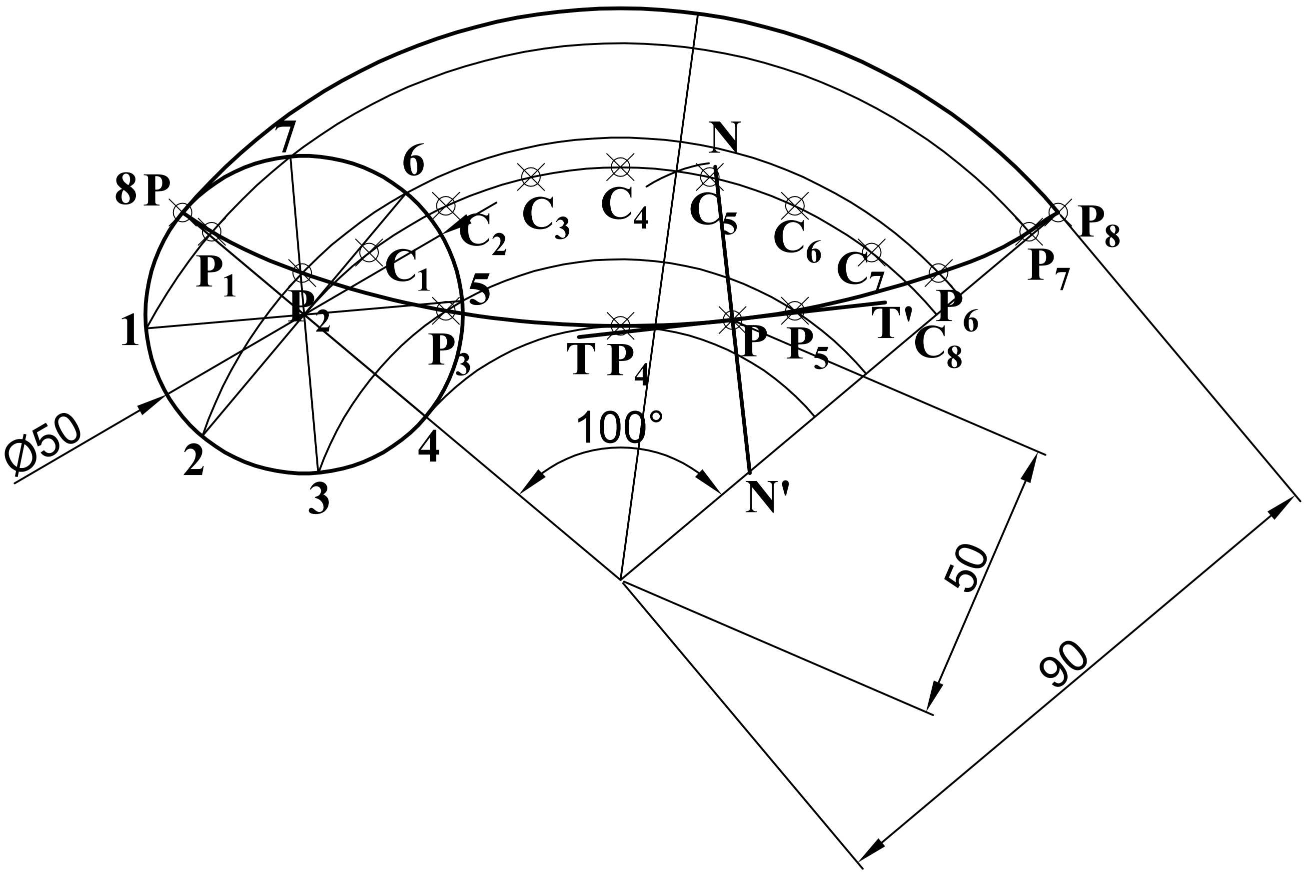
10. Draw an epicycloid of a circle of diameter 50 mm, which rolls outside a circle of diameter 180 mm for one revolution. Also, draw a tangent and a normal to the epicycloid at a point 135 mm from the center of the directing circle.

Included Angle (θ) = $\frac{25}{90}$ X 360 = 100°



Lava Kumar P	**Epicycloid**	**01.01.2023**	

11. Draw a hypocycloid of a circle of diameter 50 mm, which rolls inside a circle of diameter 180 mm for one revolution. Also, draw a tangent and a normal to the hypocycloid at a point 50 mm from the center of the directing circle.



Lava Kumar P	**Hypocycloid**	**01.01.2023**	

Unit 2

Projection of Points & Straight Lines

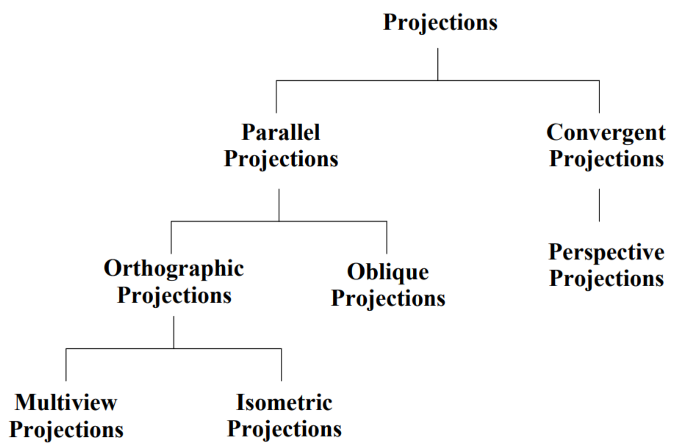
1. What do you mean by projection?

   Projection is the representation of 3D object on 2D plane.

2. What are the elements of projection?

   Elements of projection are Observer, Plane of Projection, Projectors and line of sight.

3. Classify Projections.



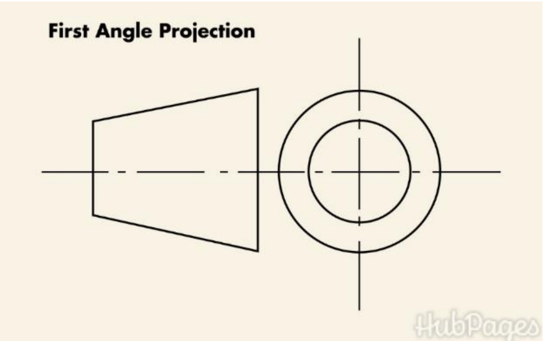
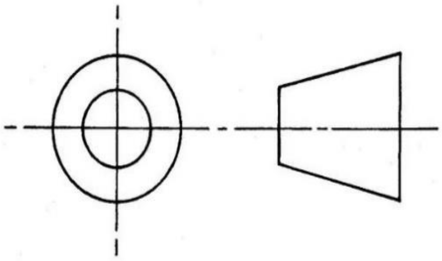
4. What do you mean by orthographic projections?

   Orthographic projections are the one in which projectors are parallel to each other and perpendicular to plane of projection.

5. Differentiate between First Angle and Third Angle Projection.

First Angle Projection	**Third Angle Projection**
Object is assumed to be in 1st quadrant.	Object is assumed to be in 3rd quadrant.
Front view of the object lies above XY line and top view of the object lies below XY line.	Front view of the object lies below XY line and top view of the object lies above XY line.
Object lies in between observer and plane of projection.	Plane of projection lies in between observer and object.
Right side view of the object is drawn left side of the front view and left side view of the object is drawn right side of the object.	Right side view of the object is drawn right side of the front view and left side view of the object is drawn left side of the front view.

6. Draw the symbol of First and Third angle projections.

First Angle Projection	**Third Angle Projection**
	

7. Why technical drawings are not drawn in Second and Fourth angle projection?

   As there is a overlap of views, second and fourth angle projection is not used in technical drawings.

1. Draw the projections of the following points on the same ground line, keeping the projectors 25 mm apart.

A, in the H.P. and 20 mm behind the V.P.

B, 40 mm above the H.P. and 25 mm in front of the V.P.

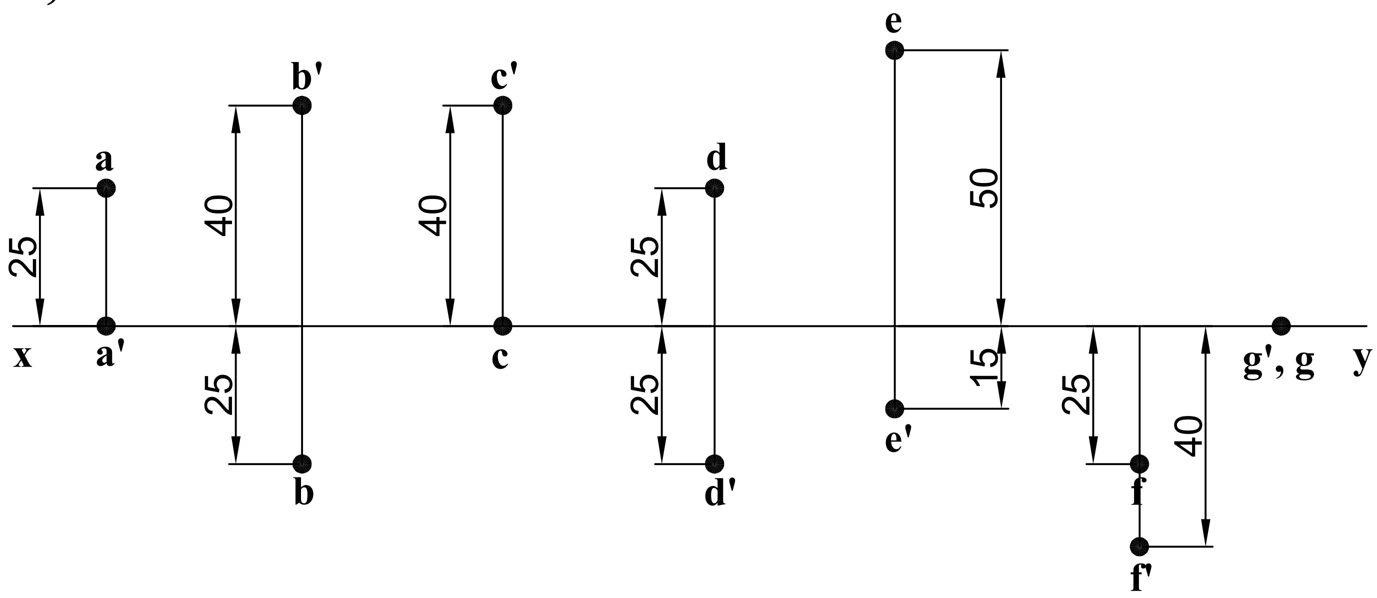
C, in the V.P. and 40 mm above the H.P.

D,25 mm below the H.P. and 25 mm behind the V.P.

£, 15 mm above the H.P. and 50 mm behind the V.P.

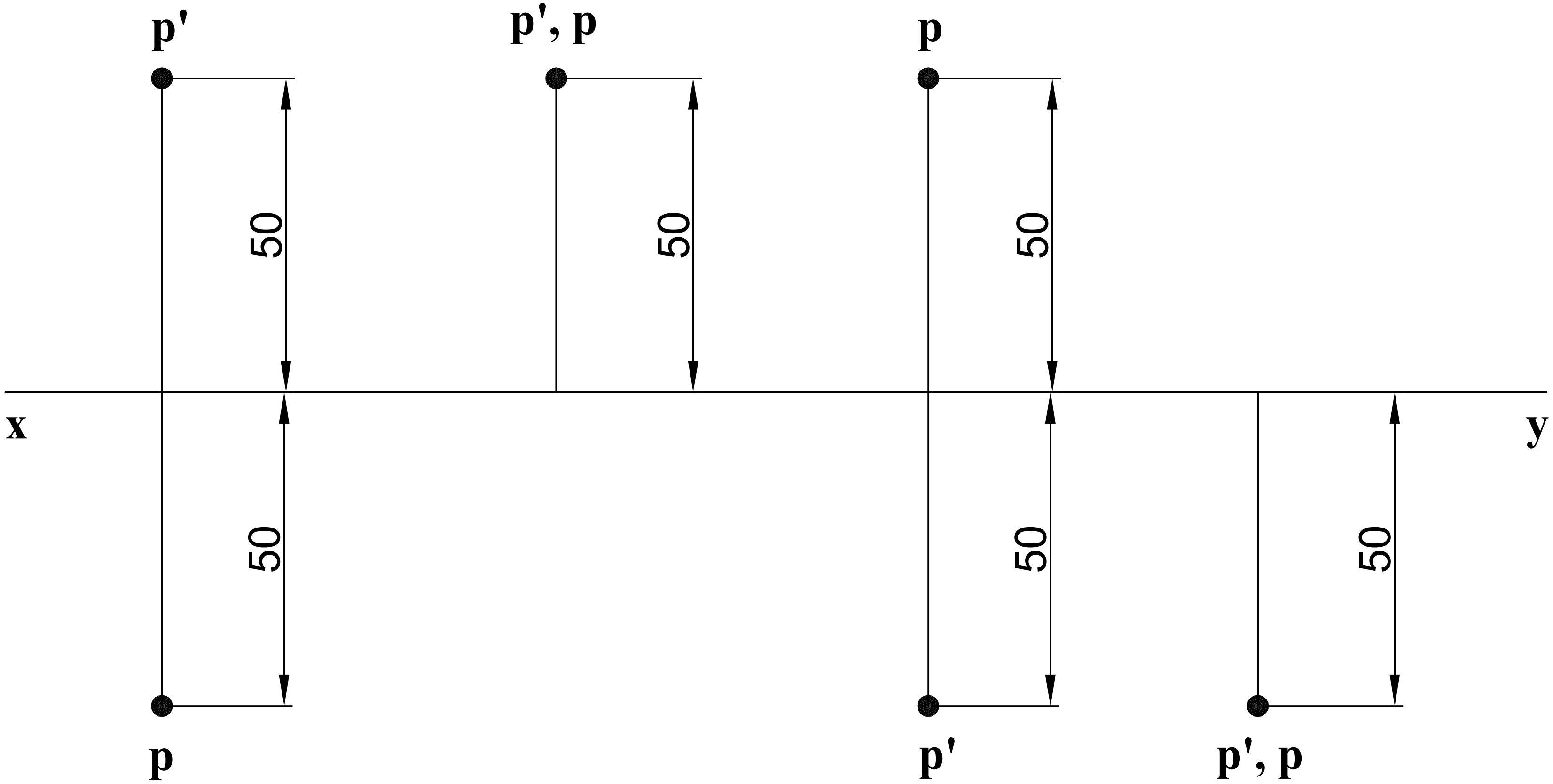
F, 40 mm below the H.P. and 25 mm in front of the V.P.

G, in both the H.P. and the V.P.



Lava Kumar P	Projection of Straight Lines	14.12.2022	

2. A point *P* is 50 mm from both the reference planes. Draw its projections in all possible positions.

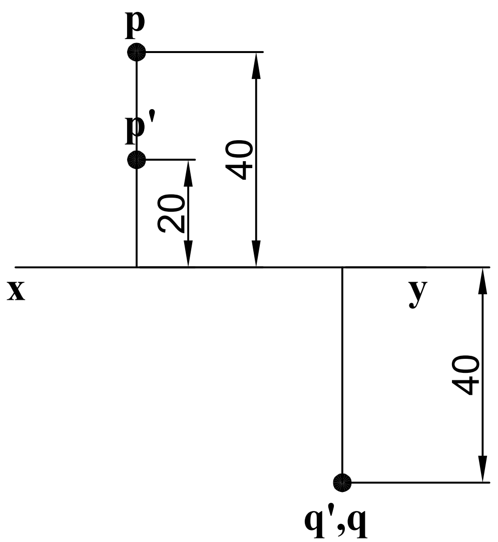


Lava Kumar P	Projection of Straight Lines	14.12.2022	

3. State the quadrants in which the following points are situated:

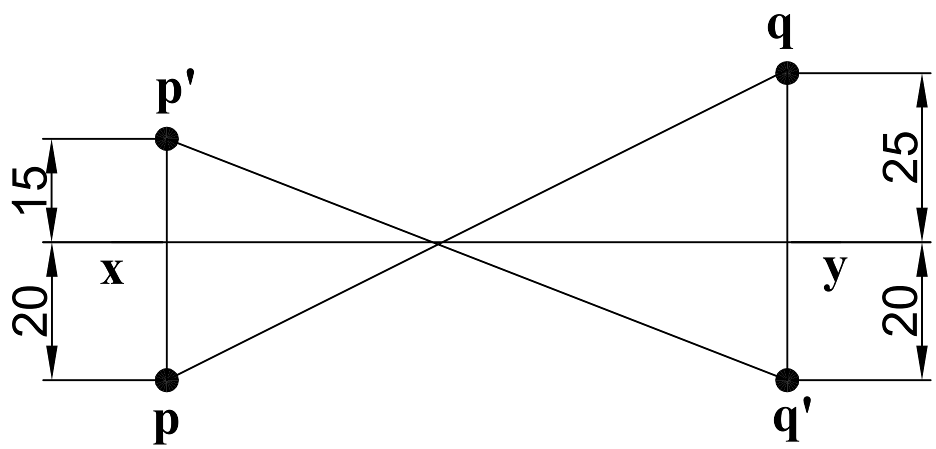
(a) A point *P;* its top view is 40 mm above *xy;* the front view, 20 mm below the top view.

(b) A point Q, its projections coincide with each other 40 mm below *xy.*



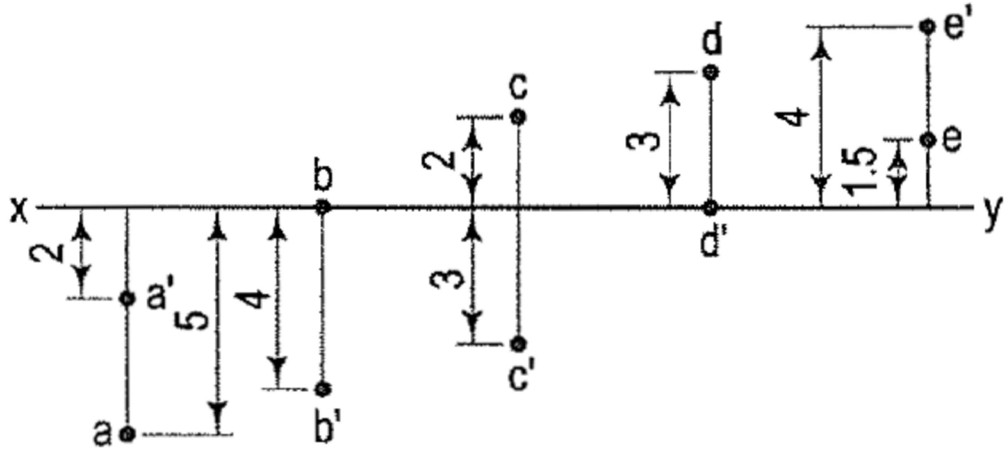
Point P is in II Quadrant
Point Q is in IV Quadrant

4. A point *P* is 15 mm above the H.P. and 20 mm in front of the V.P. Another point Q is 25 mm behind the V.P. and 40 mm below the H.P. Draw projections of *P* and Q keeping the distance between their projectors equal to 90 mm. Draw straight lines joining (i) their top views and (ii) their front views.



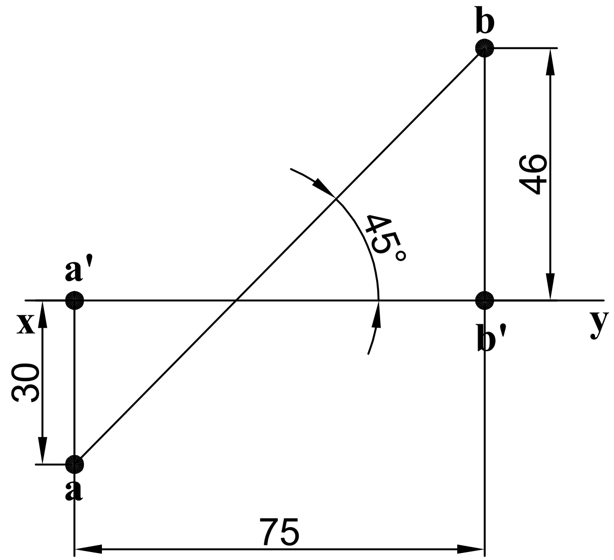
Lava Kumar P	**Projection of Points**	**10.12.2022**	

5.State the position of each point with respect to the planes of projection.



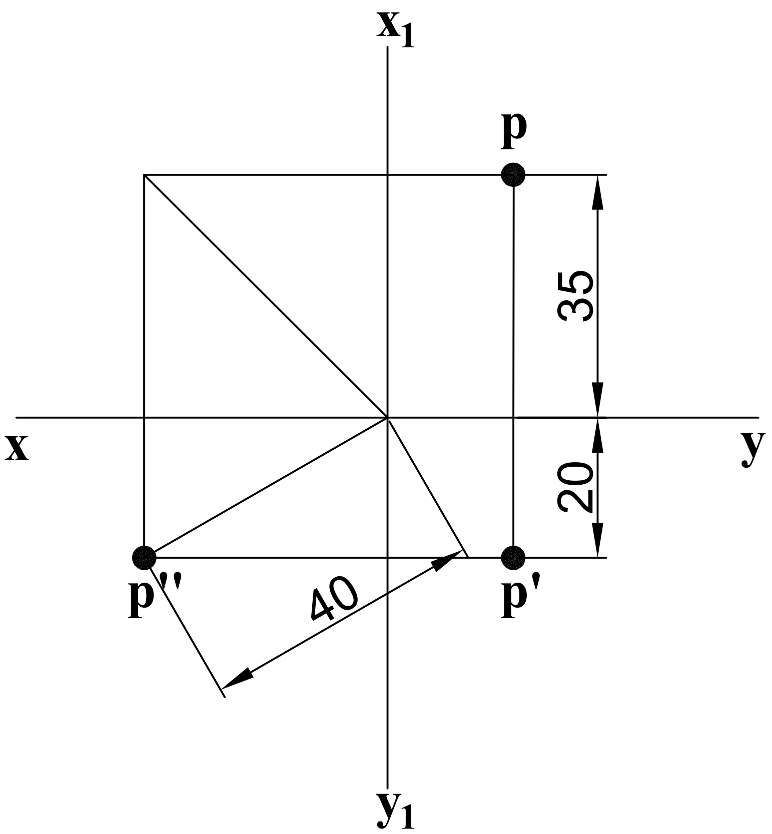
1. Point A is 20 mm below HP and 50 mm in front of VP
2. Point B is 40 mm below HP and on VP
3. Point C is 30 mm below HP and 20 mm behind VP
4. Point D is on HP and 30 mm behind VP
5. Point E is 40 mm above HP and 15 mm behind VP.

6. Two points A and B are in the H.P. The point A is 30 mm in front the V.P., while B is behind the V.P. The distance between their projectors is 75 mm and the line joining their top views makes an angle of 45° with xy. Find the distance of the point B from the V.P.

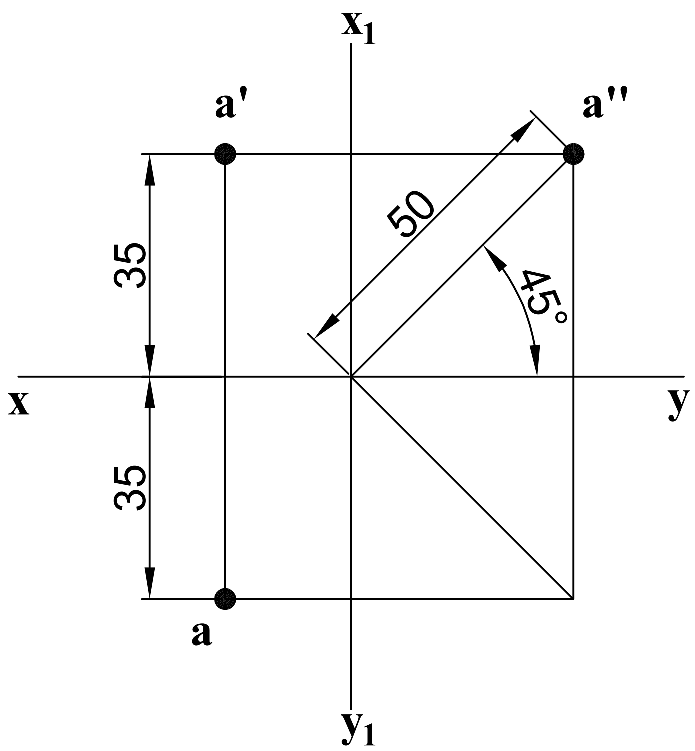


Lava Kumar P	Projection of Points	10.12.2022	

7. A point P is 20 mm below H.P. and lies in the third quadrant. Its shortest distance from xy is 40 mm. Draw its projections.

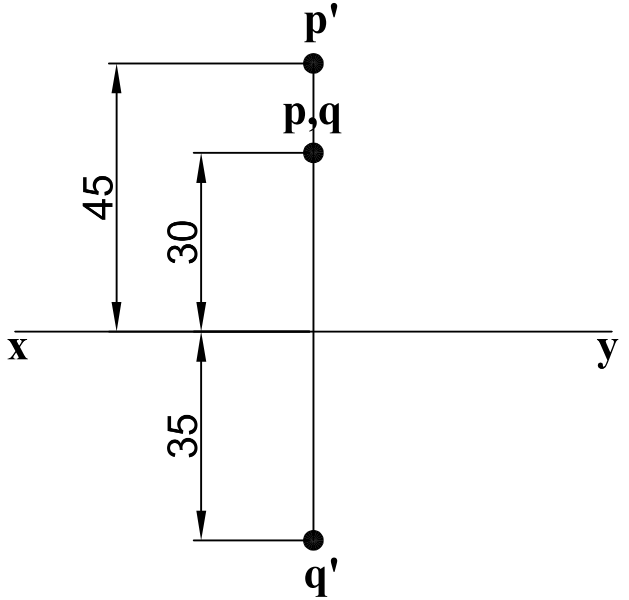


8. A point A is situated in the first quadrant. Its shortest distance from the xy is 60 mm and it is equidistant from the principal planes. Draw the projections of the point and determine its distance from the principal planes.



Lava Kumar P	**Projection of Points**	**10.12.2022**	

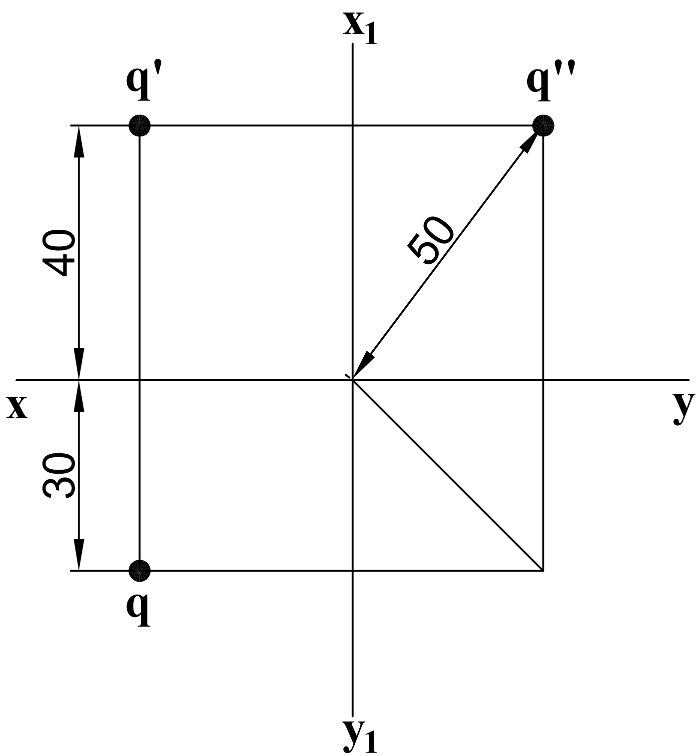
9. A point 30 mm above xy line is the plan-view of two points P and Q. The elevation of P is 45 mm above the H.P. while that of the point Q is 35 mm below the H.P. Draw the projections of the points and state their position with reference to the principal planes and the quadrant in which they lie.



1. **Point P is in II Quadrant**
2. **Point Q is in III Quadrant**

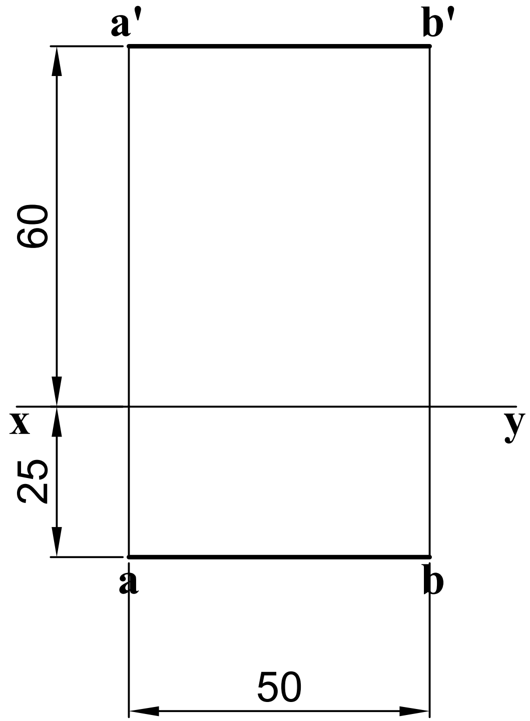
Lava Kumar P	**Projection of Points**	**10.12.2022**	

10. A point Q is situated in first quadrant. It is 40 mm above H.P. and 30 mm in front of V.P. Draw its projections and find its shortest distance from the xy line.



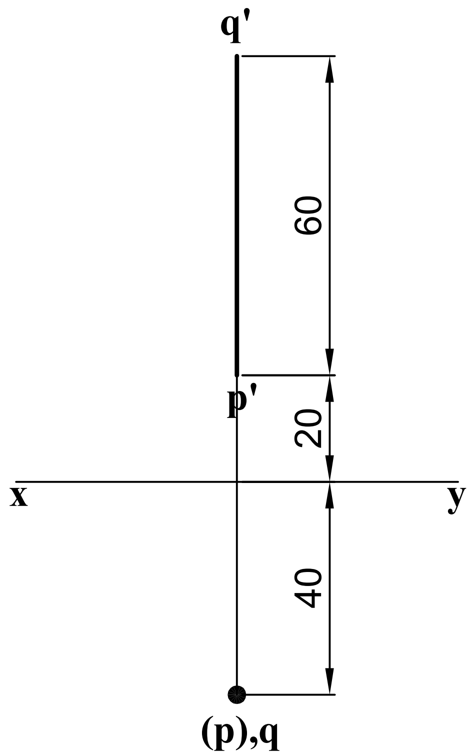
Lava Kumar P	**Projection of Points**	**10.12.2022**	

1. A 50 mm long line PQ is parallel to both the H.P. and the V.P. It is 25 mm in front of the V.P. and 60 mm above the H.P. Draw its projections.



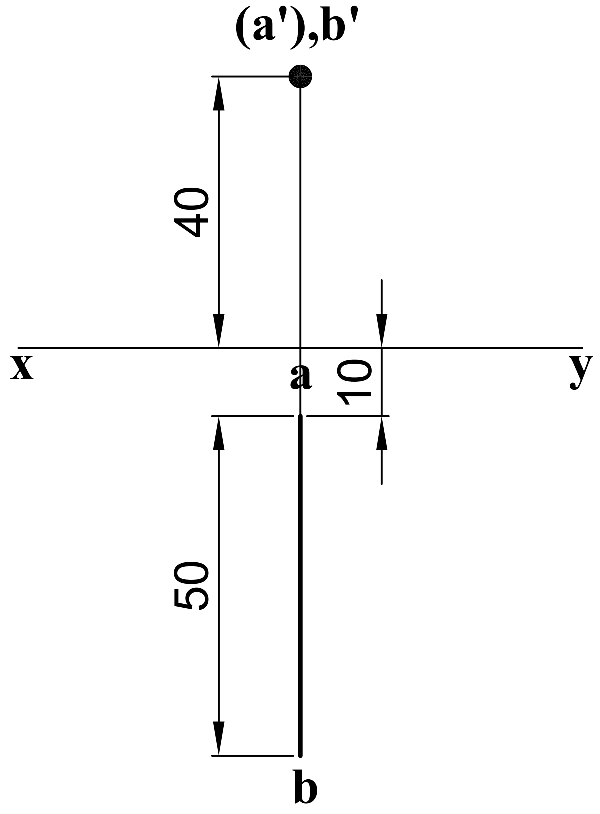
Lava Kumar P	Projection of Straight Lines	14.12.2022	

2. A 60 mm long line PQ has its end P 20 mm above H.P. The line is perpendicular to the H.P. and 40 mm in front of the V.P. Draw its projections.



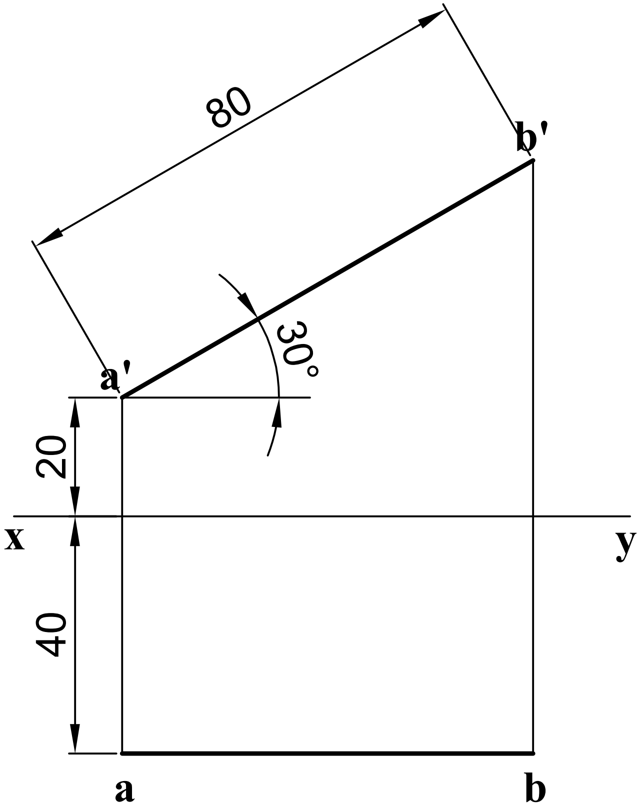
Lava Kumar P	Projection of Straight Lines	14.12.2022	

3. A 50 mm long line AB is perpendicular to the V.P. and 40 mm above the H.P. One end of the line is 10 mm in front of the V.P. Draw its projections.



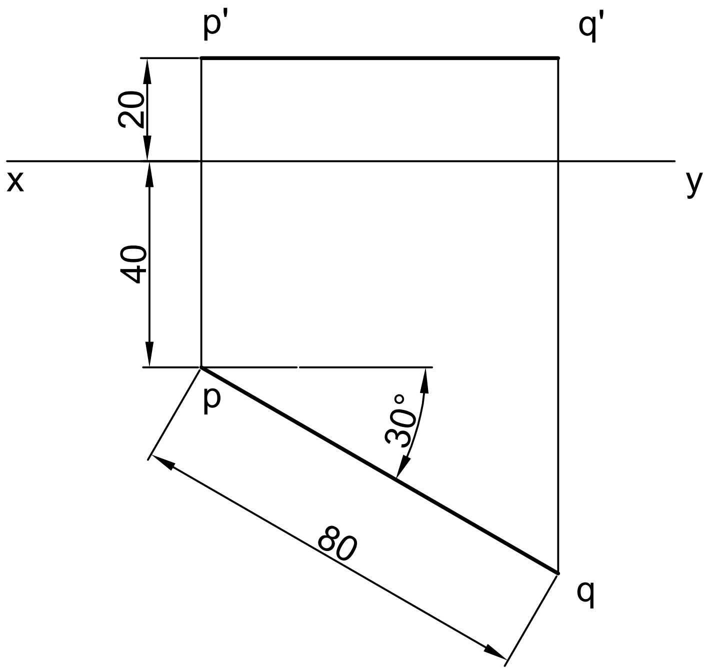
Lava Kumar P	**Projection of Straight Lines**	**14.12.2022**	

4. An 80 mm long line PQ has end P 20 mm above H.P. and 40 mm in front of the V.P. The line is inclined at 30° to the H.P. and is parallel to the V.P. Draw the projections of the line.



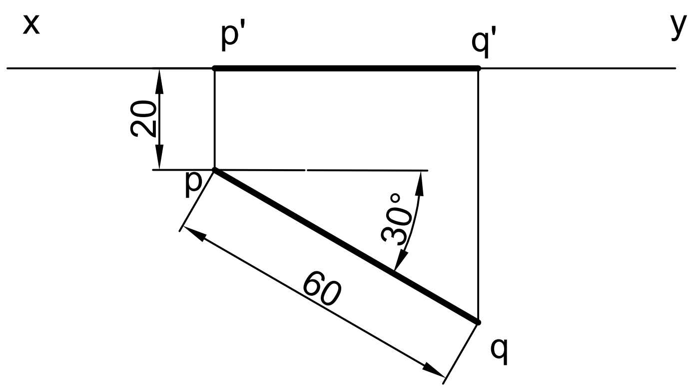
Lava Kumar P	Projection of Straight Lines	14.12.2022	

5. An 80 mm long line PQ is inclined at 30° to the V.P. and is parallel to the H.P. The end P of the line is 20 mm above the H.P. and 40 mm in front of the V.P. Draw the projections of the line.



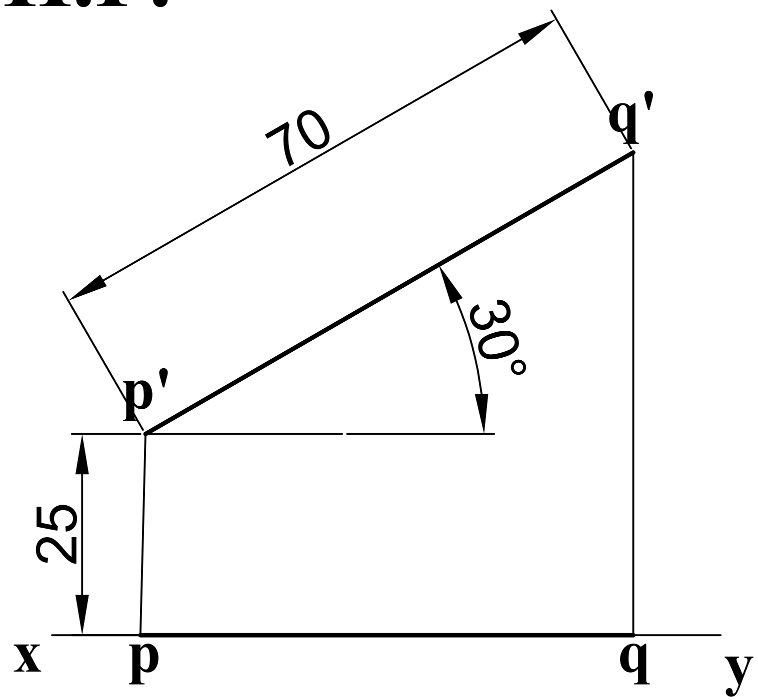
Lava Kumar P	**Projection of Straight Lines II**	**01.01.2023**	

6. A 60 mm long line PQ lying on the H.P. is inclined at 30° to the V.P. Its end P is 20 mm in front of the V.P. Draw the projections of the line.



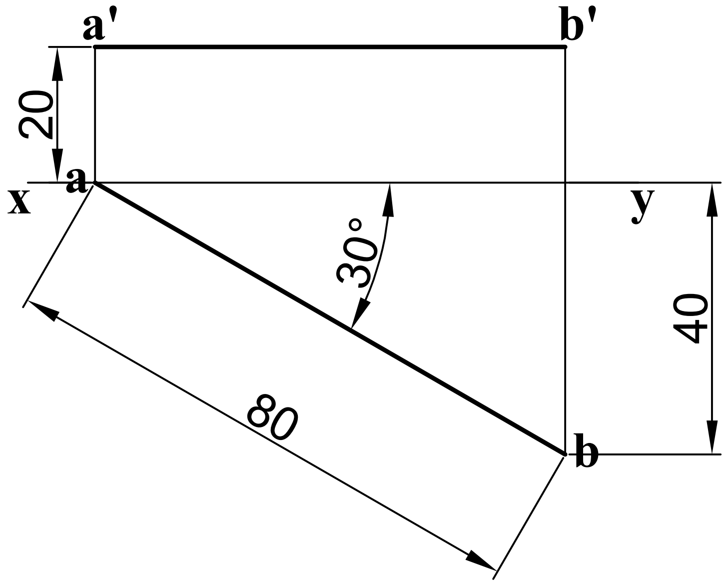
Lava Kumar P	Projection of Straight Lines II	01.01.2023	

7. Draw the projections of a 70 mm long line PQ, situated in the V.P. and inclined at 30° to the H.P. The end P of the line is 25 mm above the H.P.



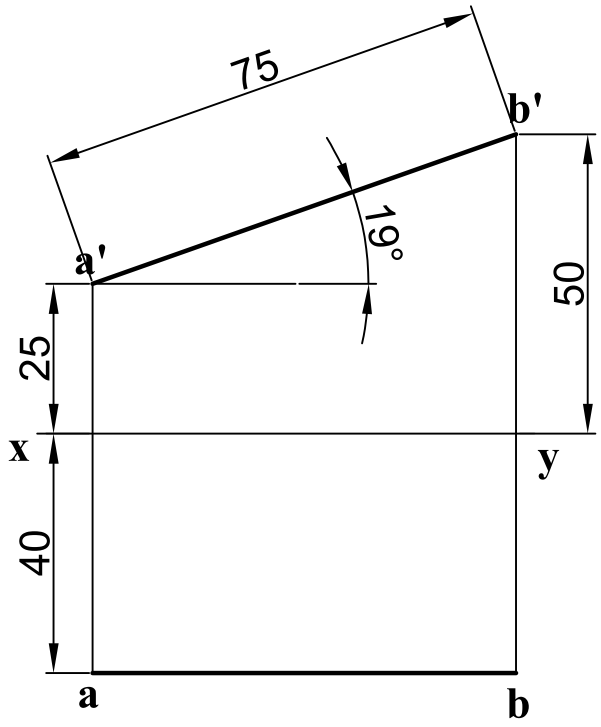
Lava Kumar P	Projection of Straight Lines	14.12.2022	

8. An 80 mm long line is parallel to and 20 mm above the H.P. One end of the line is in the V.P. whereas the other end is 40 mm in front of the V.P. Draw its projections and determine the true inclination of the line with the reference plane



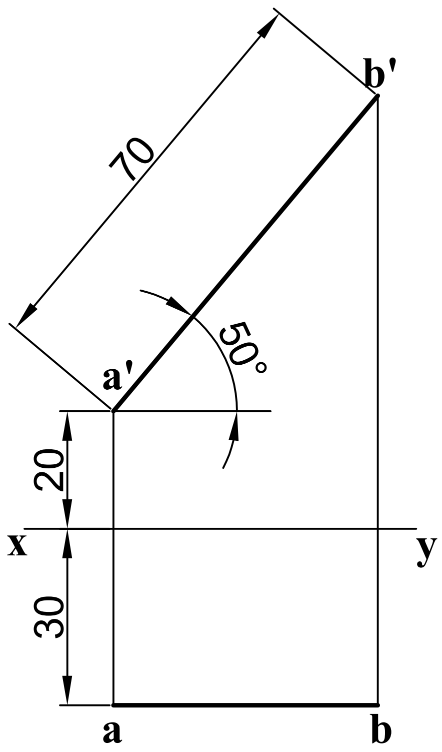
Lava Kumar P	**Projection of Straight Lines**	**14.12.2022**	

9. A 75 mm long line is parallel to and 40 mm in front of the V.P. The ends of the line are 25 mm and 50 mm above the H.P. Draw its projections and determine the true inclination of the line with the reference plane.



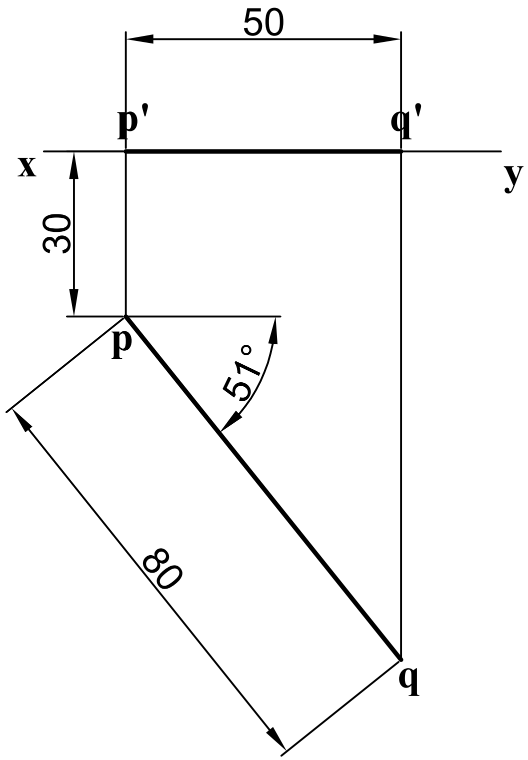
Lava Kumar P	**Projection of Straight Lines**	**14.12.2022**	

10. A 70 mm long line AB is parallel to the V.P. and inclined to the H.P. The end A is 20 mm above the H.P. and 30 mm in front of the V.P. The top view of the line measures 45 mm. Draw its projections.



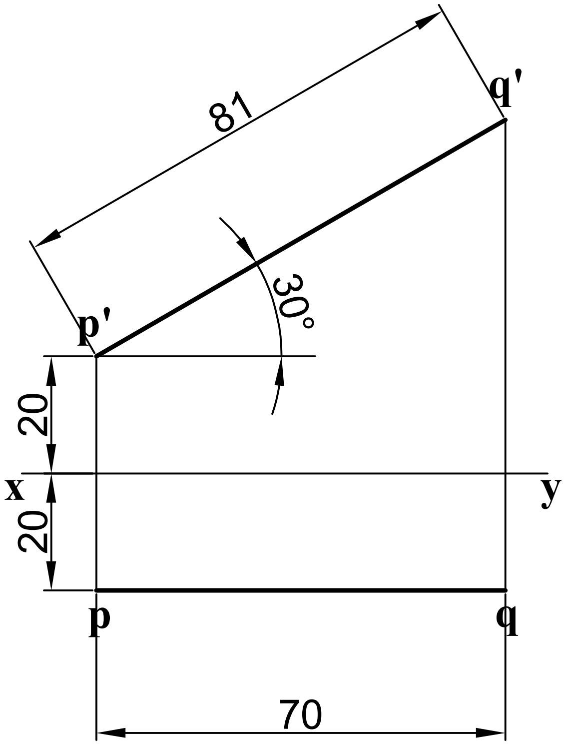
Lava Kumar P	**Projection of Straight Lines**	**14.12.2022**	

11. The front view of an 80 mm long line PQ measures 50 mm. The line lies in the H.P. such that one end is 30 mm in front of the V.P. Draw the projections of the line and find its inclination with the reference plane.



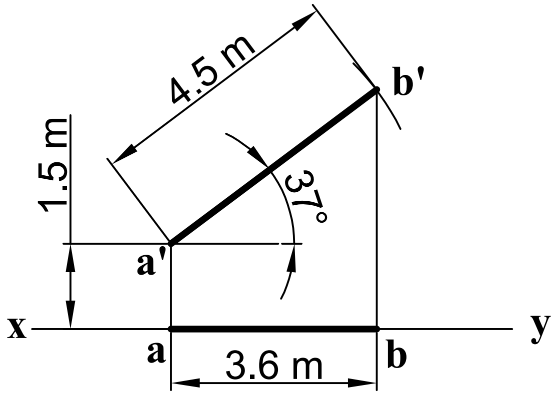
Lava Kumar P	**Projection of Straight Lines**	**14.12.2022**	

12. A line PQ is parallel to the V.P. and inclined at 30° to the H.P. End P is 20 mm from both the reference planes and the top view measures 70 mm. Draw the projections of the line and determine its true length.



Lava Kumar P	**Projection of Straight Lines**	**14.12.2022**	

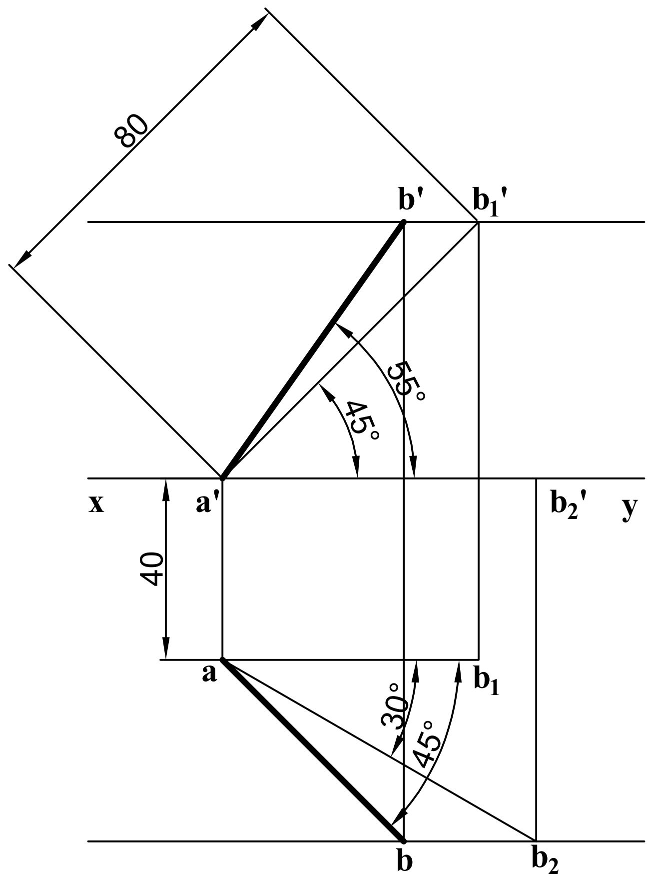
13.Two pegs fixed on a wall are 4.5 metres apart. The distance between the pegs measured parallel to the floor is 3.6 metres. If one peg is 1.5 metres above the floor, find the height of the second peg and the inclination of the line joining the two pegs, with the floor. Take scale 1 m = 10 mm.



Scale - 1:100

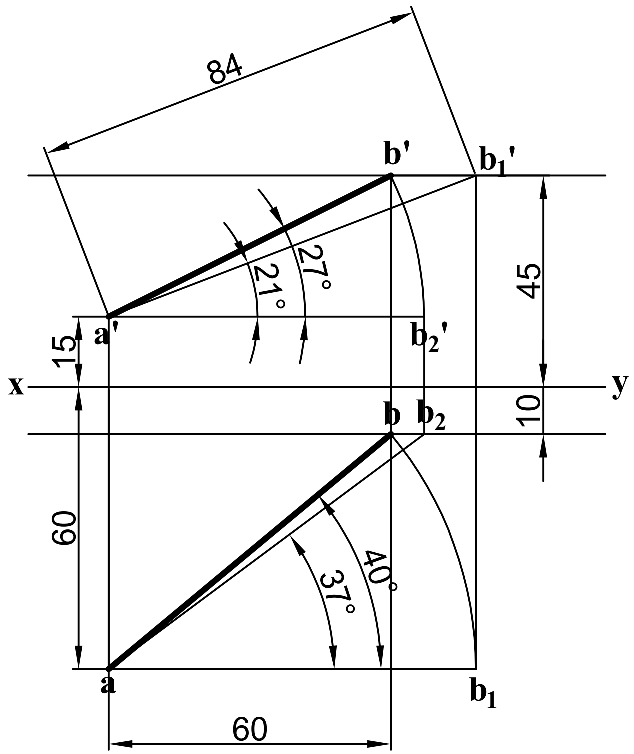
Lava Kumar P	**Projection of Straight Lines I**	**01.01.2023**	

1. **An 80 mm long line AB is inclined at 45° to the H.P. and 30° to the V.P. The end A is in the H.P. and 40 mm in front of the V.P. Draw its projections.**



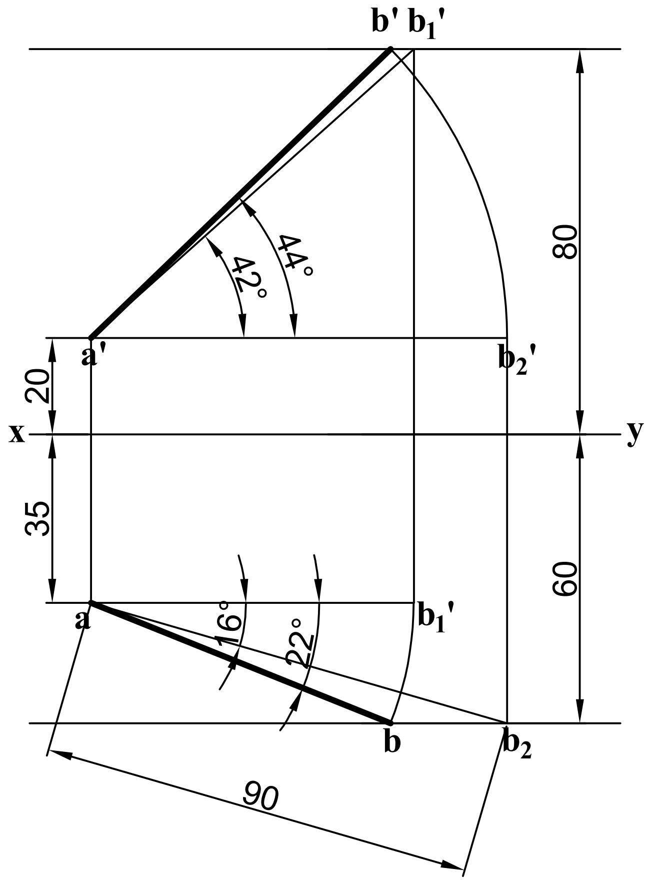
Lava Kumar P	Projection of Straight Lines II	22.12.2022	

2. A straight-line AB has its end A 15 mm above the H.P. and 60 mm in front of the V.P. The end B is 45 mm above the H.P. and 10 mm in front of the V.P. If the end Projectors of the line are 60 mm apart, draw its projections. Determine the true length and true inclinations of the line with the principal planes.



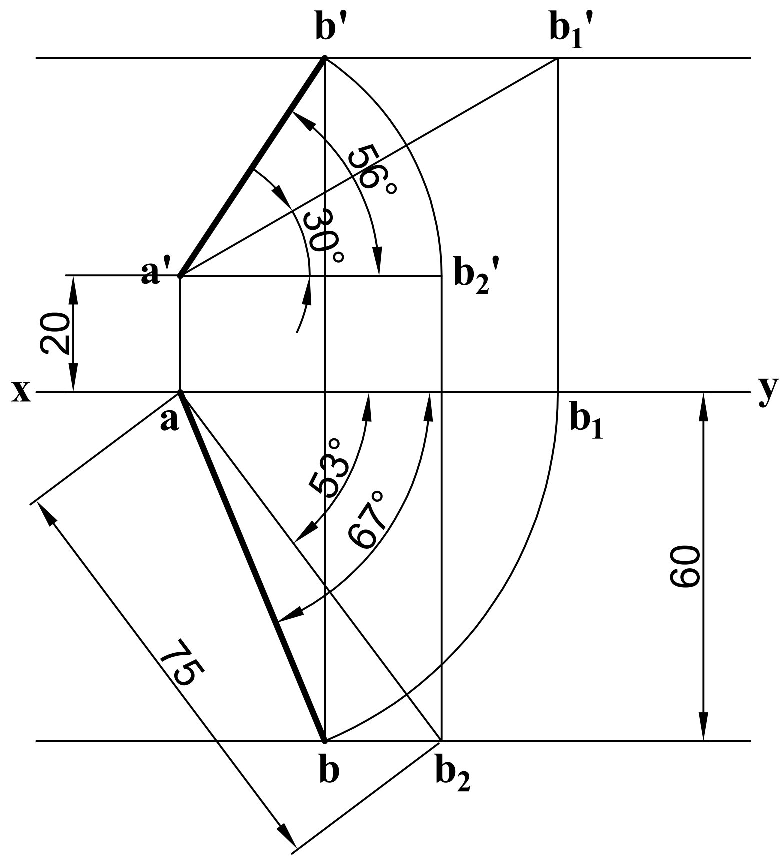
Lava Kumar P	Projection of Straight Lines II	22.12.2022	

3. A 90 mm long line AB has the end A 20 mm above the H.P. and 35 mm in front of the V.P. The end B is 80 mm above the H.P. and 60 mm in front of the V.P. Draw the projections of AB and determine its true inclinations with the principal planes.



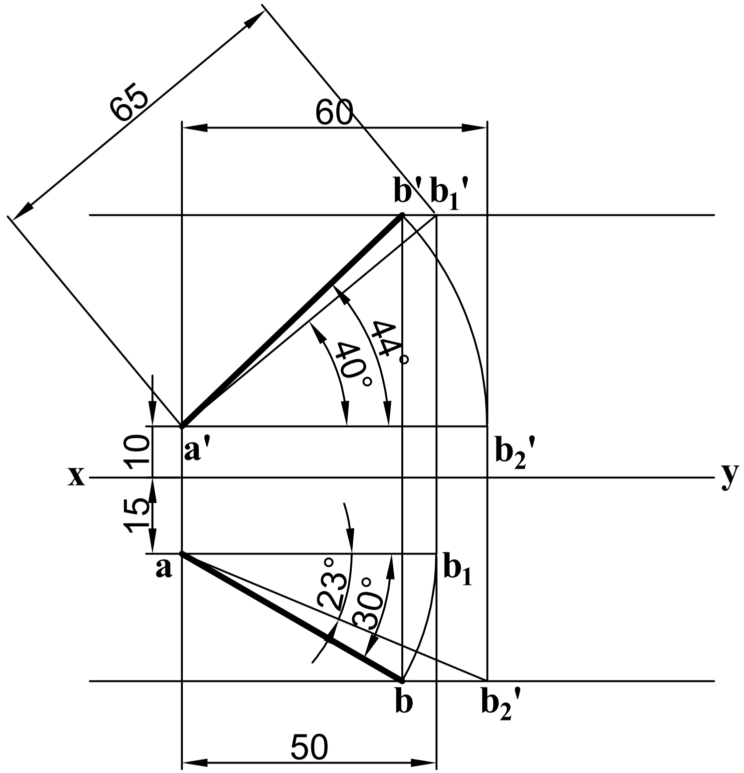
Lava Kumar P	**Projection of Straight Lines II**	**22.12.2022**	

4. A 75 mm long line AB is inclined at 30° to the H.P. Its end A is 20 mm above the H.P. and on the V.P. End B is 60 mm in front of the V.P. Draw the projections of the line.



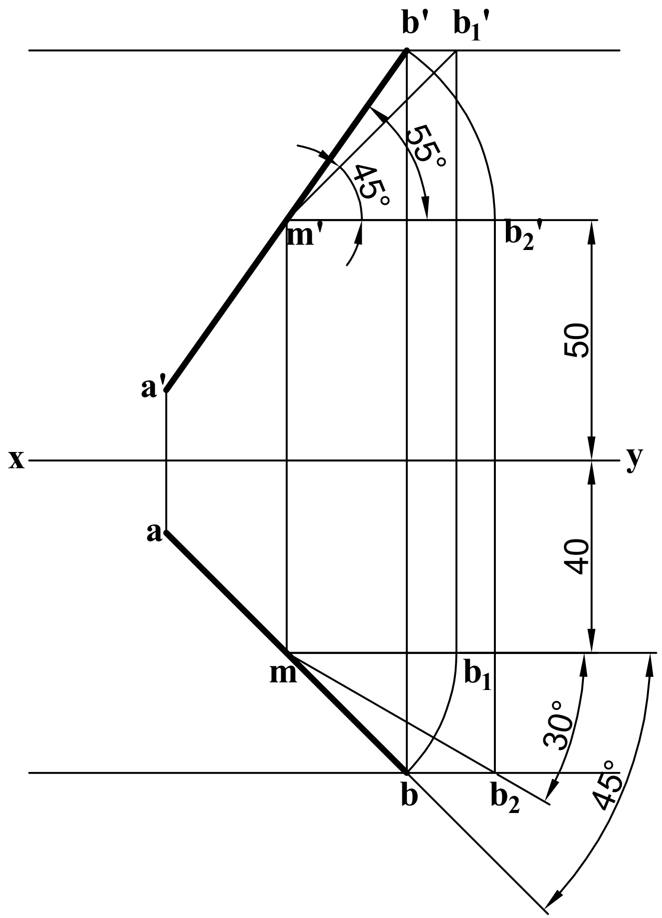
Lava Kumar P	Projection of Straight Lines II	22.12.2022	

5. A line AB has its end A 10 mm above the H.P. and 15 mm in front of the V.P. The lengths of its front and top views are 60 mm and 50 mm respectively. If the top view of the line is inclined at 30° to the reference line, draw its projections. Determine the true length and true inclinations of the line with the principal planes.



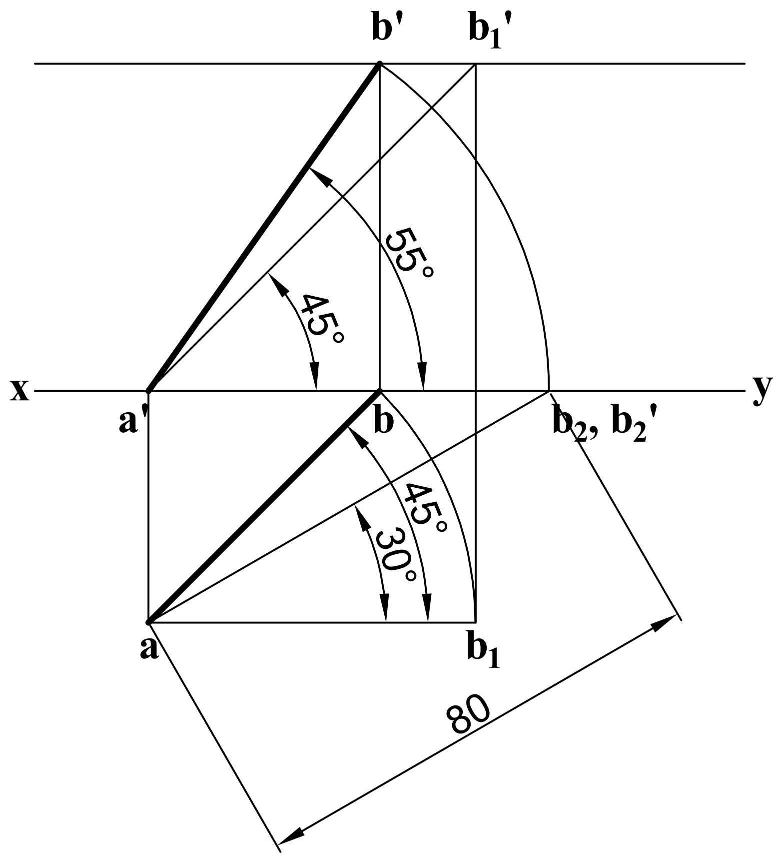
Lava Kumar P	Projection of Straight Lines II	22.12.2022	

6. A 100 mm long line AB is inclined at 45° to H.P. and 30° to the V.P. Its mid-point is 50 above the H.P. and 40 mm in front of the V.P. Draw its projections.



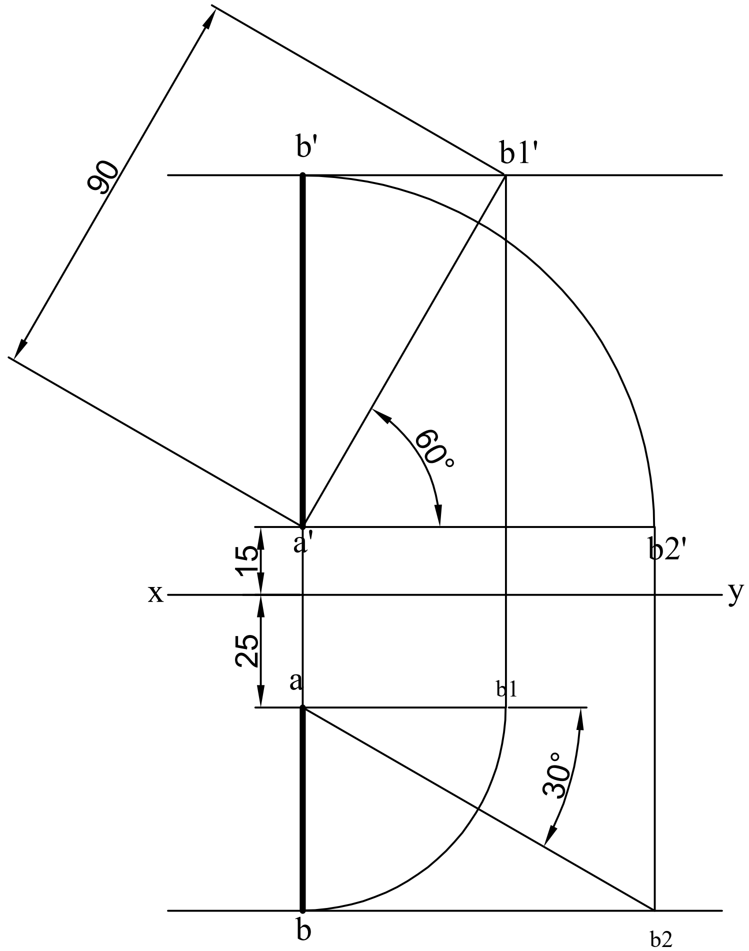
Lava Kumar P	**Projection of Straight Lines II**	**22.12.2022**	

7. An 80 mm long line AB lying in the first angle, has the end A on the H.P. and end B in the V.P. The line is inclined at 45° to the H.P. and 30° to the V.P. Draw its projections.



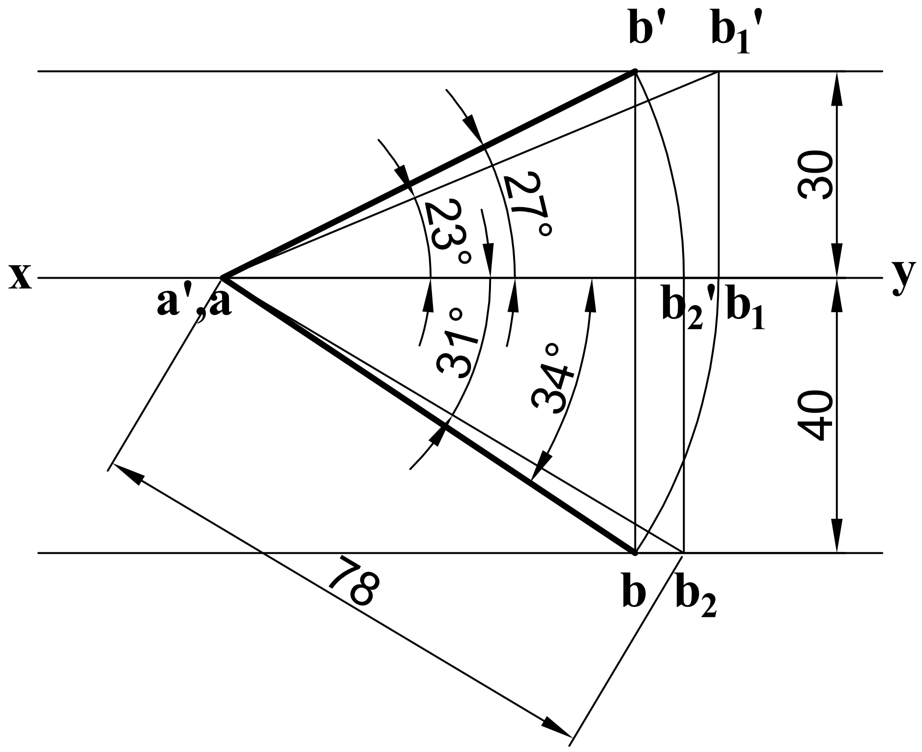
Lava Kumar P	**Projection of Straight Lines II**	**22.12.2022**	

8. A 90 mm long line AB has its end A 15 mm above the H.P. and 25 mm in front of the V.P. The line is inclined at 60° to the H.P. and 30° to the V.P. Draw its projections.



Lava Kumar P	**Projection of Straight Lines II**	**01.01.2023**	

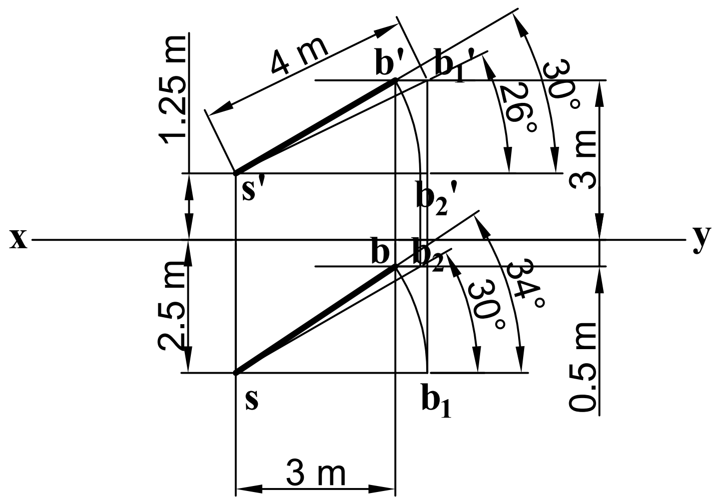
9. Find graphically the length of the largest rod that can be kept inside a room of 60 mm x 40 mm x 30 mm.



Largest rod that can be kept in a room of 60 mm x 40 mm x 30 mm = 78 mm

Lava Kumar P	**Projection of Straight Lines II**	**01.01.2023**	

10. A room is 6 m x 5 m x 4 m high. An electric bulb B is above the centre of the longer wall and 1 m below the ceiling. The bulb B is 50 cm away from the longer wall. The switch S for the light is 1.25 m above the floor on the centre of the adjacent wall. Determine graphically, the shortest distance between the bulb B and the switch S.

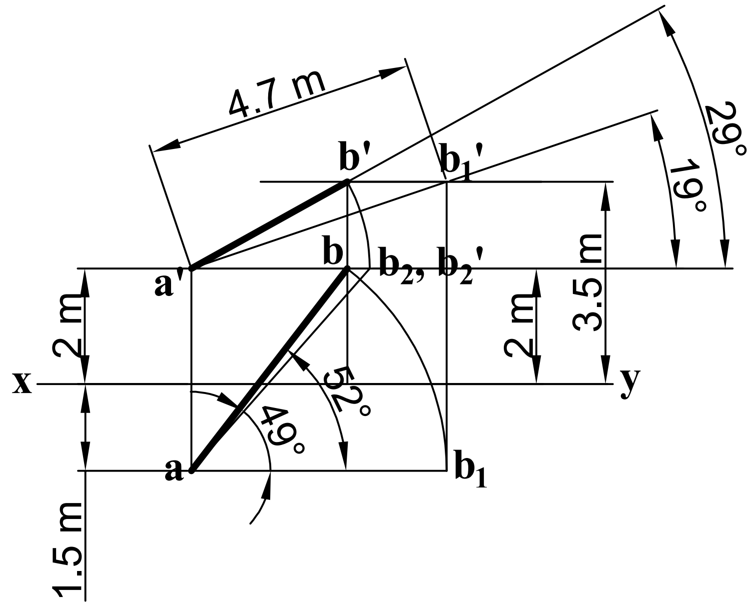


Shortest Distance Between Bulb and Switch = 4 m

Scale = 1 : 100

Lava Kumar P	Projection of Straight Lines II	01.01.2023	

11. Two mangoes on a tree are respectively 2.0 m and 3.5 m above the ground and 1.5 m and 2.0 m away from a thin compound wall, but on the opposite sides of it. The distance between the mangoes, measured along the ground and parallel to the wall is 2. 7 m. Determine the real distance between the mangoes. Take scale 1 m = 10 mm.



Real Distance between Mango A and B is 4.7 m

Lava Kumar P	**Projection of Straight Lines II**	**01.01.2023**	

Unit 3

Projection of Planes and Solids

1. Differentiate between right solid and oblique solid.

   Right solid - Right solid is one whose axis is perpendicular to its base

   Oblique solid - Oblique solid is one whose axis is inclined at angle to its base.

2. Define Polyhedron.

   A polyhedron is a solid bounded by planes called faces, which meet in straight lines called edges.

3. What is regular polyhedron?

   A regular polyhedron has all the faces equal and regular.
   Examples are tetrahedron, cube etc.

4. What is prism?

   A prism is a polyhedron with two n-sided polygonal bases which are parallel and congruent, and lateral faces are rectangles.

5. What is pyramid?

   A pyramid is a polyhedron with n-sided polygonal base and lateral faces are triangles meeting at a point called the vertex or apex.

6. What is solid of revolution?

   These solids are obtained by revolving a plane figure like rectangle, triangle or a semi-circle about a fixed line.
   Examples are cone, cylinder and sphere.

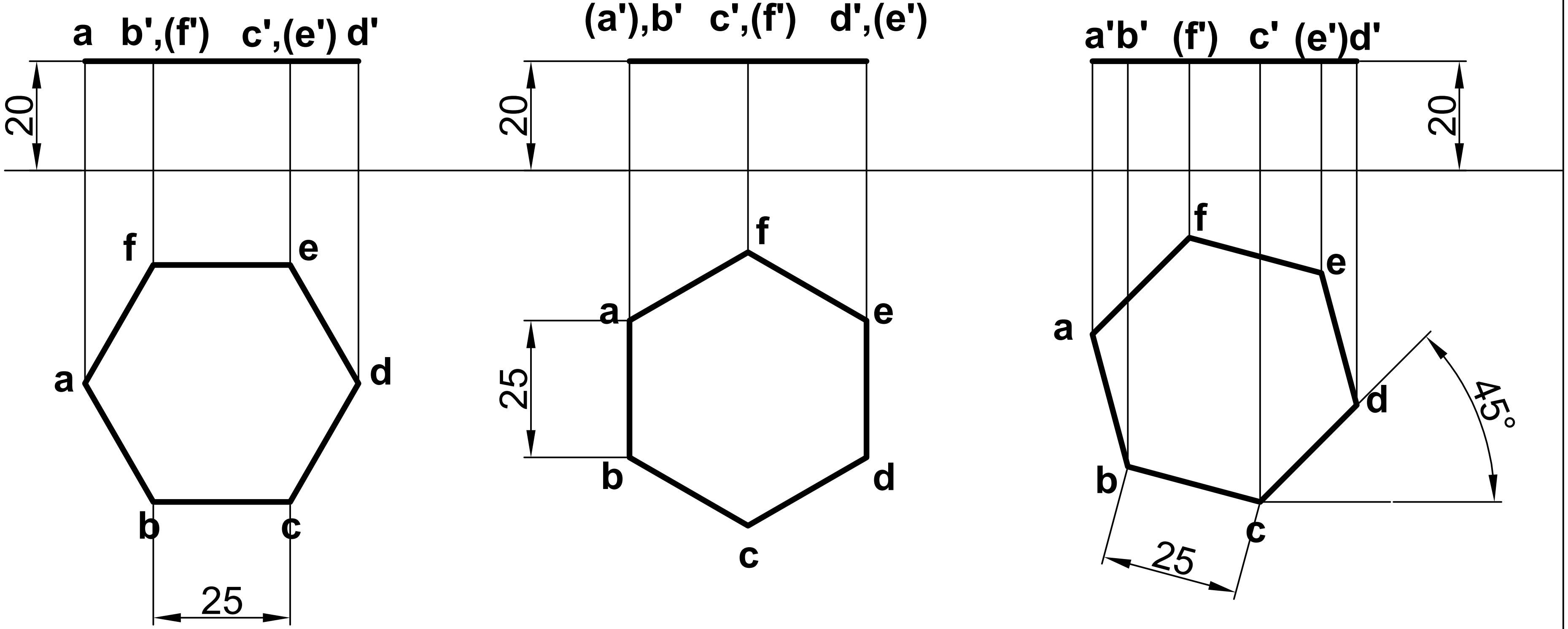
7. What is frustum of cone/pyramid?

   When a regular pyramid or a cone is cut by a plane parallel to its base and the portion of the solid containing apex is removed, the remaining portion of the solid is called the frustum of that pyramid or cone.

8. What is truncated solid?

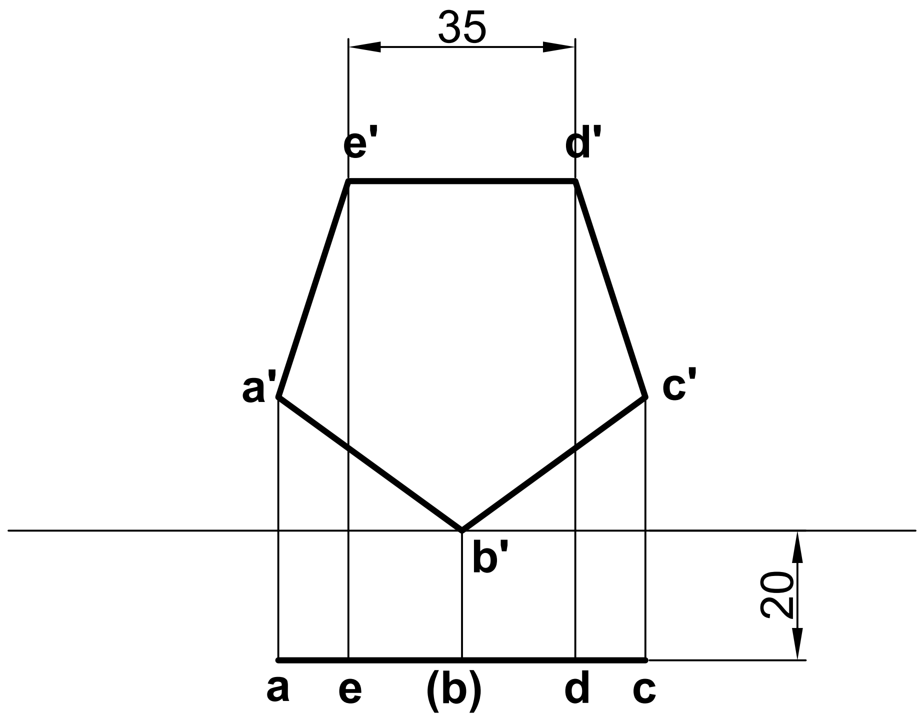
   If a solid is cut by a section plane which is inclined to base of the solid and the portion of the solid produced after cutting is called Truncated solid.

1. **A hexagonal plane of side 25 mm has its surface parallel to and 20 mm above the H.P. Draw its projections, when a side is (a) parallel to V.P., (b) perpendicular to V.P., (c) inclined at 45° to V.P.**



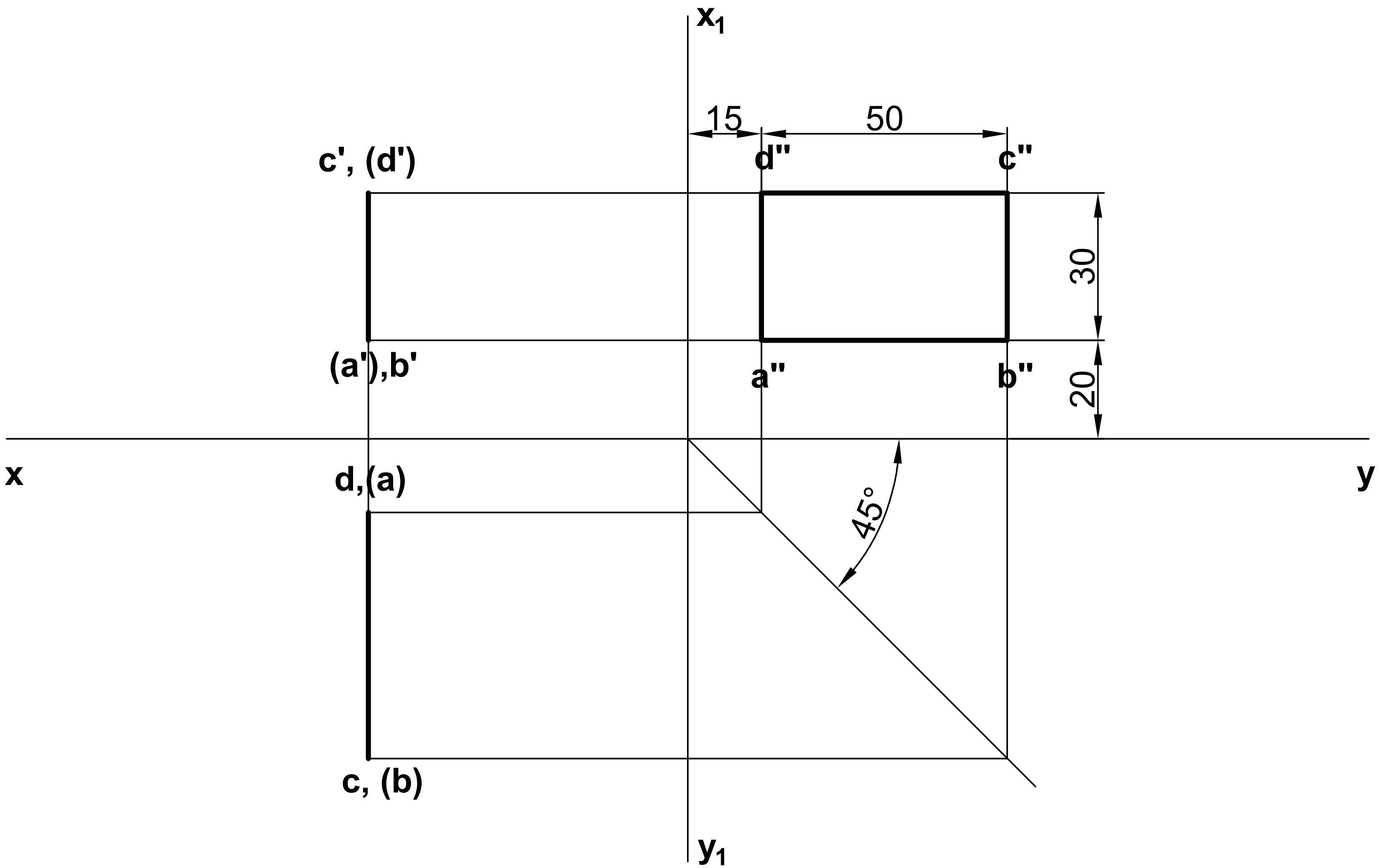
Lava Kumar P	**Projection of Planes**	**14.01.2023**	

2. A pentagonal plane of side 35 mm has a corner on the H.P. and the side opposite to this corner is parallel to the H.P. The plane is parallel to and 20 mm in front of the V.P. Draw its projections.



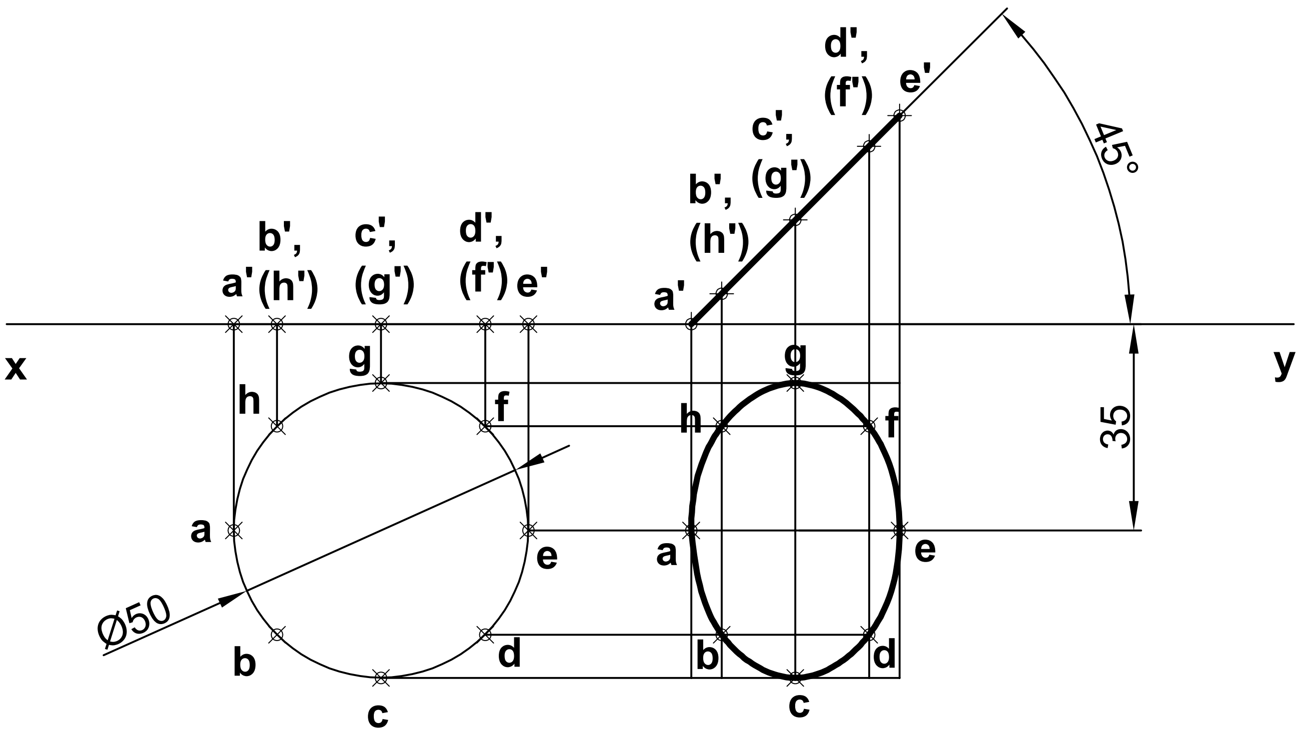
Lava Kumar P	Projection of Planes	14.01.2023	

3. A rectangular plane of sides 50 mm and 30 mm is perpendicular to both H.P. and V.P. The longer edges are parallel to the H.P. and nearest one is 20 mm above it. The shorter edge nearer to V.P. is 15 mm from it. Draw its projections.



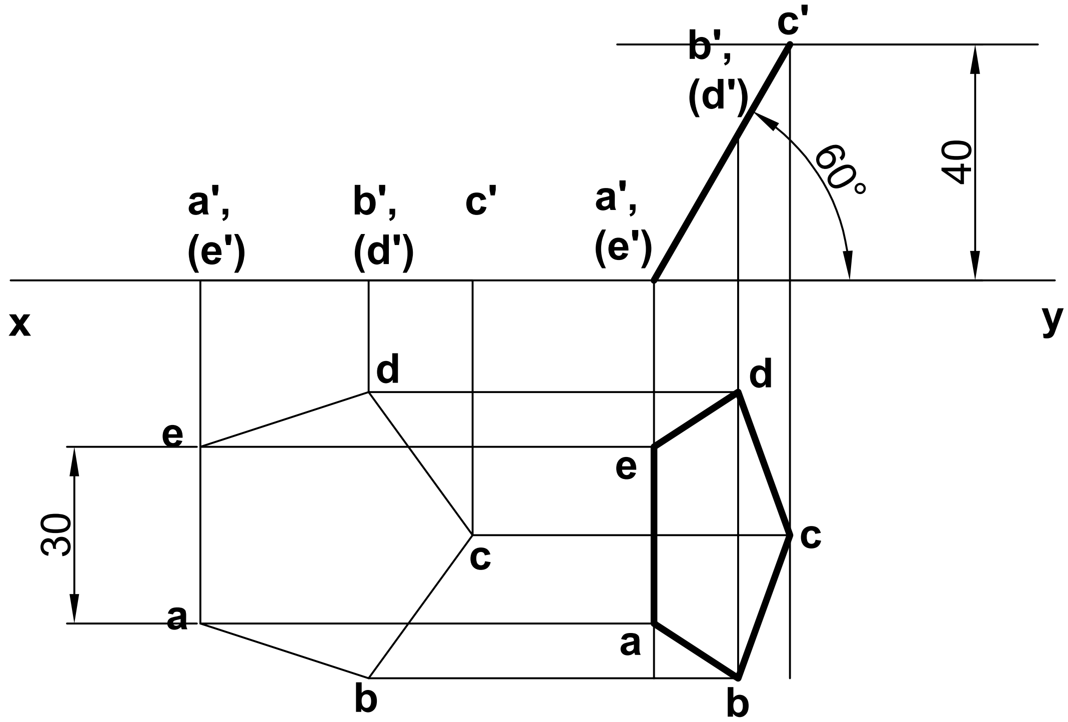
Lava Kumar P	**Projection of Planes**	**14.01.2023**	

4. A circular plane of diameter 50 mm is resting on a point of the circumference on the H.P. The plane is inclined at 45° to the H.P. and the centre is 35 mm in front of the V.P. Draw its projections.



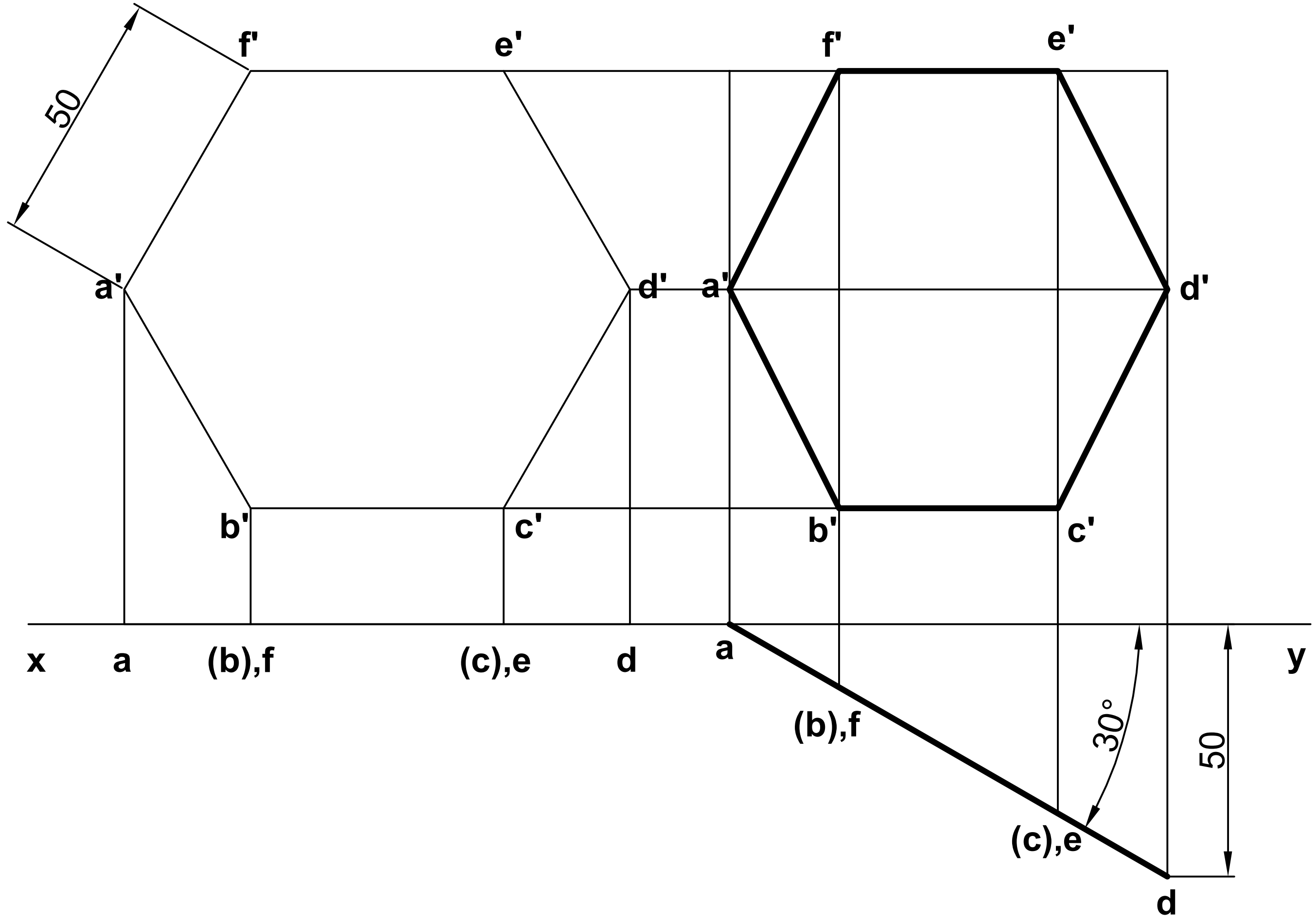
Lava Kumar P	Projection of Planes	14.01.2023	

5. A pentagonal plane of side 30 mm has a side on the HP and the surface perpendicular to the VP. The corner opposite to that side is 40 mm above the HP. Draw the projections of the plane and determine its inclination with the HP.



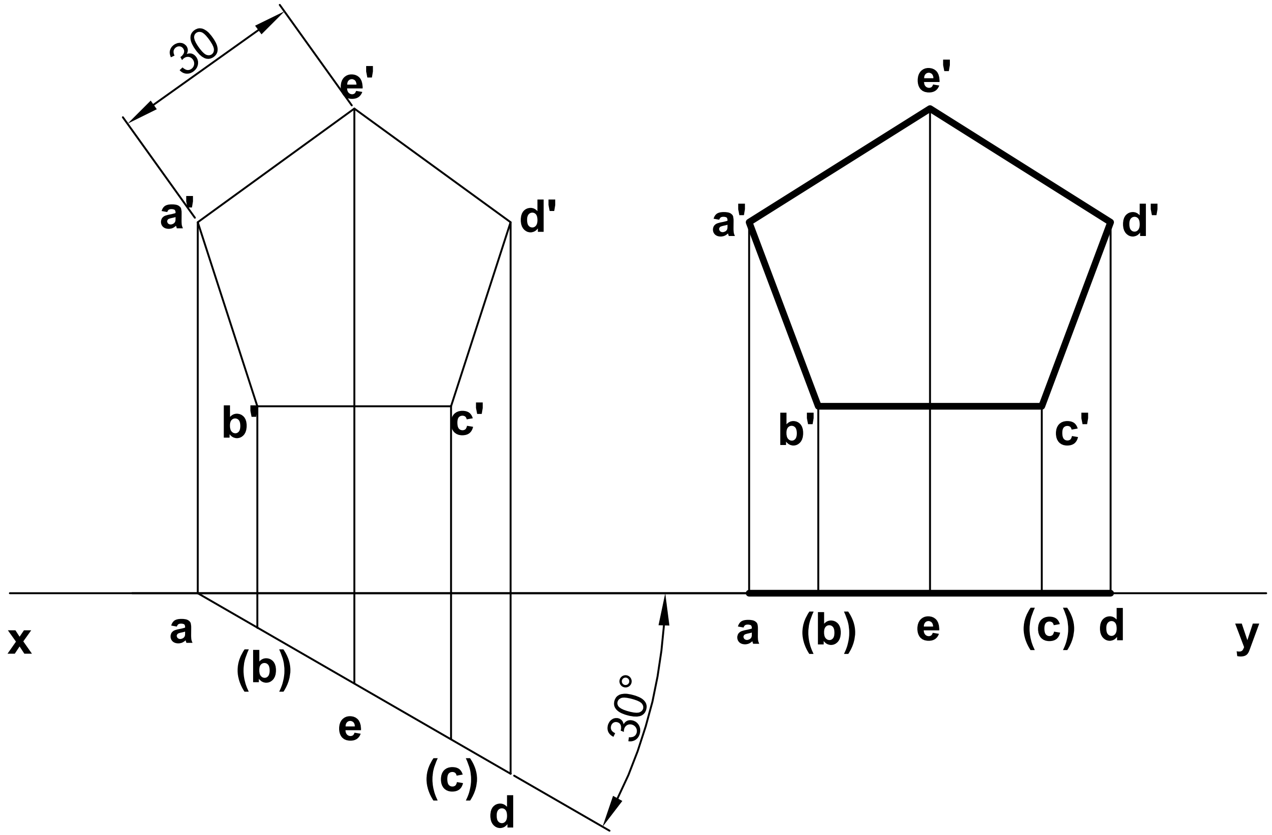
Lava Kumar P	Projection of Planes	14.01.2023	

6. A hexagonal lamina of side 50 mm has a corner in the VP. The diagonal through that corner is parallel to HP and inclined at 30° to the VP. Draw its projections when the lamina is perpendicular to the HP. Measure the distance of the topmost corner from the VP.



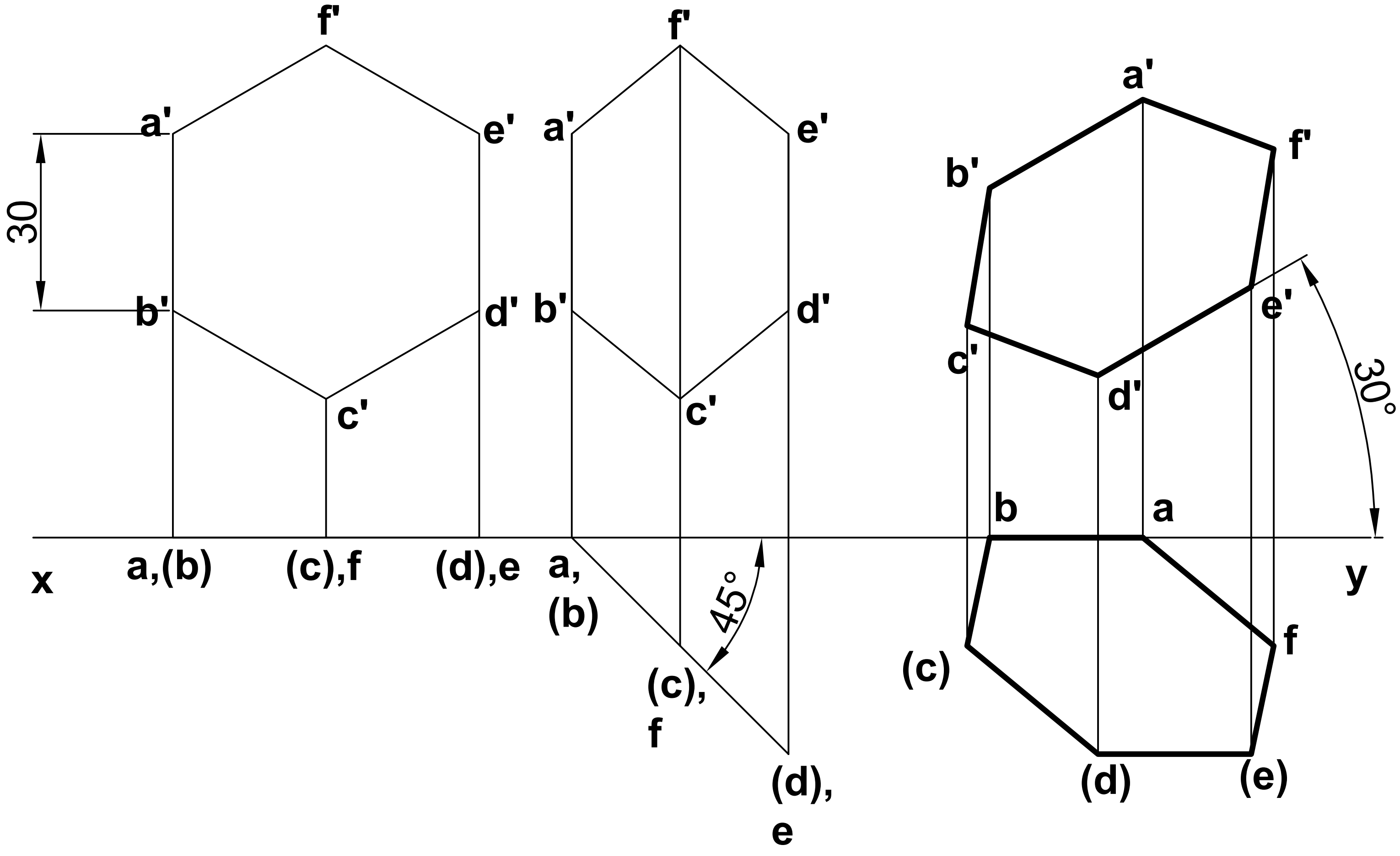
Lava Kumar P	Projection of Planes	14.01.2023	

7. The front view of a plane whose surface is perpendicular to H.P. and inclined at 30° to the V.P. appears as a regular pentagon of side 30 mm with a side parallel to the reference line. Draw the projections of the plane and determine its true shape.



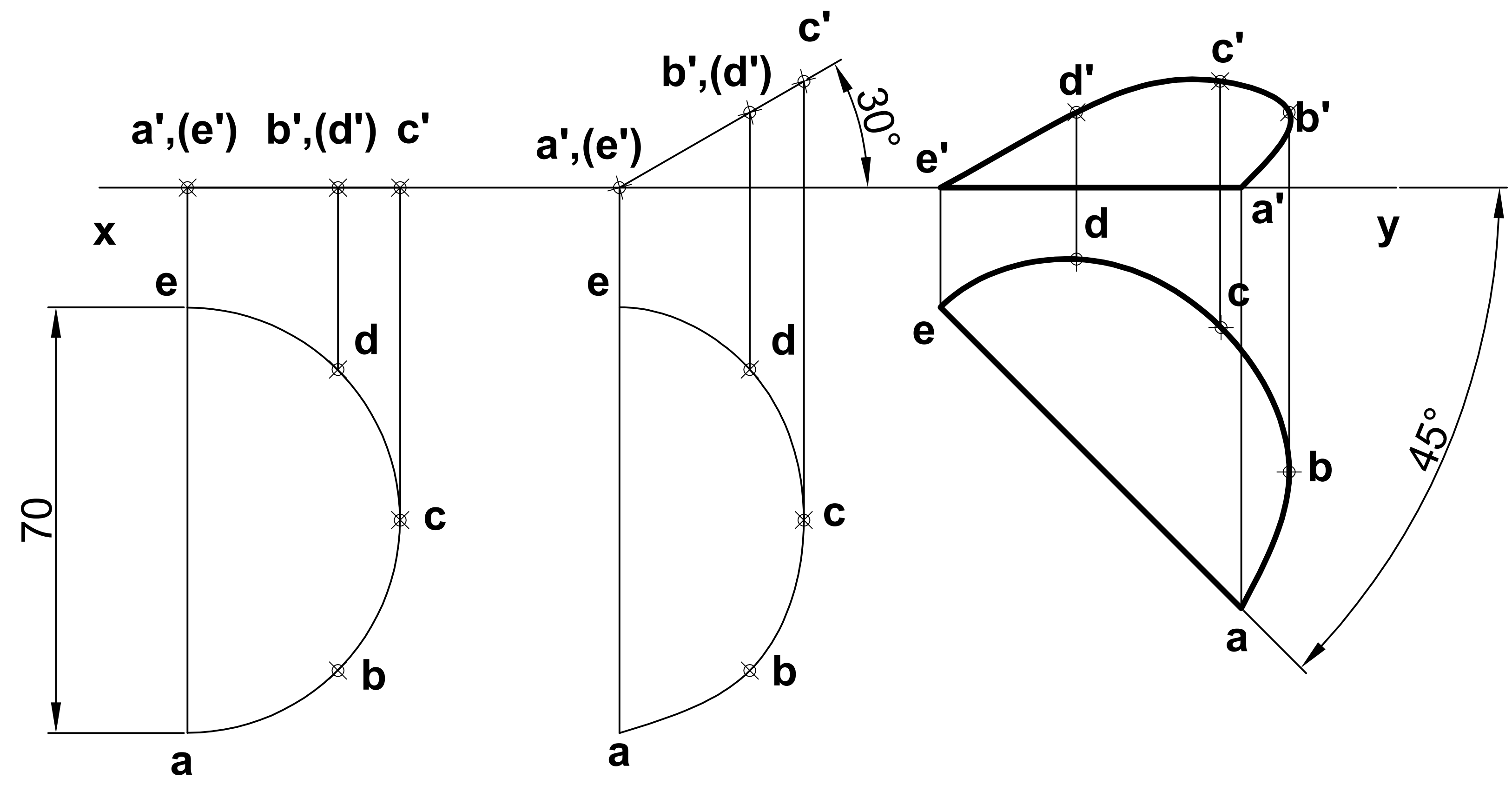
Lava Kumar P	Projection of Planes	14.01.2023	

8. A hexagonal plane of side 30 mm has an edge in the V.P. The surface of the plane is inclined at 45^{o} to the V.P. and the edge on which it rests is inclined at 30^{o} to the H.P. Draw its projections.



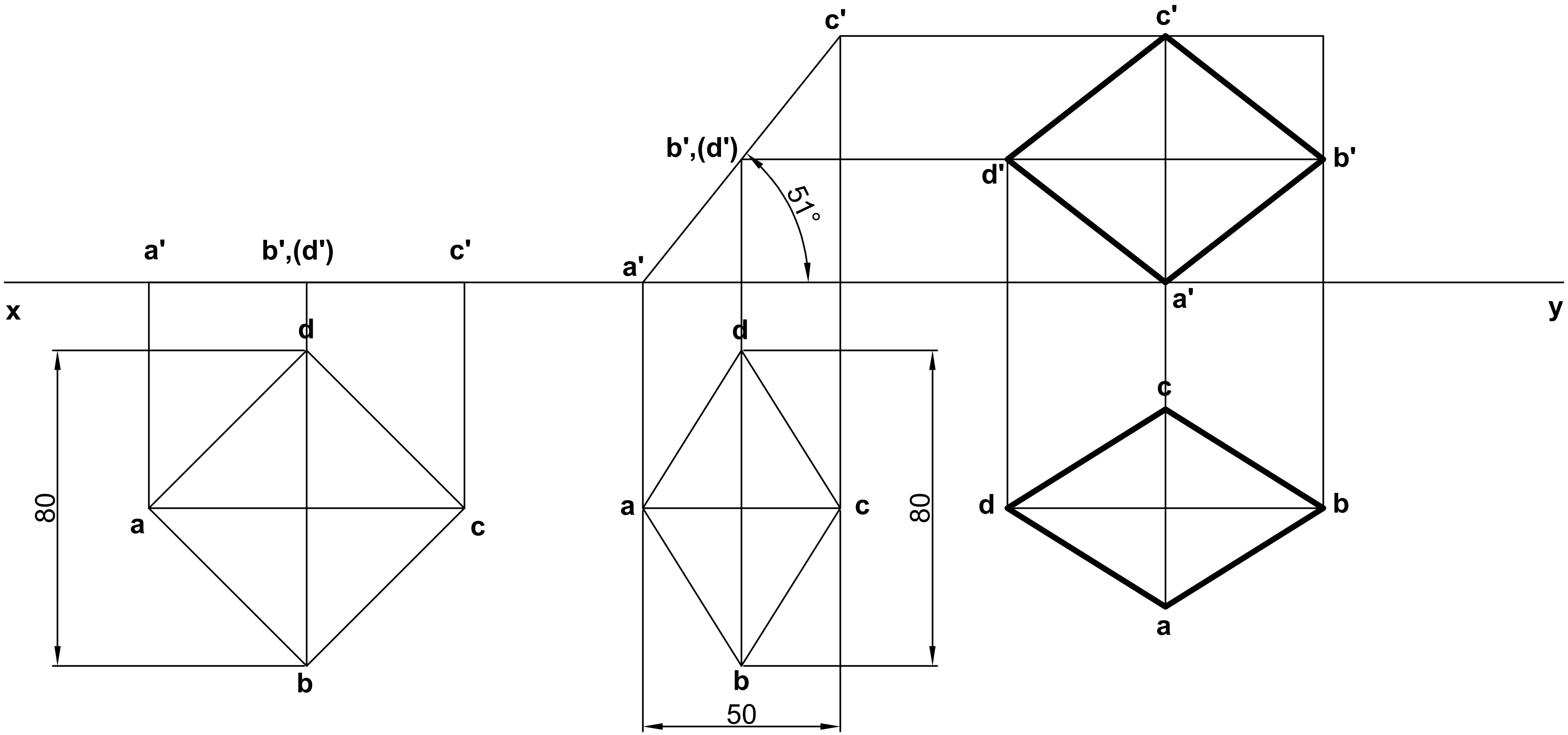
Lava Kumar P	**Projection of Planes**	**14.01.2023**	

9. A semi-circular plane of diameter 70 mm has its straight edge on the H.P. and inclined at 45° to the V.P. Draw the projection of the plane when its surface is inclined at 30° to the H.P.



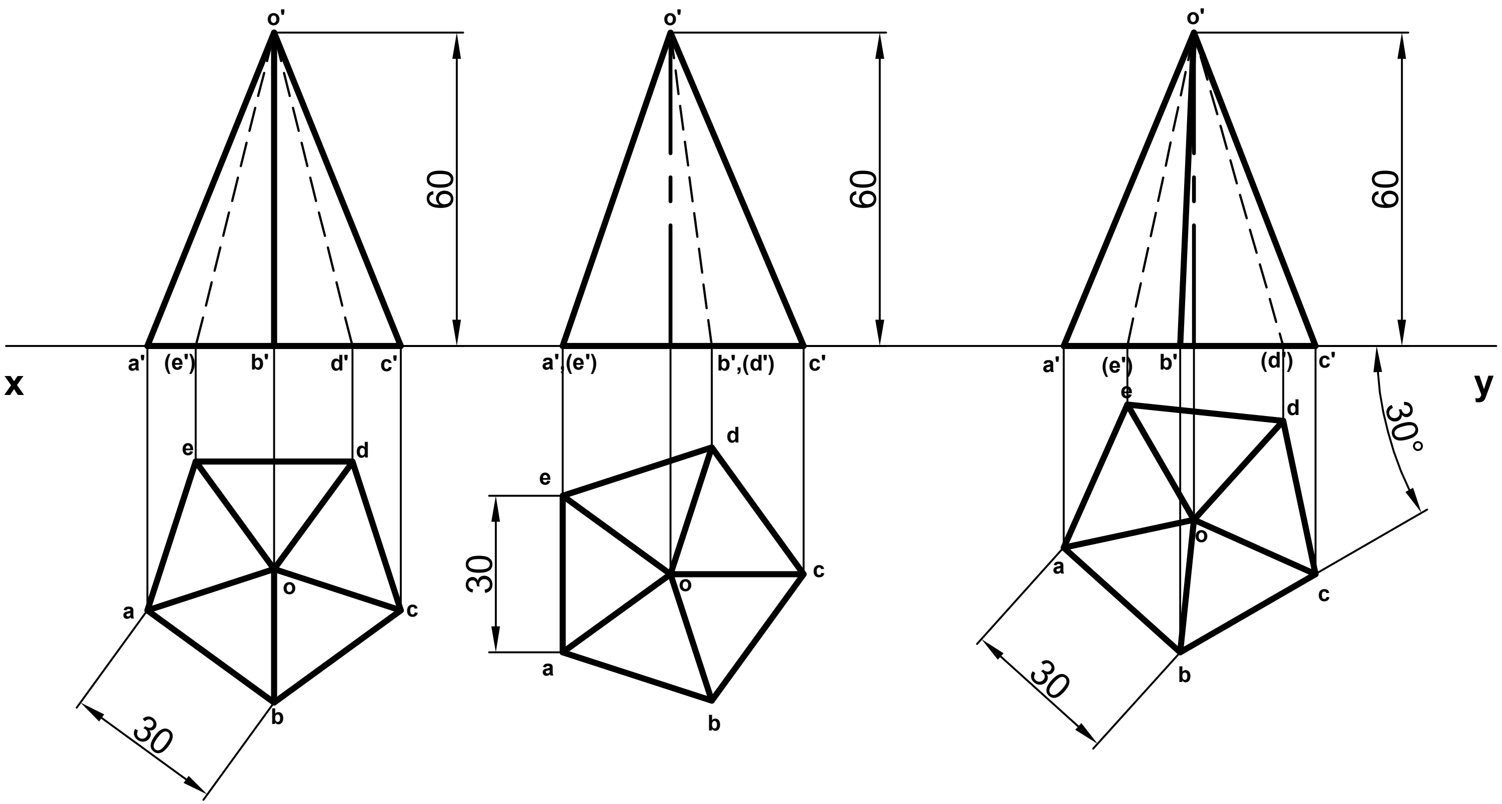
Lava Kumar P	**Projection of Planes**	**14.01.2023**	

10. The top view of a square plane of diagonal 80 mm appears as a rhombus of 80 mm and 50 mm diagonals. One of the corners of the plane is in the H.P. Draw its projections when one of the diagonals is parallel to both the principal plane.



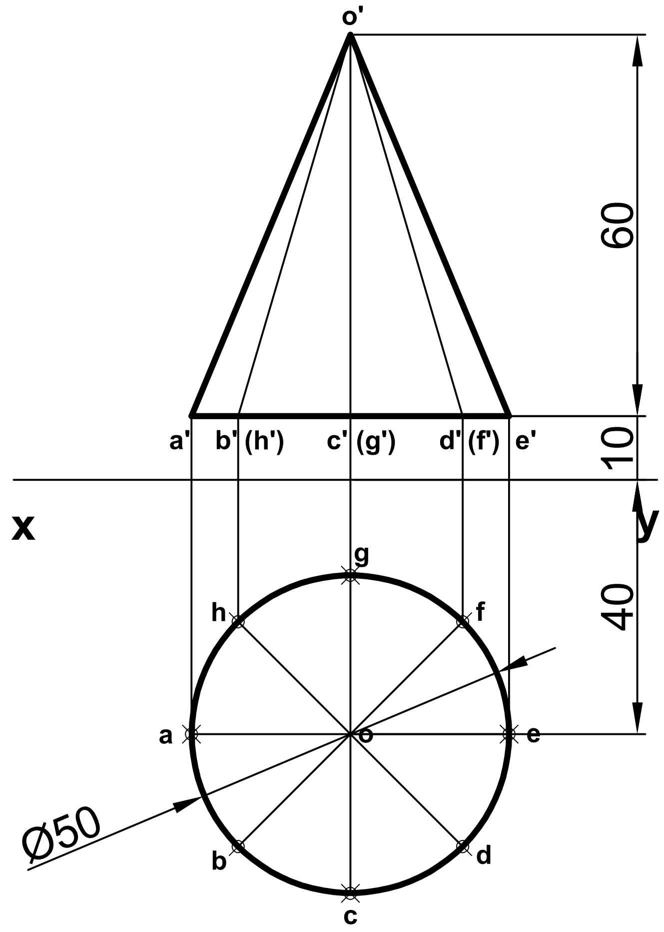
Lava Kumar P	Projection of Planes	14.01.2023	

1. **Draw the projections of a pentagonal pyramid, base side 30 mm and axis 60 mm, rests on its base on the HP with a side of the base (a) parallel to the VP, (b) perpendicular to the VP and (c) inclined at 30° to the VP.**



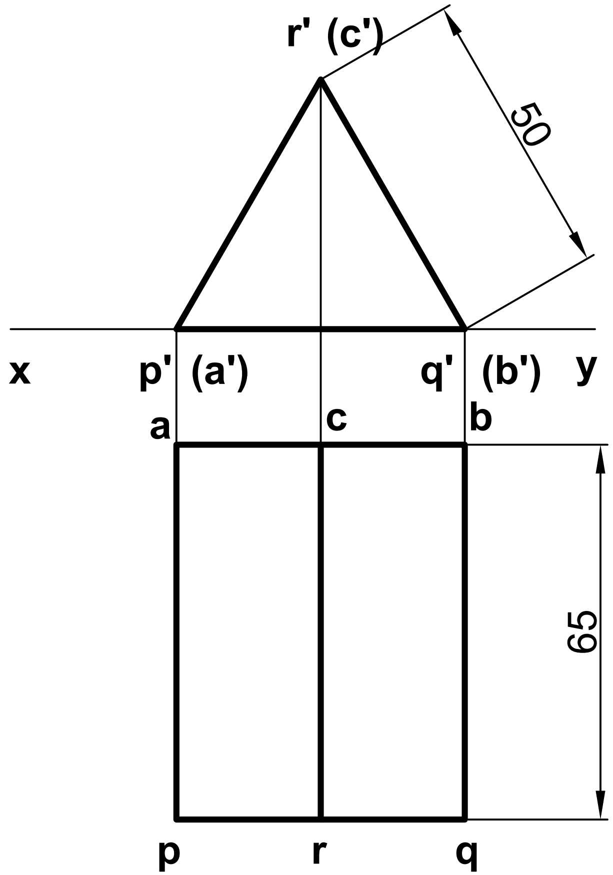
Lava Kumar P	**Projection of Solids**	**15.01.2023**	

2. A cone of base diameter 50 mm and axis 60 mm has its base parallel to and 10 mm above the HP while the axis is parallel to and 40 mm in front of the VP. Draw its projections.



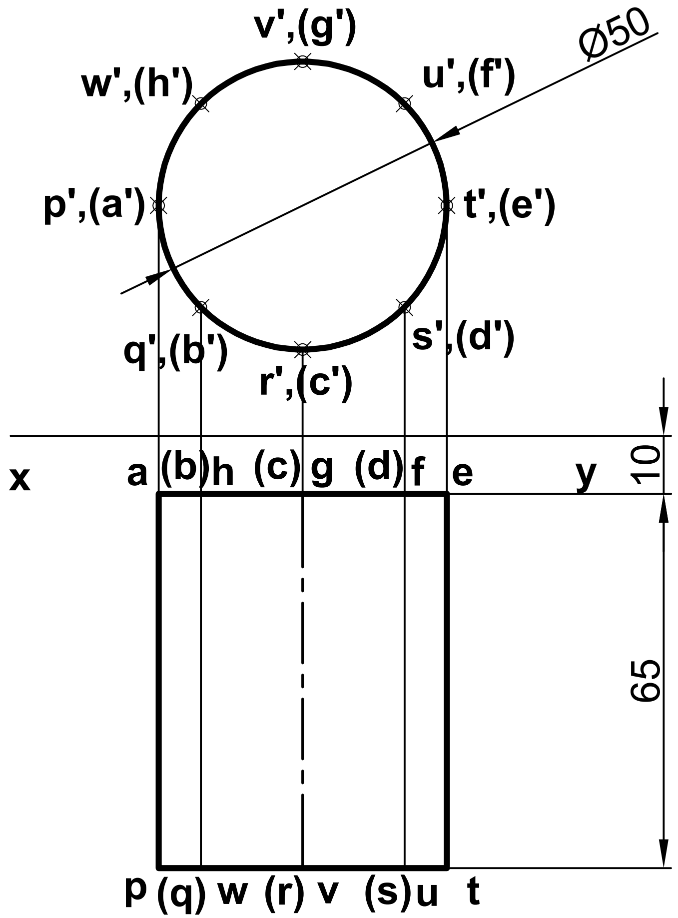
Lava Kumar P	**Projection of Solids**	**15.01.2023**	

3. Draw the projections of a triangular prism of base edge 50 mm and axis 65 mm is placed on one of its rectangular faces on the HP such that the axis is perpendicular to the VP.



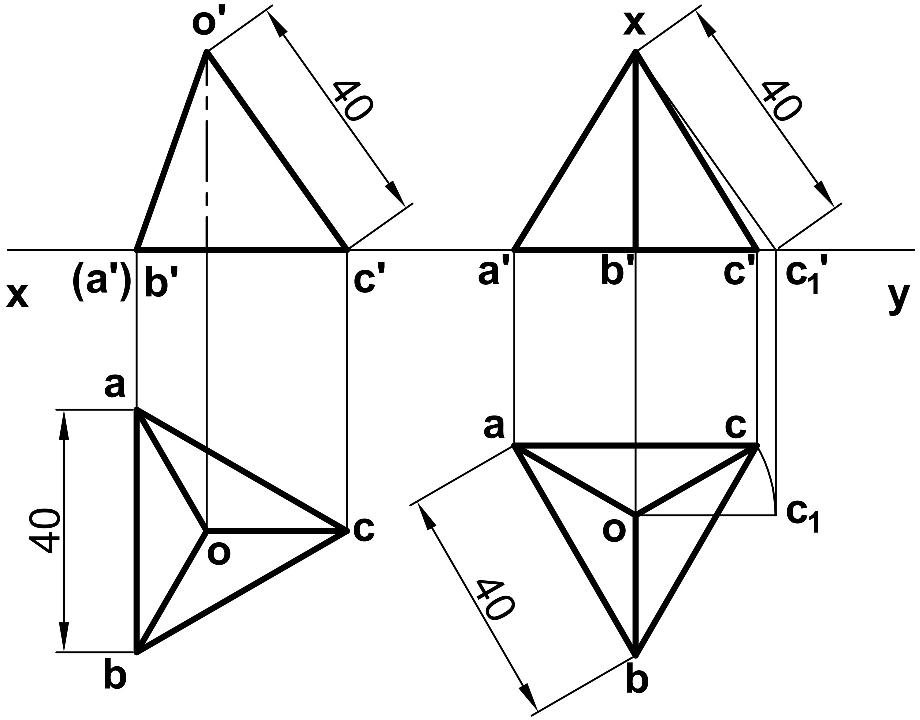
Lava Kumar P	**Projection of Solids**	**15.01.2023**

4. A cylinder of base diameter 50 mm and axis 65 mm has its axis 40 mm above H.P. and perpendicular to VP. Draw its projections when one of the bases being 10 mm in front of the VP.



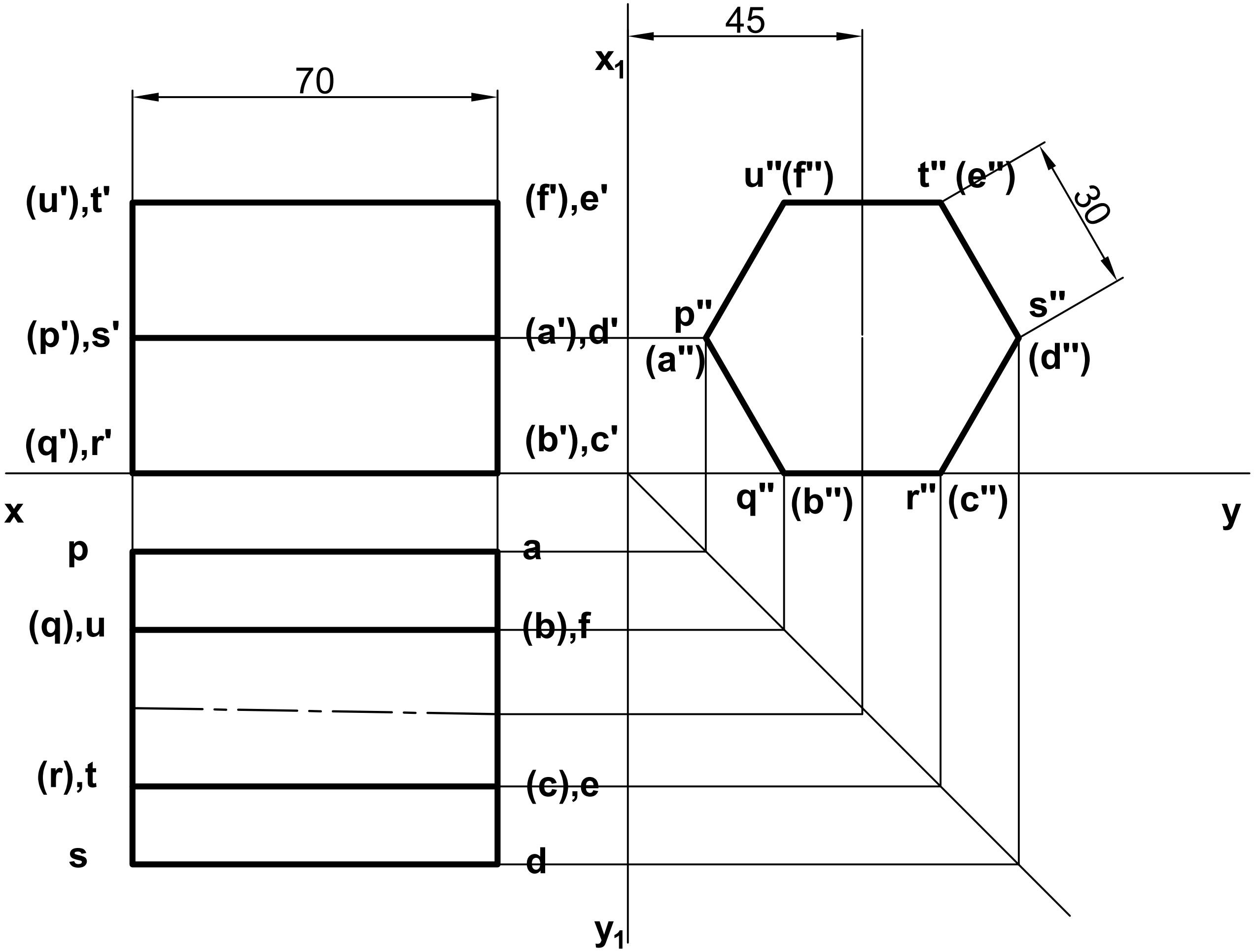
Lava Kumar P	Projection of Solids	15.01.2023	

5. A tetrahedron of side 40 rests with its base on HP Draw its projections when one of its edges is (a) perpendicular to VP (b) parallel to VP and 10 in front of VP



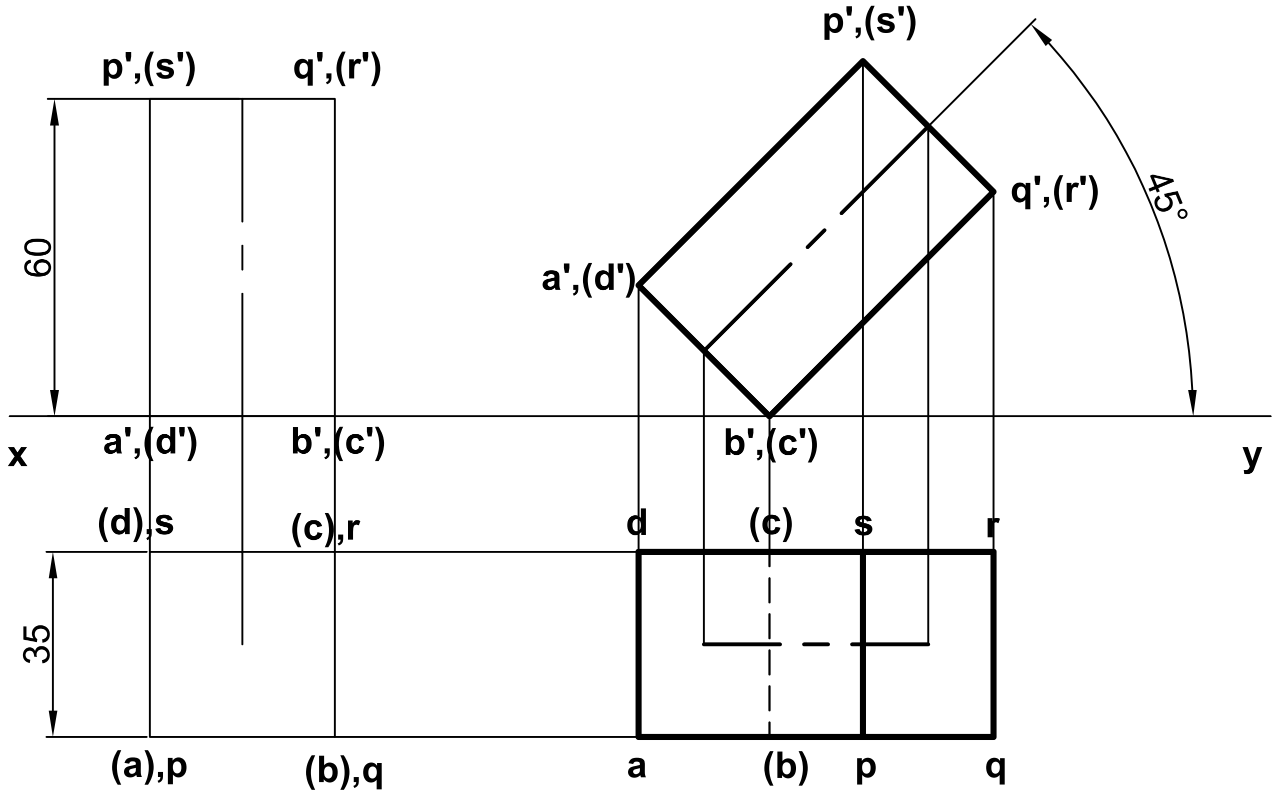
Lava Kumar P	**Projection of Solids**	**15.01.2023**	

6. A hexagonal prism of base side 30 mm and axis 70 mm, rests on a rectangular face on the HP such that the axis is parallel to and 45 mm in front of the VP. Draw its projections.



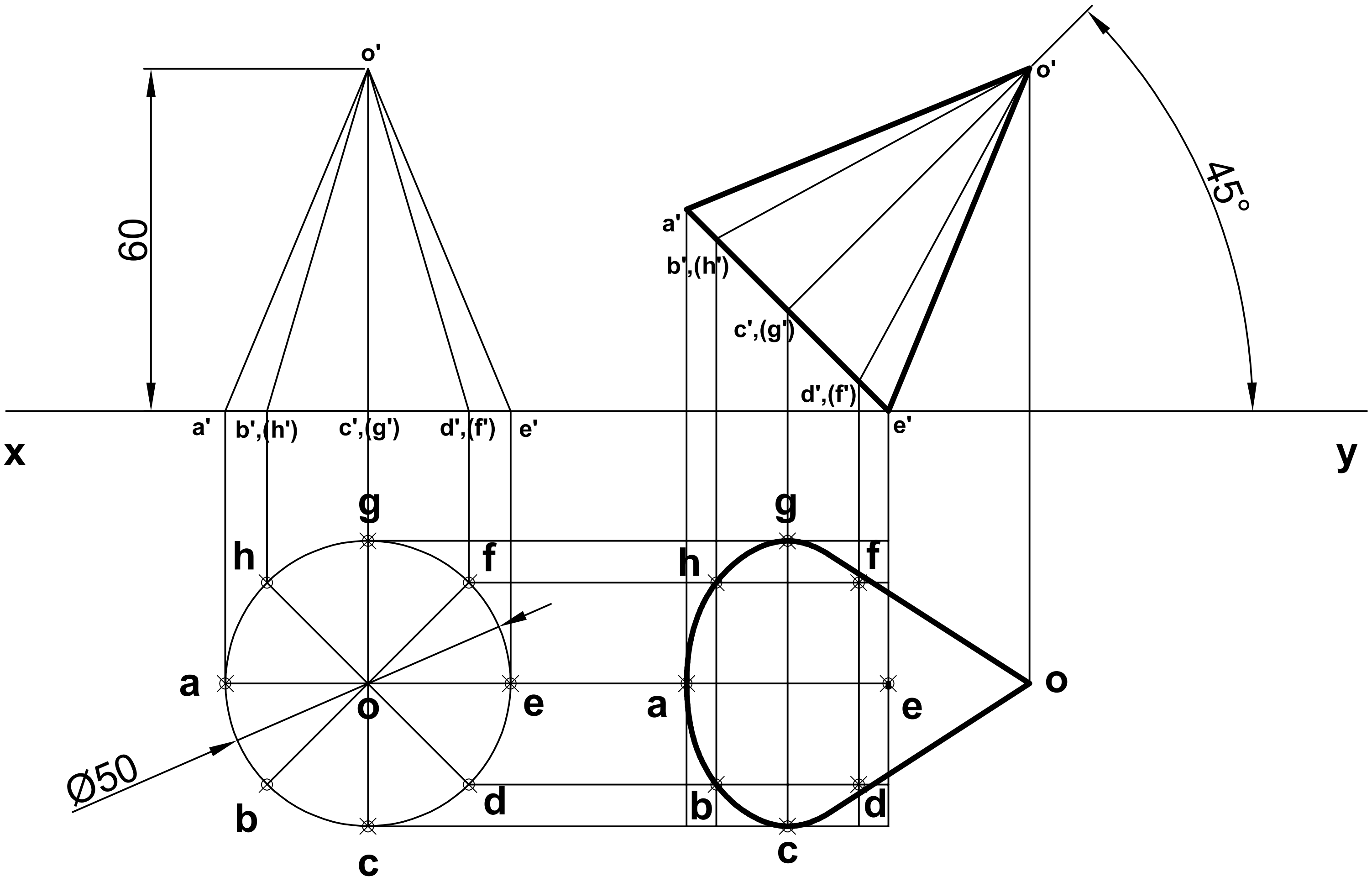
Lava Kumar P	Projection of Solids	15.01.2023	

7. A square prism of base edge 35 mm and axis 60 mm is resting on an edge of its base such that the axis is parallel to VP and inclined at 45° to the HP. Draw its projections.



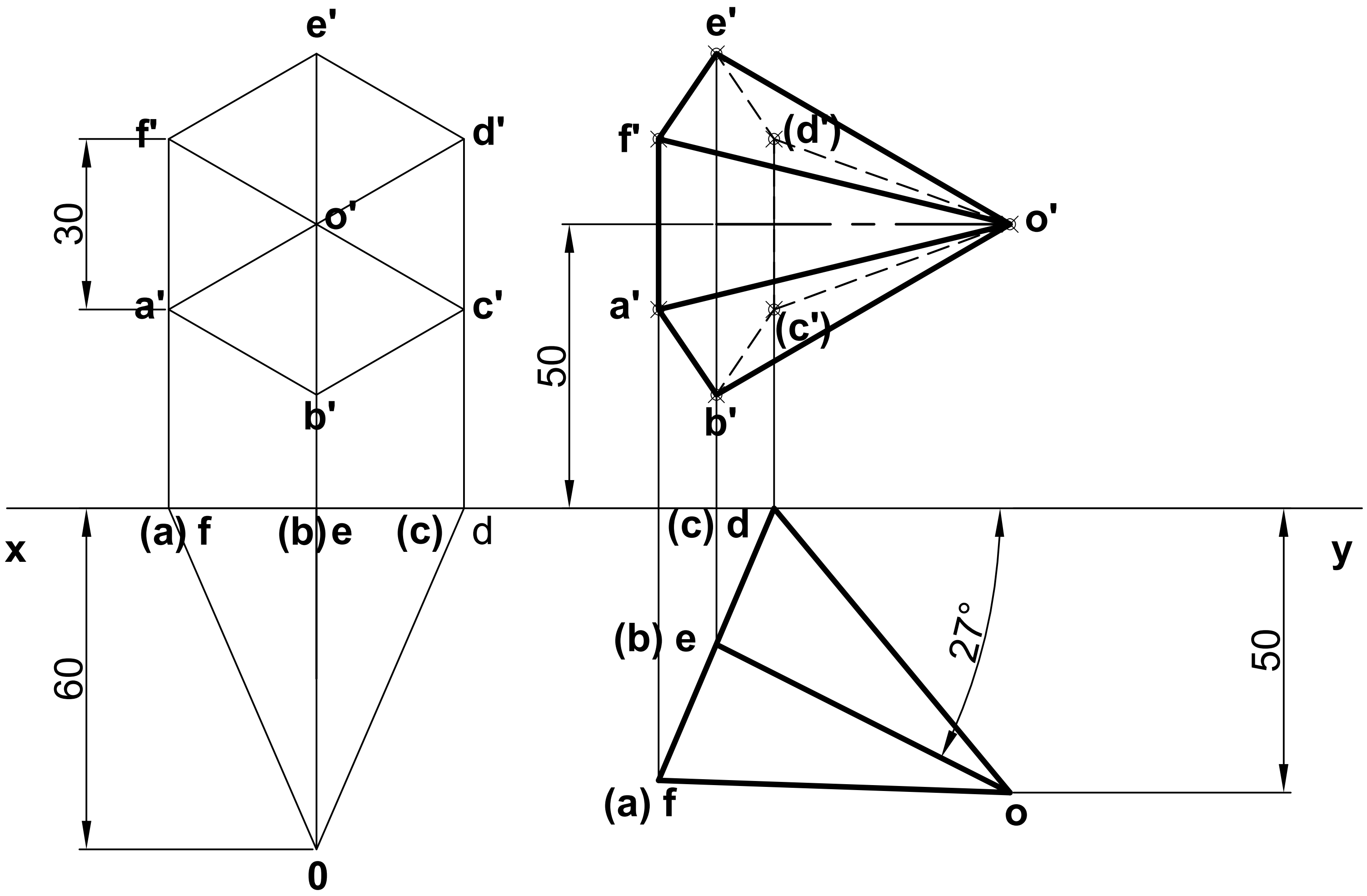
Lava Kumar P	Projection of Solids	15.01.2023	

8. A cone of base diameter 50 mm and height 60 mm is resting on a point of its base circle on the HP with its axis parallel to the VP and inclined at 45° to the HP. Draw its projections.



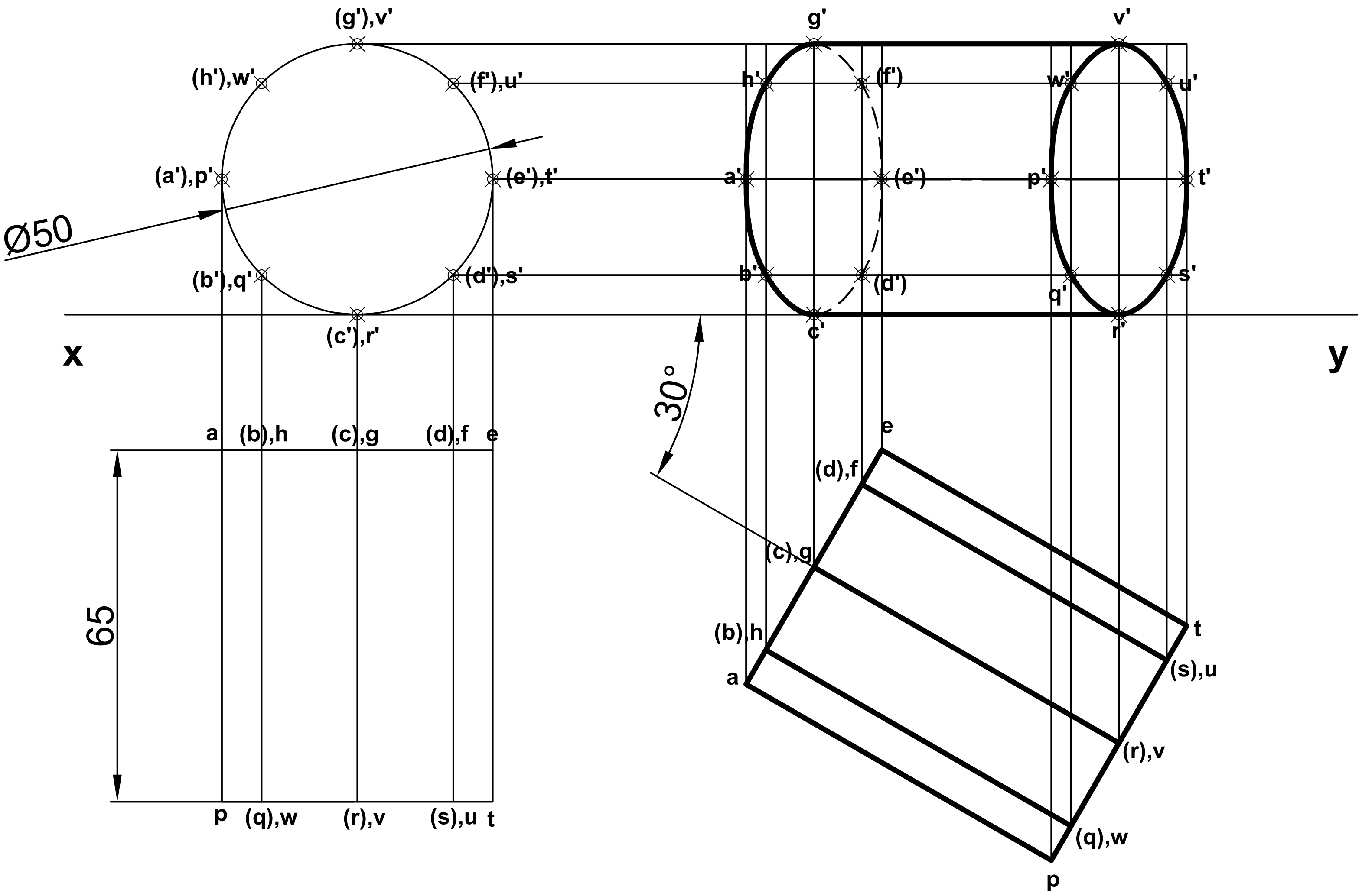
Lava Kumar P	**Projection of Solids**	**15.01.2023**	

9. A hexagonal pyramid of base side 30 mm and axis 60 mm has an edge of its base in the VP and the apex is 50 mm away from both the reference planes. Draw its projections when the axis is parallel to the HP.



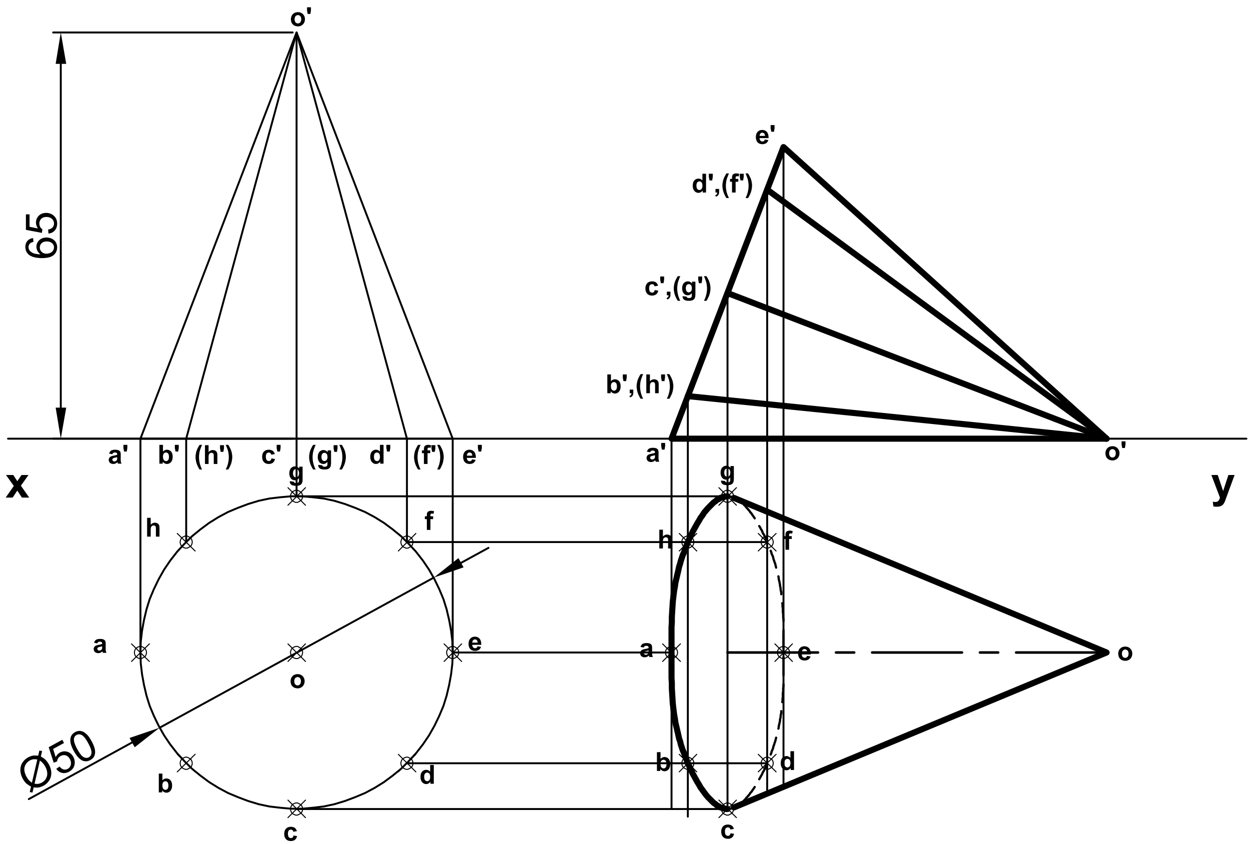
Lava Kumar P	Projection of Solids	15.01.2023	

10. A cylinder of base diameter 50 mm and axis 65 mm is resting on one of its generators on the HP. Draw its projections when the axis is inclined at 30° to the VP.



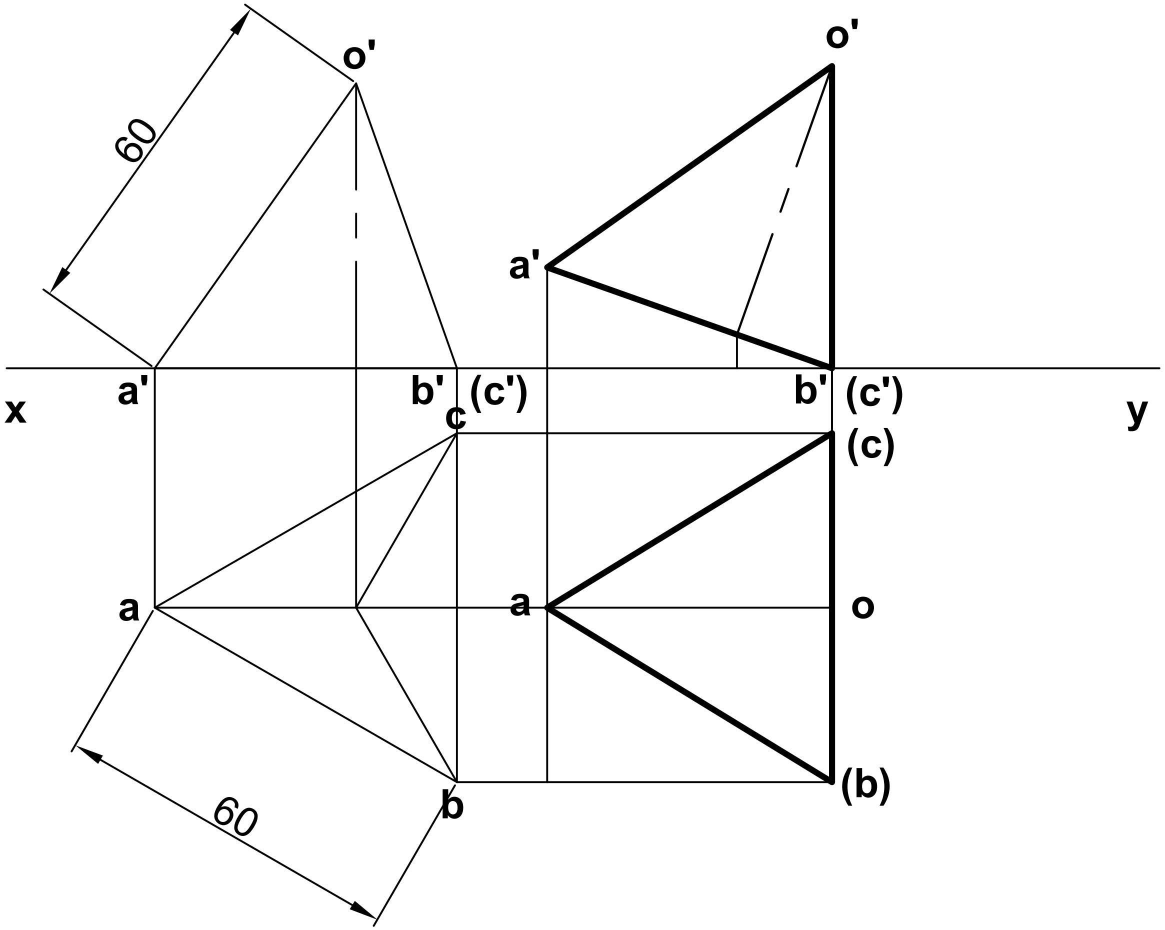
Lava Kumar P	Projection of Solids	15.01.2023	

11. A cone of base diameter 50 mm and axis 65 mm is lying on one of its generators on the HP. Draw its projections.



Lava Kumar P	Projection of Solids	15.01.2023	

12. A tetrahedron of side 60 mm is resting on a side on the HP. such that a face containing that edge is perpendicular to HP. Draw its projections.



Lava Kumar P	**Projection of Solids**	**15.01.2023**	

Unit 4

Sections of Solids and Development of Surfaces

1. Define section of solids

   The solid obtained by cutting a solid by cutting plane is called section of solid.

2. Discuss the need for sectioning of solids in engineering practices.

   Need of sectioning is to reveal hidden details of an object.

3. How do we represent a sectional surface in drawing?

   A sectional surface is represented by hatching.

4. Distinguish between true and apparent sections.

   <u>True section:</u> Projection of cut surface on a plane parallel to the section plane is known as true shape of the section

   <u>Apparent section:</u> Projection of cut surface on a plane not parallel to the section plane is known as apparent shape of the section.

5. What do you mean by development of surfaces?

   The development of surface is the shape of a plain sheet that by proper folding could be converted into desired object.

6. Explain the importance of development of surfaces in engineering.

   Main importance of development of surface is it helps to reduce wastage of materials during production of objects.

7. List out various methods for development of regular solids.

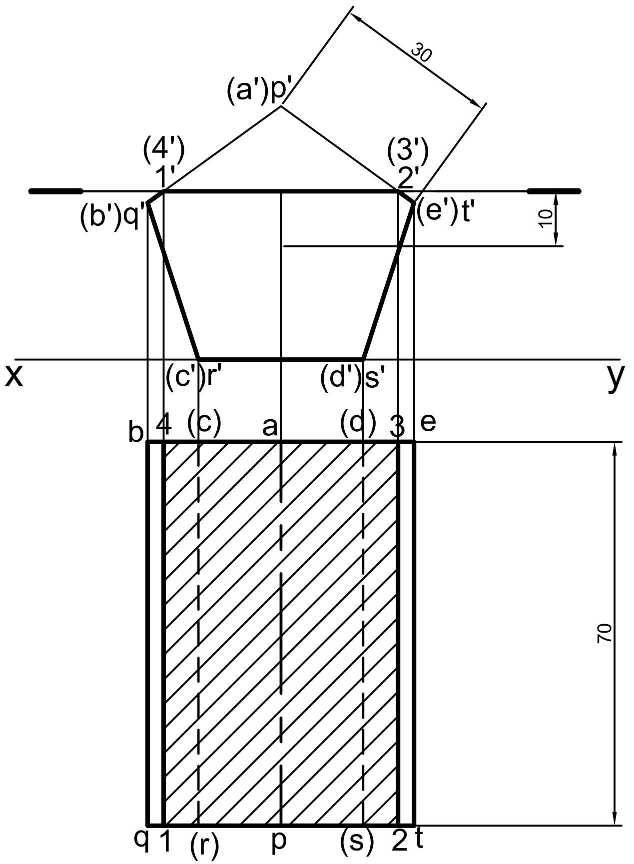
   Various methods for development of solids are

   - Parallel line method which is used for prisms and cylinders
   - Radial line method which is used for pyramids and cones

8. Write down applications of development of surfaces.

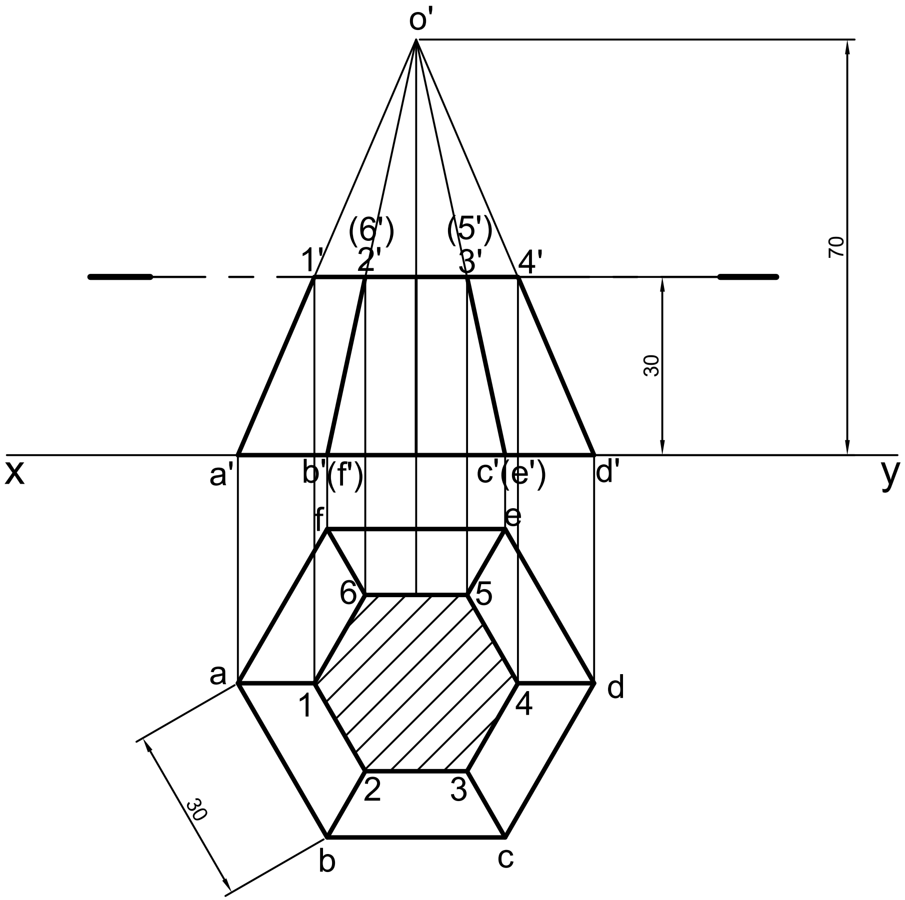
   Applications are chimneys, AC ducts, funnels, automobile bodies etc.

1. **A pentagonal prism of 30 x 70 is resting on one of its rectangular faces on HP and axis is perpendicular to VP. It is cut by a horizontal sectional plane and cuts the prism at a distance 10 above the axis. Draw its sectional top view and front view.**



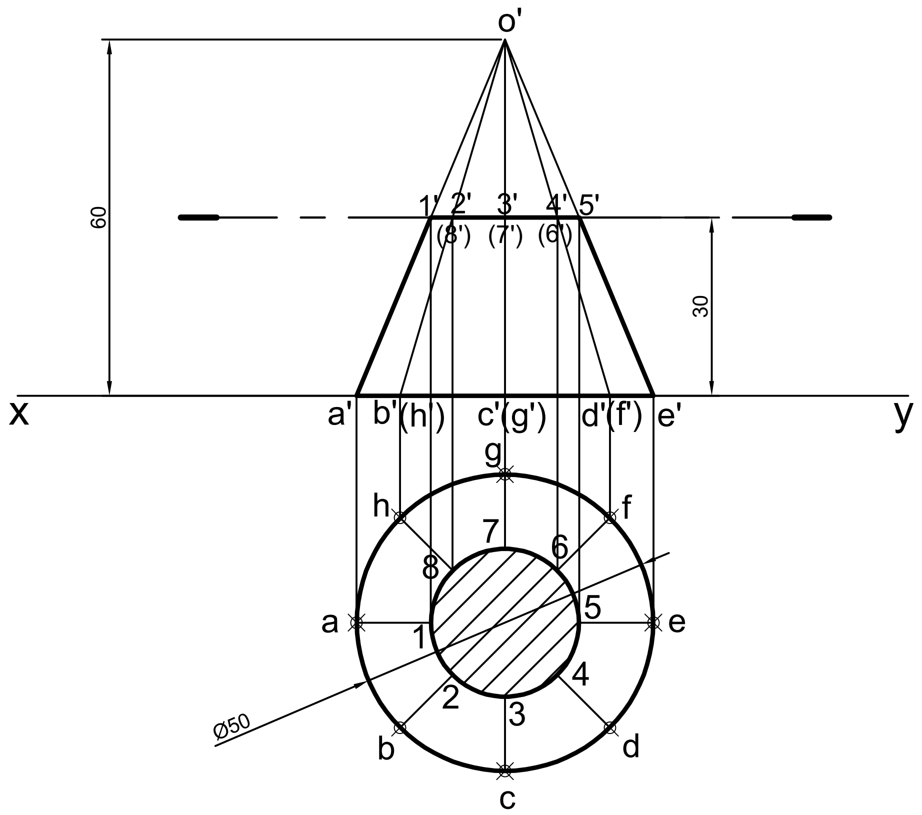
Lava Kumar P	**Section of Solids**	**29.01.2023**	

2. A hexagonal pyramid of 30 x 70 is resting on its base on HP with one of the base edge parallel to VP. It is cut by a horizontal sectional plane and cuts the pyramid at a distance 30 from base. Draw its sectional top view and front view.



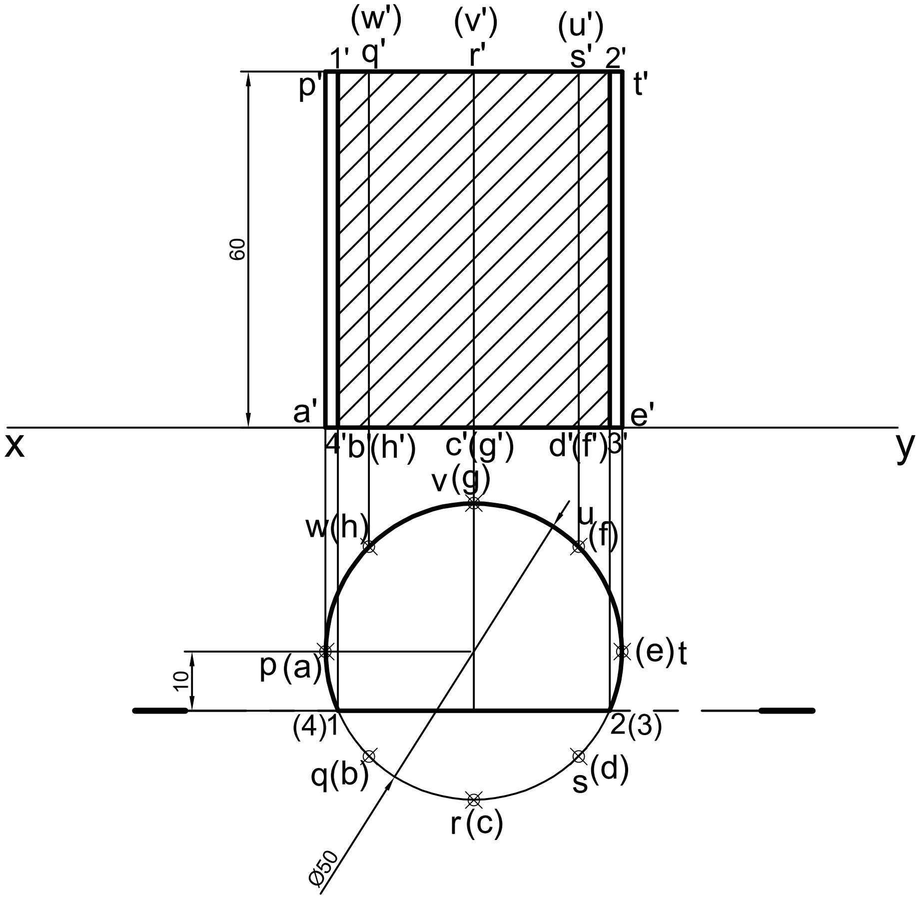
Lava Kumar P	Section of Solids	29.01.2023	

3. A cone of 50 x 60 is resting on its base on HP. It is cut by a horizonal sectional plane and bisects the axis, Draw its sectional top view and front view.



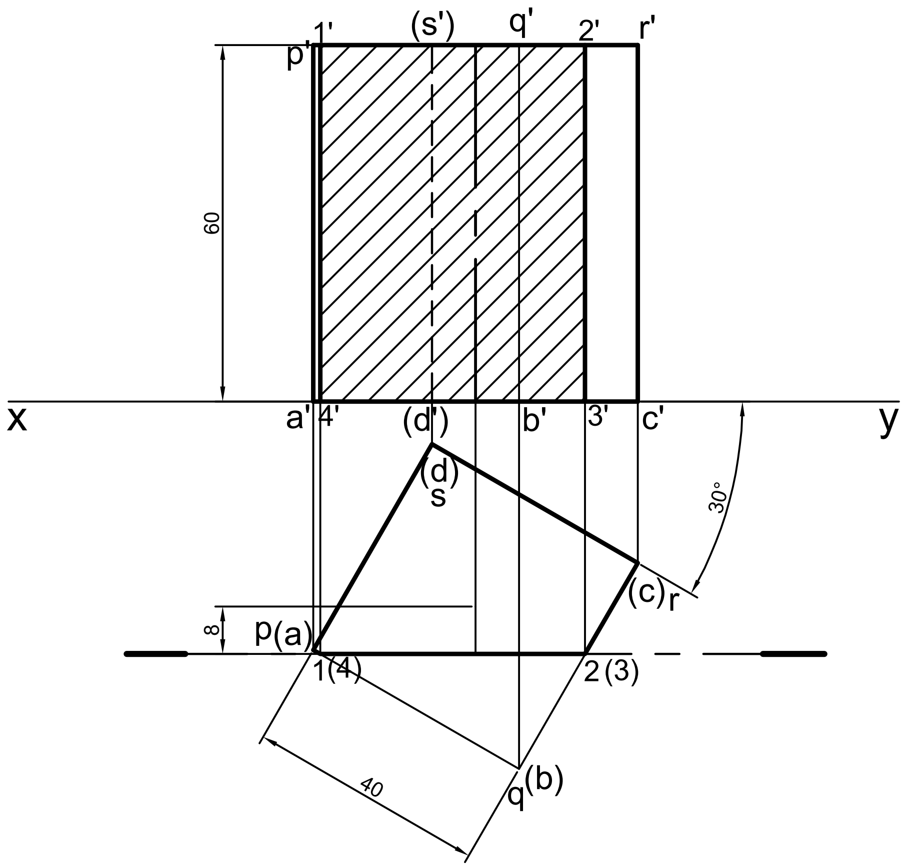
Lava Kumar P	**Section of Solids**	**29.01.2023**	

4.A cylinder of 50 x 60 is resting on one of its bases on HP. It is cut by a vertical sectional plane and cuts the cylinder at a distance 10 from the axis. Draw its sectional front view and top view.



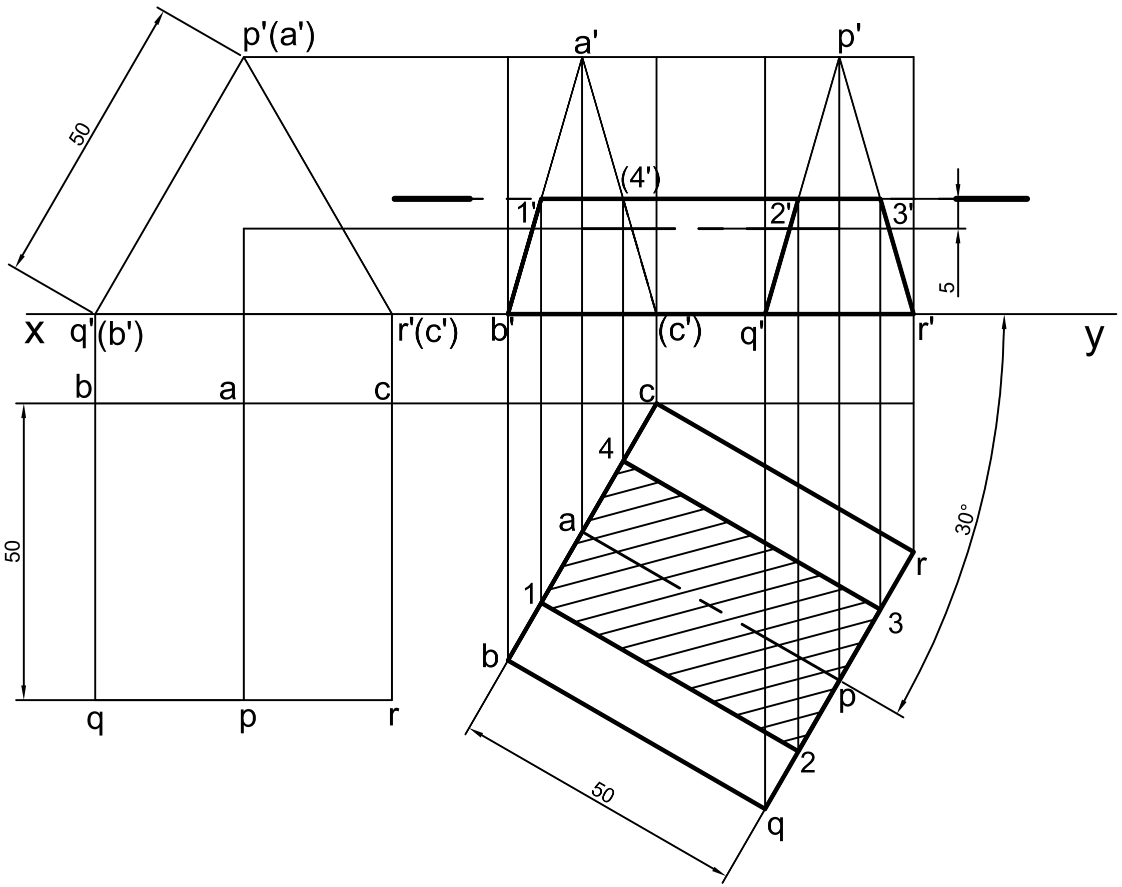
Lava Kumar P	Section of Solids	29.01.2023	

5. A square prism of 40 x 60 is resting on one of its bases on HP with one of the base edges inclined at an angle 30^0 to VP. It is cut by a vertical sectional plane and cuts the prism at a distance 8 from the axis. Draw its sectional front view and top view.



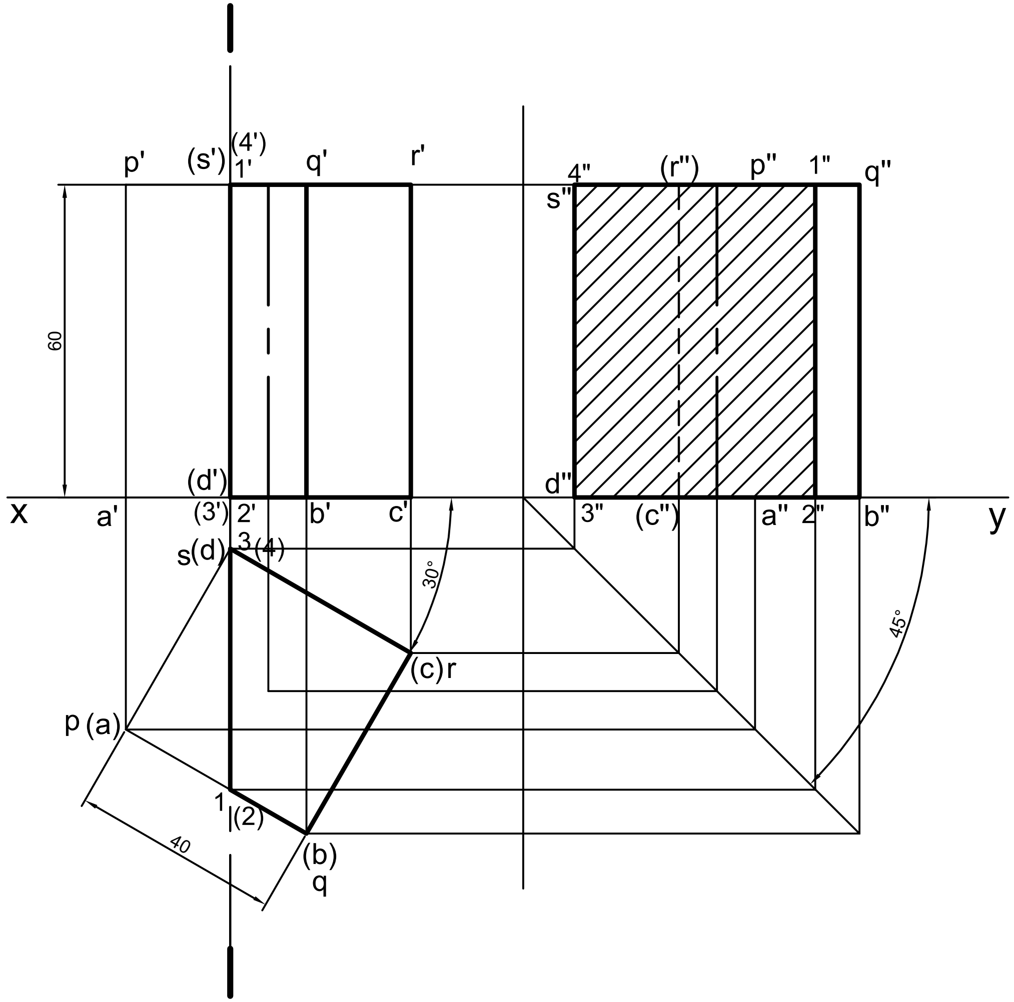
Lava Kumar P	Section of Solids	29.01.2023	

6.A triangular prism of 50 x 50 lies on one of its rectangular faces on the HP with its axis inclined at 30° to the VP. It is cut by a horizontal section plane at a distance of 5 from the axis. Draw its front view and sectional top view



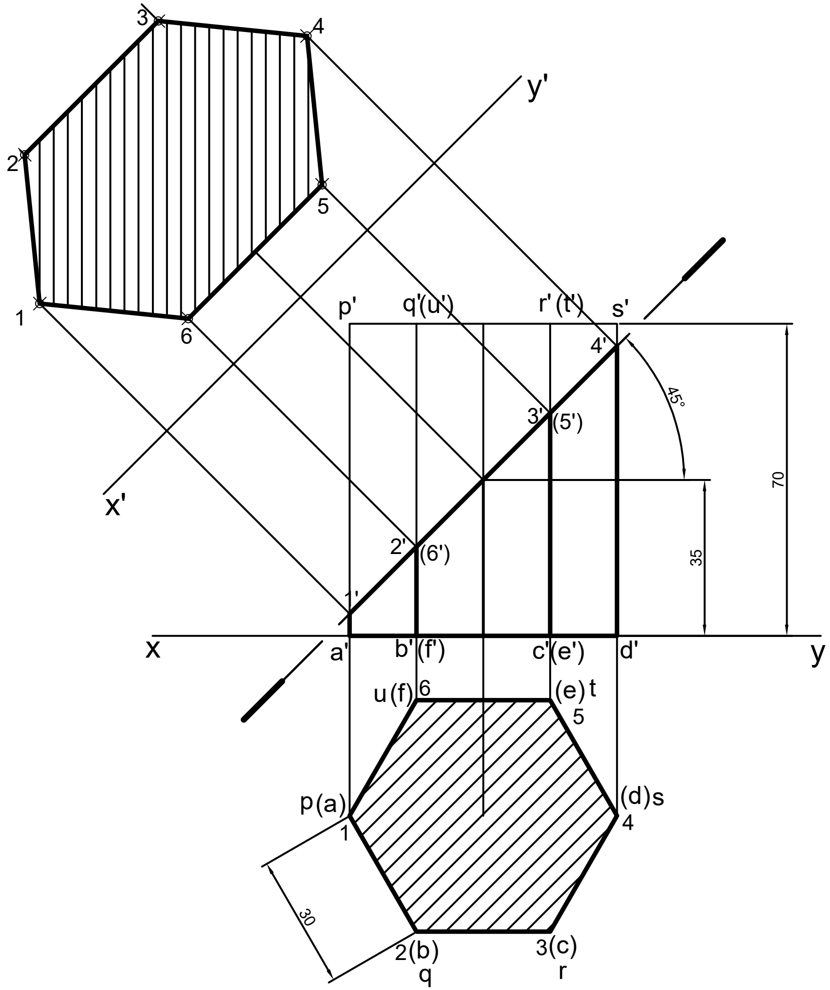
Lava Kumar P	**Section of Solids**	**29.01.2023**

7. A square prism of 40 x 60 on its base on the HP such that one of its rectangular faces is inclined at 30° to the VP. It is cut by a section plane perpendicular to both the HP and the VP, passing through one of the vertical edges. Draw its front view, top view and sectional side view.



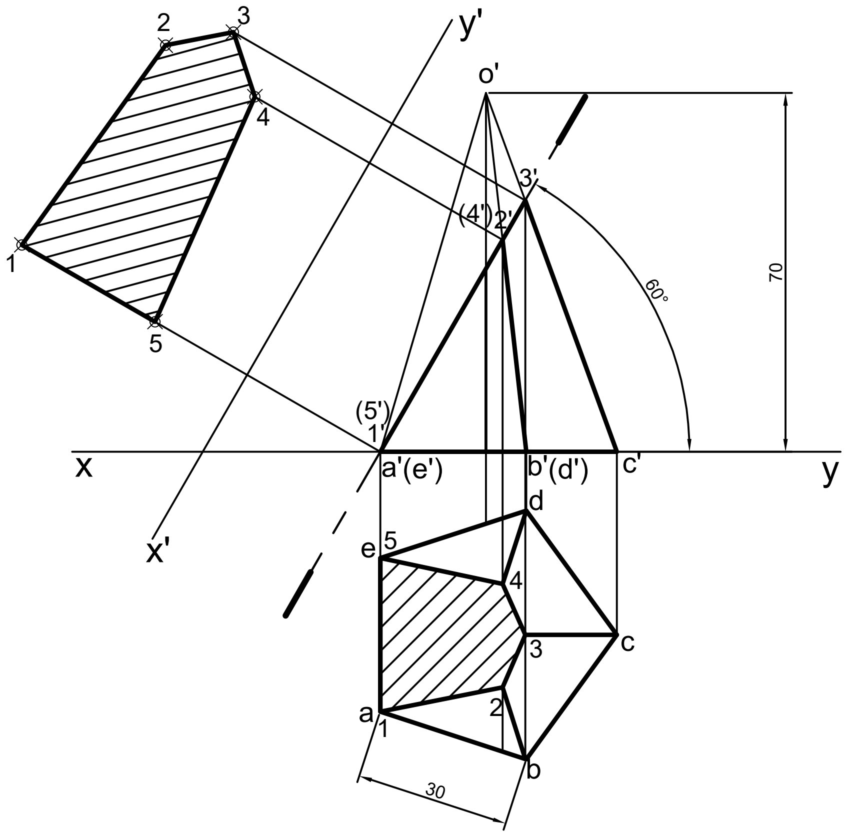
Lava Kumar P	**Section of Solids**	**29.01.2023**

8. A Hexagonal Prism of 30 x 70 is resting on one of its bases on HP with one of the base edge parallel to VP. It is cut by an A.I.P which is inclined at an angle 45^0 to HP and bisects the axis. Draw Sectional top view, front view and true shape of the section.



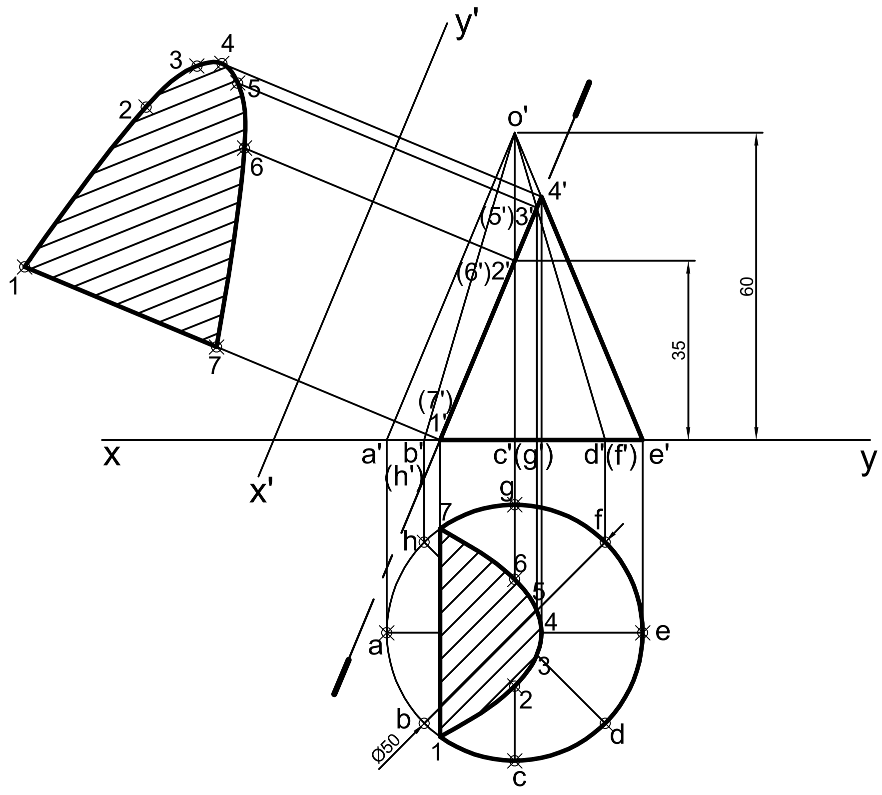
Lava Kumar P	Section of Solids	29.01.2023	

9. A pentagonal pyramid of 30 x 70 is resting on its base with one of the base edge perpendicular to VP. It is cut by an A.I.P which is inclined at an angle 60^0 to HP and passing through the bottom base edge which is perpendicular to VP. Draw Sectional top view, front view and true shape of the section.



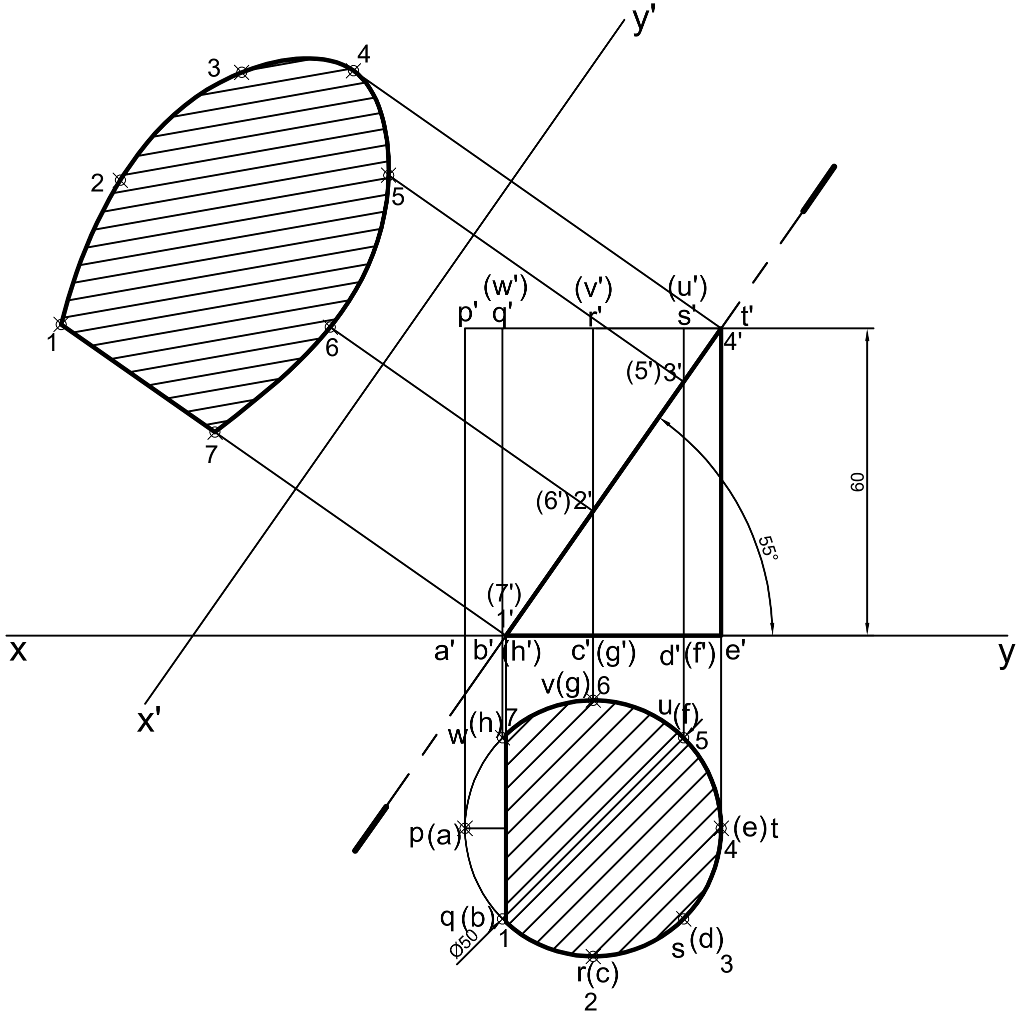
Lava Kumar P	**Section of Solids**	**29.01.2023**	

10. **A cone of 50 x 60 is resting on its base on HP. It is cut by an A.I.P which is parallel to one of its extreme generators and passing through a point on the axis at a distance 35 from its base. Draw Sectional top view, front view and true shape of the section.**



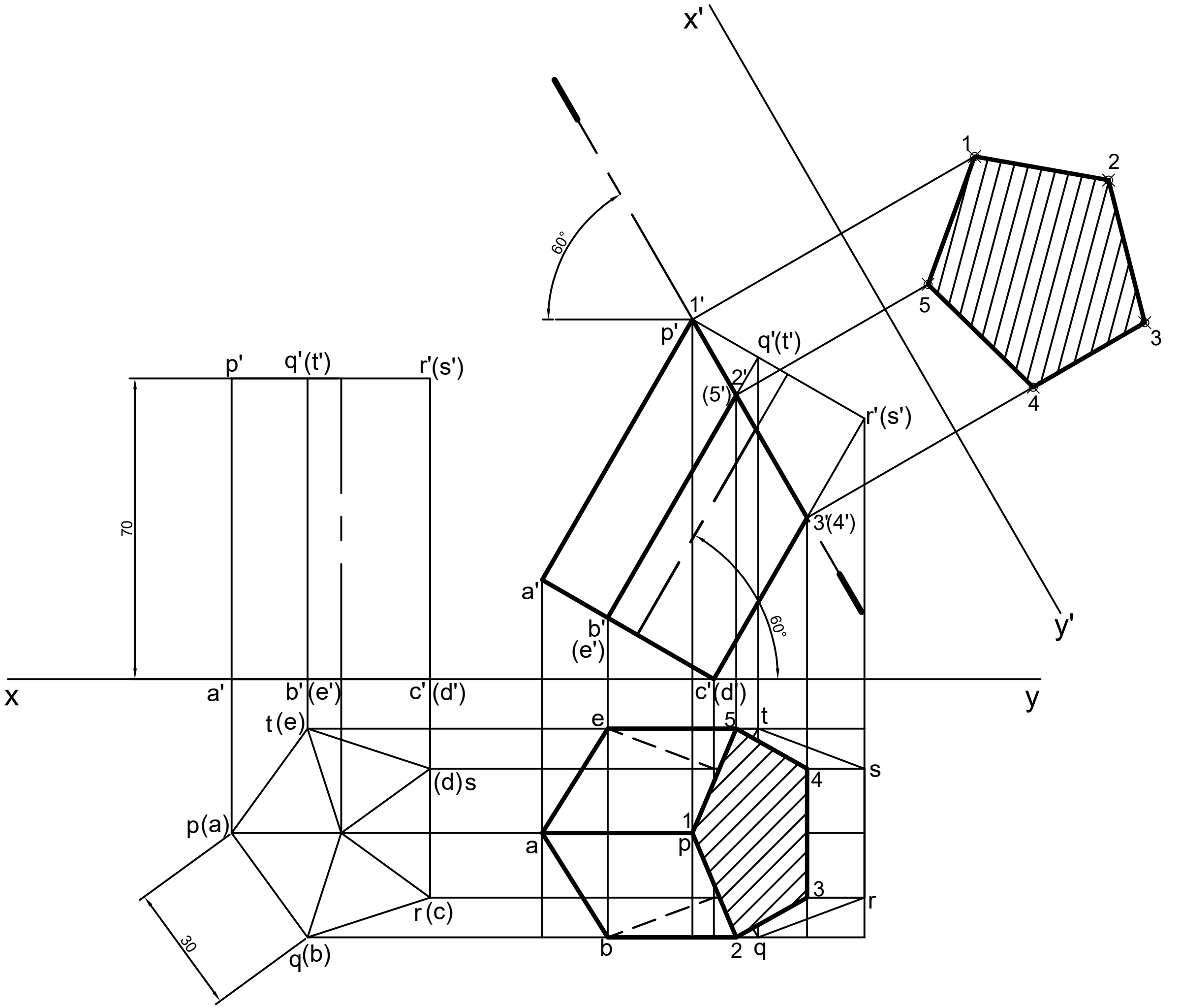
Lava Kumar P	**Section of Solids**	**29.01.2023**	

11.A cylinder of 50 x 60 is resting on one of its bases on HP. It is cut by an A.I.P which is inclined at an angle 55^0 to HP and passing through top end of the extreme right generator. Draw Sectional top view, front view and true shape of the section.



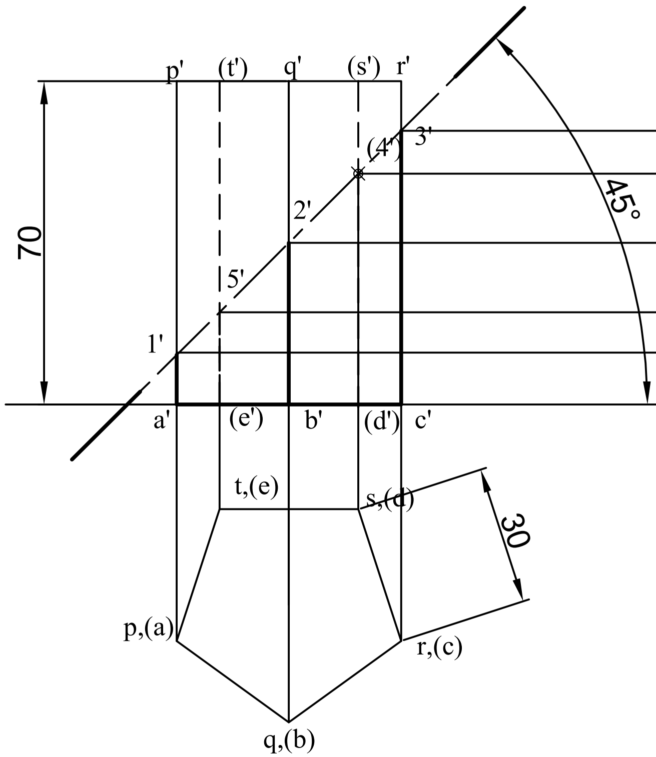
Lava Kumar P	**Section of Solids**	**29.01.2023**	

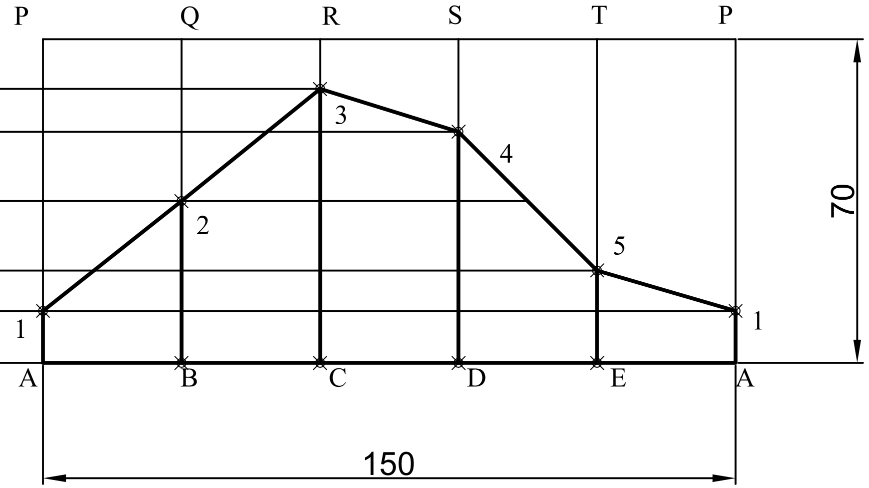
12.A pentagonal prism of 30 x 70 has an edge of its base on the HP. The axis is parallel to the VP and inclined at 60° to the HP. It is cut by an A.I.P. inclined at 60° to the HP and passing through the highest corner of the prism. Draw its sectional top view and true shape of the section.



Lava Kumar P	**Section of Solids**	**29.01.2023**	

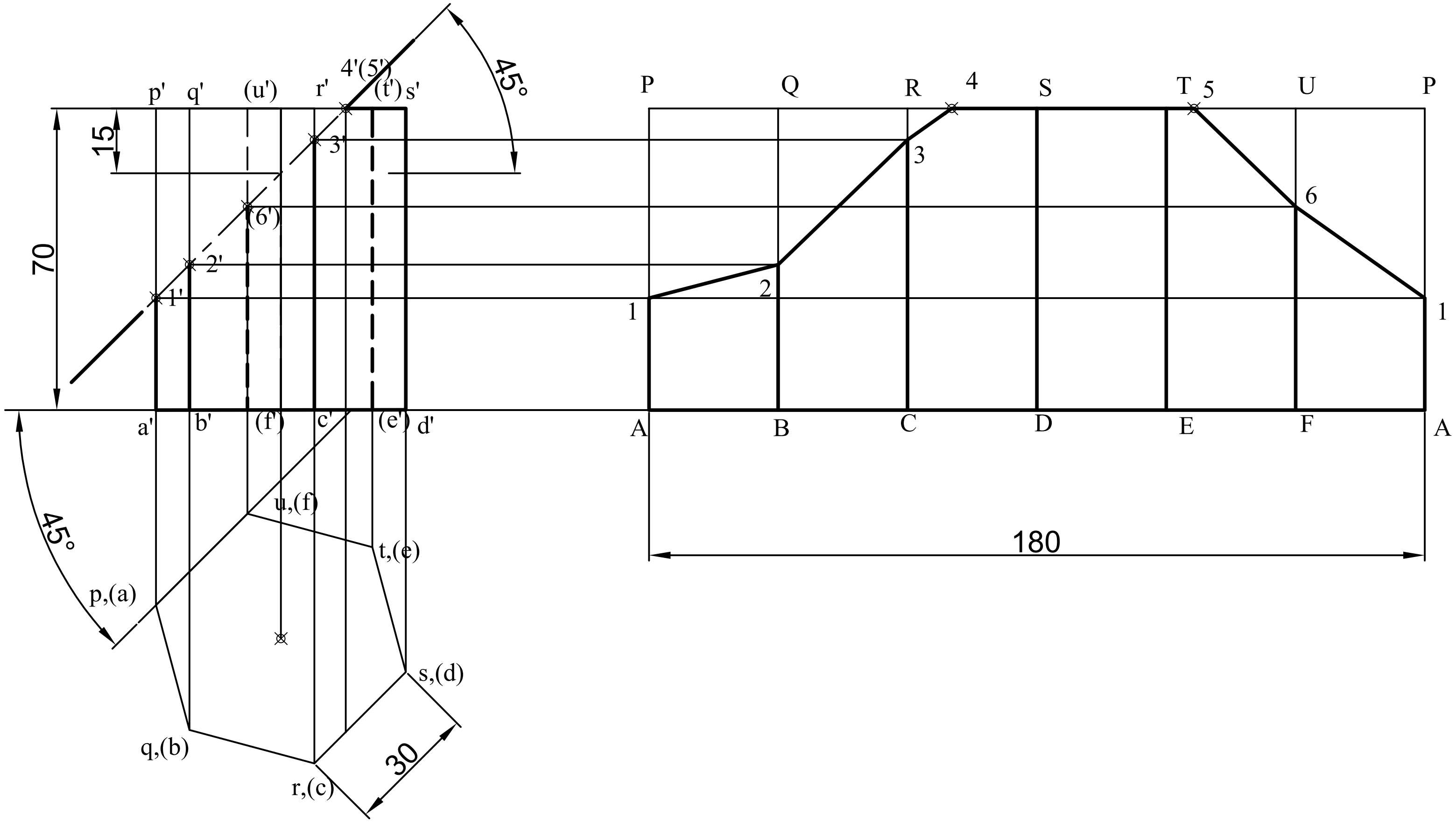
1. **A pentagonal prism of base side 30 mm and axis 70 mm is resting on its base on the HP with a rectangular face parallel to the VP. It is cut by an auxiliary inclined plane (A.I.P.) which is inclined at 45° to the HP and passes through the mid-point of the axis. Draw the development of the lateral surface of the truncated prism.**





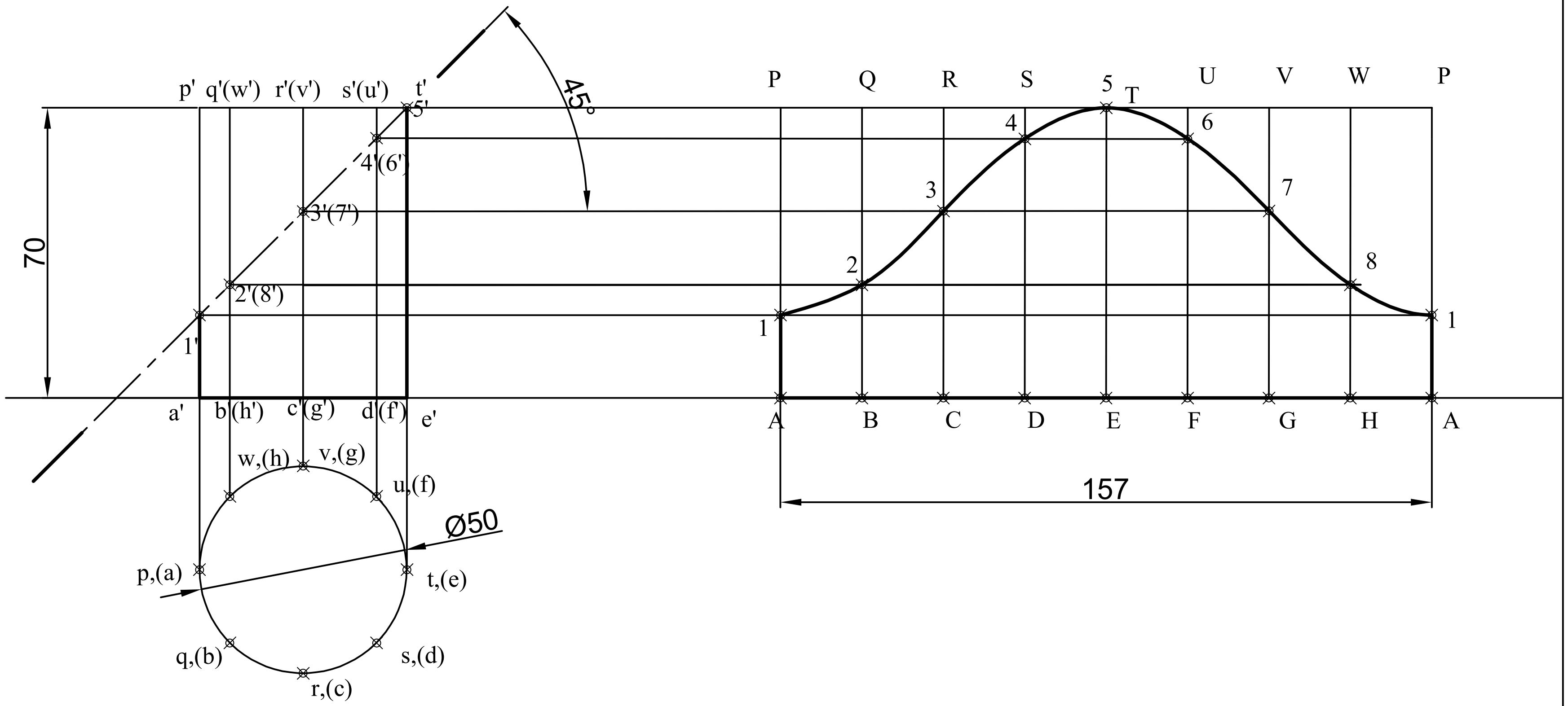
Lava Kumar P	**Development of Surfaces**	**06.02.2023**

2. A hexagonal prism of base side 30 mm and axis 70 mm is resting on its base on the ground with a side of base inclined at 45° to the VP It is cut by an auxiliary inclined plane inclined at 45° to the HP and passes through a point 15 mm below the top end of the axis. Draw the development of the lateral surface of the truncated prism.



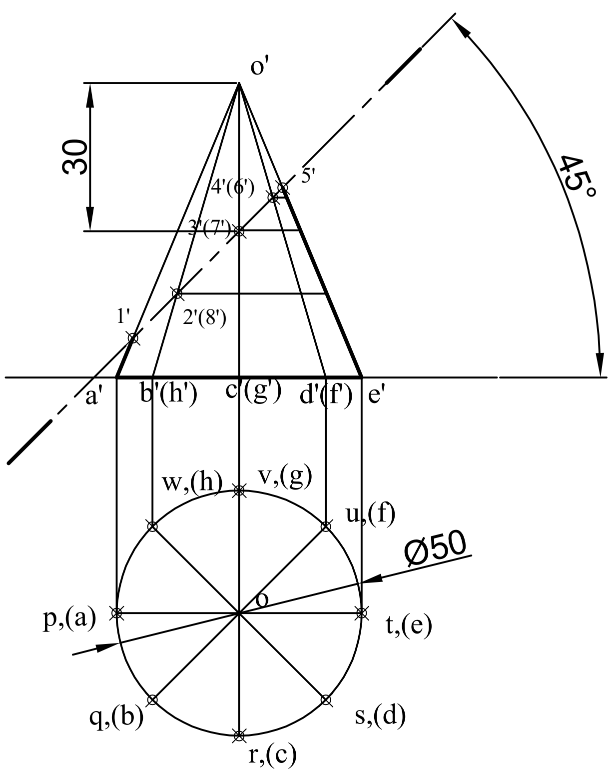
Lava Kumar P	Development of Surfaces	06.02.2023	

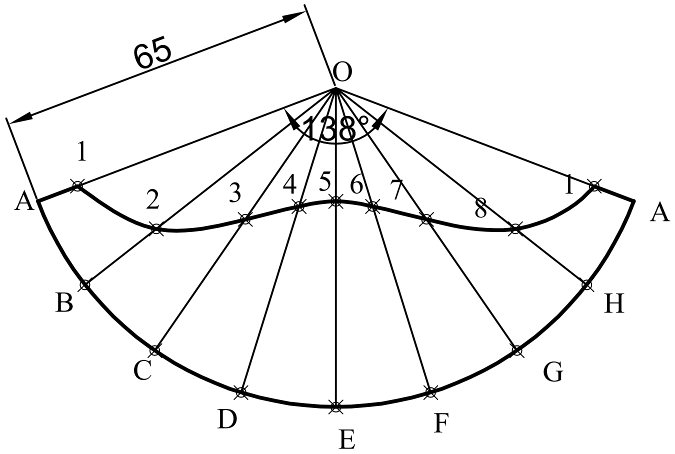
3. A cylinder of base diameter 50 mm and axis 70 mm is resting on ground with its axis vertical. It is cut by a section plane perpendicular to the VP, inclined at 45° to the HP, passing through the top of a generator and cuts all the other generators. Draw the development of its lateral surface.



Lava Kumar P	Development of Surfaces	06.02.2023	

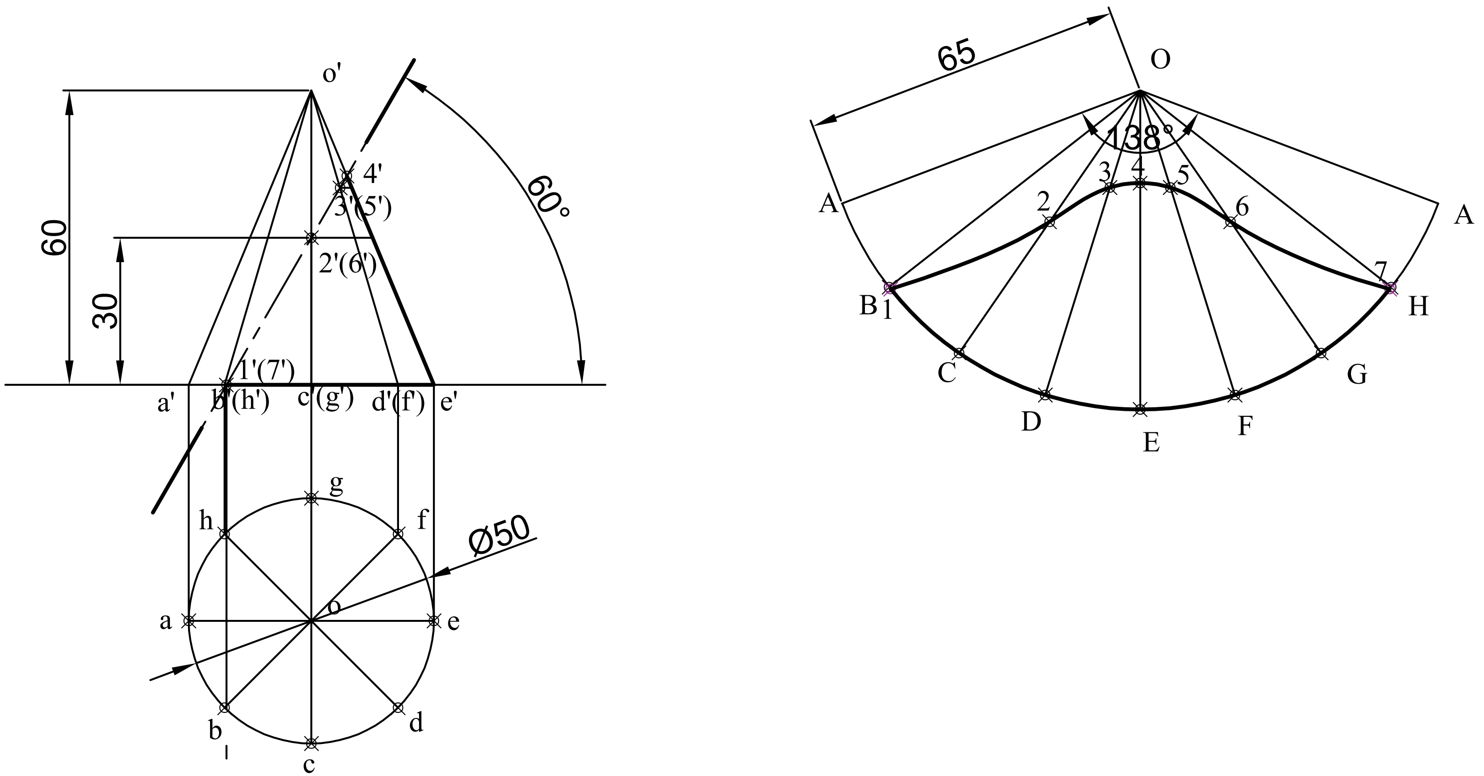
4. **A cone of base diameter 50 mm and axis 60 mm is resting on its base on the HP. A section plane perpendicular to VP and inclined at 45° to HP, bisects the axis of the cone. Draw the development of its lateral surface.**





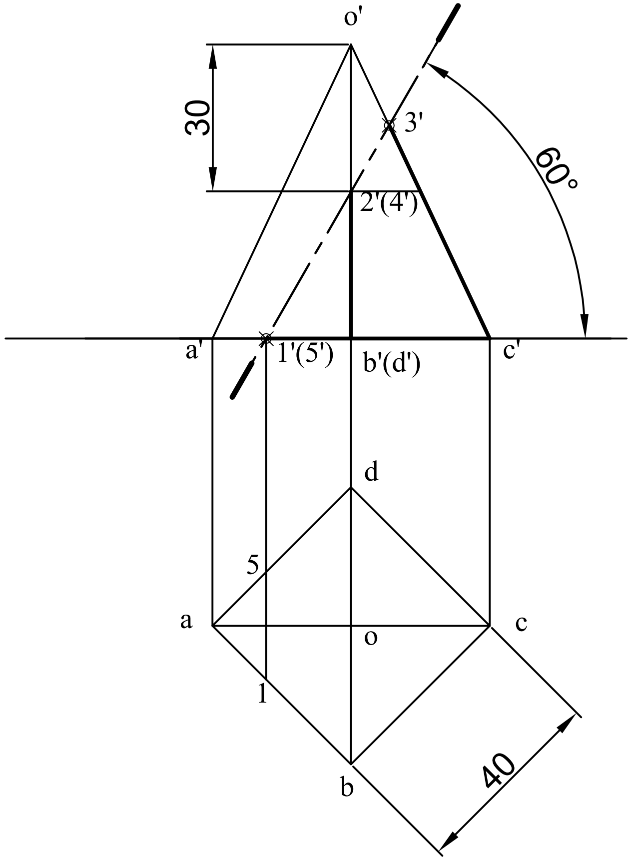
Lava Kumar P	Development of Surfaces	06.02.2023	

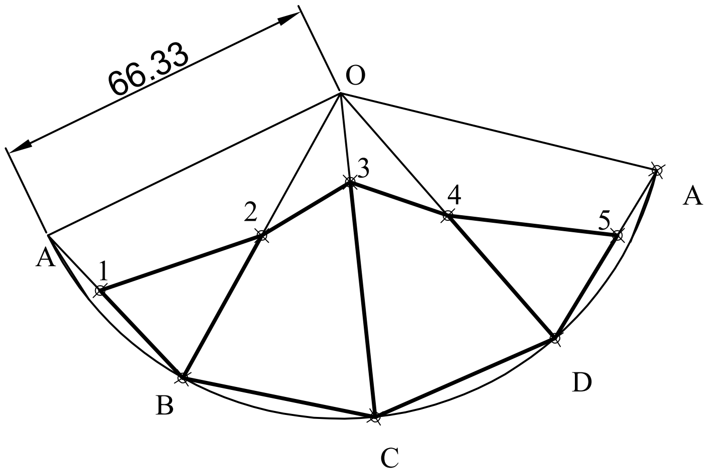
5. A cone of base diameter 50 mm and axis 60 mm is resting on its base on the HP Draw the development of its lateral surface when it is cut by an auxiliary inclined plane inclined at 60° to the HP and bisecting the axis.



Lava Kumar P	**Development of Surfaces**	**06.02.2023**	

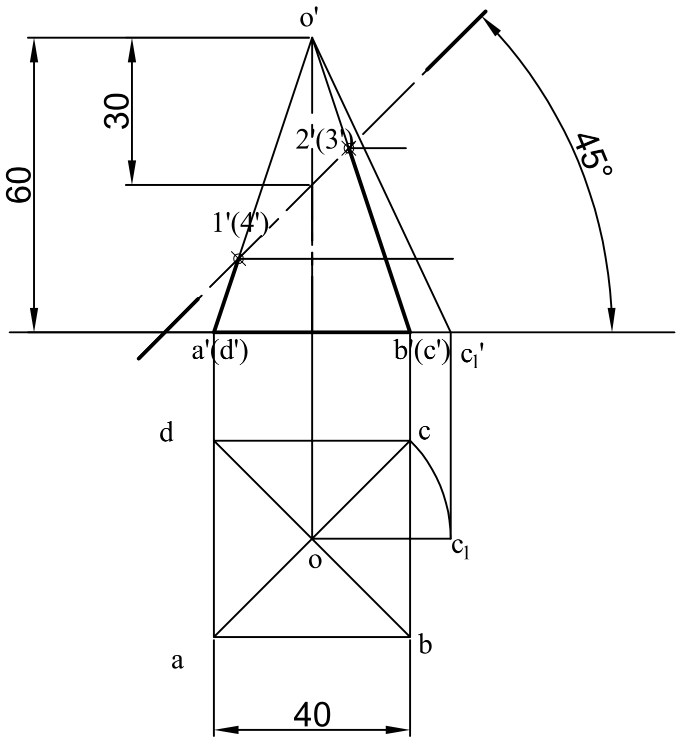
6. **A square pyramid of base side 40 mm and axis 60 mm is resting on its base on the HP such that all the sides of the base are equally inclined to the VP It is cut by a section plane perpendicular to the VP and inclined at 60° to the HP, bisecting the axis. Draw the development of its lateral surface.**

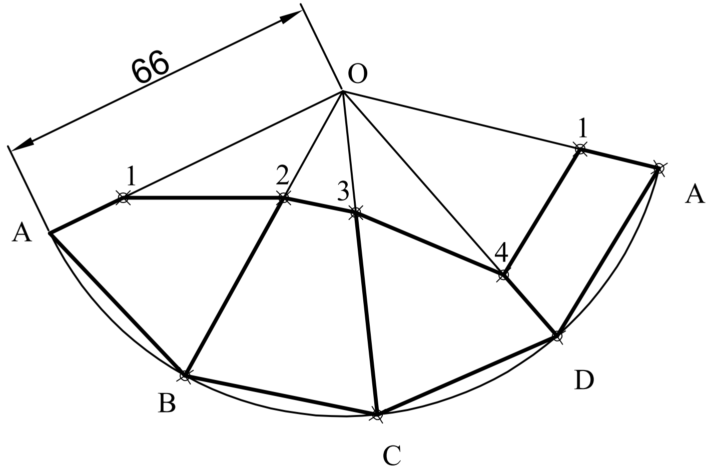




Lava Kumar P	Development of Surfaces	06.02.2023	

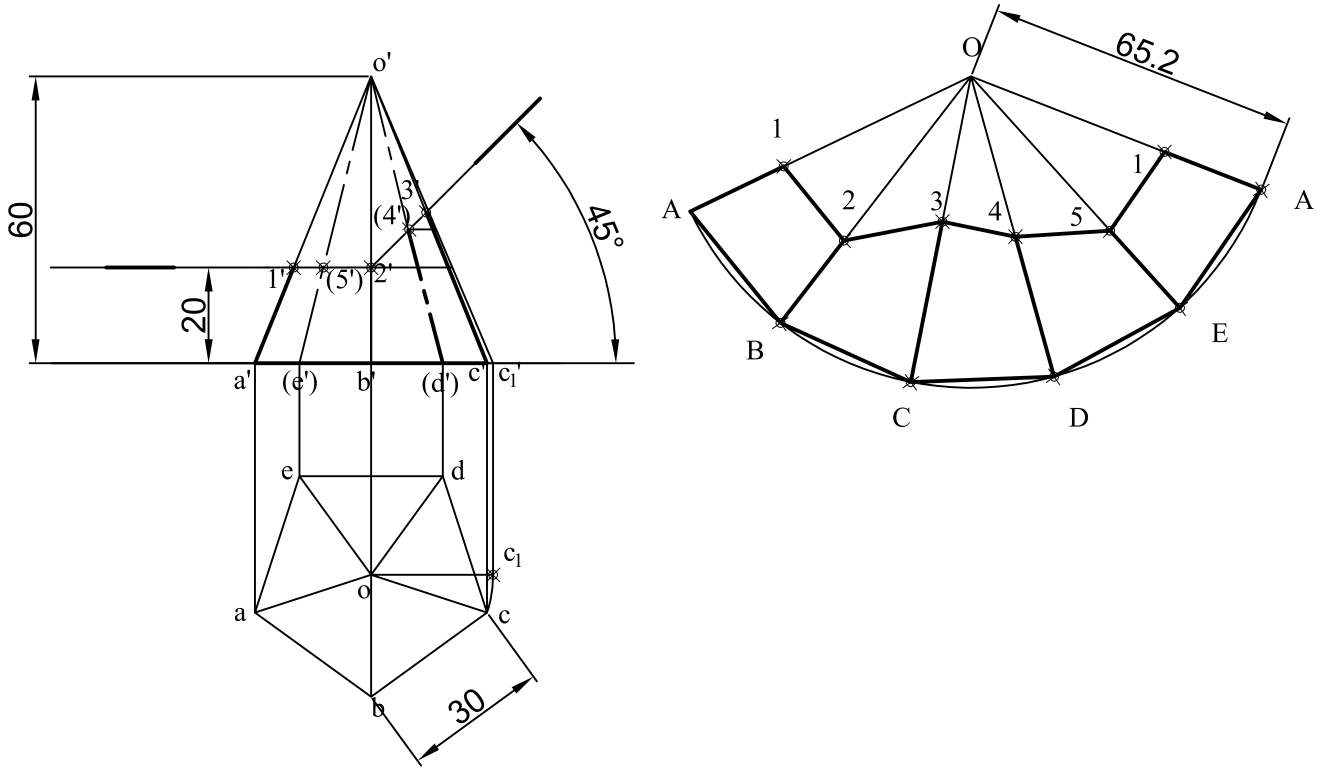
7. A square pyramid of base side 40 mm and axis 60 mm is resting on its base on the HP such that a side of the base is parallel to the VP It is cut by a section plane perpendicular to the VP and inclined at 45° to the HP, bisecting the axis. Draw the development of its lateral surface.





Lava Kumar P	Development of Surfaces	06.02.2023	

8. A pentagonal pyramid of base side 30 mm and axis 60 mm, rests on its base on the HP with a side of the base parallel to the VP It is cut by two section plane which meet at a height of 20 mm from the base. One of the section planes is horizontal, while the other is an auxiliary inclined which is inclined at 45° to the HP. Draw the development of the lateral surface of the solid when apex is removed.



Lava Kumar P	Development of Surfaces	06.02.2023	

Unit 5

Isometric Projections

1. What do you mean by isometric position?

   If all the sides of an object is equally inclined to plane of projection then we can say that object is in isometric position.

2. What do you mean by isometric projections?

   Projection of an object on plane of projection in isometric position is called Isometric projection.

3. What is the relation between isometric and true length?

   Isometric length= 0.816 x True length

4. Differentiate between isometric projection and isometric view.

   Isometric projection- In this, 3D drawing of an object is done by using isometric lengths

   Isometric view - In this, 3D drawing of an object is done by using true lengths.

5. Define isometric lines and isometric planes.

   The lines which are parallel to any one of the isometric axes are called isometric lines.

   The planes representing the faces of the cube as well as other planes parallel to this plane are called isometric plane.

6. What are the advantages of drawing isometric views?

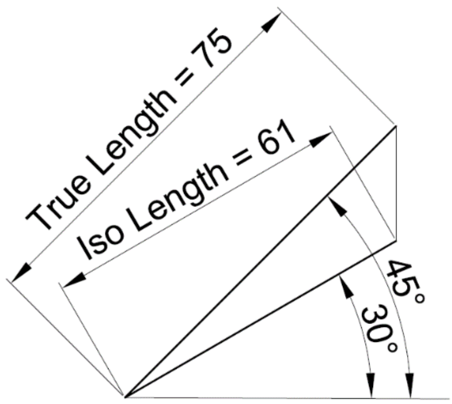
   Main advantage of isometric view is

   - Easy to understand shape and size of the object
   - All dimensions of the object are represented in a single view

7. Define isometric scale? Explain its construction.

   Isometric scale: Isometric scale is the one by which you can convert any length to isometric length.

   Construction: First draw a horizontal line. At any point on this line, draw 45^0 and 30^0 lines which represents the true length and isometric length lines respectively

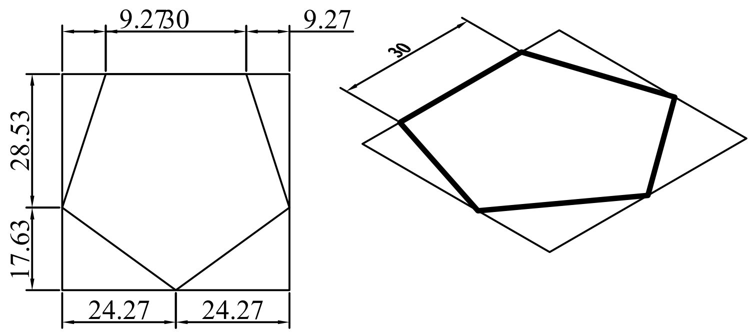


1. **Draw the isometric view of following lamina whose surface is parallel to HP with one of the side parallel to VP.**

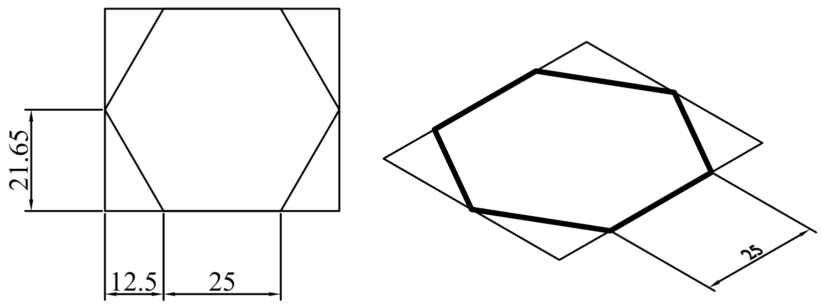
a) **Pentagonal Plane of 30**

b) **Hexagonal plane of 25**

QUESTION 1 (A)



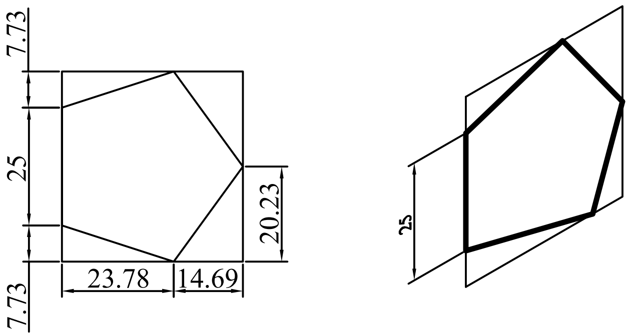
QUESTION 1 (B)



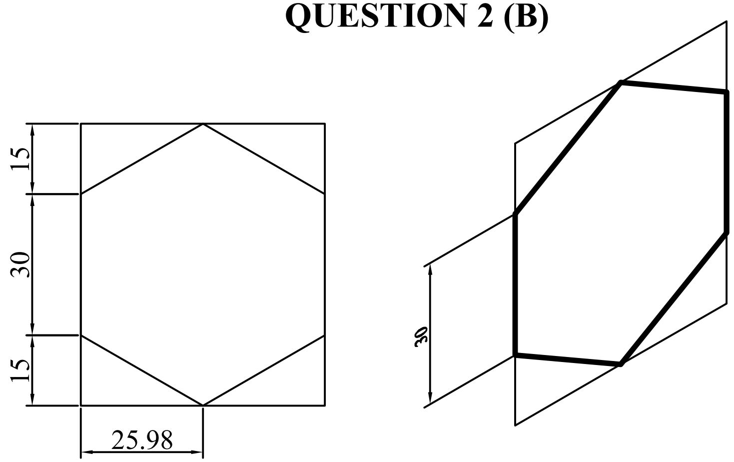
Lava Kumar P	**Isometric Projections**	**18.02.2023**

2. **Draw the isometric view of following lamina whose surface is parallel to VP with one of the side perpendicular to HP.**
   a) **Pentagonal Plane of 30**
   b) **Hexagonal plane of 25**

QUESTION 2 (A)



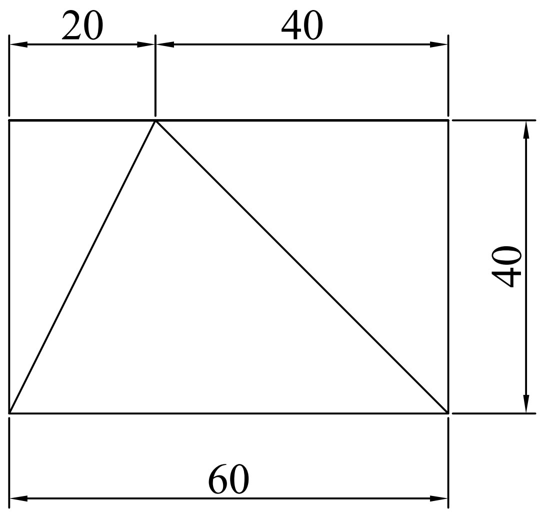
QUESTION 2 (B)

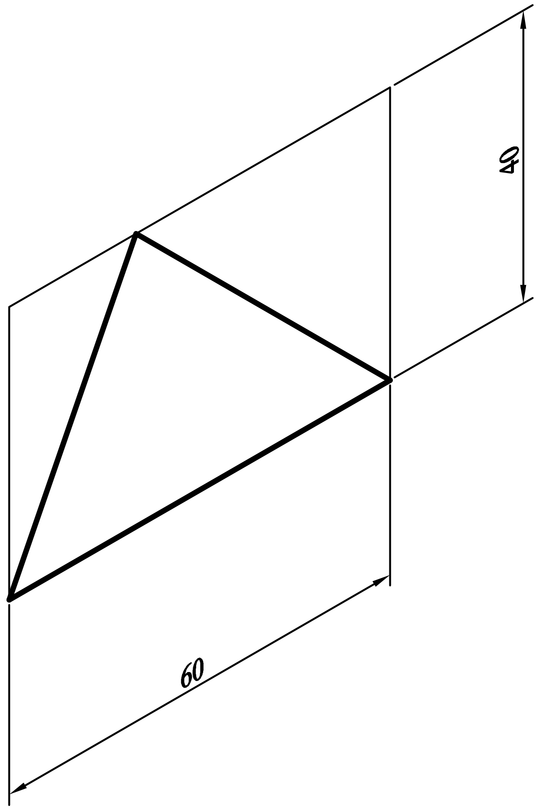


Lava Kumar P	Isometric Projections	18.02.2023	

3. Draw the isometric view of following. a) Surface is parallel to VP

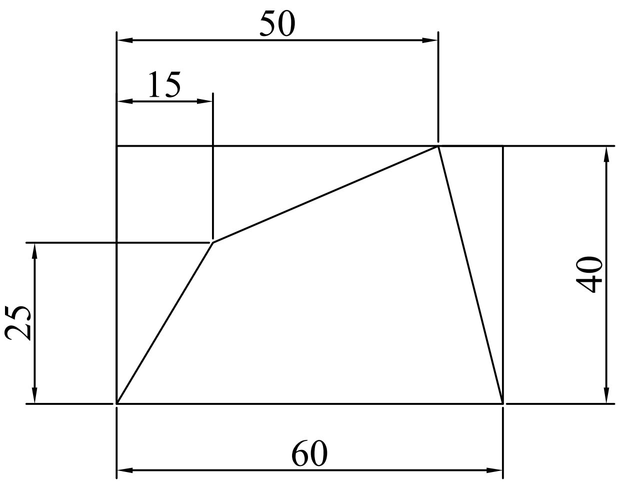
QUESTION 3 (A)

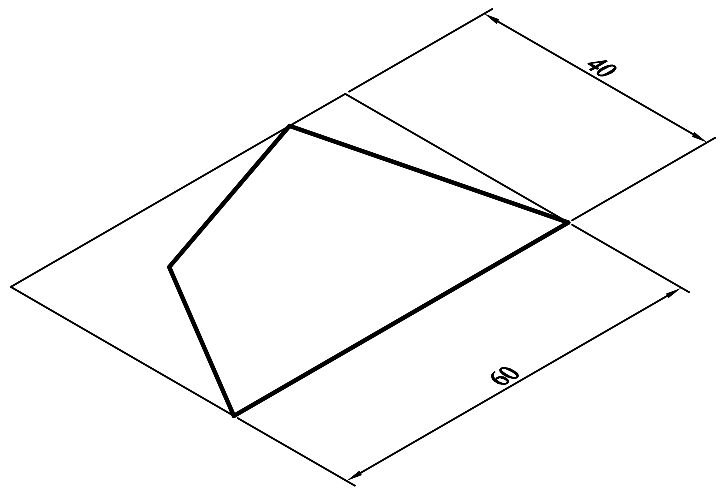




Lava Kumar P	Isometric Projections	18.02.2023	

3. Draw the isometric view of following. b) Surface is parallel to HP

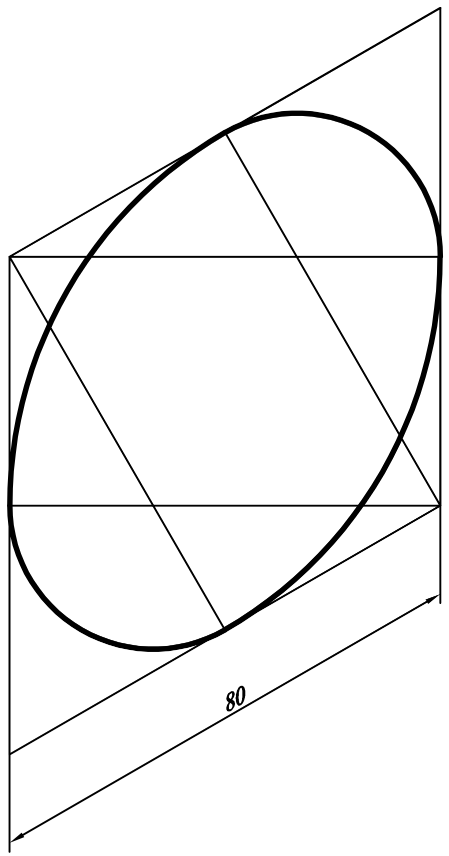




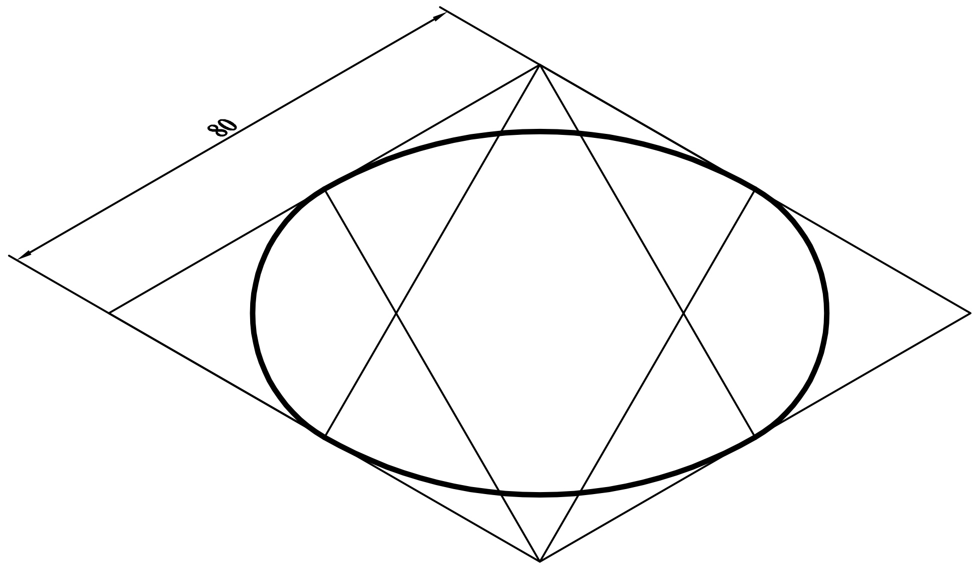
Lava Kumar P	**Isometric Projections**	**18.02.2023**	

4. Draw the isometric view of circle of 80 diameter when surface is parallel to a) VP b) HP.

QUESTION 4 (B)



QUESTION 4 (B)



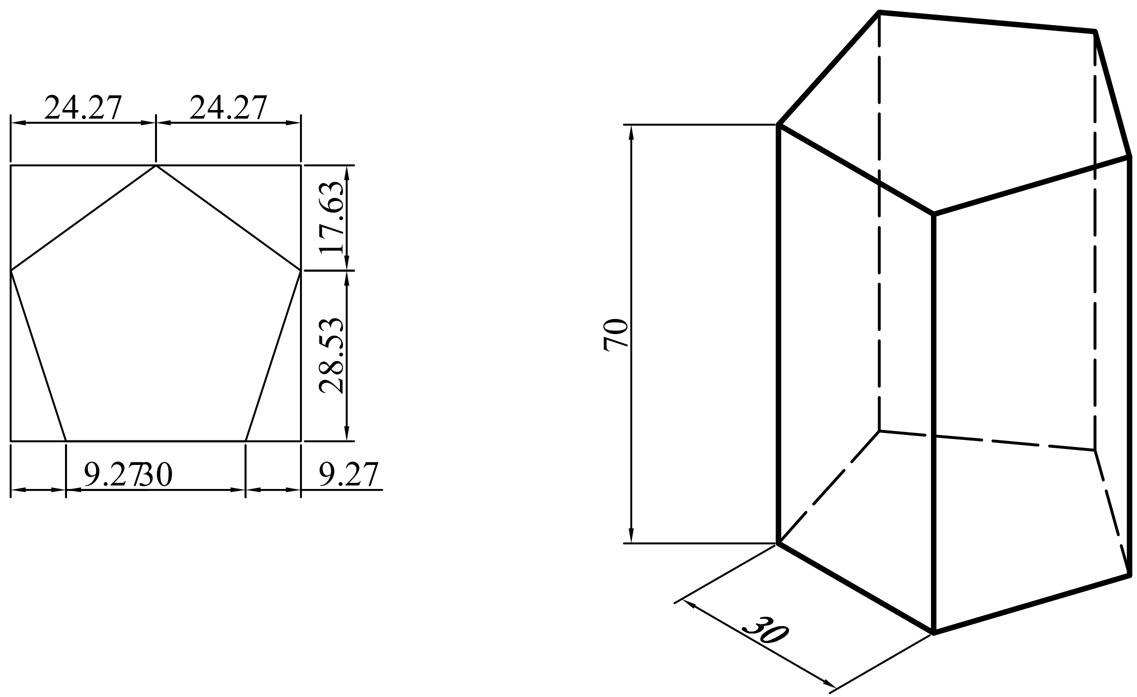
Lava Kumar P	**Isometric Projections**	**18.02.2023**	

5. **Draw the Isometric view of following prisms which are resting on one of its bases on HP with one of the base edge parallel to VP.**

a) **Pentagonal Prism of 30 x 70**

b) **Hexagonal Prism of 40 x 60**

QUESTION 5 (a)



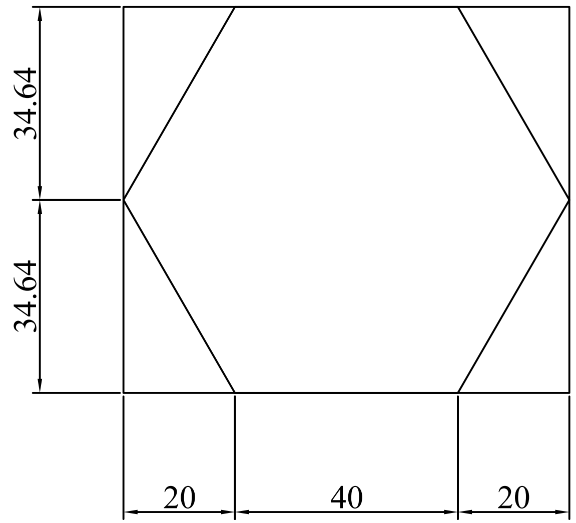
Lava Kumar P	**Isometric Projections**	**18.02.2023**	

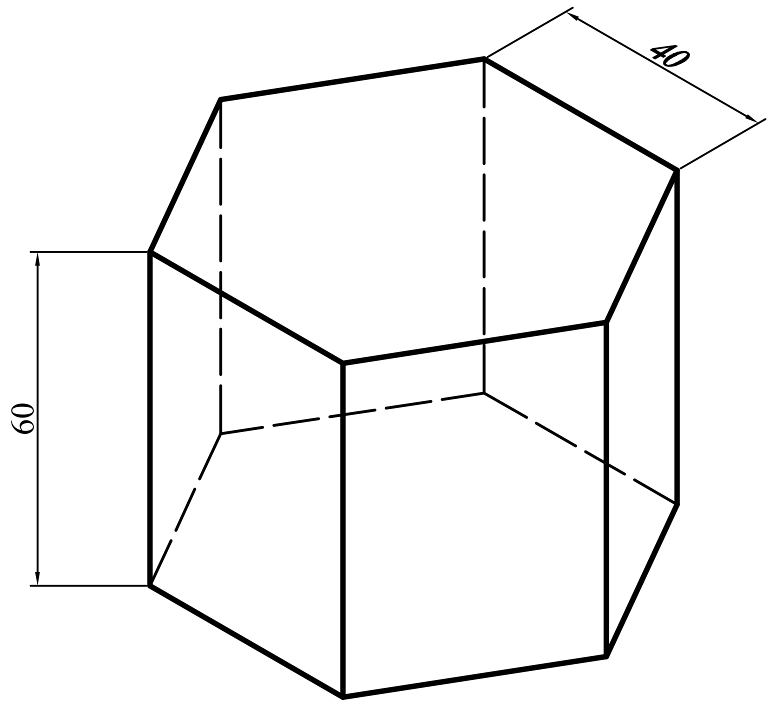
5. **Draw the Isometric view of following prisms which are resting on one of its bases on HP with one of the base edge parallel to VP.**

a) **Pentagonal Prism of 30 x 70**

b) **Hexagonal Prism of 40 x 60**

QUESTION 5 (b)





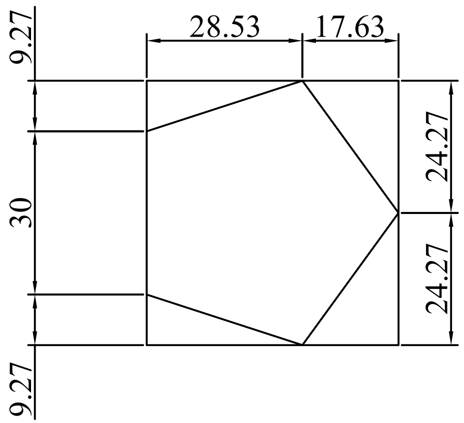
Lava Kumar P	Isometric Projections	18.02.2023	

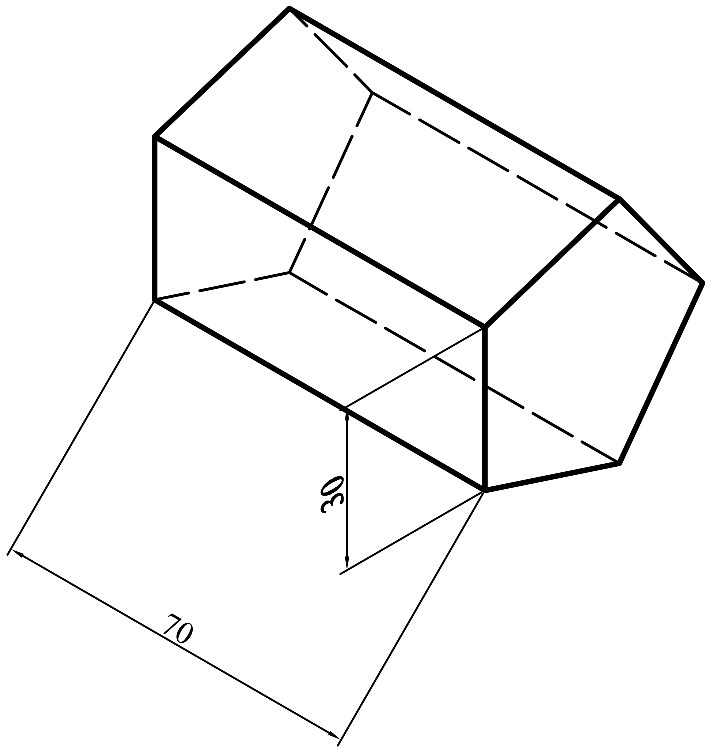
6. Draw the Isometric view of following prisms which are resting on one of its bases on VP with one of the base edge perpendicular to HP.

a) Pentagonal Prism of 30 x 70

b) Hexagonal Prism of 40 x 60

QUESTION 6 (a)





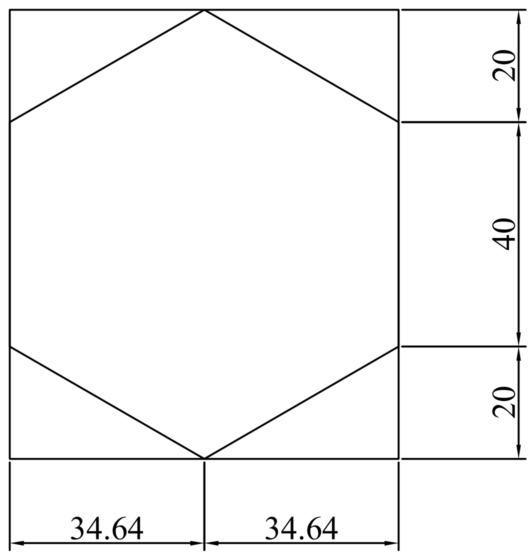
Lava Kumar P	**Isometric Projections**	**18.02.2023**	

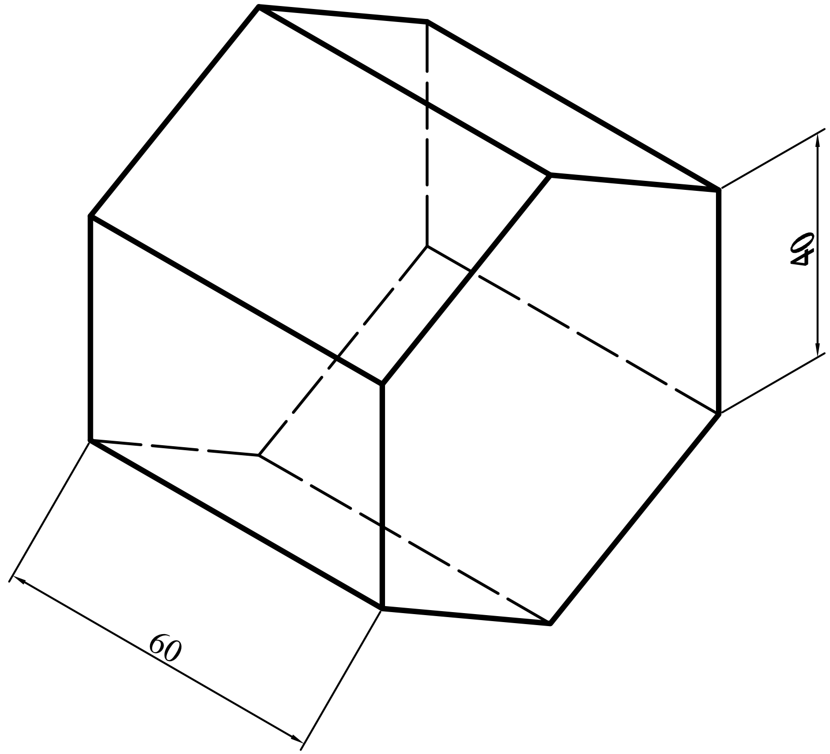
6. Draw the Isometric view of following prisms which are resting on one of its bases on VP with one of the base edge perpendicular to HP.

a) Pentagonal Prism of 30 x 70

b) Hexagonal Prism of 40 x 60

QUESTION 6 (b)

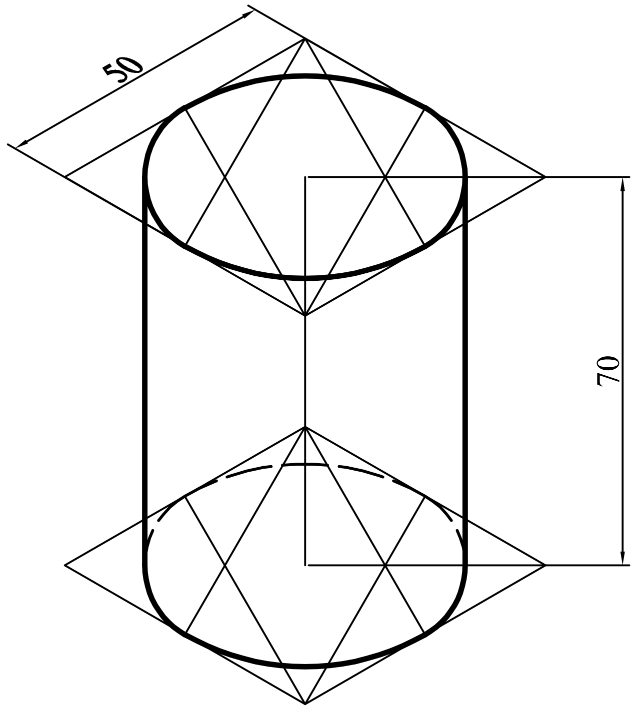




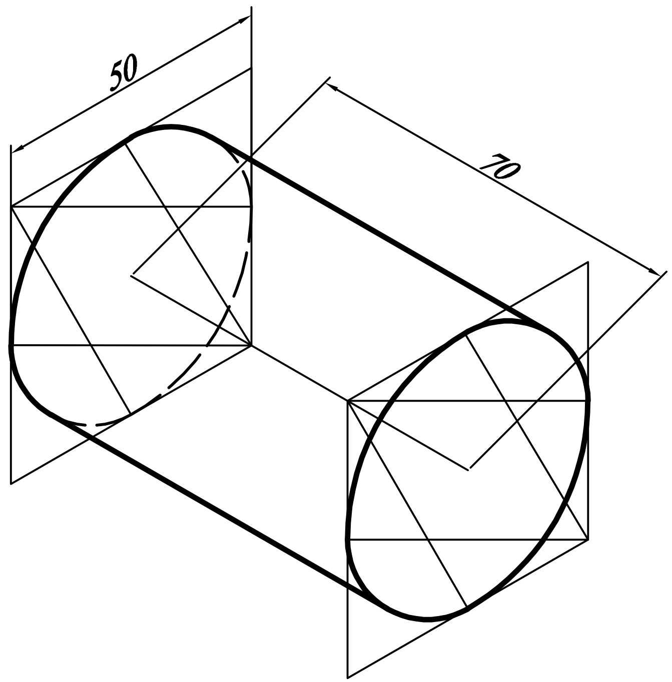
Lava Kumar P	Isometric Projections	18.02.2023	

7. **Draw the isometric view of cone of 50 x 70 whose axis is**
a) Perpendicular to HP
b) Perpendicular to VP

QUESTION 7 (a)



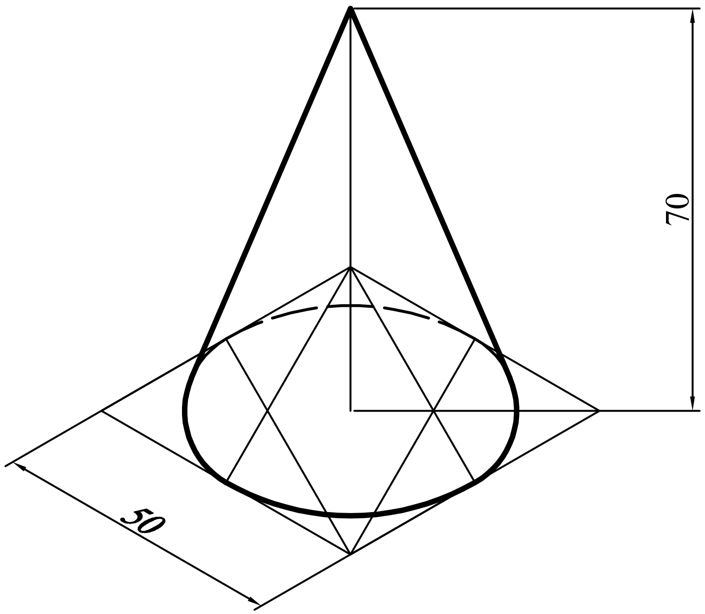
QUESTION 7 (b)



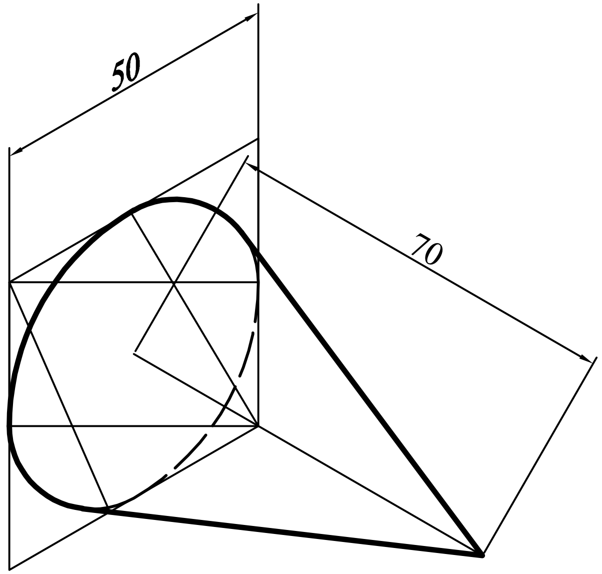
Lava Kumar P	**Isometric Projections**	**18.02.2023**	

8.Draw the isometric view of cylinder of 50 x 70 whose axis is
a)Perpendicular to HP
b)Perpendicular to VP

QUESTION 8 (a)

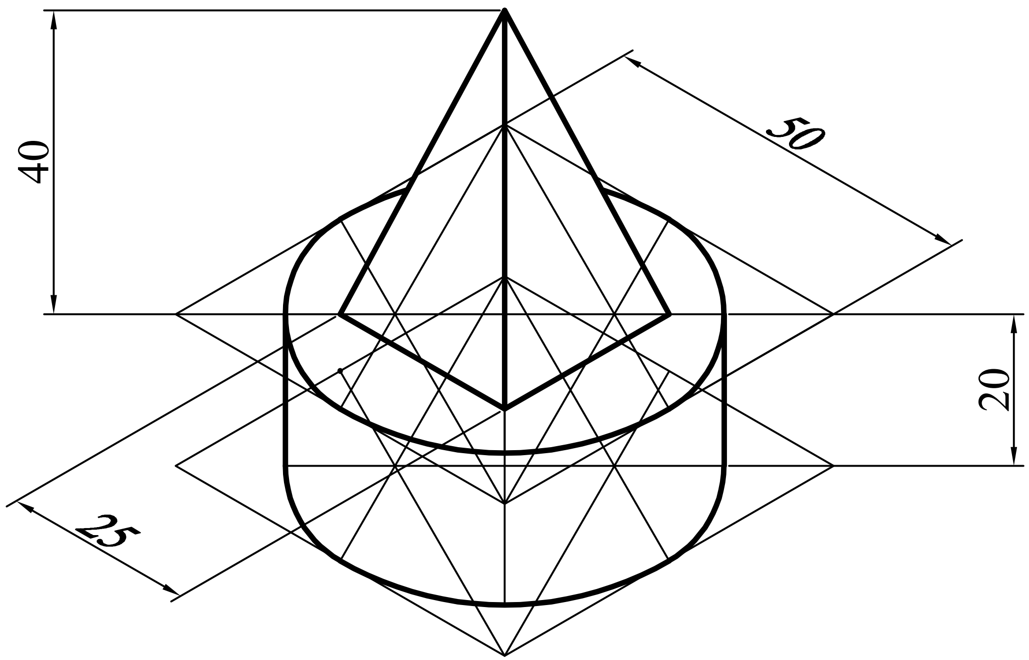


QUESTION 8 (b)



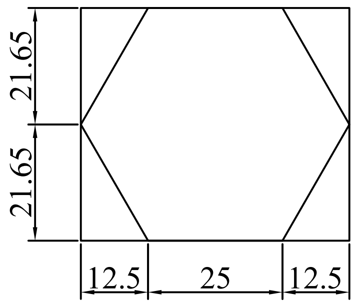
Lava Kumar P	**Isometric Projections**	**18.02.2023**	

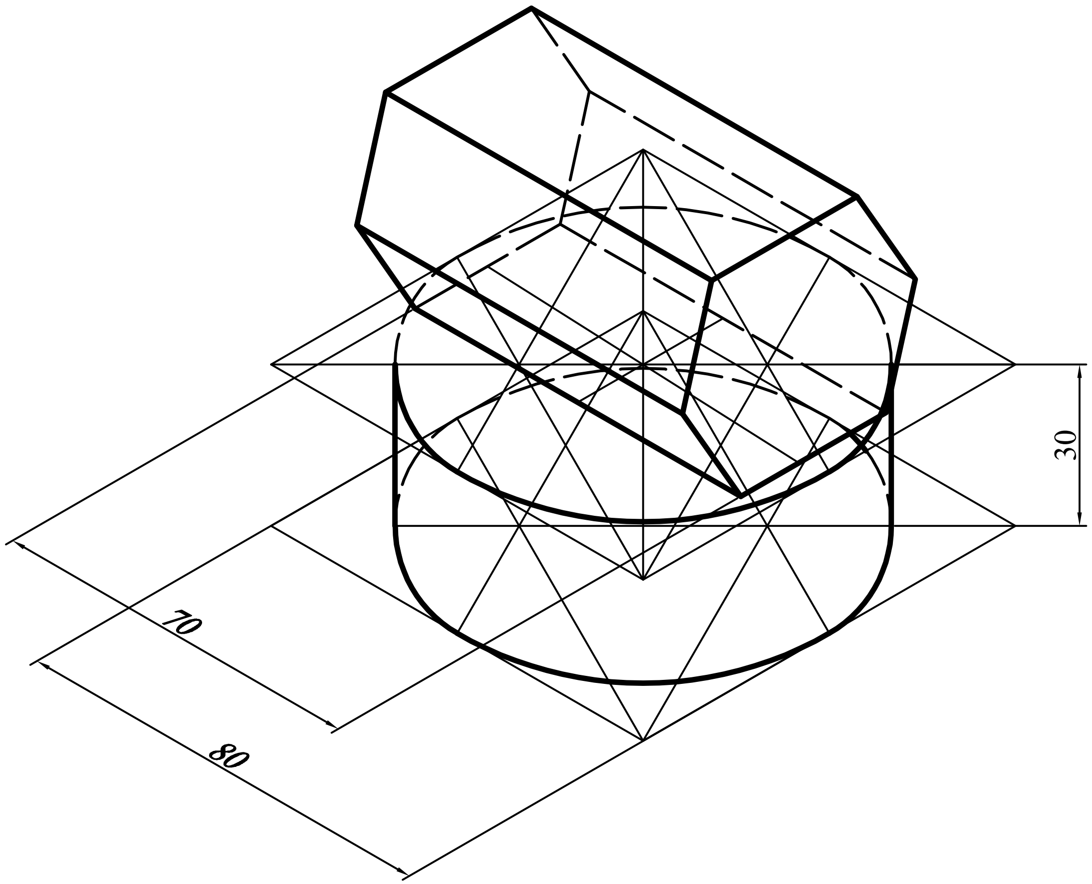
9. A square pyramid of base side 25 mm and axis 40 mm rests centrally over a cylindrical block of base diameter 50 mm and thickness 20 mm. Draw the isometric view of the arrangement.



Lava Kumar P	**Isometric Projections**	**18.02.2023**	

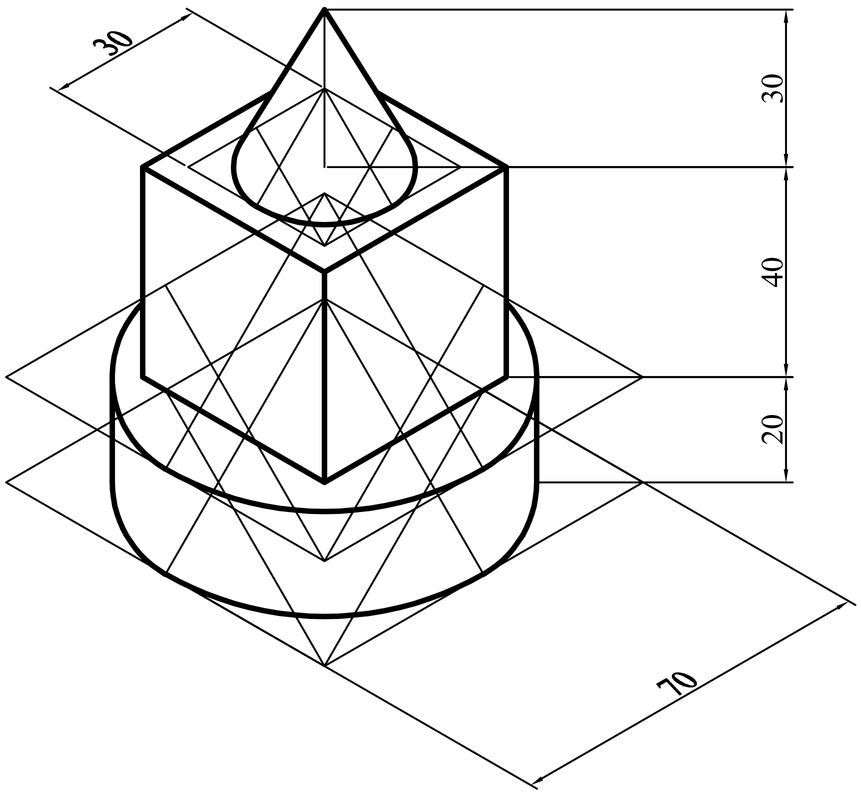
10.A hexagonal prism of base side 25 mm and axis 70 mm is placed centrally on its rectangular face over a cylindrical block of base diameter 80 mm and thickness 30 mm. Draw the isomeric view of the arrangement.





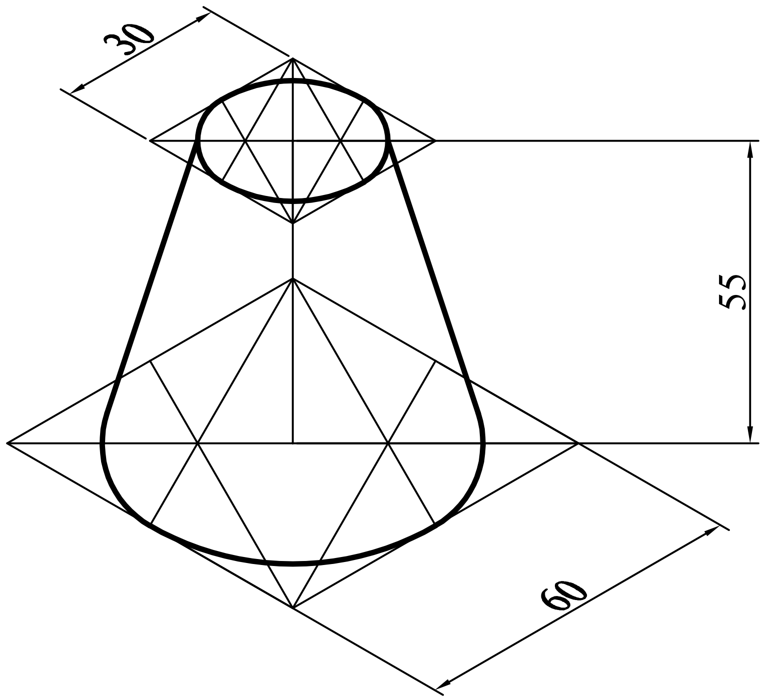
Lava Kumar P	Isometric Projections	18.02.2023	

11.A cone is placed centrally on the top of a cube of 40 mm side which is placed centrally over a cylindrical block. The cone has its base diameter 30 mm and axis 30 mm. The cylindrical block has its base diameter 70 mm and thickness 20 mm. Draw isometric view of the arrangement.



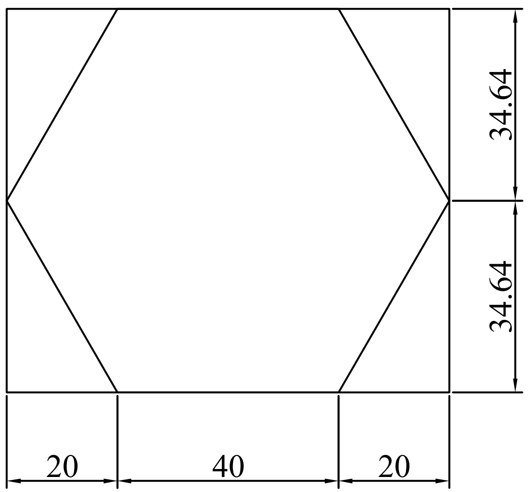
Lava Kumar P	Isometric Projections	18.02.2023	

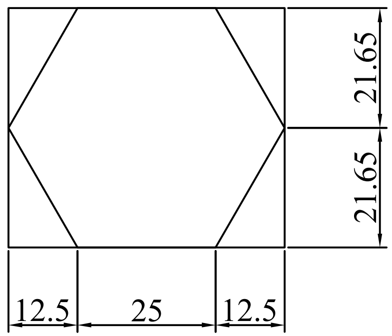
12.Draw the isometric projection of the frustum of a cone of base diameter 60 mm, top diameter 30 mm and height 55 mm.

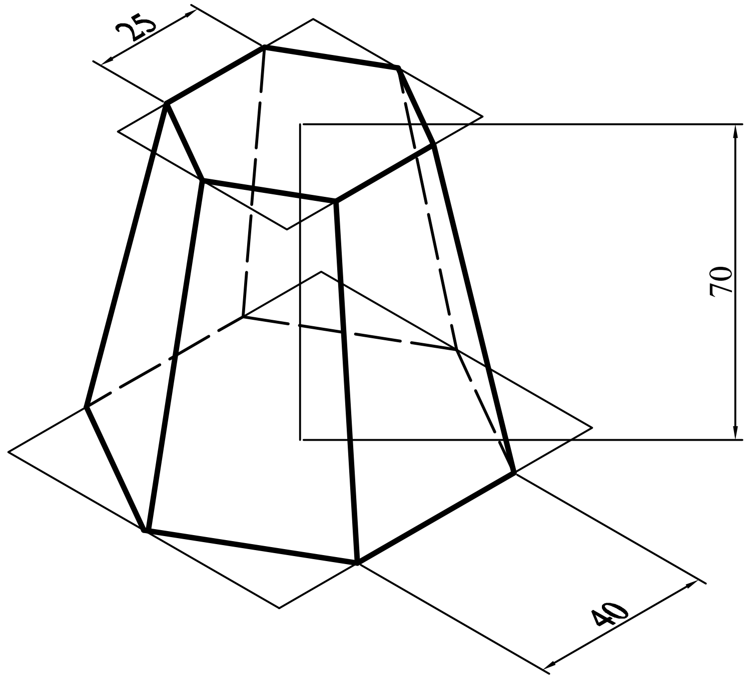


Lava Kumar P	**Isometric Projections**	**18.02.2023**	

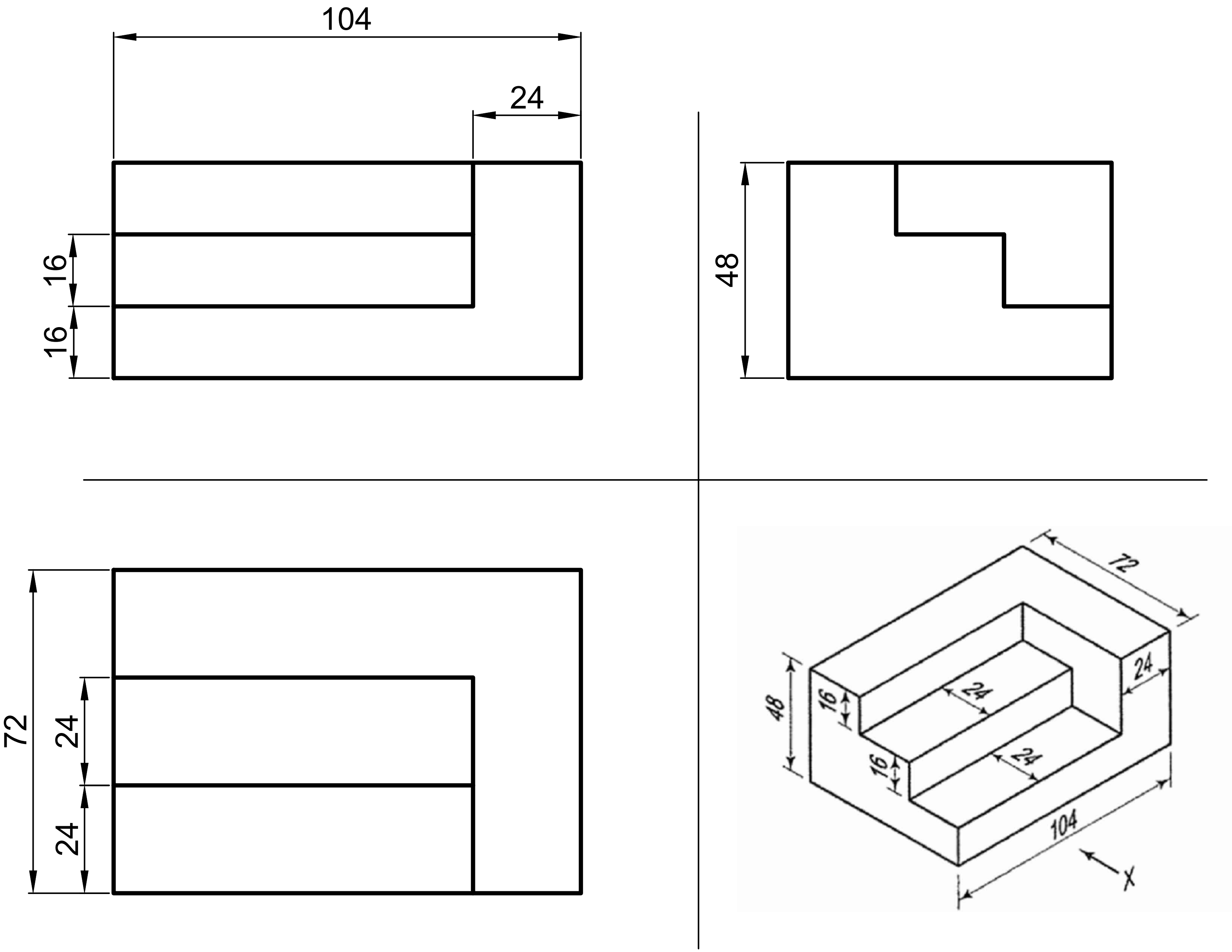
13.Draw the isometric projection of the frustum of a hexagonal pyramid of base side 40 mm, top side 25 mm and height 70 mm. The frustum rests on the base on the H.P.







Lava Kumar P	**Isometric Projections**	**18.02.2023**	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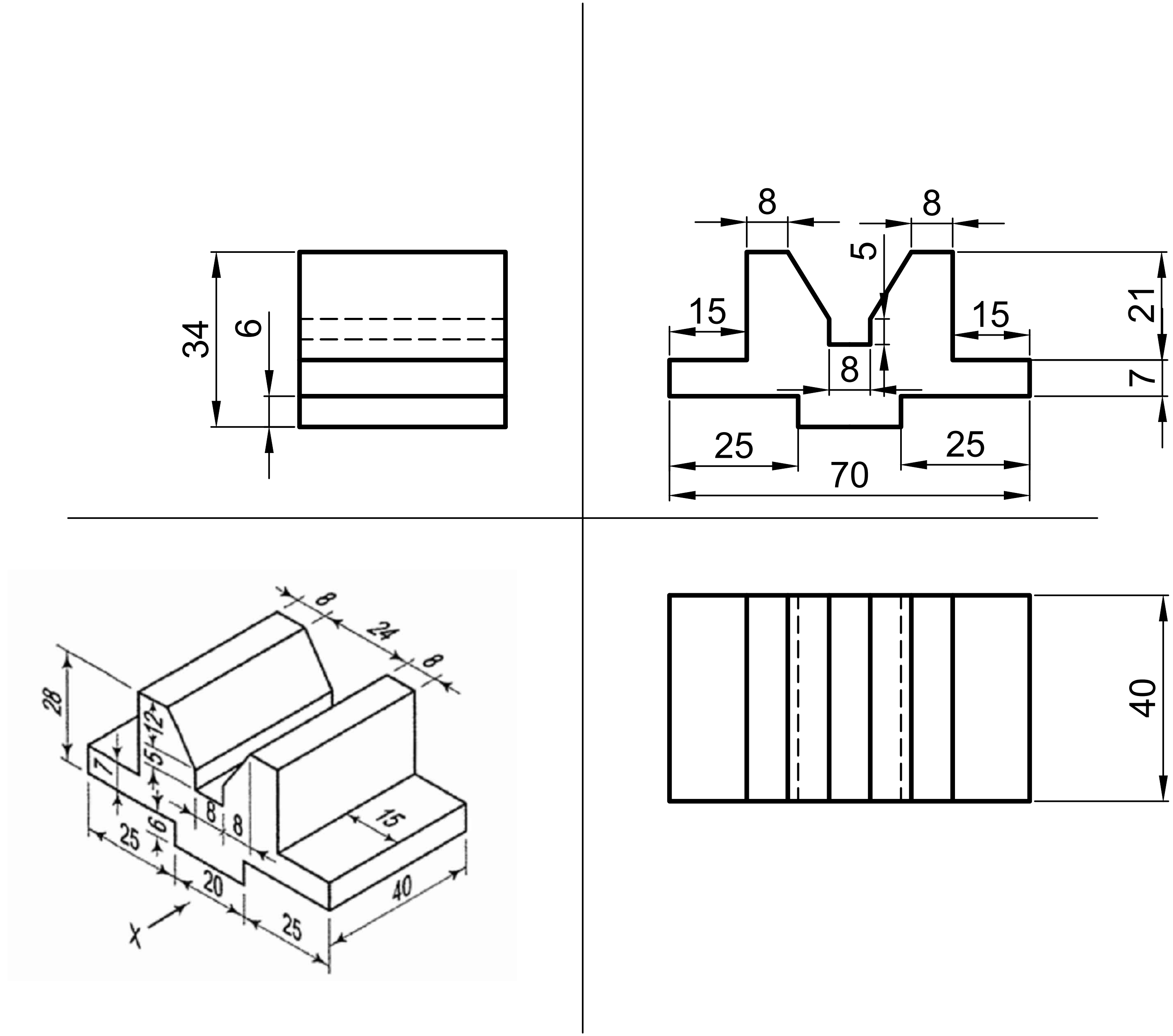

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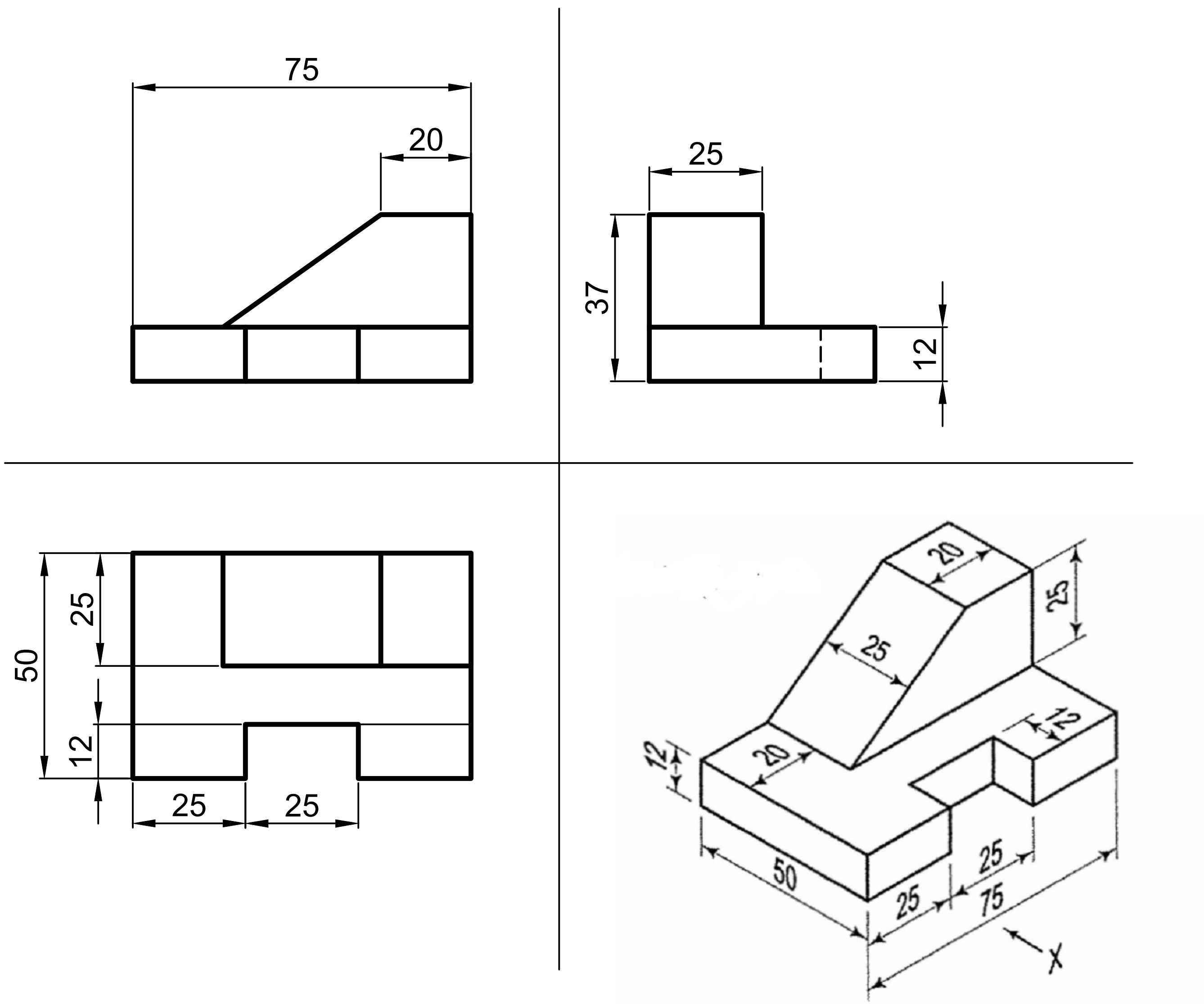

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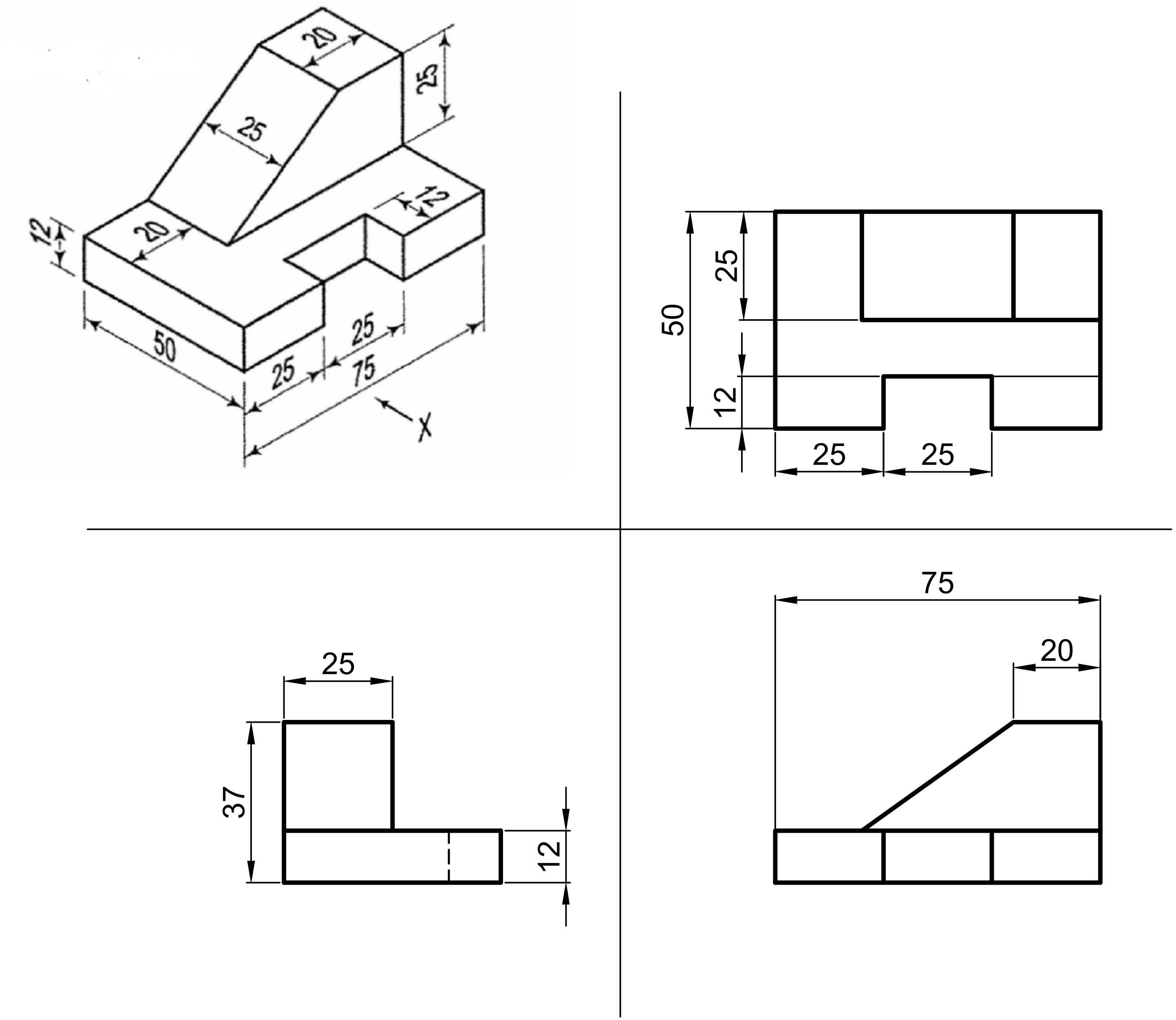
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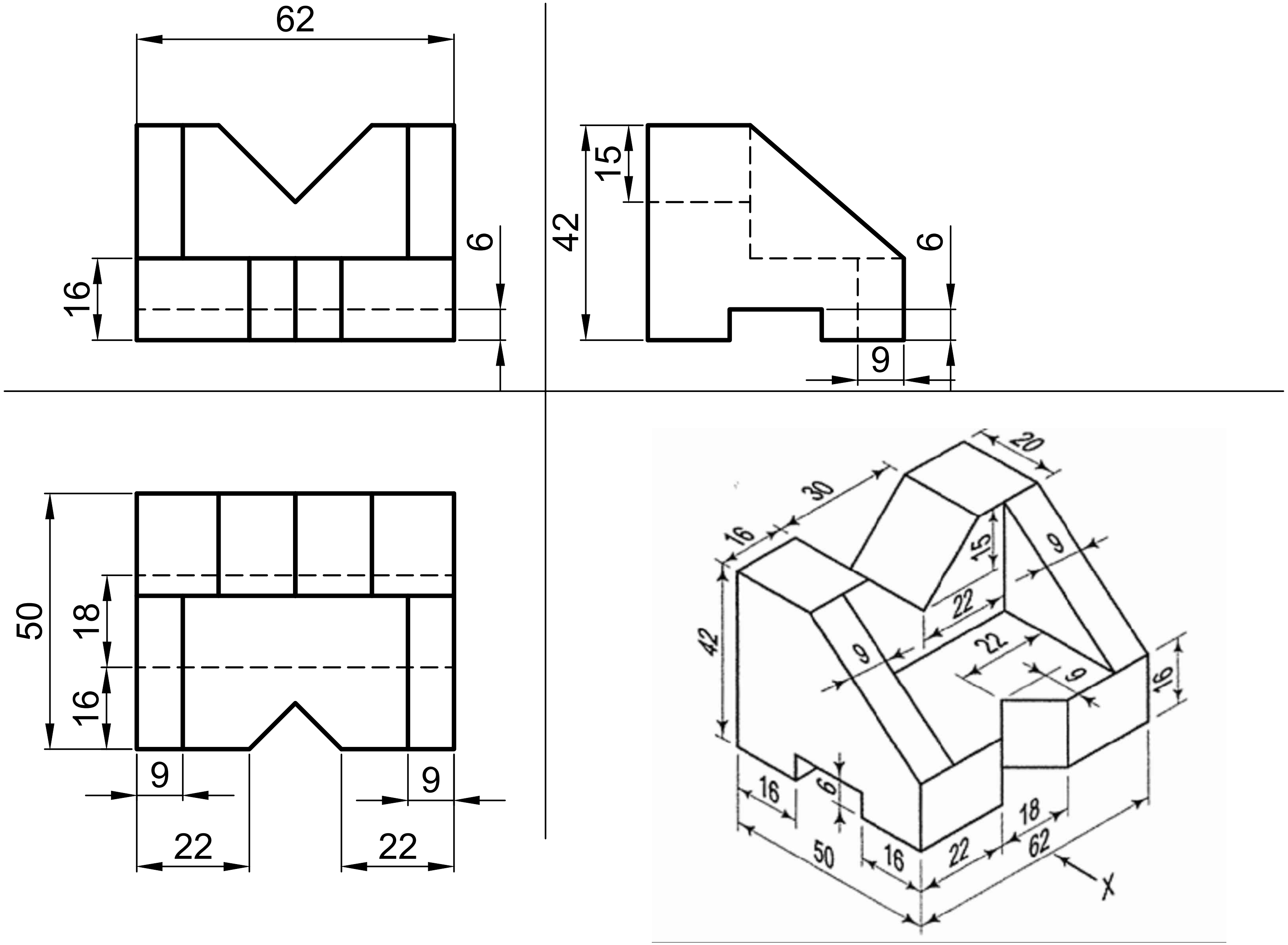
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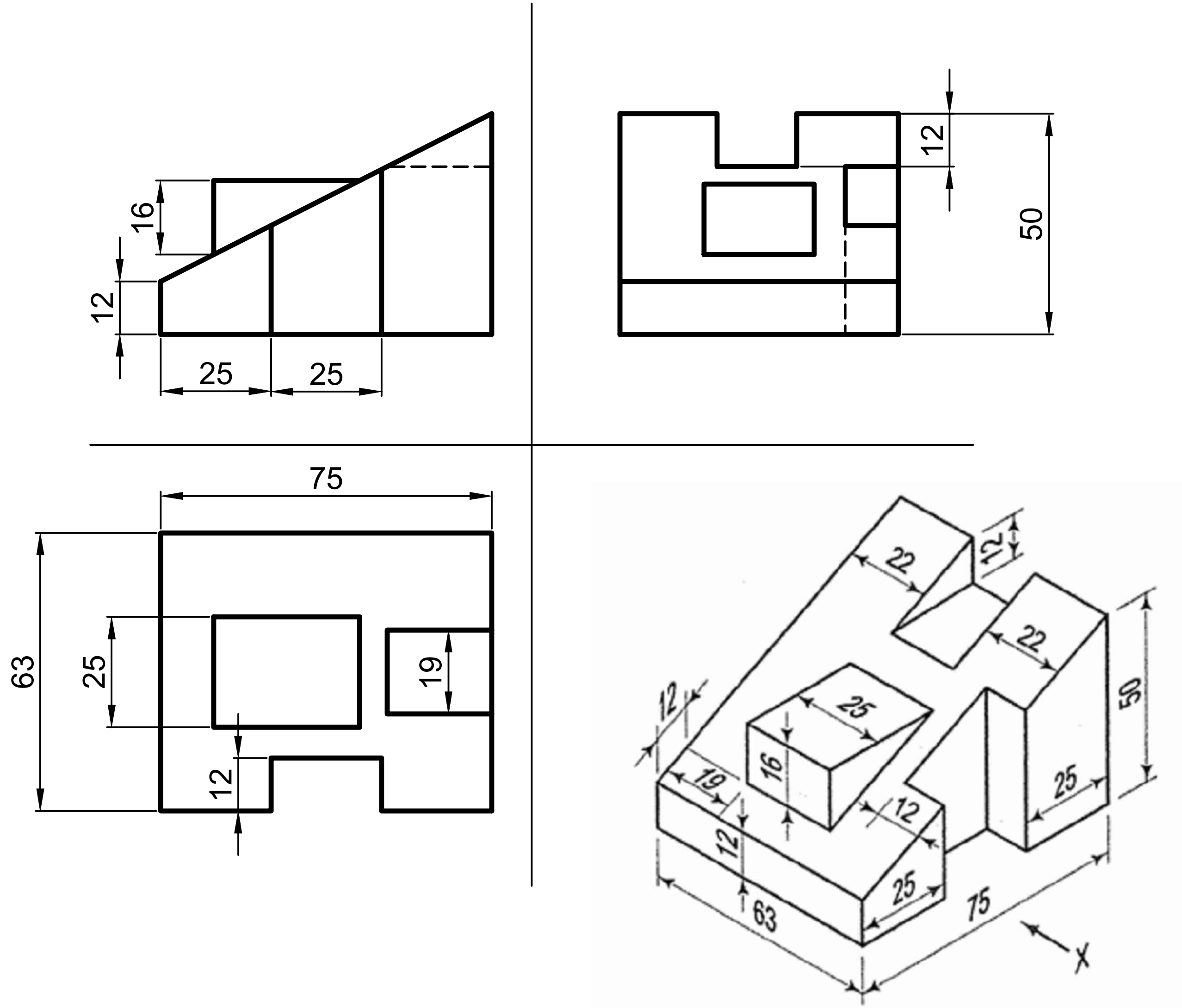
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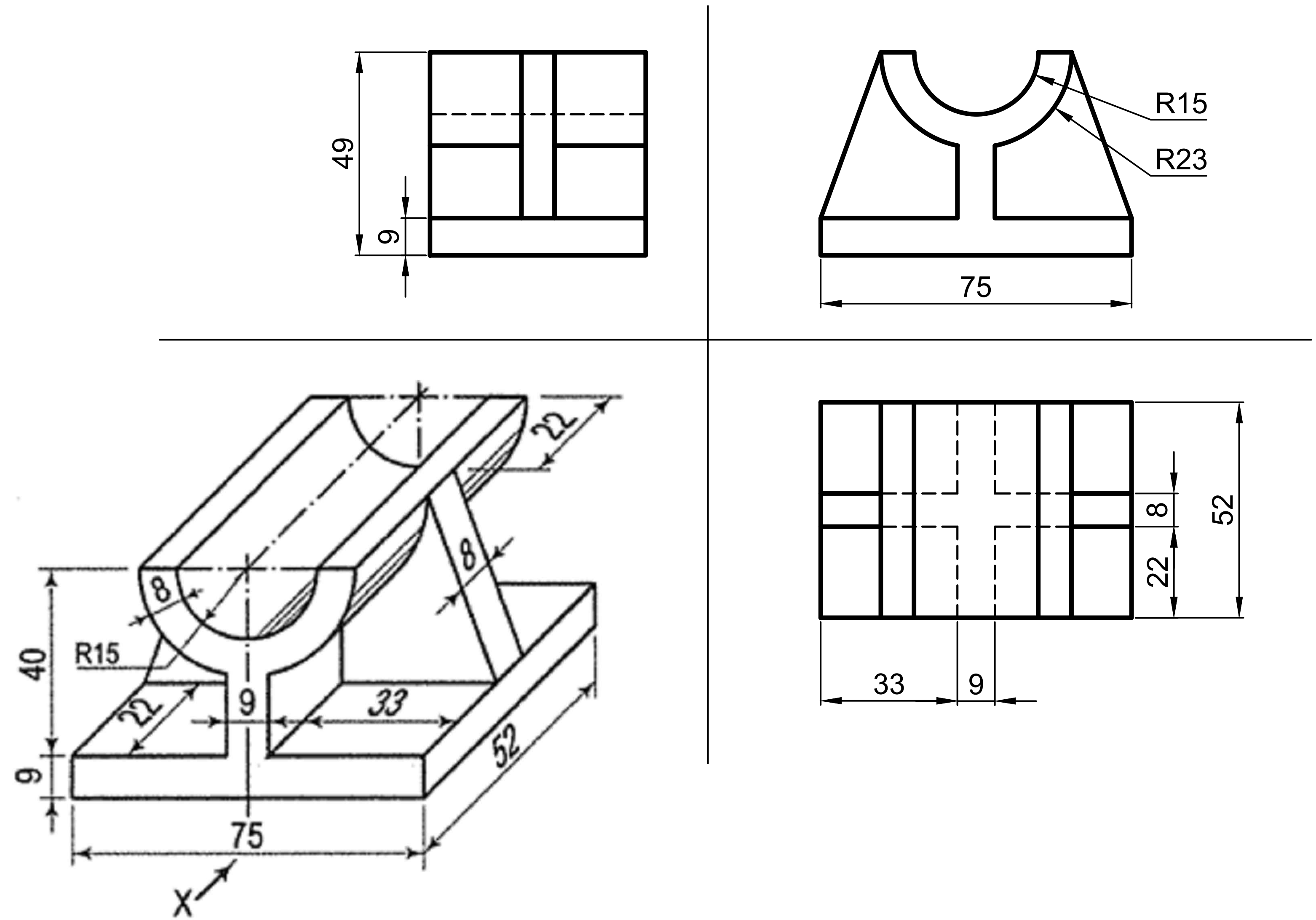
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R15
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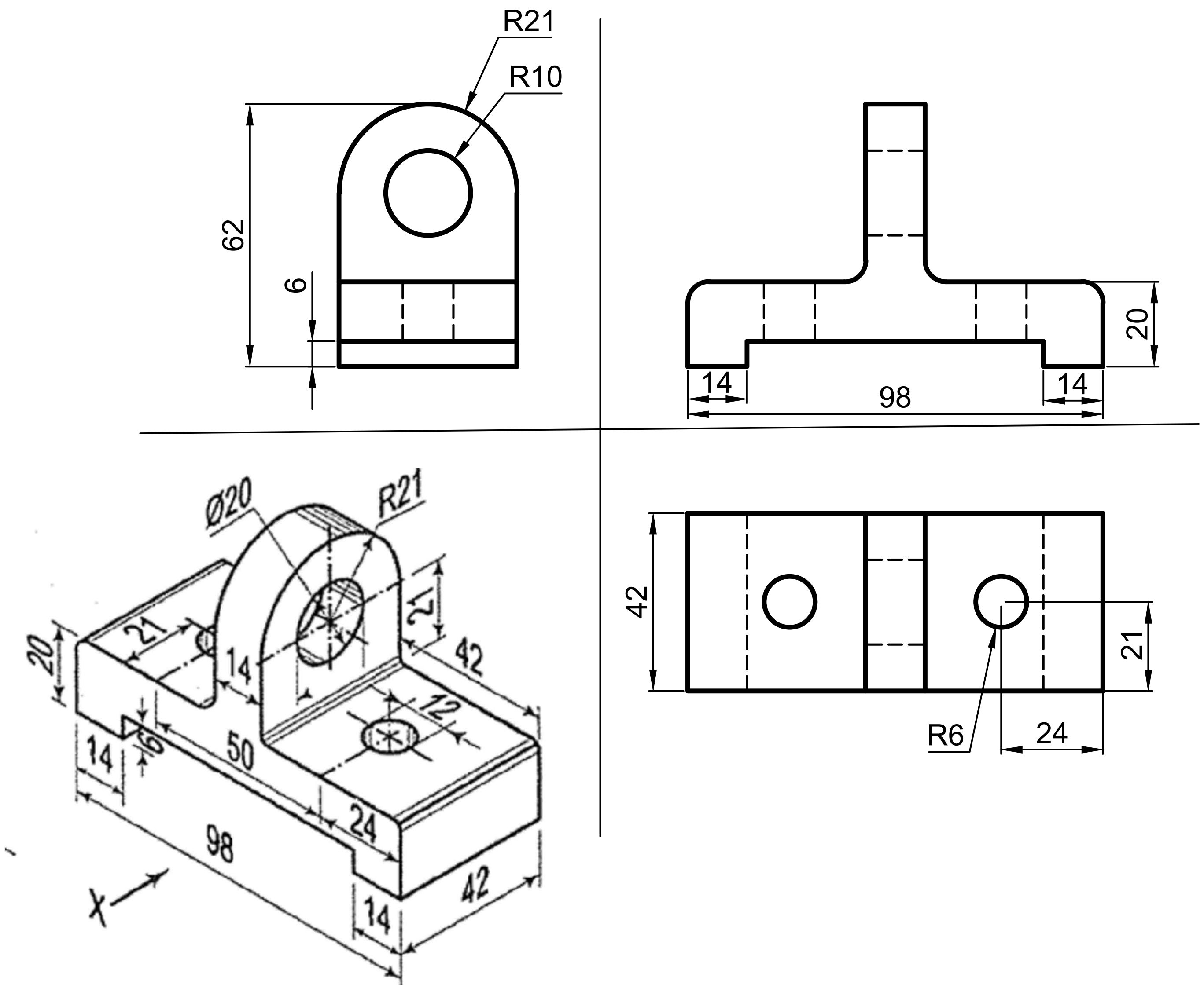
R21
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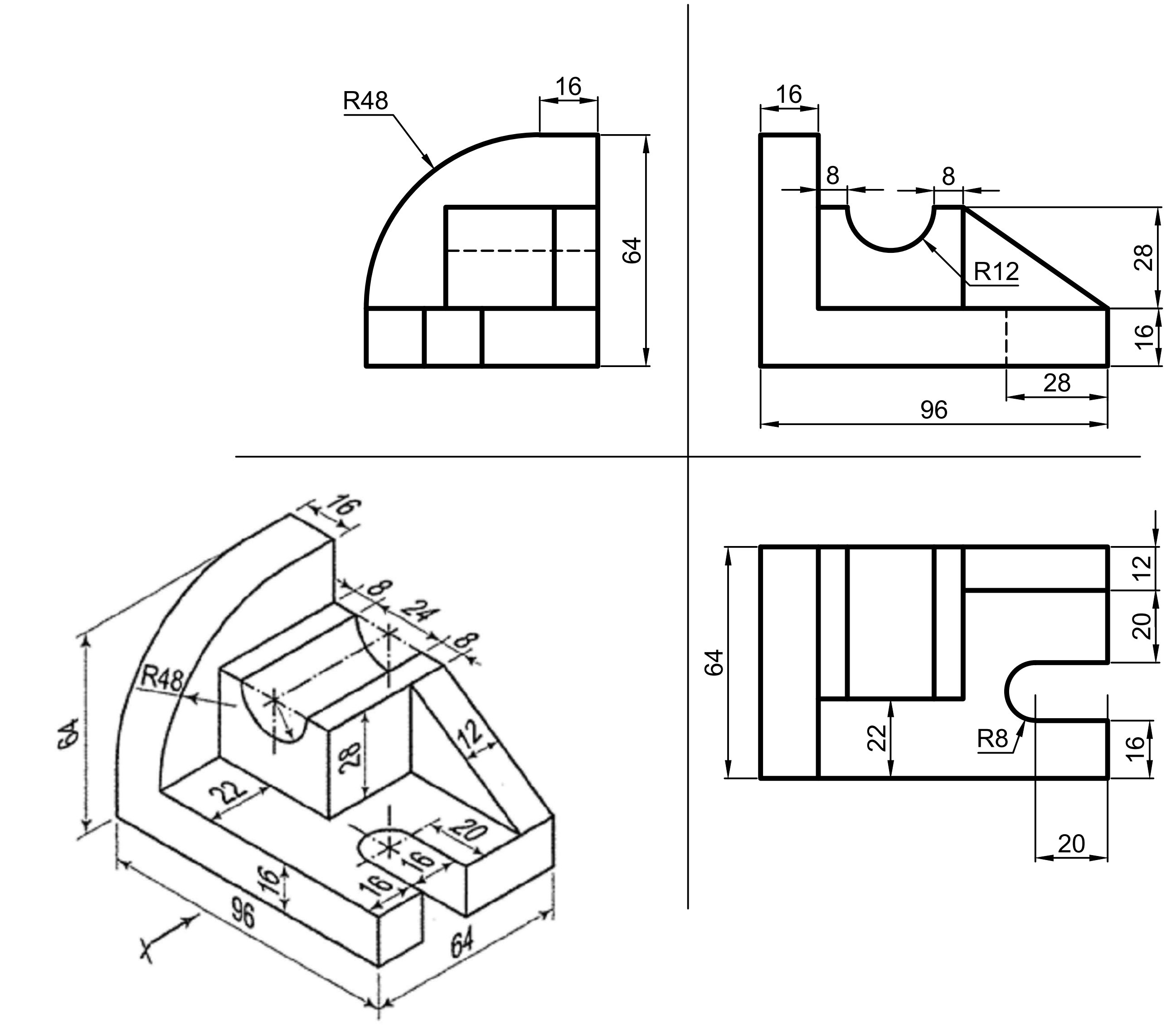

R48
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R12
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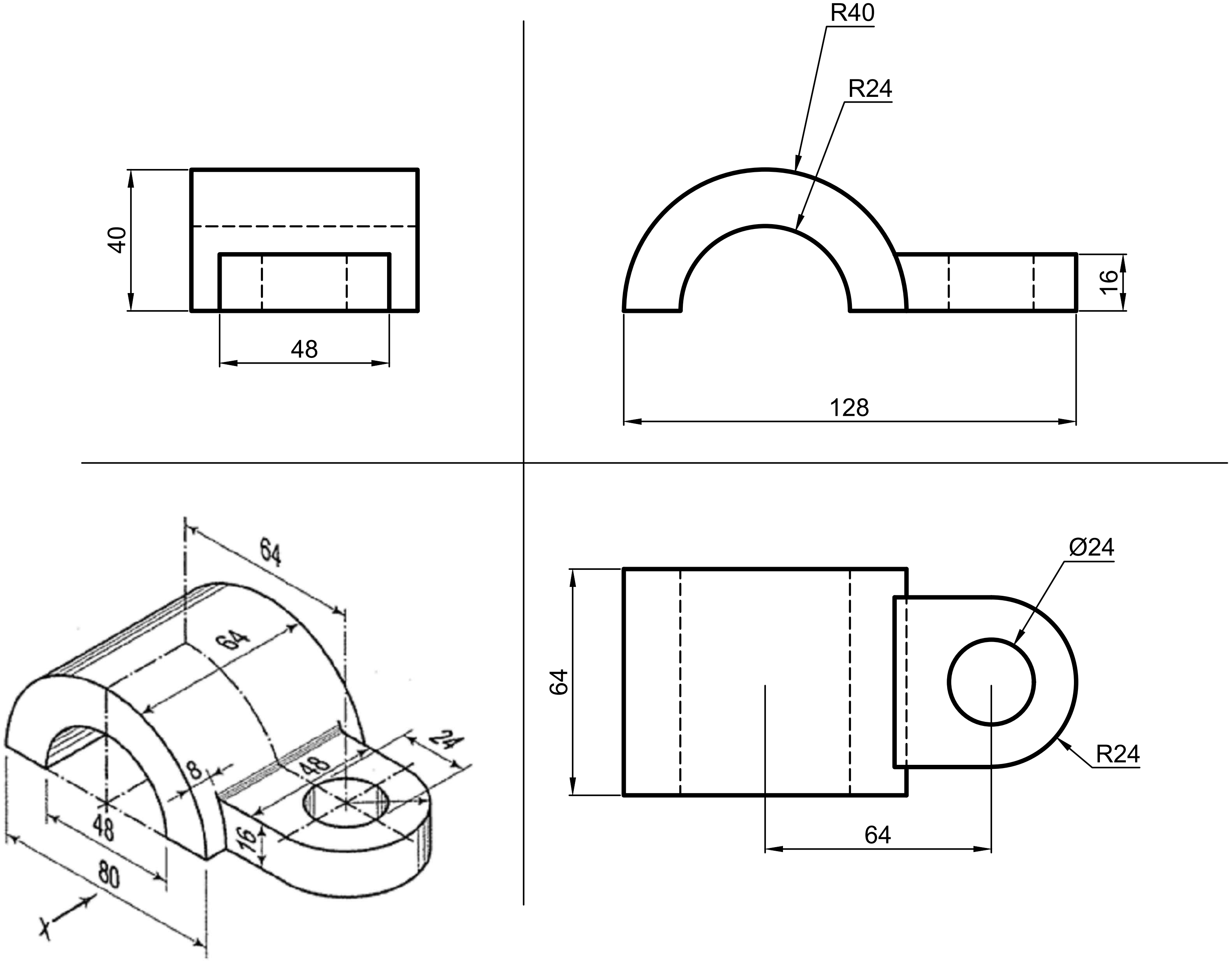

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Ø24
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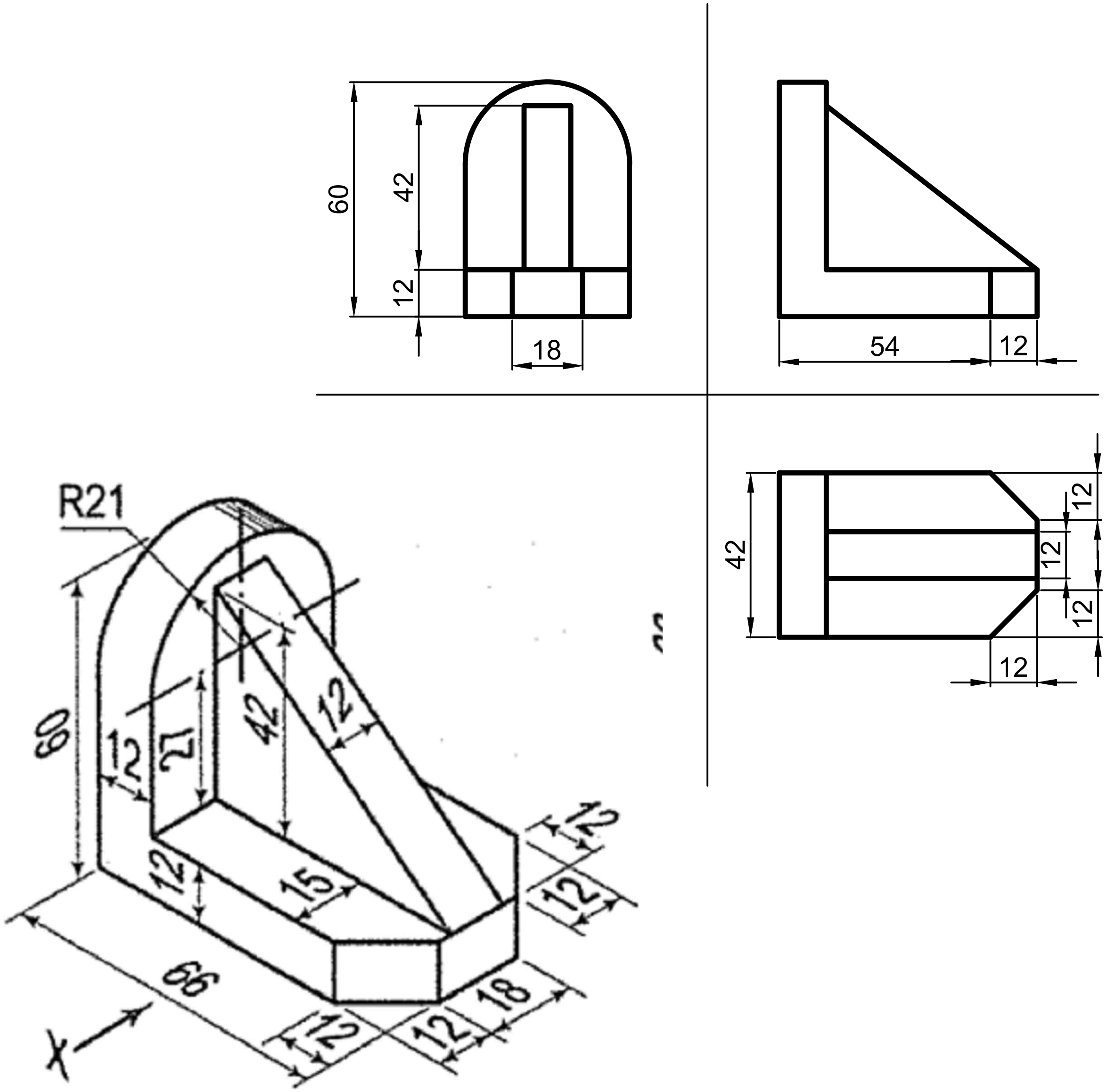

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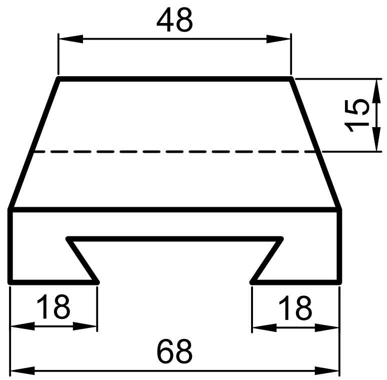
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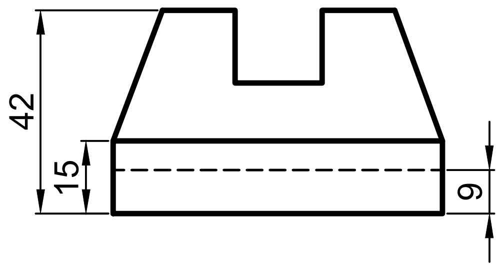
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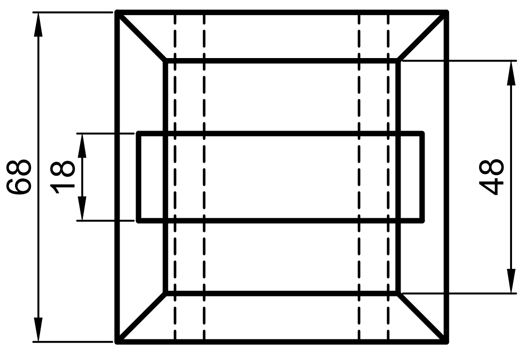
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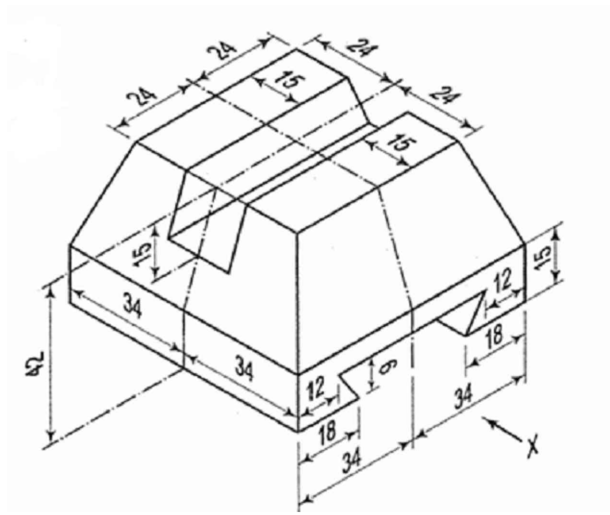
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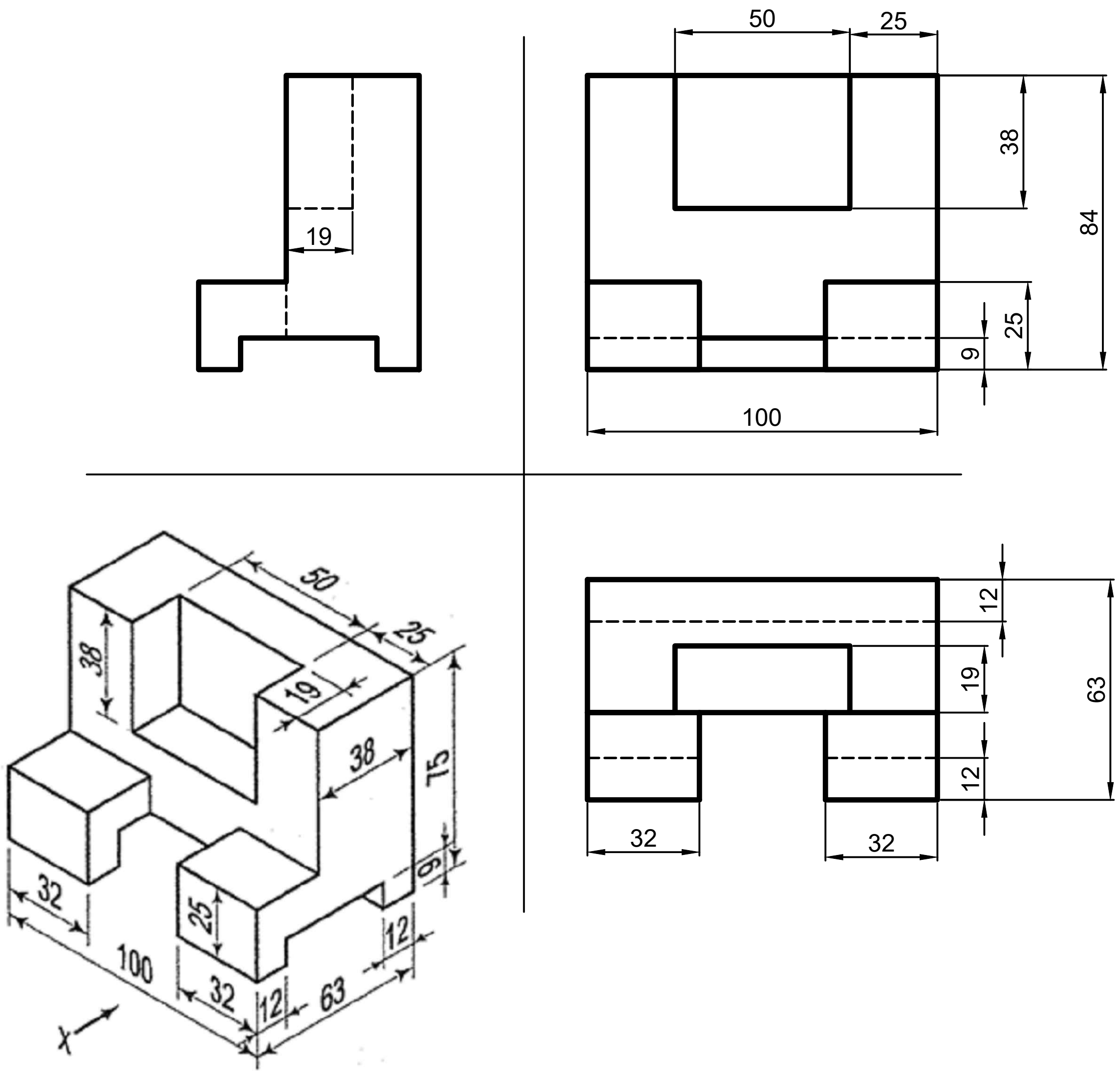
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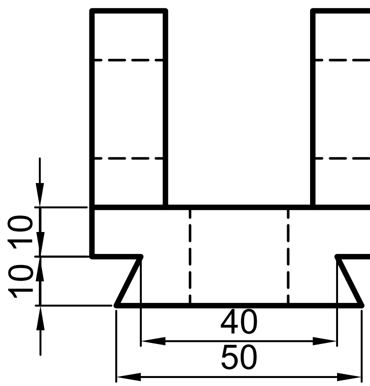
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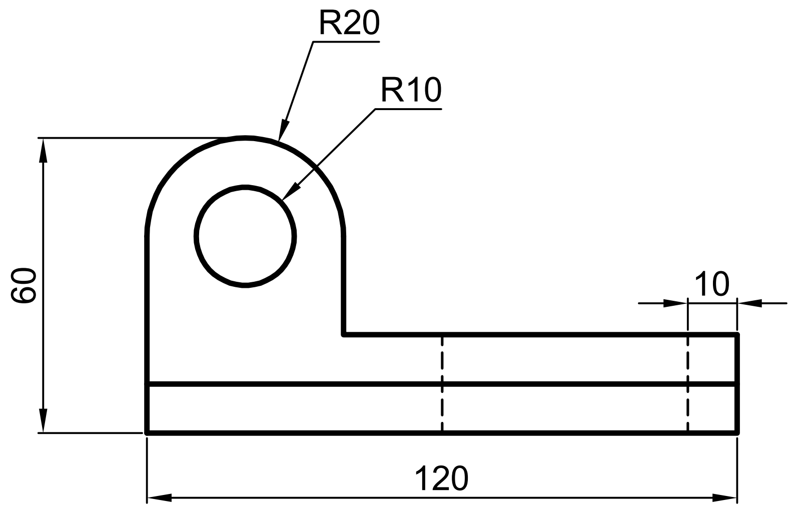
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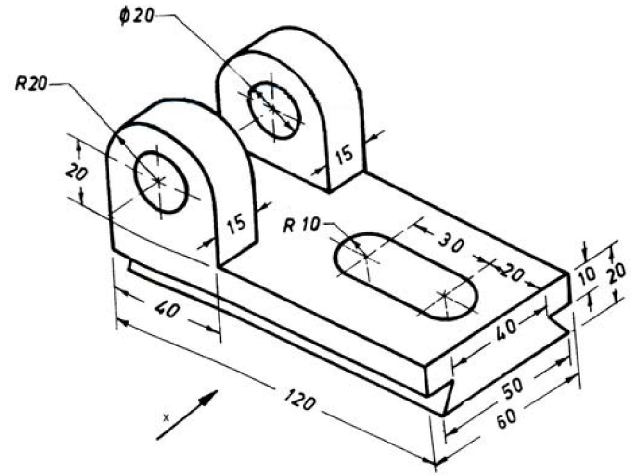
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R20
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R 10
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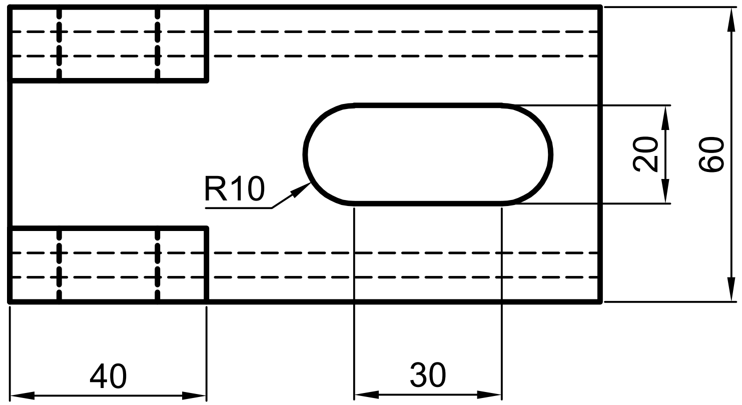
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