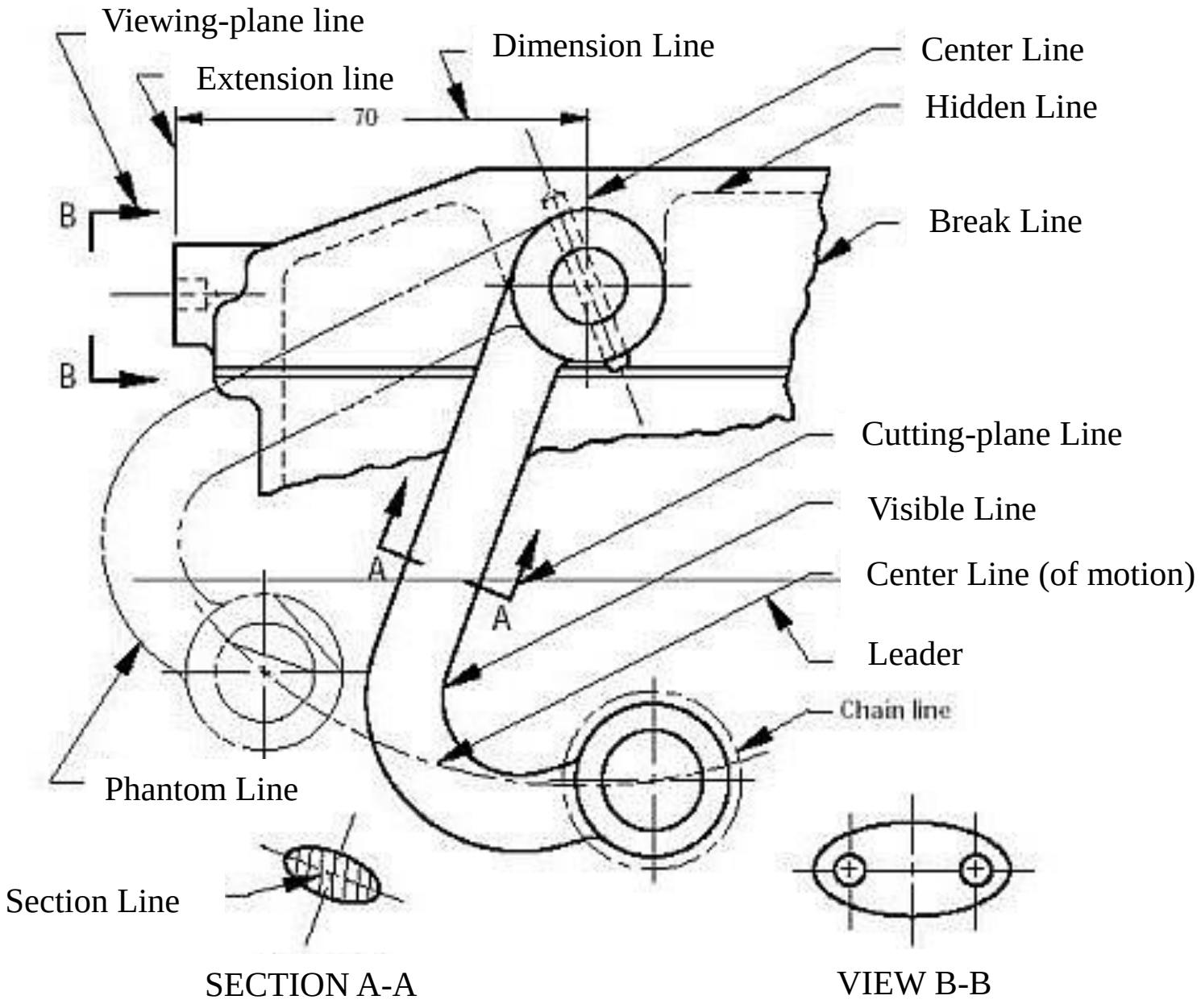
COMPUTER AIDED ENGINEERING DRAWING

Why Engineering Drawings?

- • Engineering drawing is a formal and precise way of communicating information about the shape, size, features and precision of physical objects.
- • Drawing is the universal language of engineering.

Line Conventions

- Visible Lines – solid thick lines that represent visible edges or contours
- Hidden Lines – short evenly spaced dashes that depict hidden features
- Section Lines – solid thin lines that indicate cut surfaces
- Center Lines – alternating long and short dashes
- Dimensioning
  - Dimension Lines - solid thin lines showing dimension extent/direction
  - Extension Lines - solid thin lines showing point or line to which dimension applies
  - Leaders – direct notes, dimensions, symbols, part numbers, etc. to features on drawing
- Cutting-Plane and Viewing-Plane Lines – indicate location of cutting planes for sectional views and the viewing position for removed partial views
- Break Lines – indicate only portion of object is drawn. May be random “squiggled” line or thin dashes joined by zigzags.
- Phantom Lines – long thin dashes separated by pairs of short dashes indicate alternate positions of moving parts, adjacent position of related parts and repeated detail
- Chain Line – Lines or surfaces with special requirements

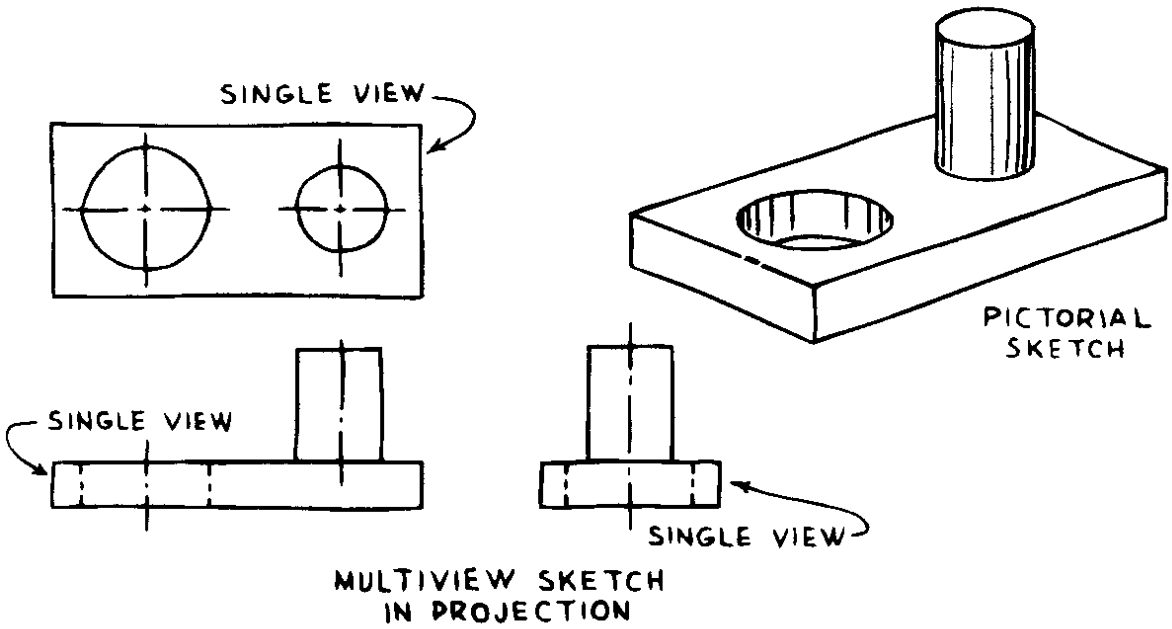


Source: http://www.genium.com/pdf/dmpc.pdf

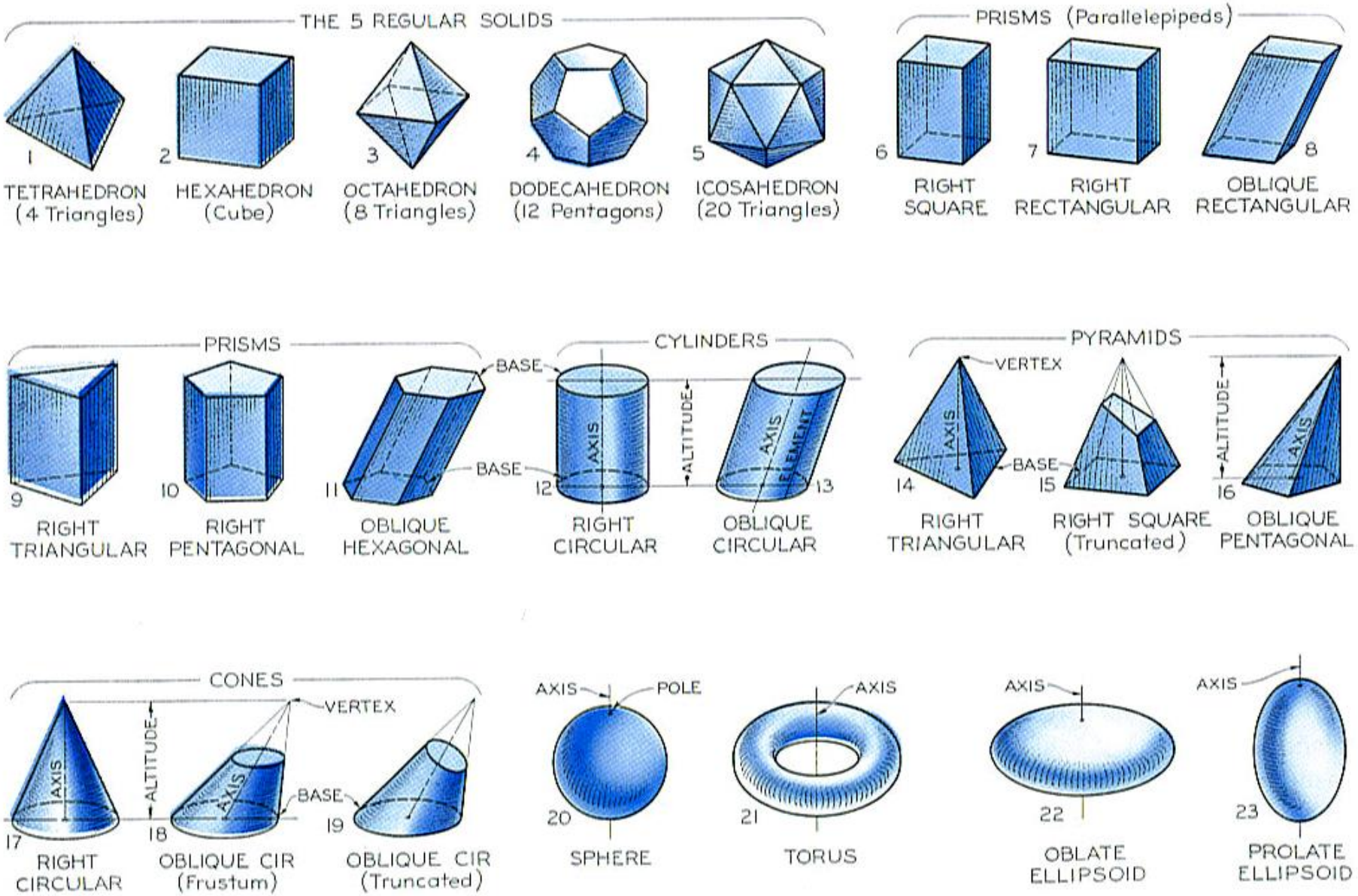
Sketching

- Drawings made without mechanical drawing tools
  - Free-Hand

Figure C.2



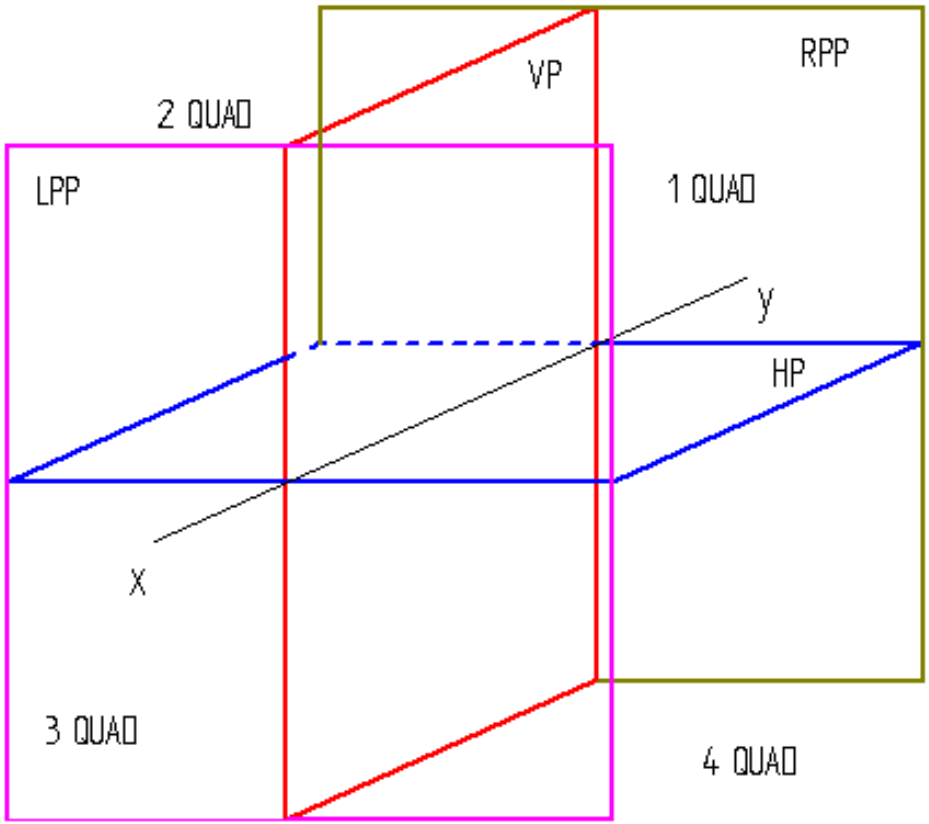
Freehand drawings.

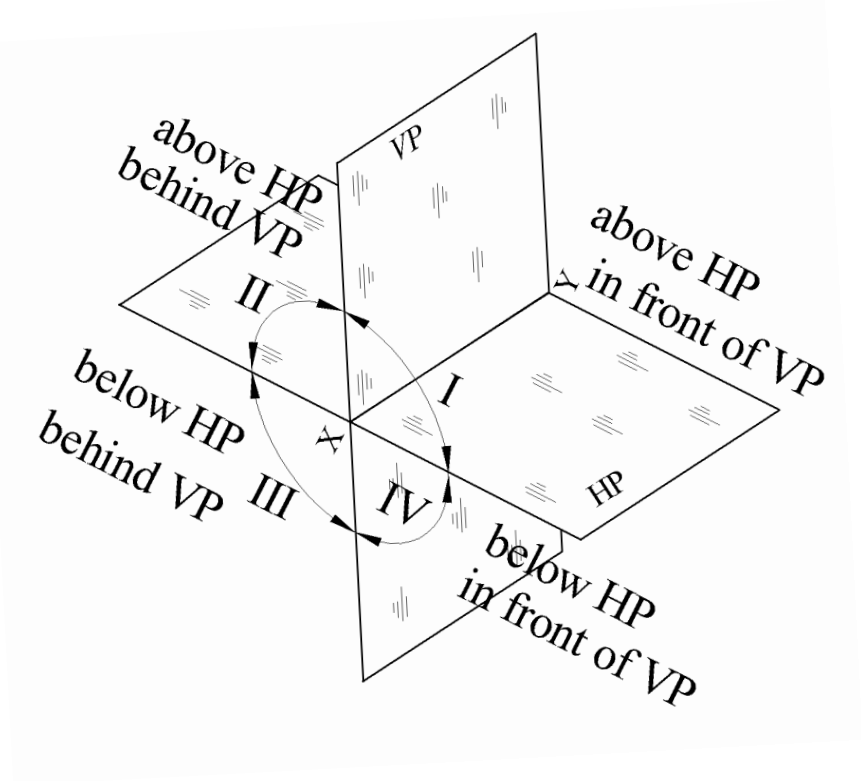

THE 5 REGULAR SOLIDS
1
TETRAHEDRON
(4 Triangles)
2
HEXAHEDRON
(Cube)
3
OCTAHEDRON
(8 Triangles)
4
DODECAHEDRON
(12 Pentagons)
5
ICOSAHEDRON
(20 Triangles)
PRISMS (Parallelepipeds)
6
RIGHT
SQUARE
7
RIGHT
RECTANGULAR
8
OBLIQUE
RECTANGULAR
PRISMS
9
RIGHT
TRIANGULAR
10
RIGHT
PENTAGONAL
11
OBLIQUE
HEXAGONAL
BASE
BASE
CYLINDERS
AXIS
ALTITUDE
12
RIGHT
CIRCULAR
AXIS
ELEMENT
13
OBLIQUE
CIRCULAR
PYRAMIDS
VERTEX
AXIS
BASE
14
RIGHT
TRIANGULAR
15
RIGHT SQUARE
(Truncated)
ALTITUDE
AXIS
16
OBLIQUE
PENTAGONAL
CONES
AXIS
17
RIGHT
CIRCULAR
ALTITUDE
VERTEX
AXIS
BASE
18
OBLIQUE CIR
(Frustum)
19
OBLIQUE CIR
(Truncated)
AXIS
POLE
20
SPHERE
AXIS
21
TORUS
AXIS
22
OBLATE
ELLIPSOID
AXIS
23
PROLATE
ELLIPSOID

Projection of points

- **In 1st quadrant**
- **In 2nd quadrant**
- **In 3rd quadrant**
- **In 4th quadrant**

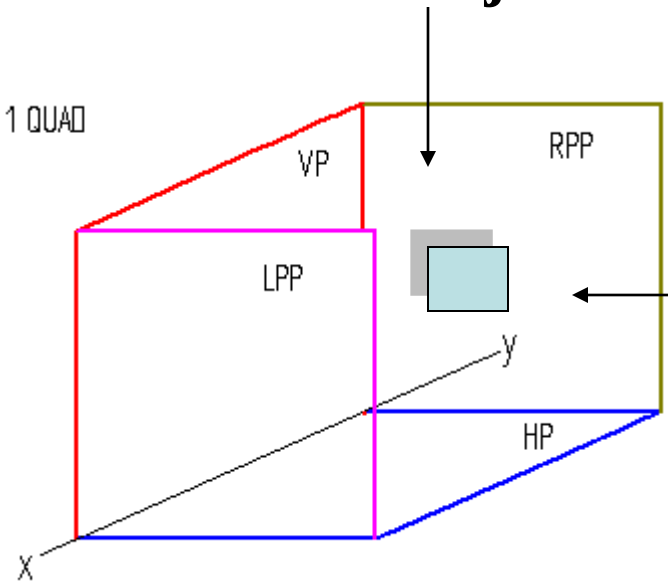
Quadrants


VP
RPP
2 QUAD
LPP
1 QUAD
y
HP
X
3 QUAD
4 QUAD

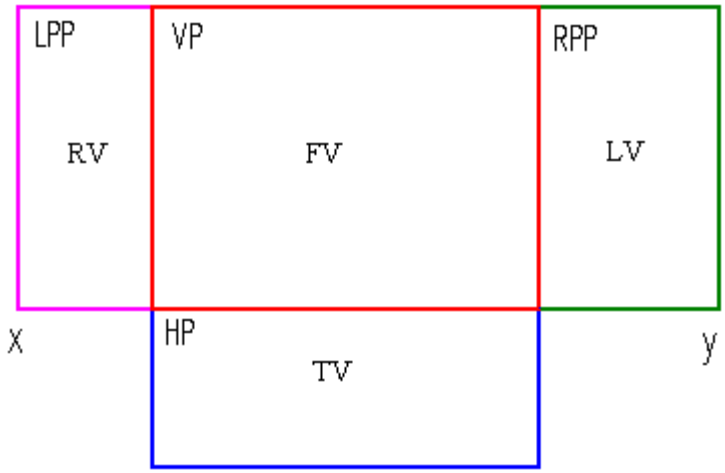

above HP
behind VP
VP
above HP
in front of VP
II
I
X
Y
below HP
behind VP
III
IV
HP
below HP
in front of VP

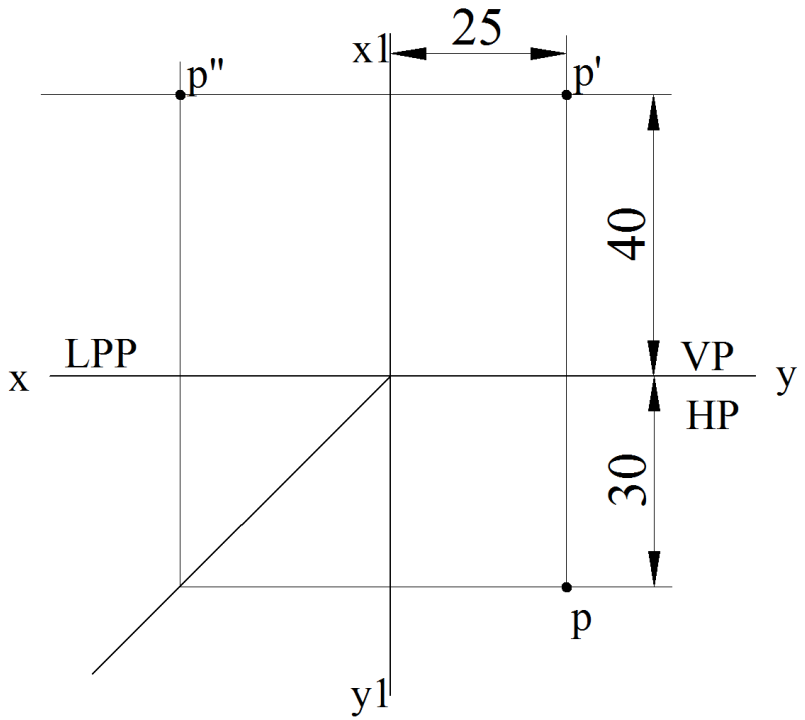
Projection of points In 1st quadrant

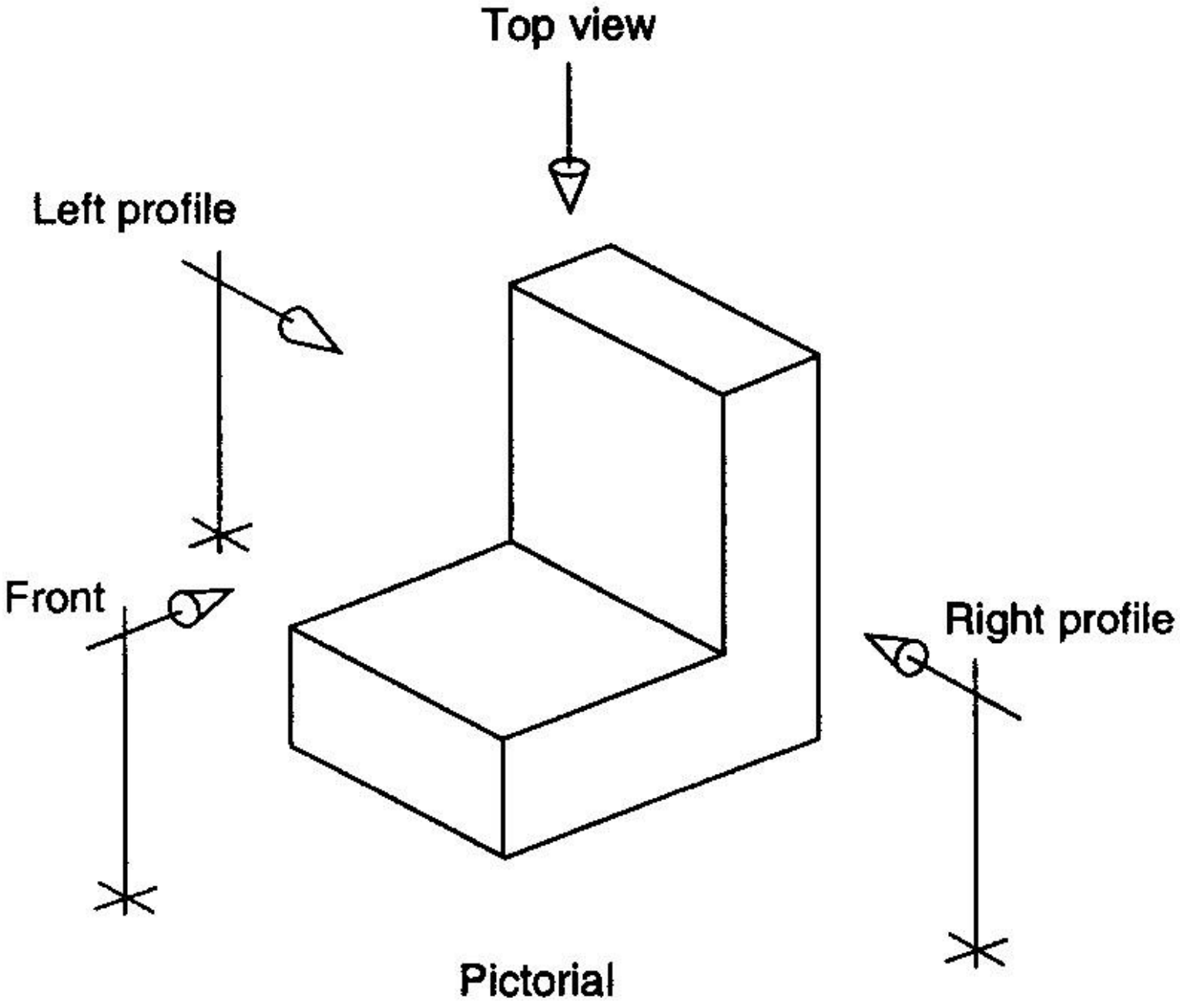
- **Above HP**
- **In front of VP**



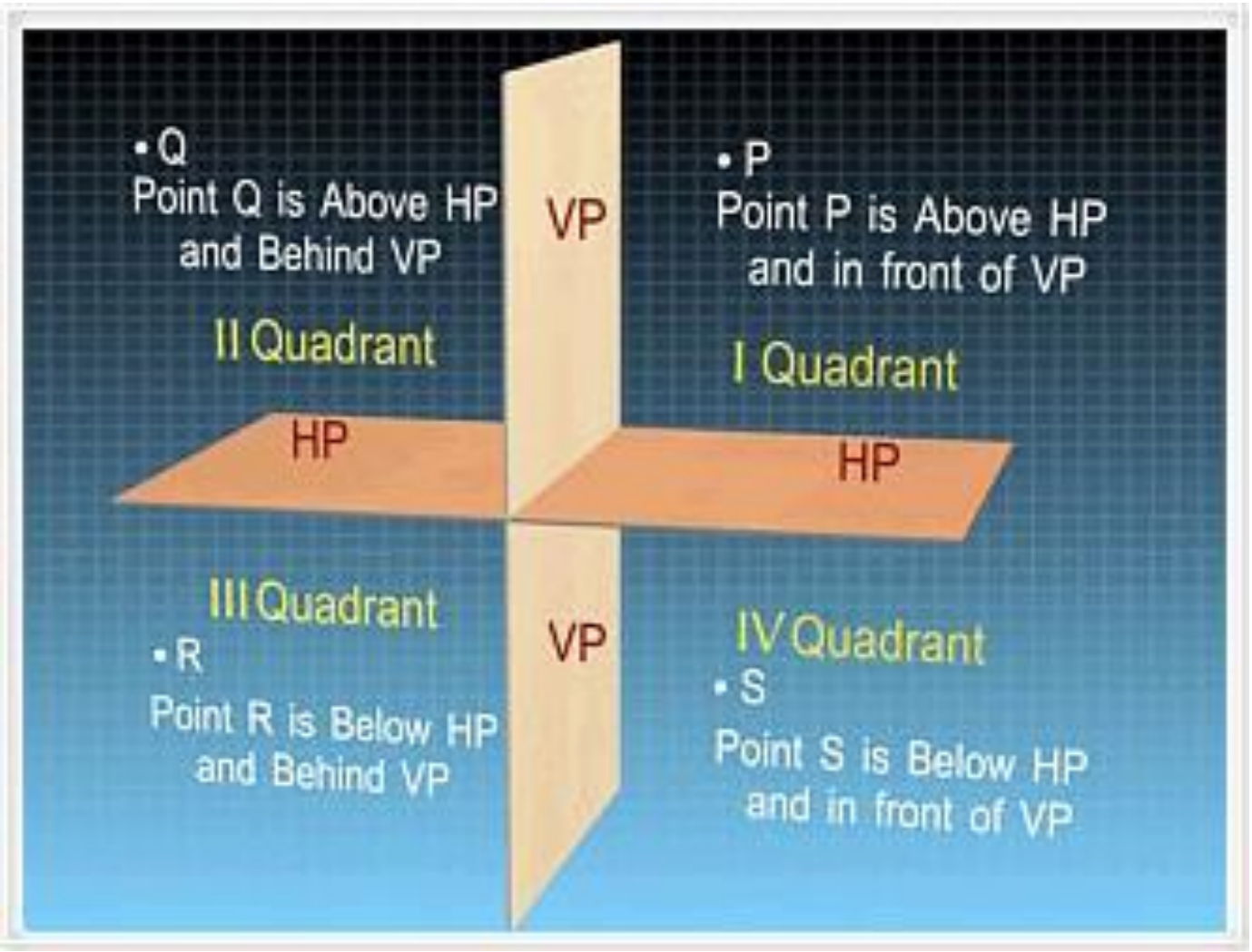
A point is 30 mm in front of VP, 40 mm above HP and 25 mm in front of left profile plane. Draw its projections.





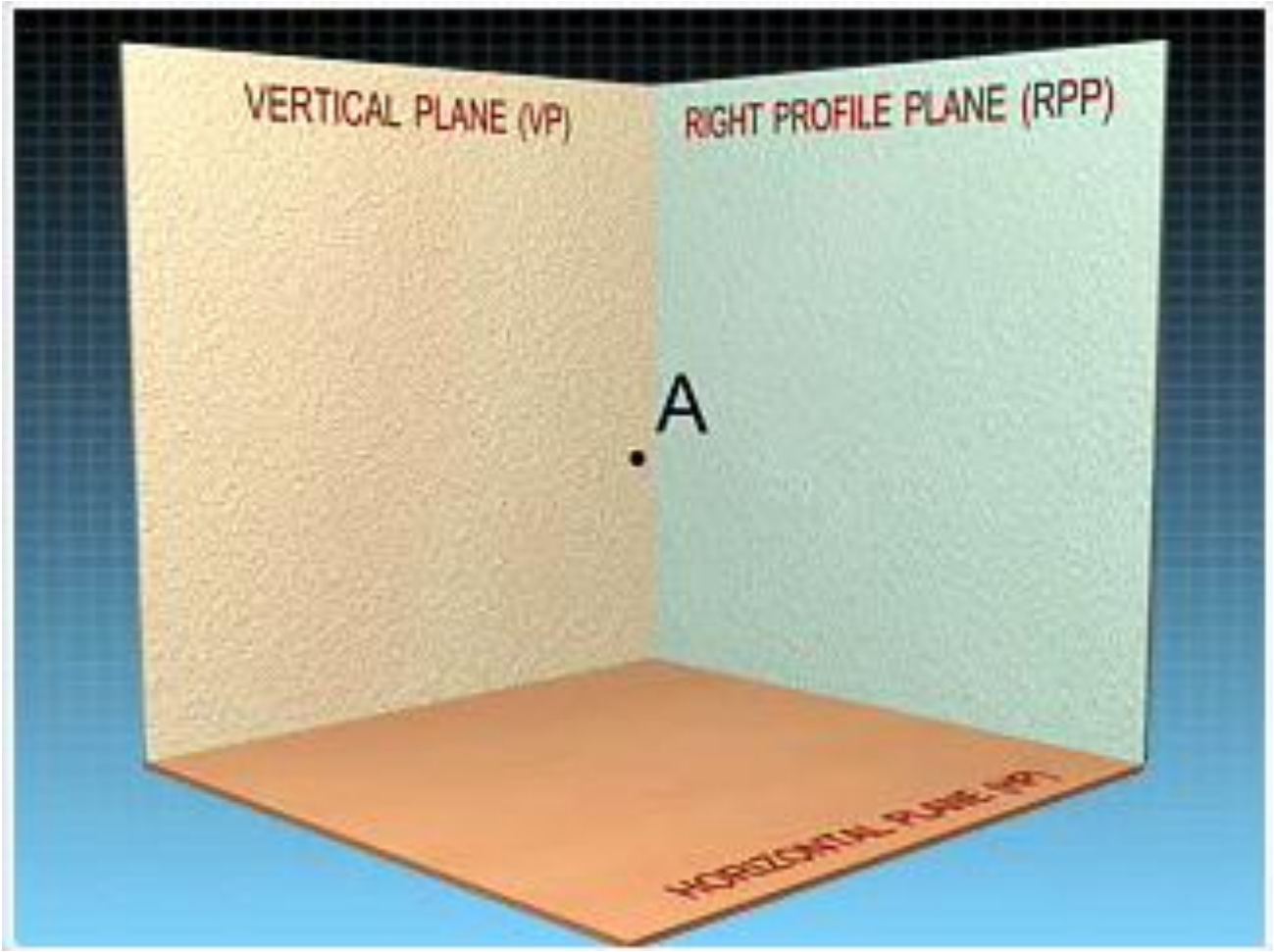

Top view
Left profile
Front
Right profile
Pictorial

Projection of Points



- **In 1st quadrant**
- **In 2nd quadrant**
- **In 3rd quadrant**
- **In 4th quadrant**

Projection of point – I quadrant

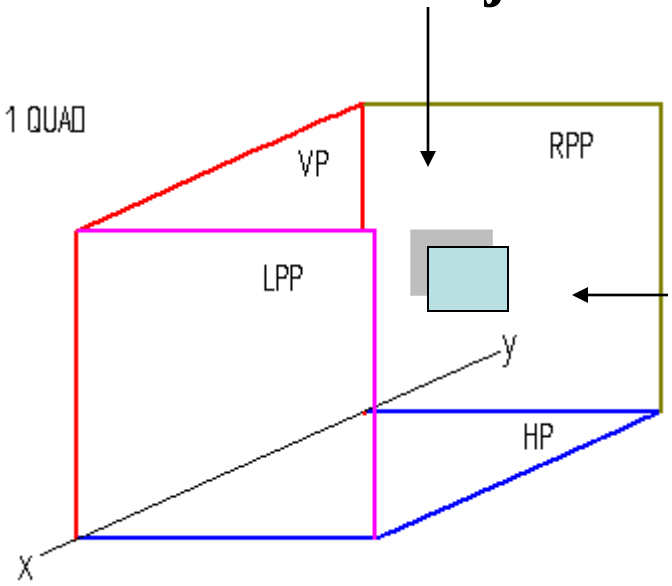


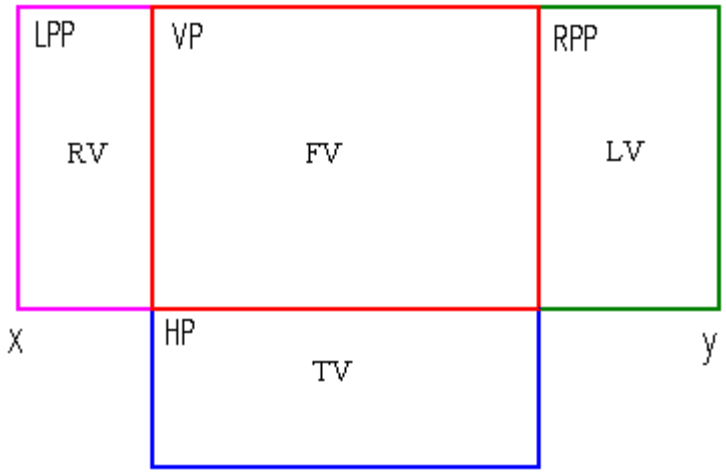
Projection of point – I quadrant

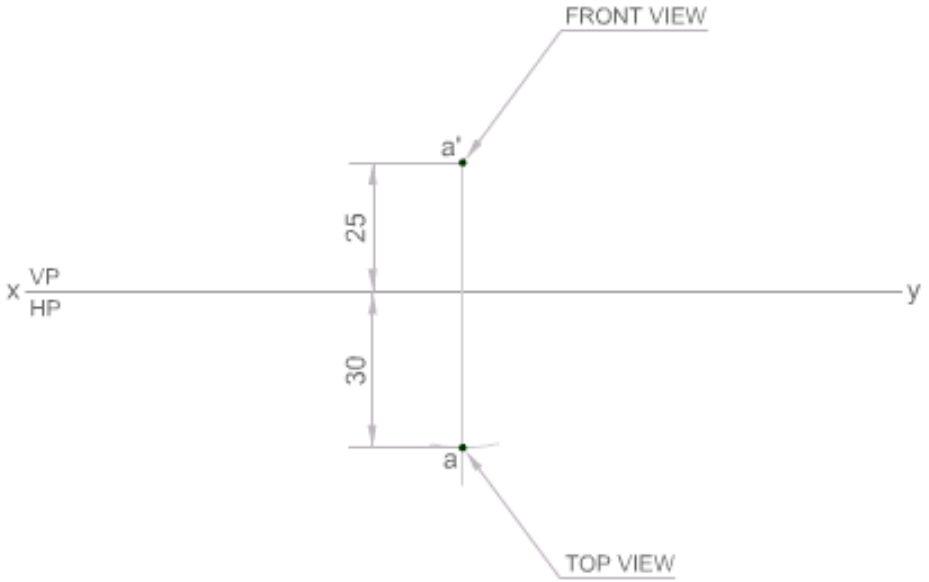
Projection of points In 1st quadrant

- **Above HP**
- **In front of VP**

A point is 30 mm in front of VP, 25 mm above HP. Draw its projections.



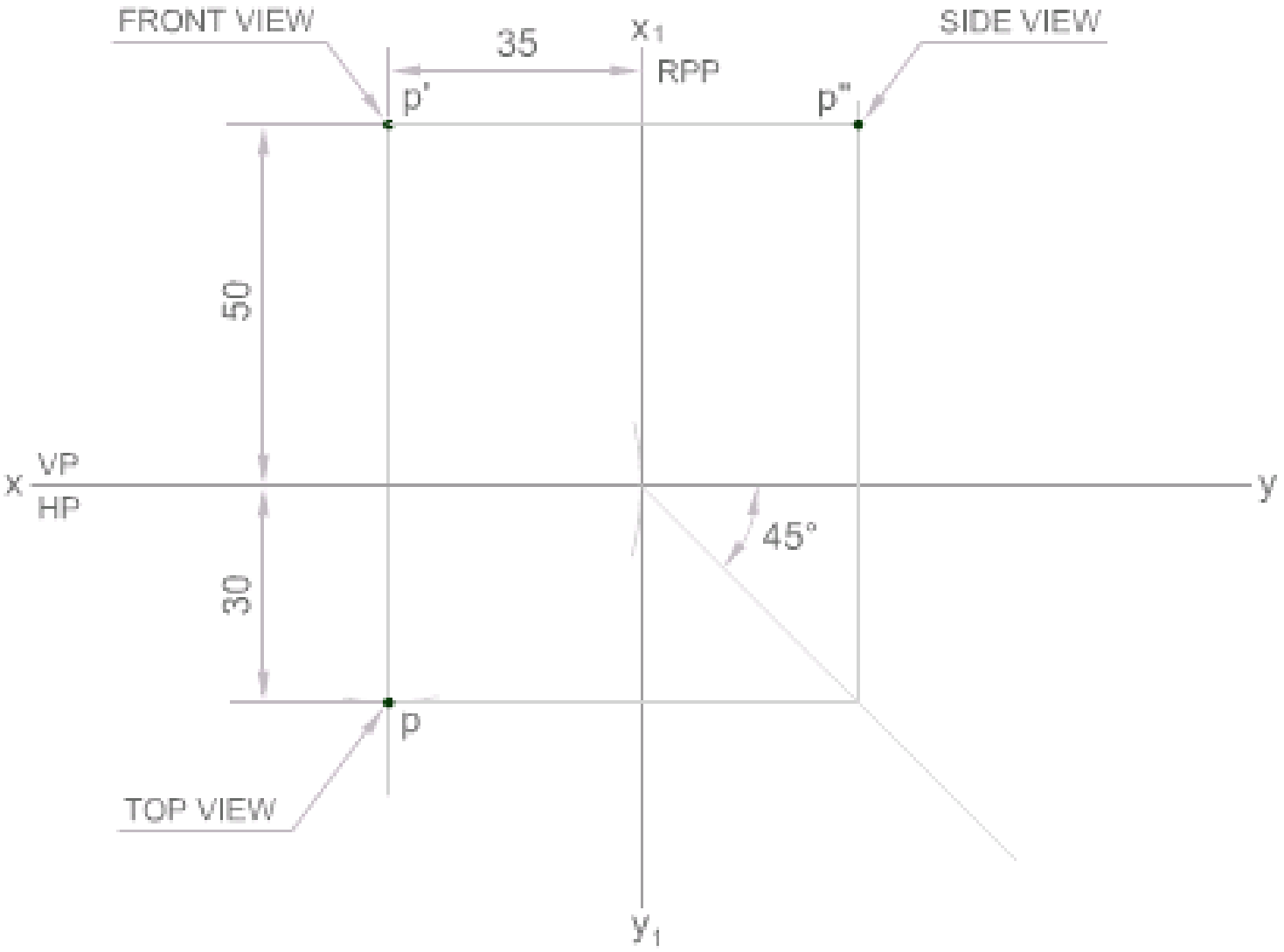




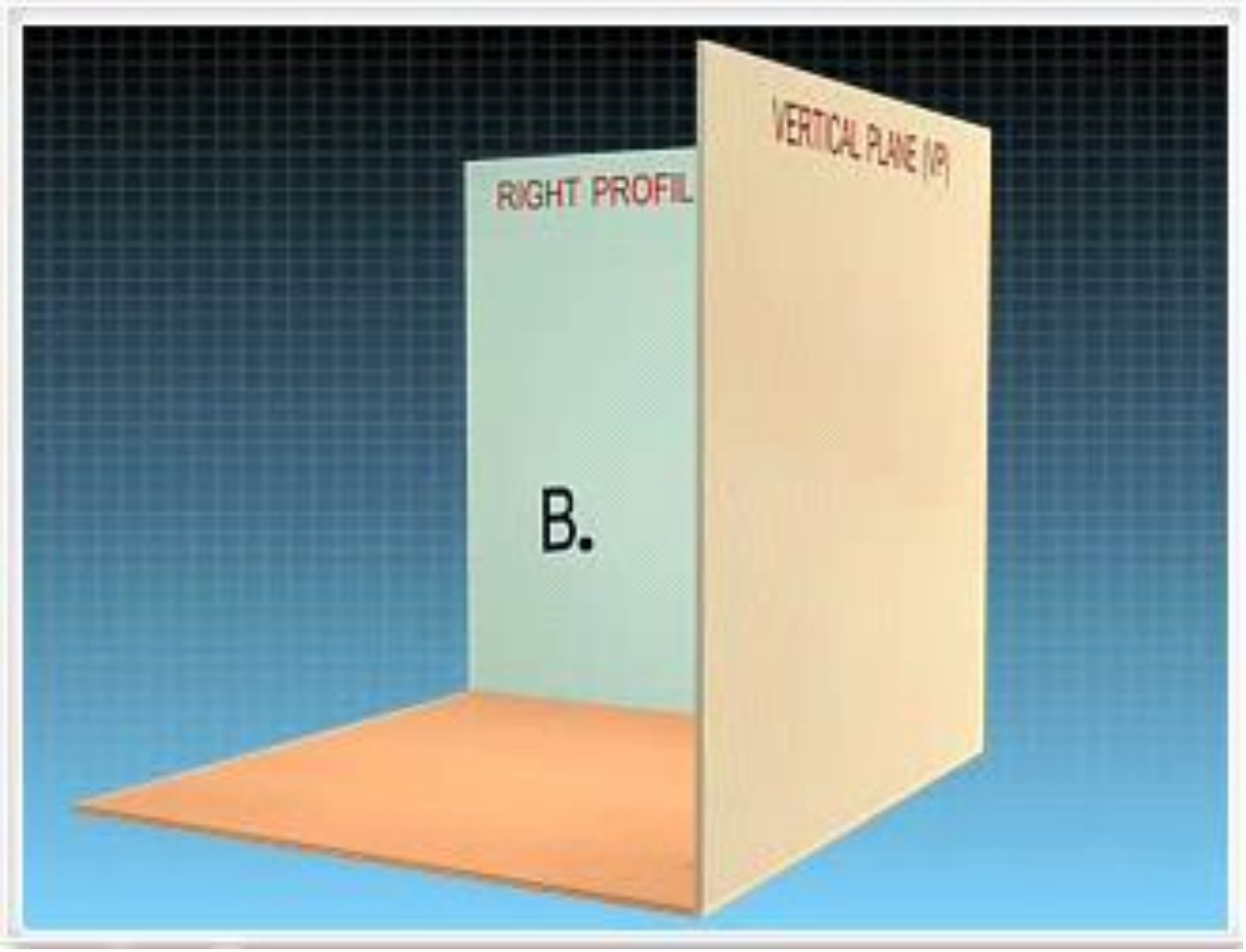
Projection of points In 1st quadrant

2. Draw the projection of a point P that is 30 mm in front of VP, 50 mm above HP and 35 mm in front of right profile plane

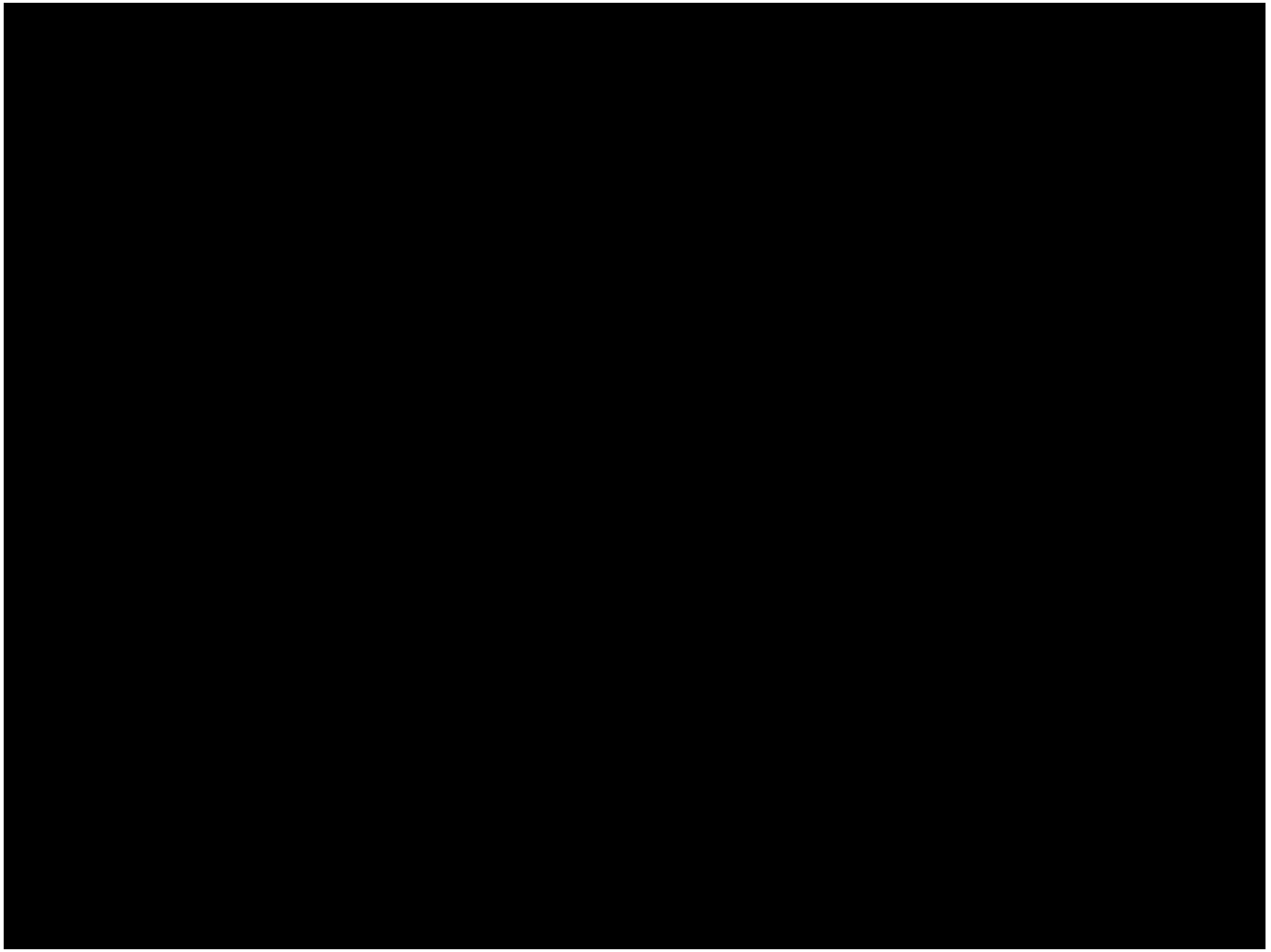
Solution



Projection of point – II quadrant

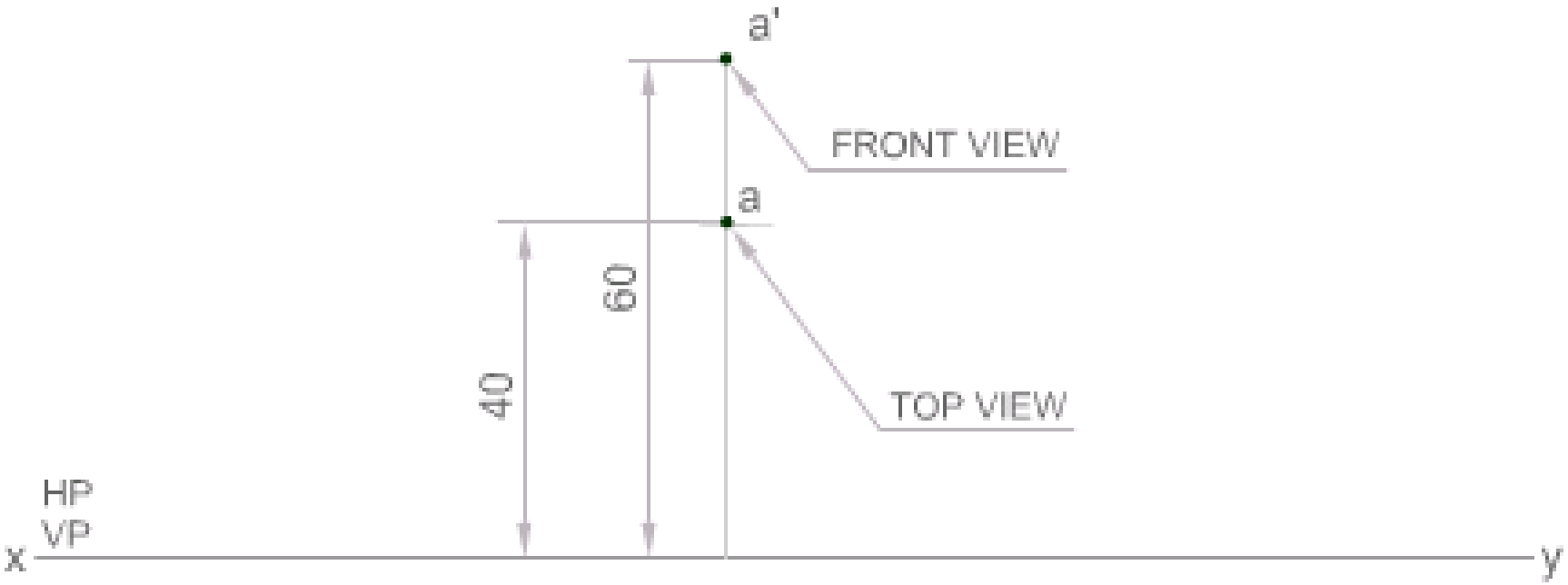


Projection of point – II quadrant



Projection of point – II quadrant

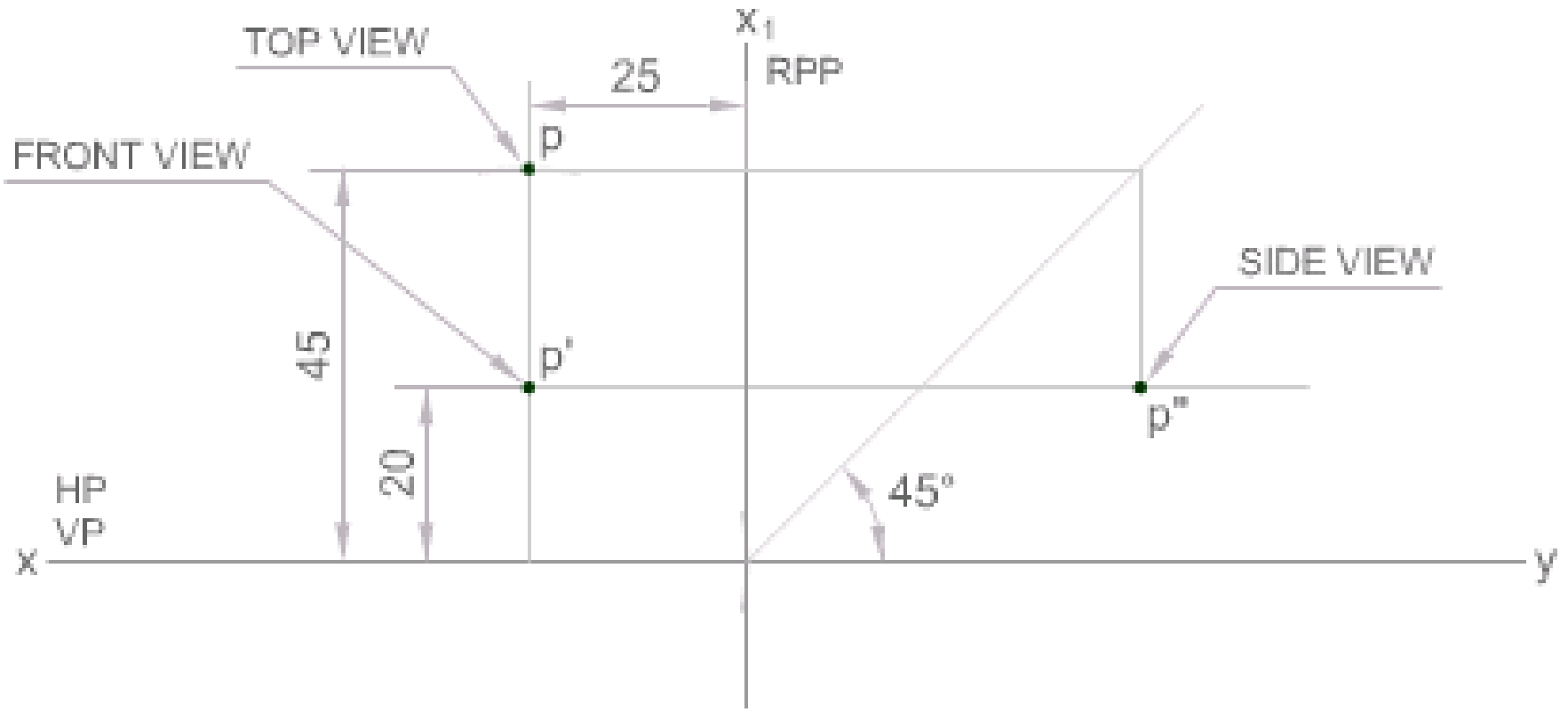
- Draw the projection of a point A lying 60mm above HP and 40mm behind VP



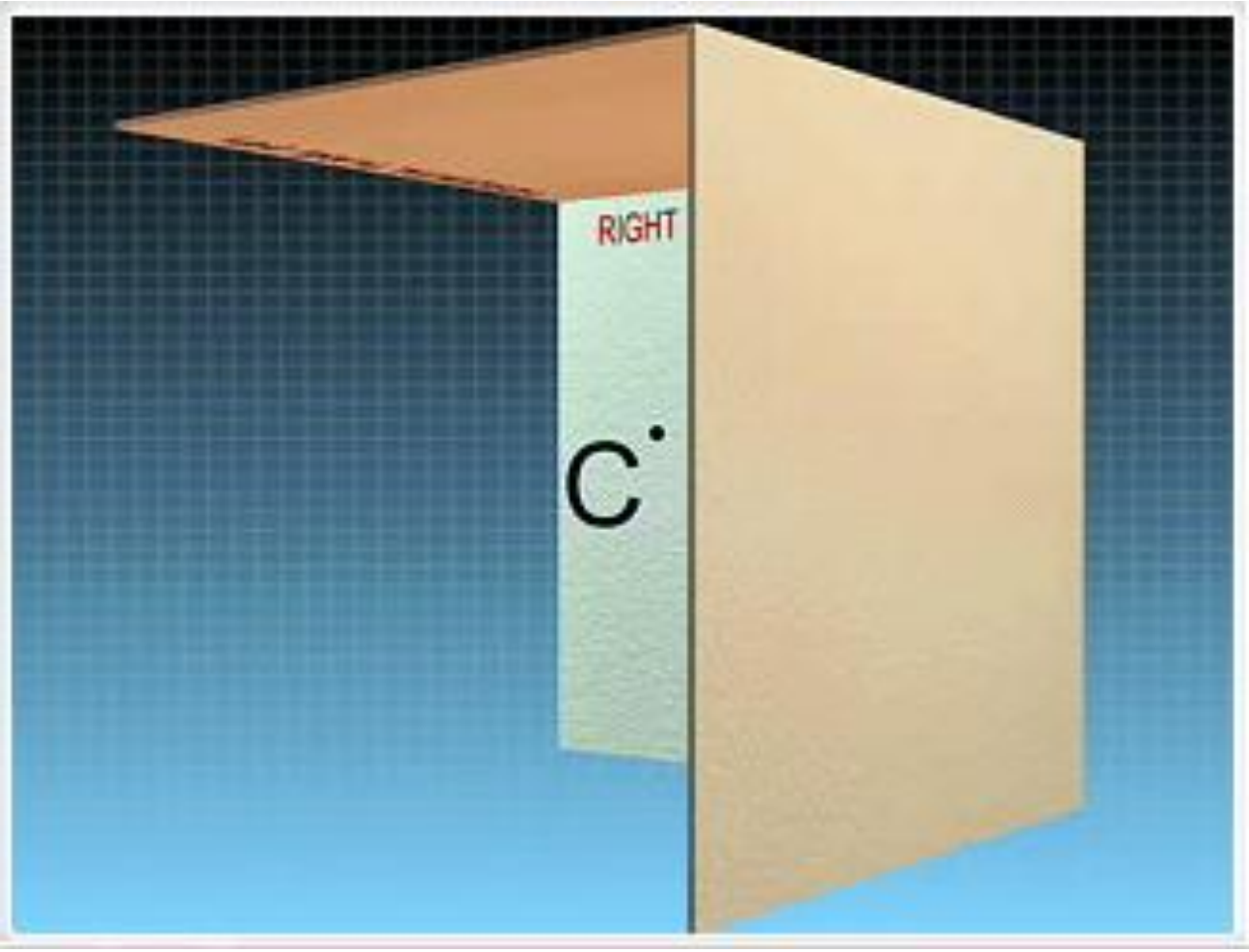
Projection of point – II quadrant

- A point is 20 mm above HP, 45 mm behind VP and 25 mm in front of RPP. Draw its projections.

Solution



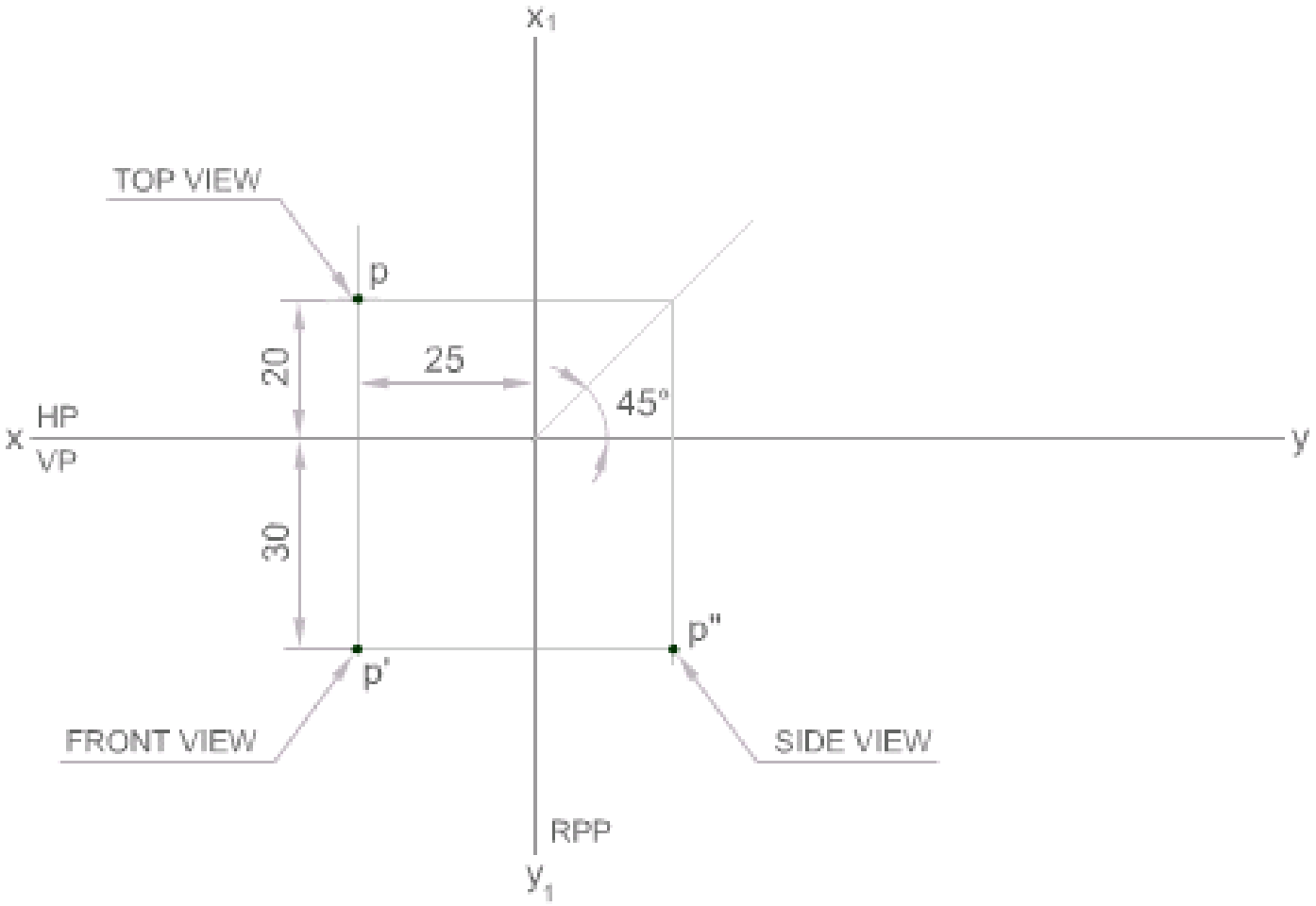
Projection of point – III quadrant



Projection of point – III quadrant

Projection of point – III quadrant

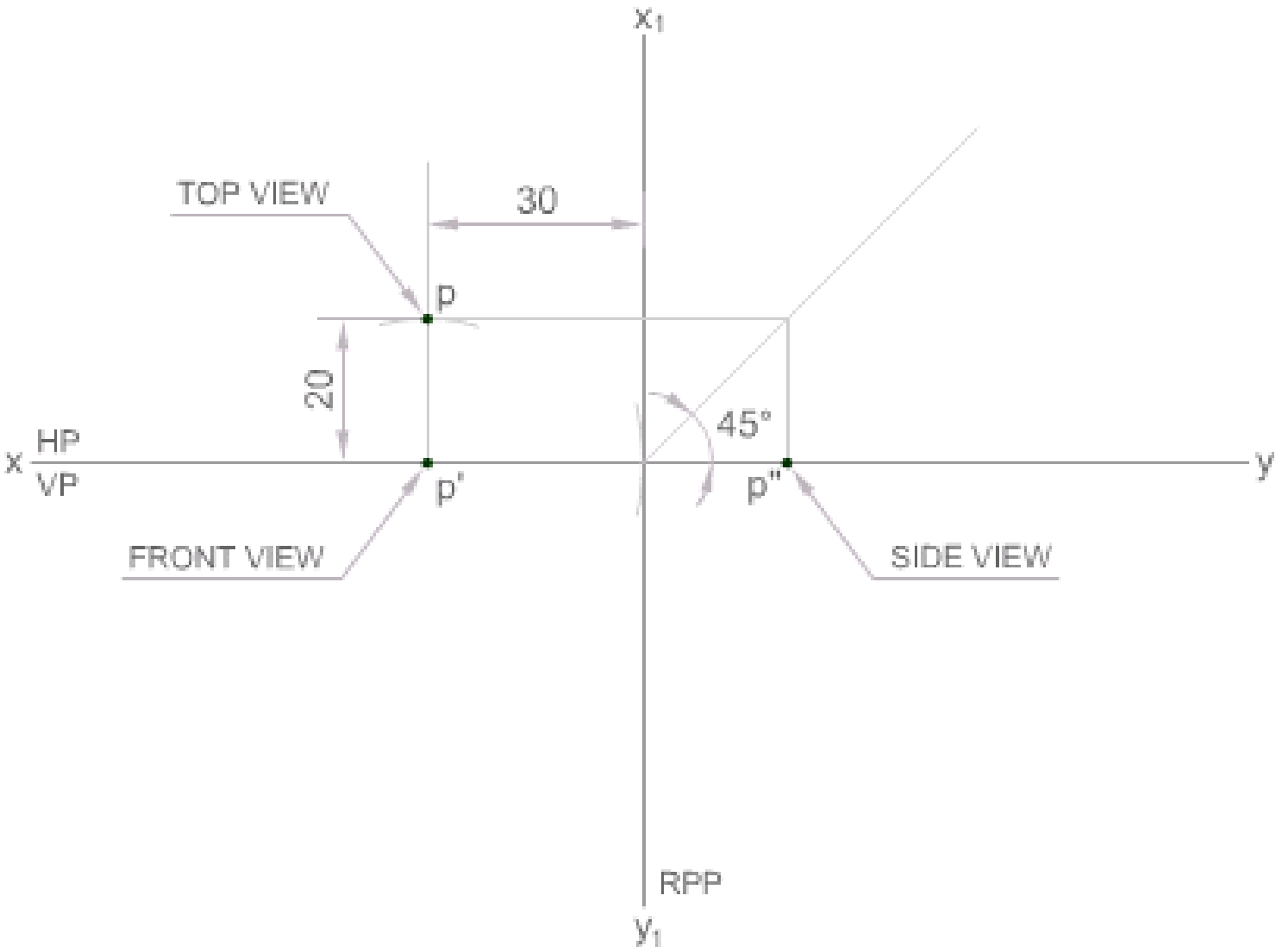
- A point P is 30 mm below HP, 20 mm behind VP and 25 mm behind RPP. Draw the projections of the point.



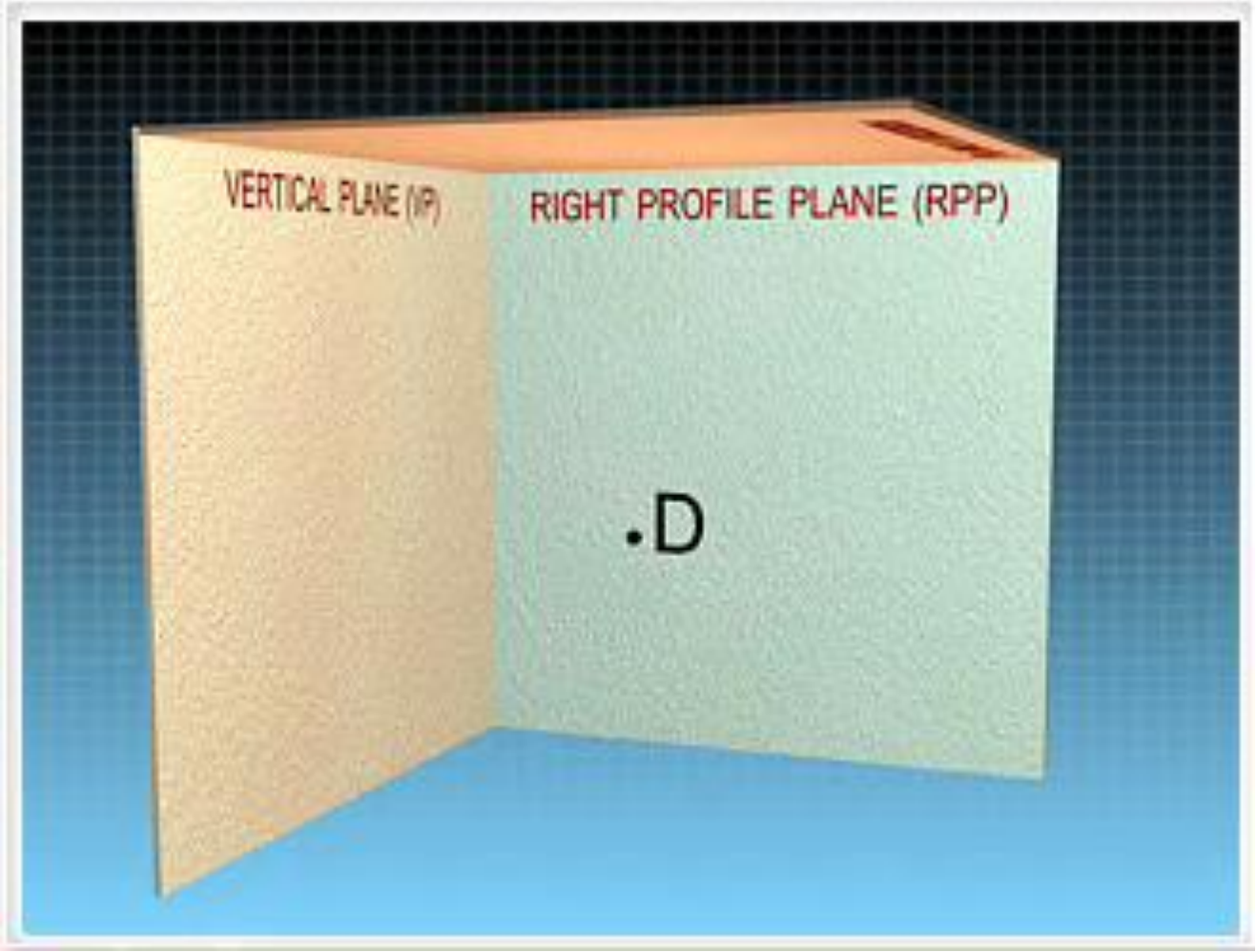
Projection of point – III quadrant

- Problem 2.
- Draw the projection of a point P that is lying in HP, 20 mm behind VP and 30 mm behind RPP

Solution



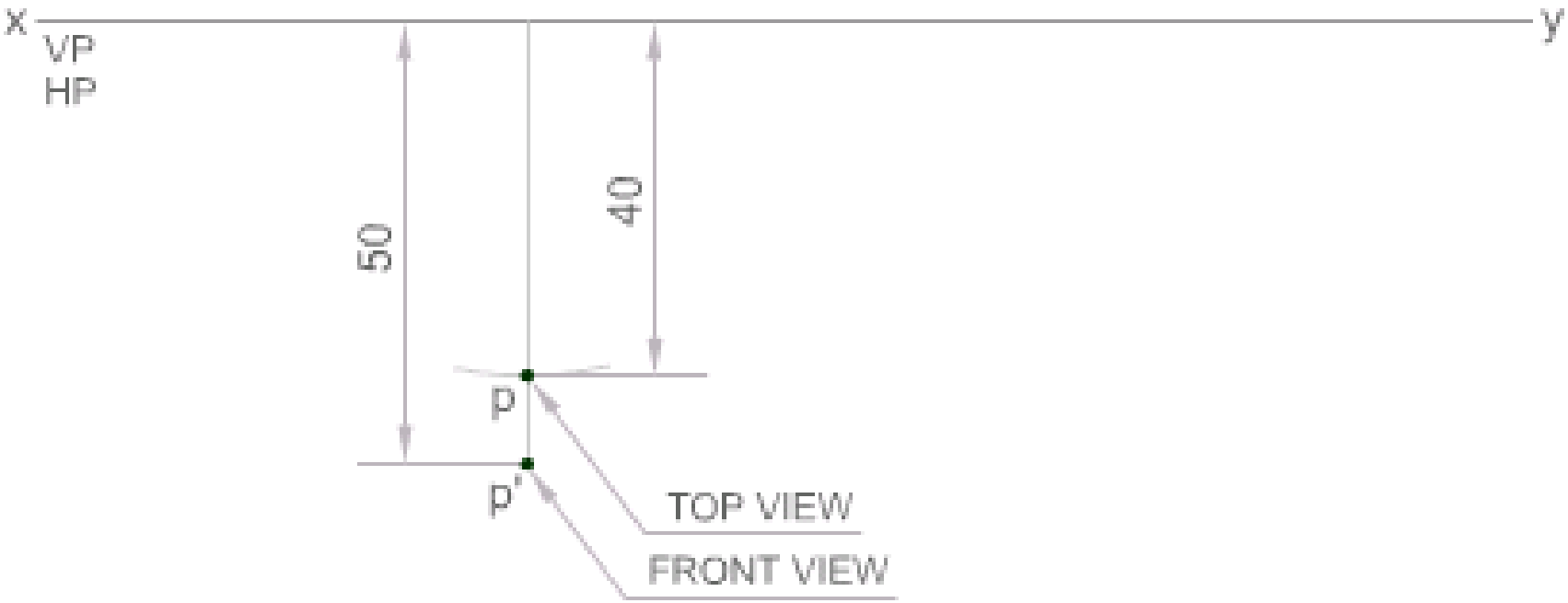
Projection of point – IV quadrant



Projection of point – IV quadrant

Projection of point – IV quadrant

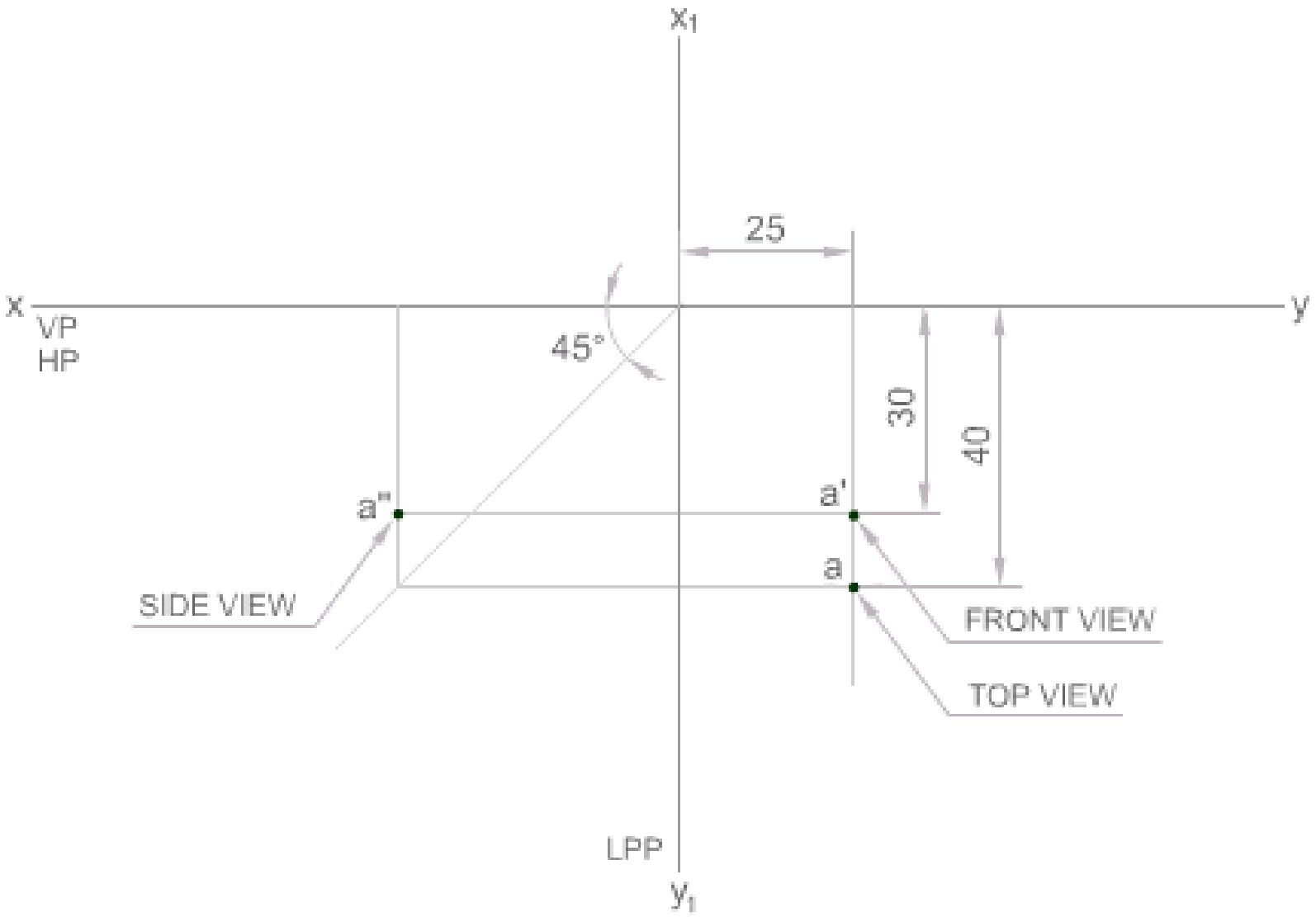
- A point P is lying 50 mm below HP and 40 mm in front of VP. Draw its projection.



Projection of point – IV quadrant

- Problem 2
- Draw the top, front and profile view of a point A 40 mm in front of VP, 30 mm below HP and 25 mm in front of LPP

Solution



Projection of Lines

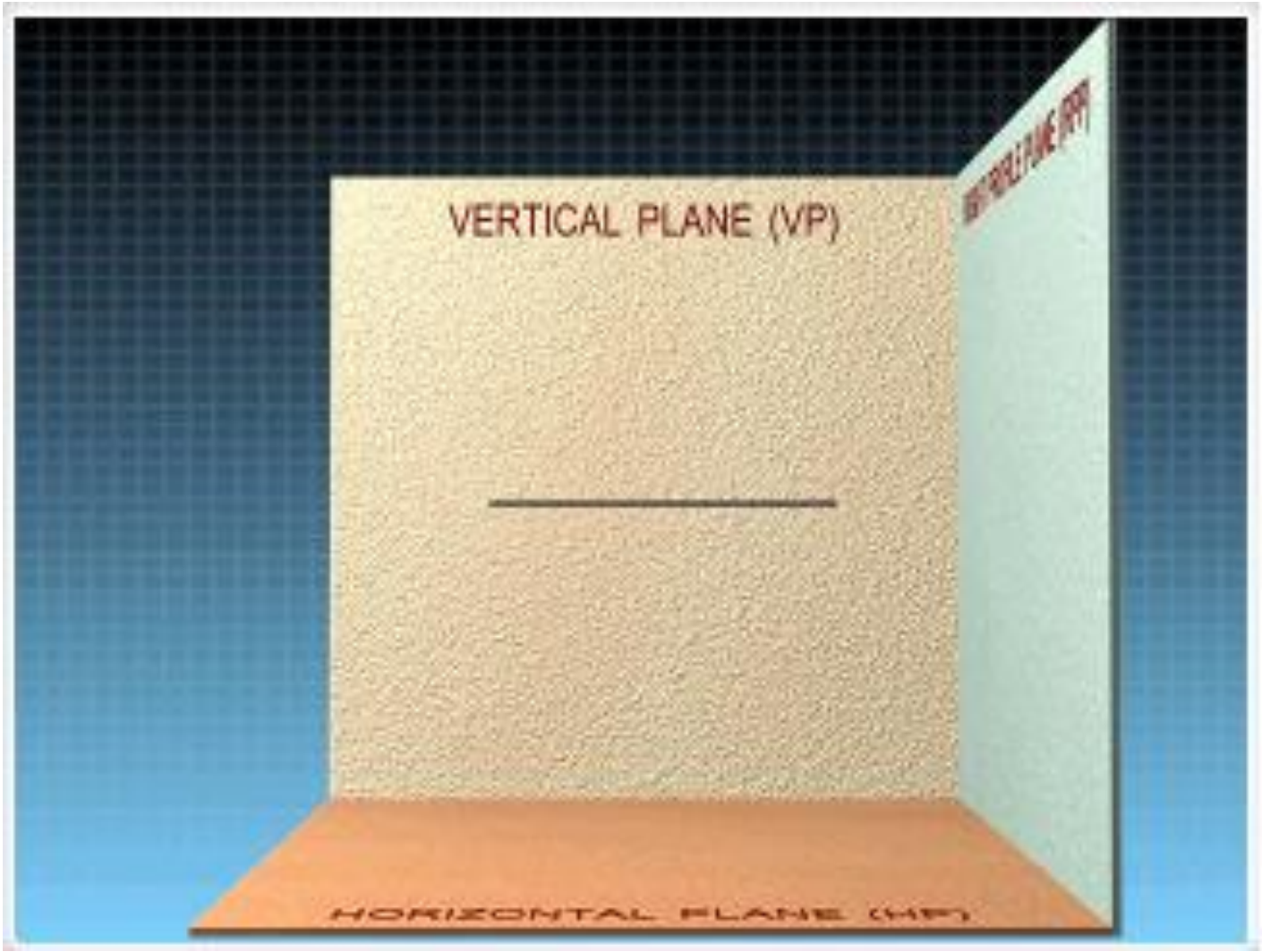
- Straight line: Defined as the locus of a point, which moves linearly.
- Or – Shortest distance between any two given points.
- Straight line is one dimensional object.
- Projection of Line: is obtained by placing the straight line in space and projecting the end points of the line on the principal planes of projection (HP, VP, PP) and connecting the points.
- From now on we look at the projections with respect to First quadrant only.

Projection of Lines

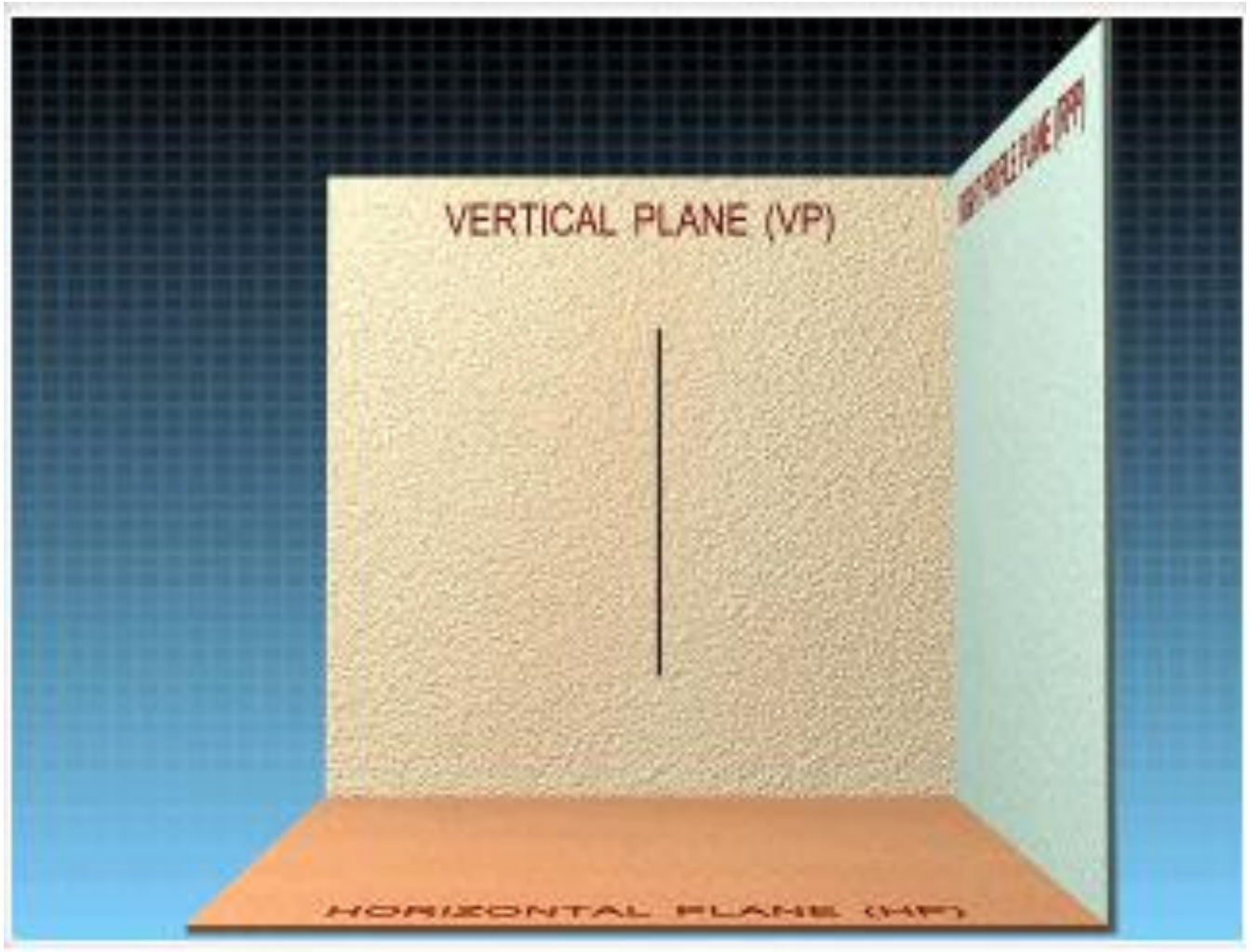
- A line may be held in space with reference to HP,VP and PP in infinite number of positions.

1. Parallel to both the planes
2. Parallel to one plane and perpendicular to the other
3. Parallel to one plane and inclined to the other
4. Inclined to both the planes

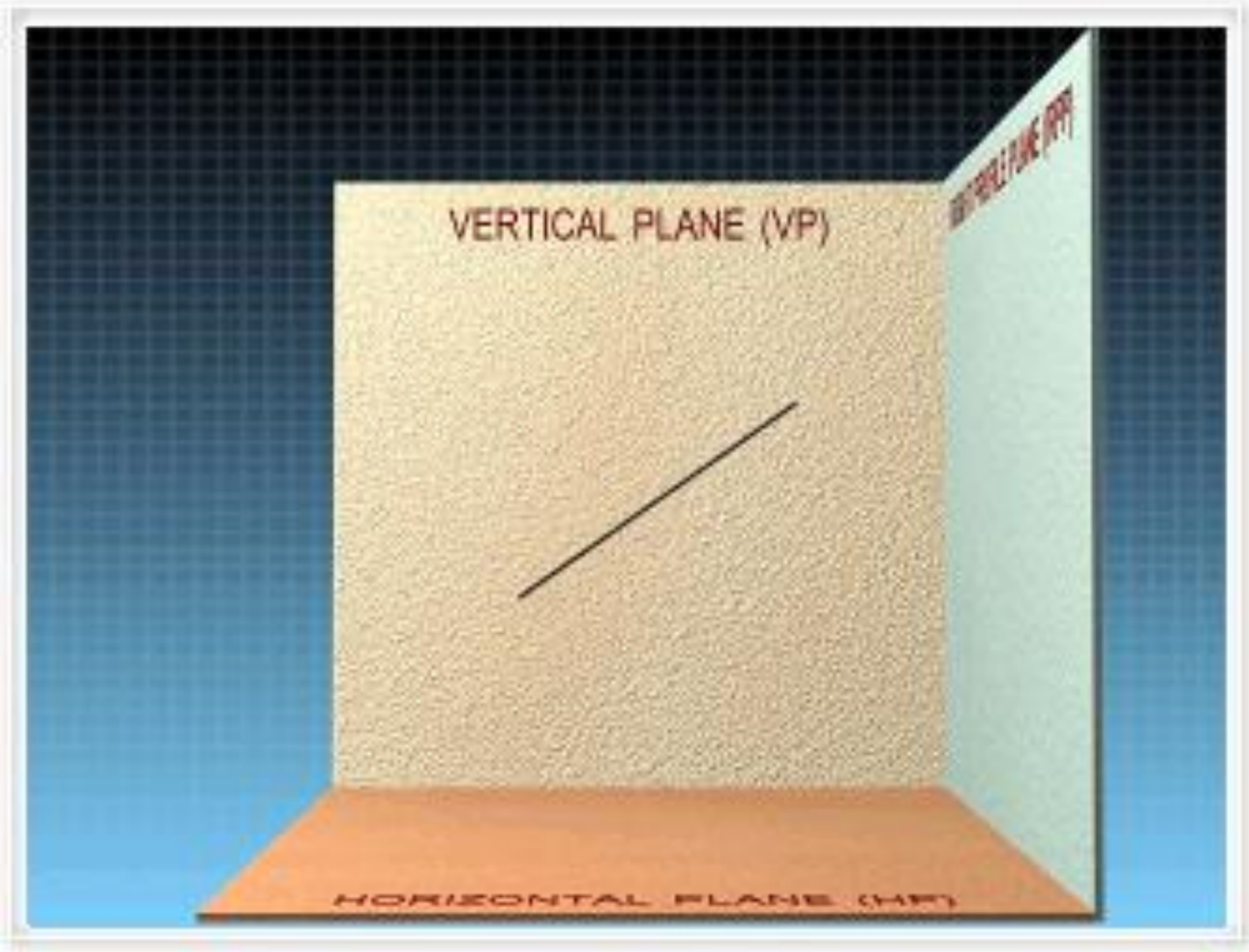
Parallel to both the planes



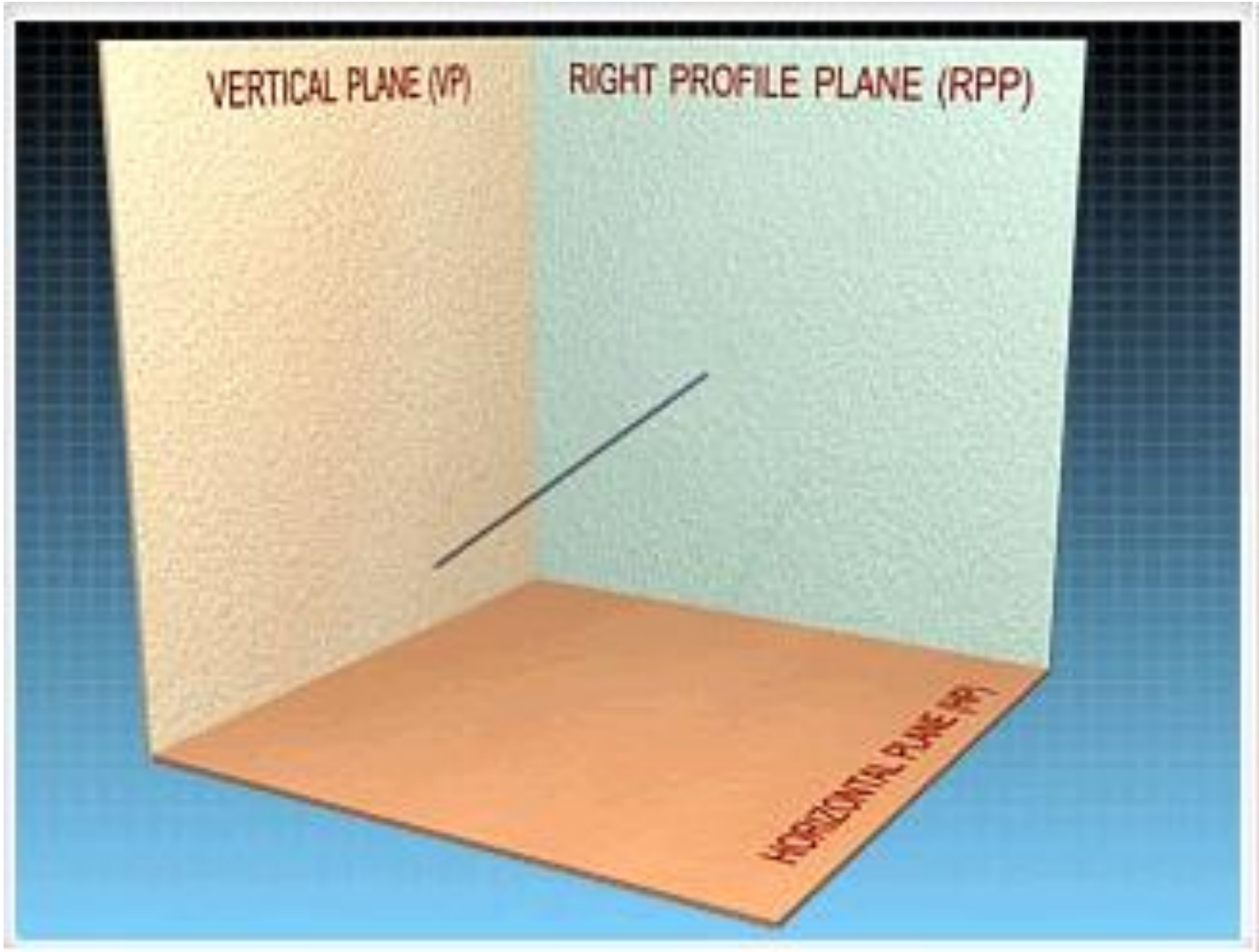
Parallel to one plane and perpendicular to the other



Parallel to one plane and inclined to the other

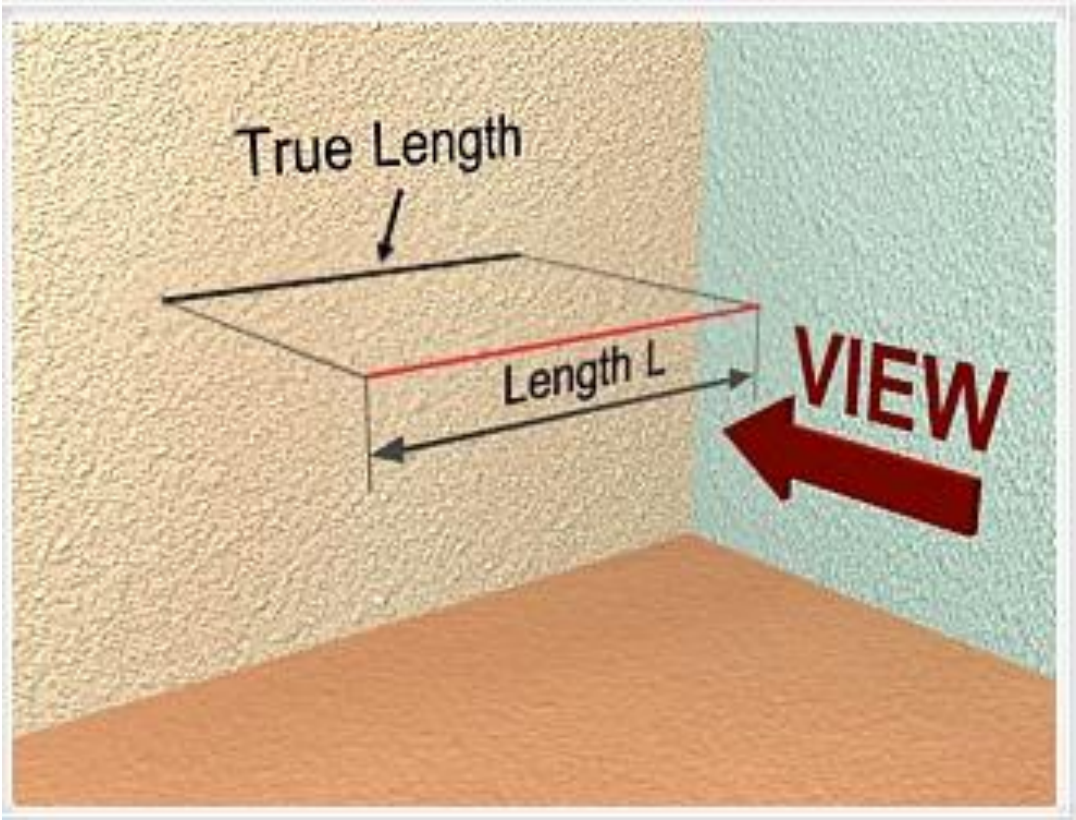


Inclined to both the planes



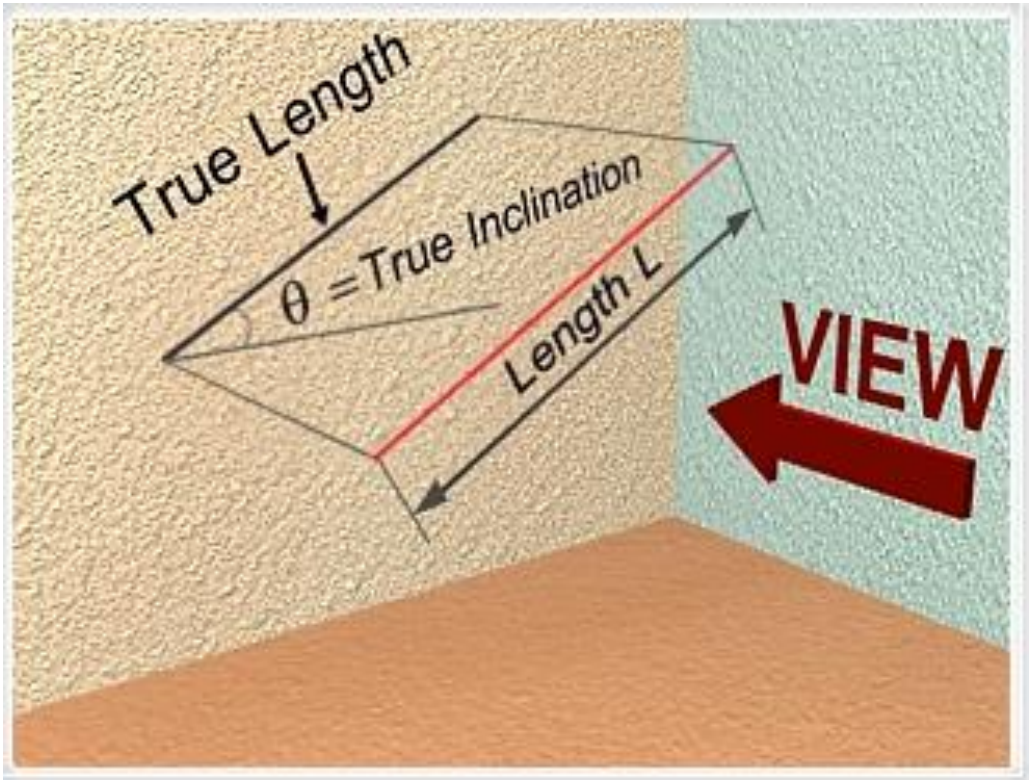
True length

- If a line is parallel to any one of the planes, its projection on that plane will give true length

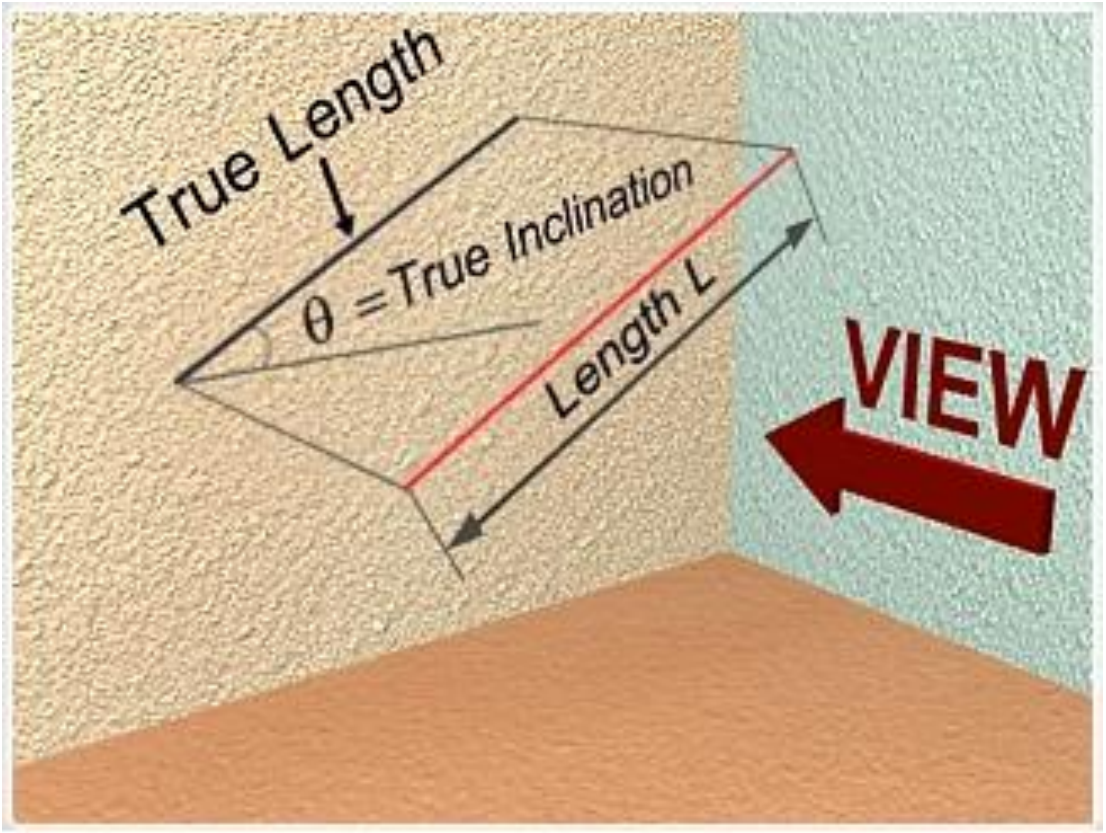


True length and true inclination

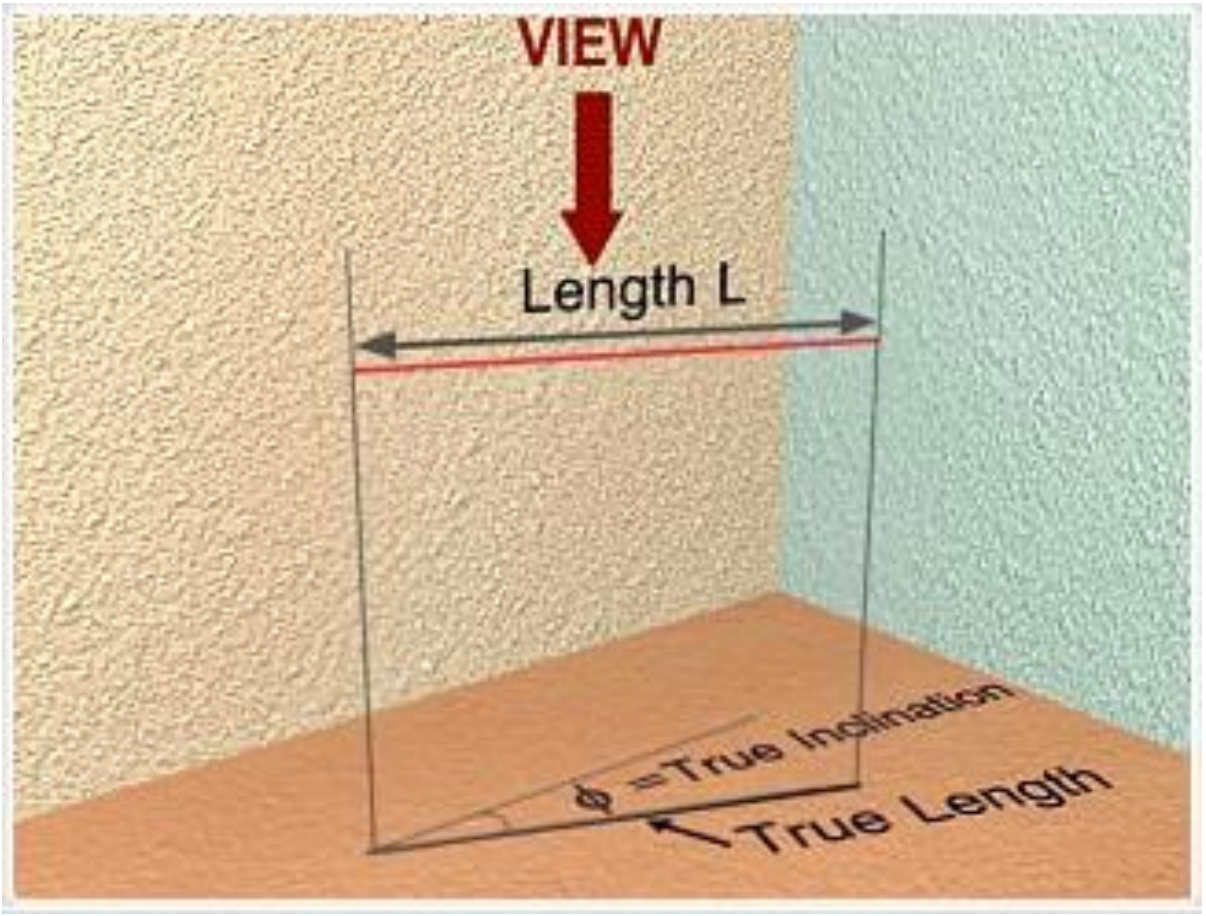
- If a line is inclined to one principal plane and is parallel to the other plane, its projection on that plane gives true length and true inclination.



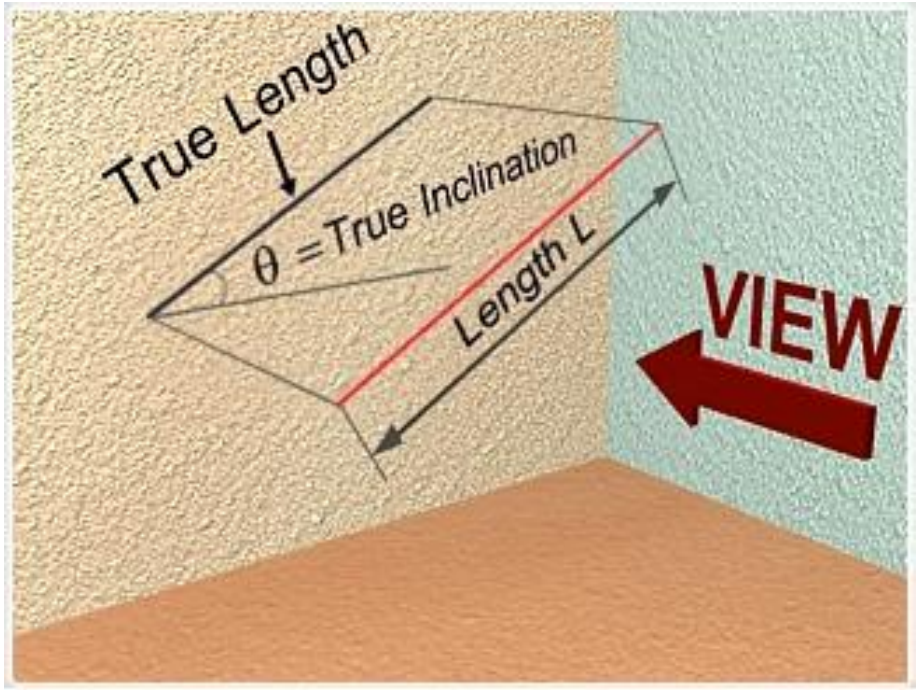
- If a line is parallel to VP and inclined at θ to HP, the front view will be true length and at true inclination θ

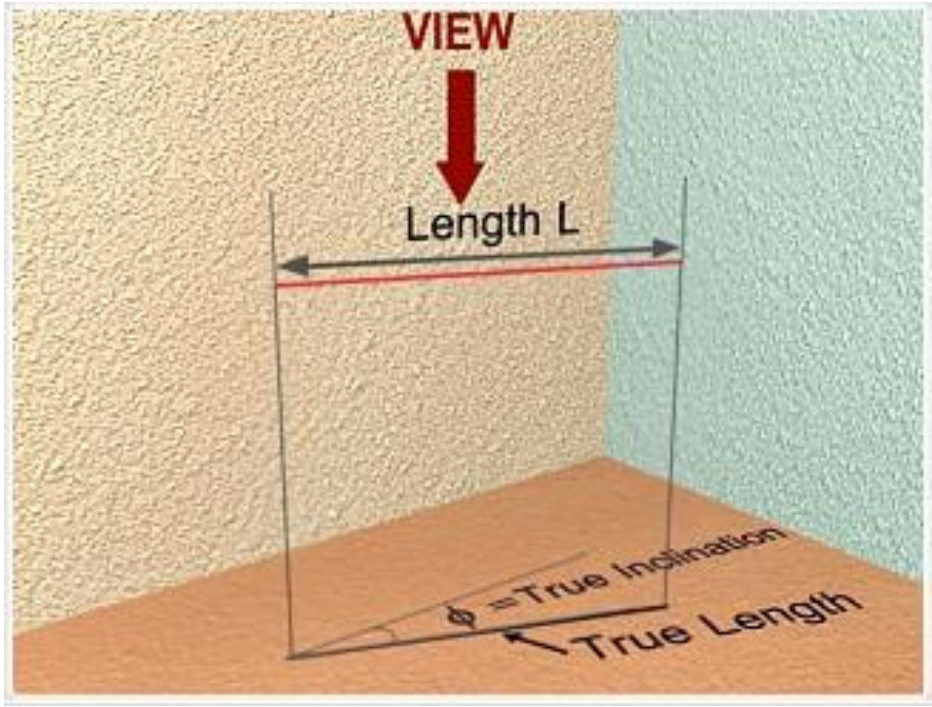


- If a line is parallel to HP and inclined at ø to VP, the top view will be true length and true inclination ø.

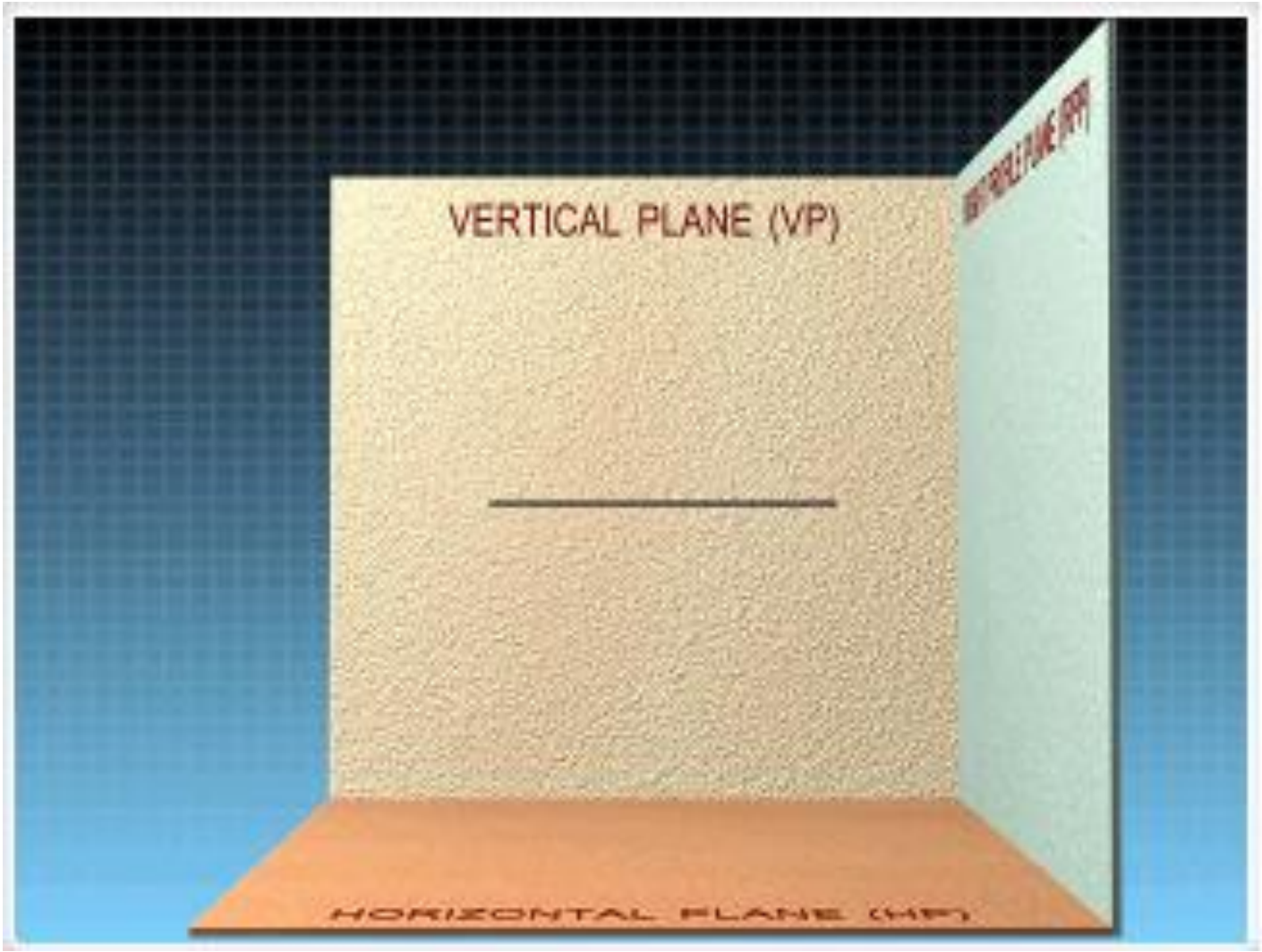


- θ is the inclination always measured with respect to object and HP
- ø is the inclination always measured with respect to object and VP



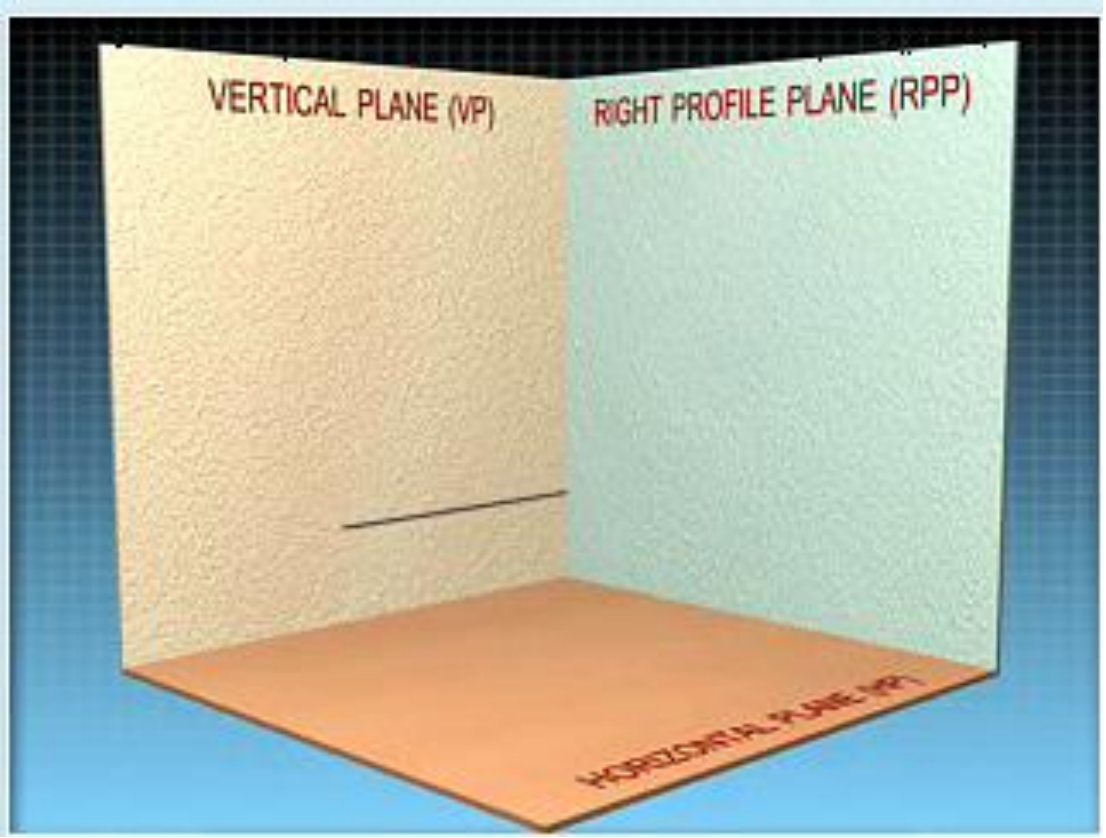


Parallel to both the planes

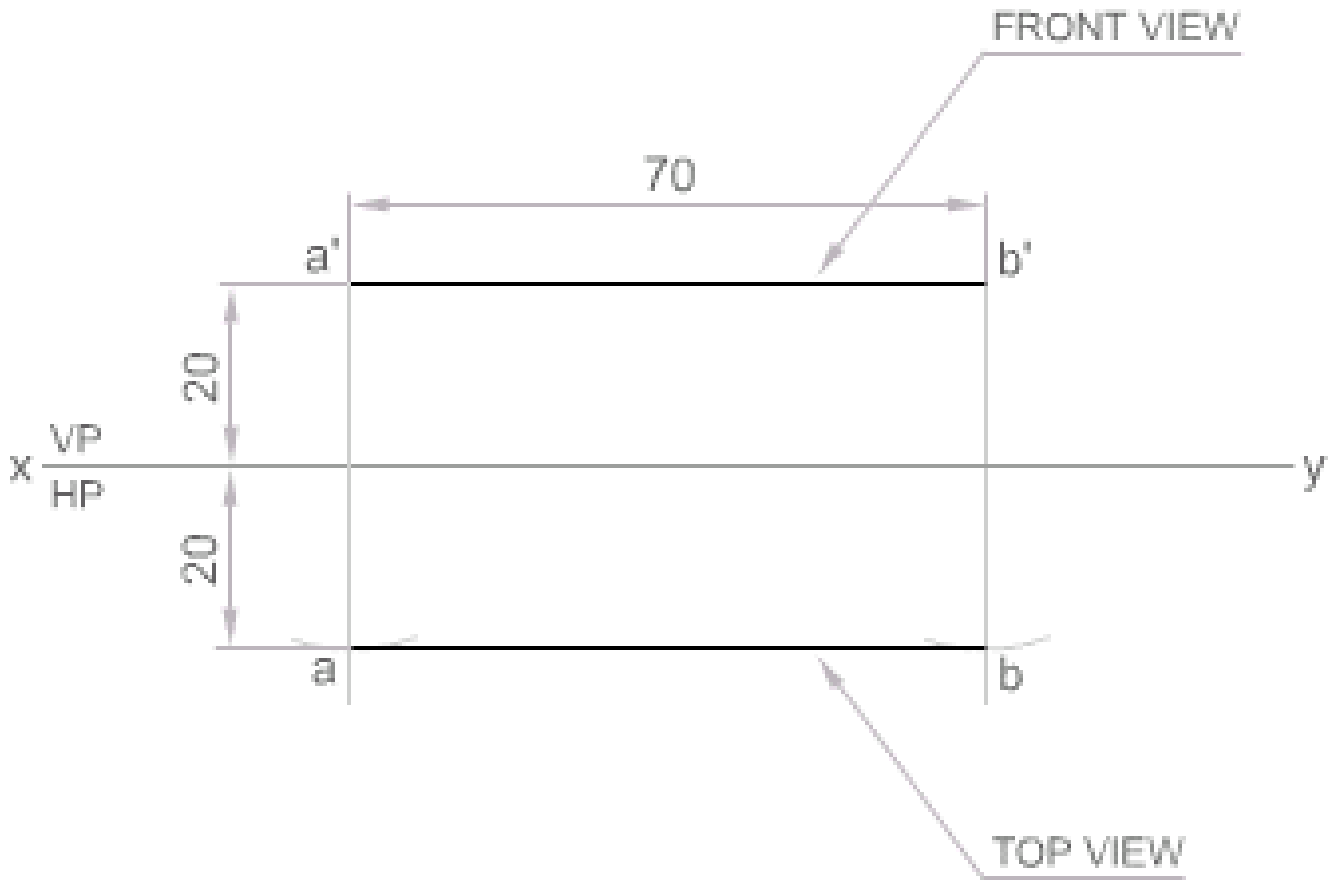


Problem 1

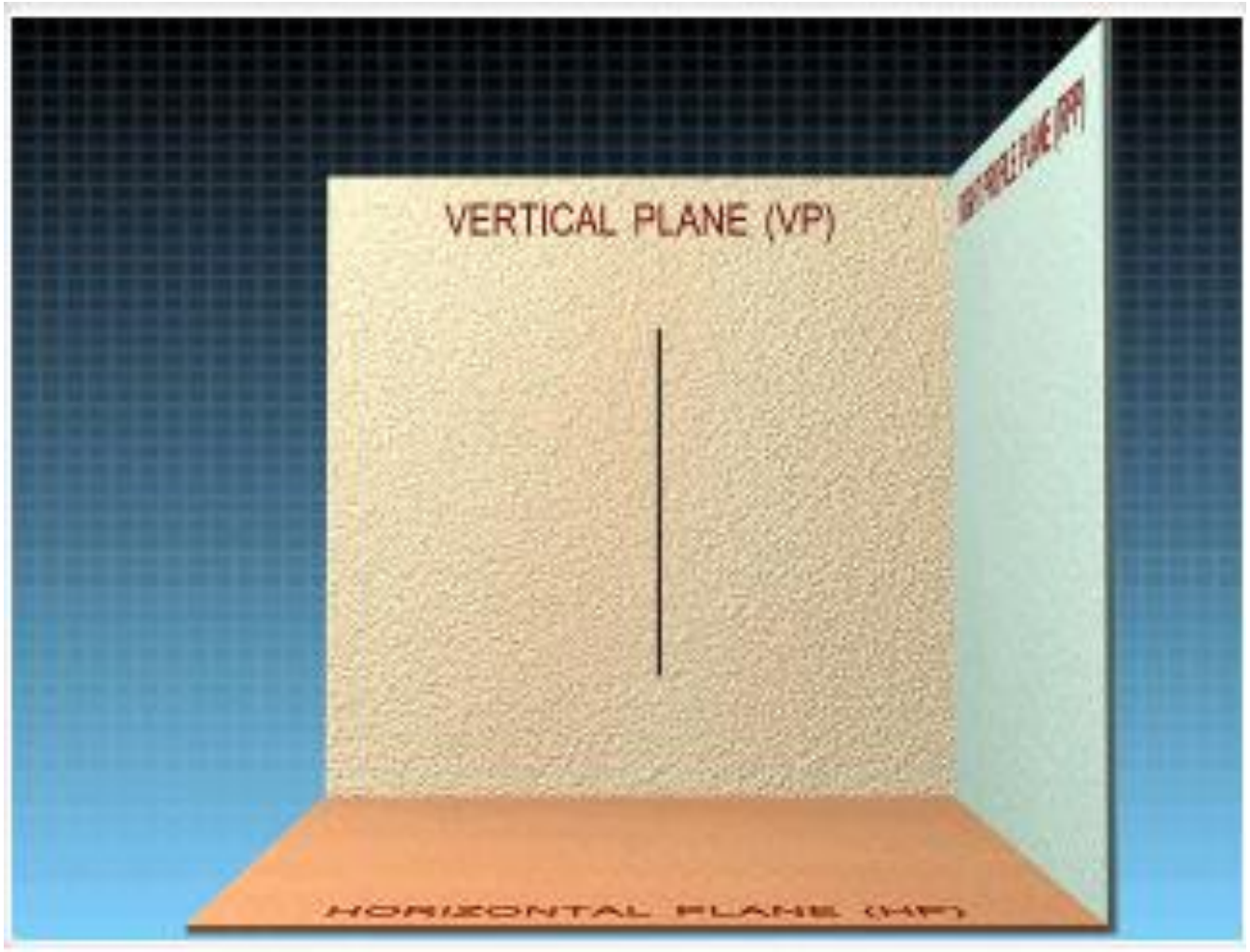
- Draw the projections of a line 70 mm long when it is parallel to both HP and VP. The line is 20 mm from both HP and VP.



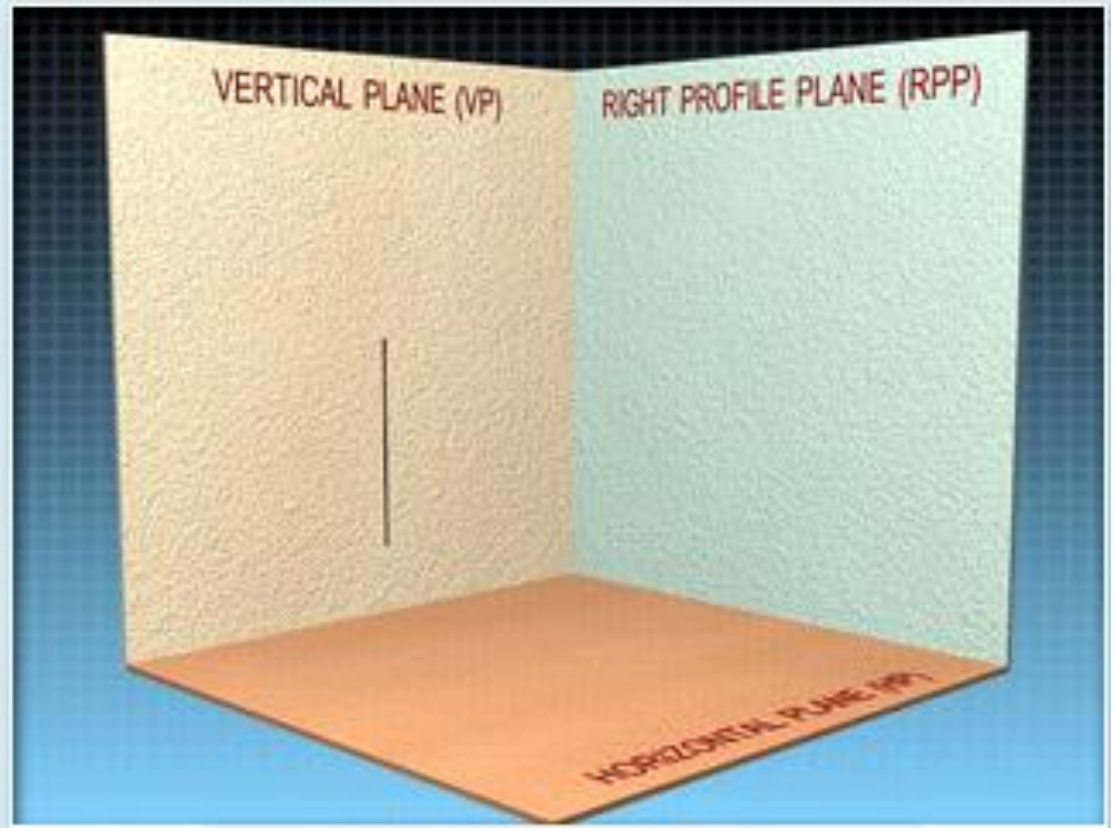
Solution :



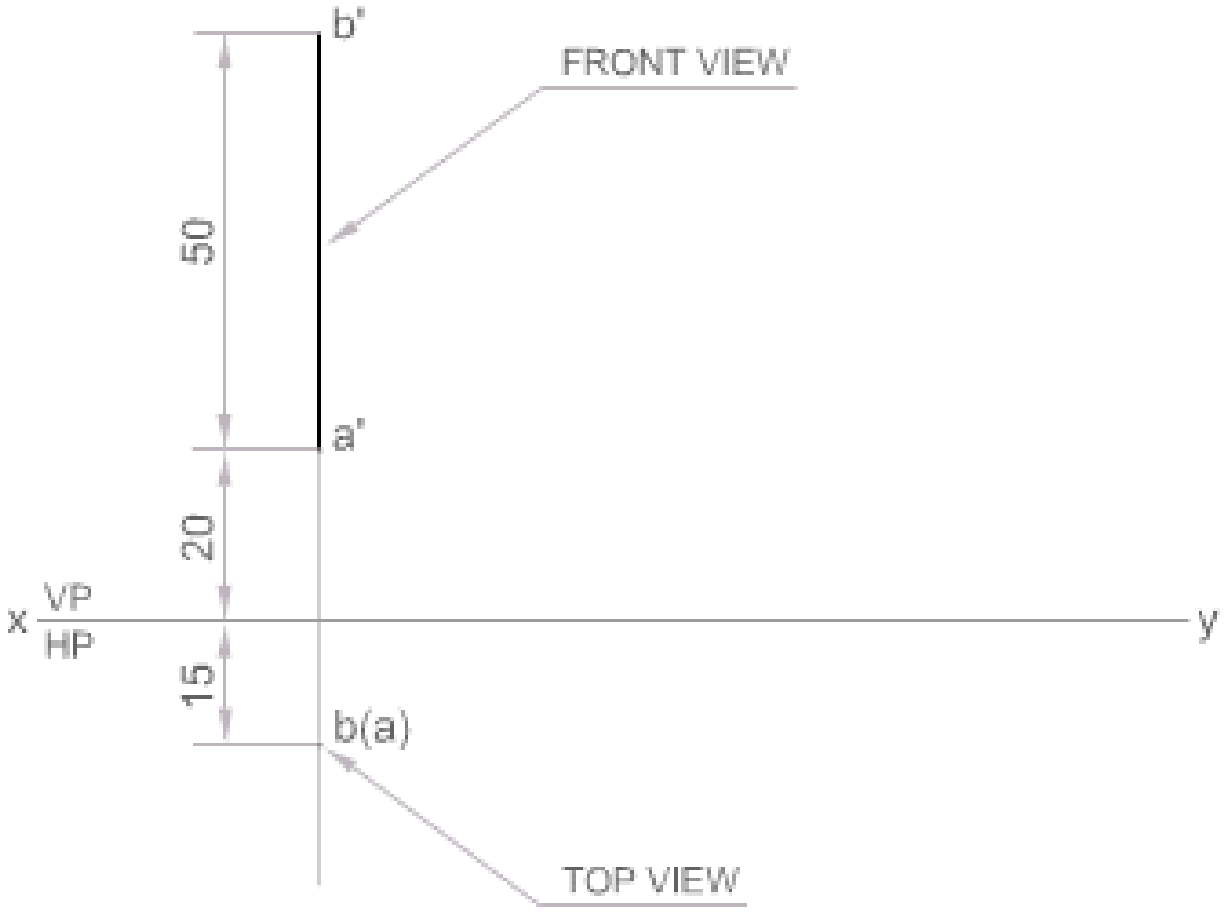
Parallel to one plane and perpendicular to the other



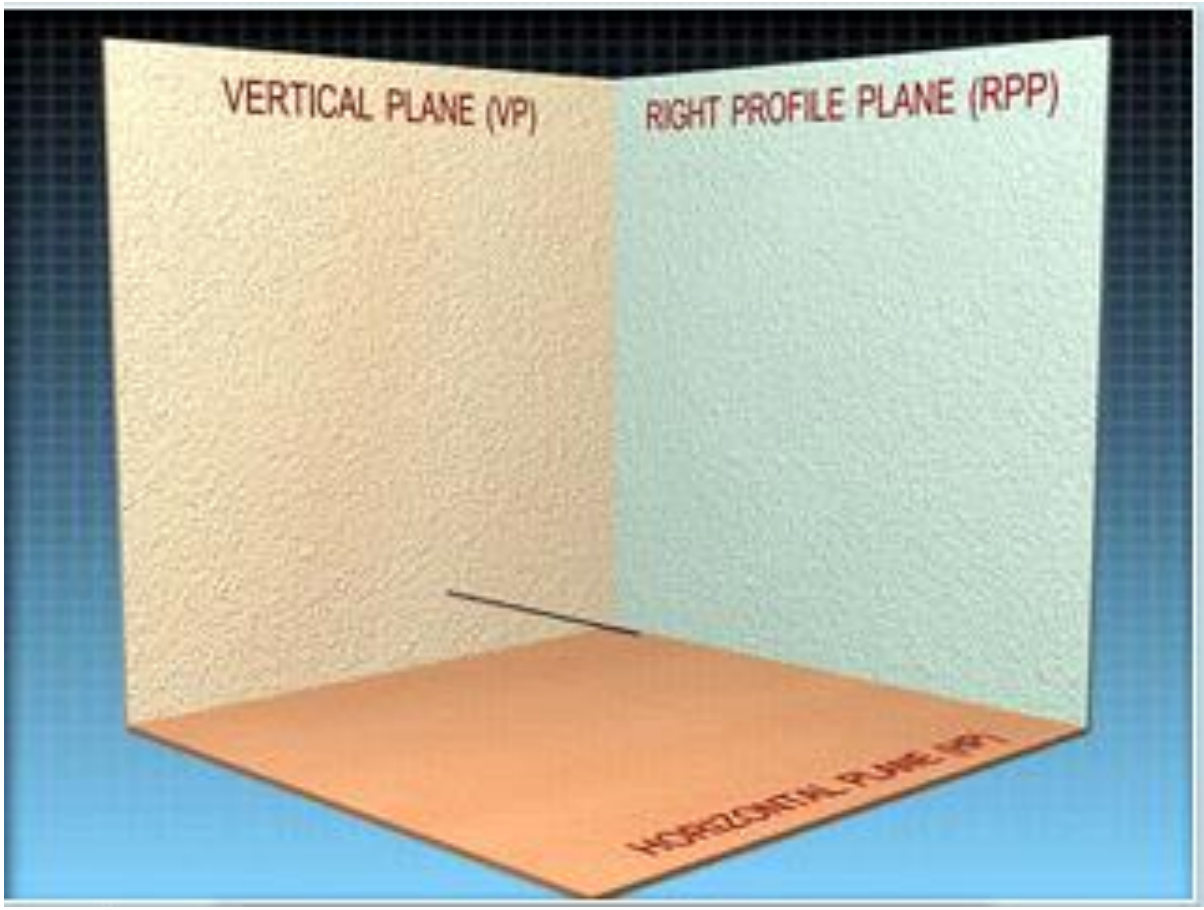
Draw the projections of a line 50 mm long when it is perpendicular to HP and parallel to VP and 15 mm in front of VP. The end nearer to HP is 20 mm above it.



Solution :



Draw the projections of a line 60 mm long when it is perpendicular to VP, parallel to HP and 20 mm above HP. The end nearer to the observer is 80 mm in front of VP.



Solution :