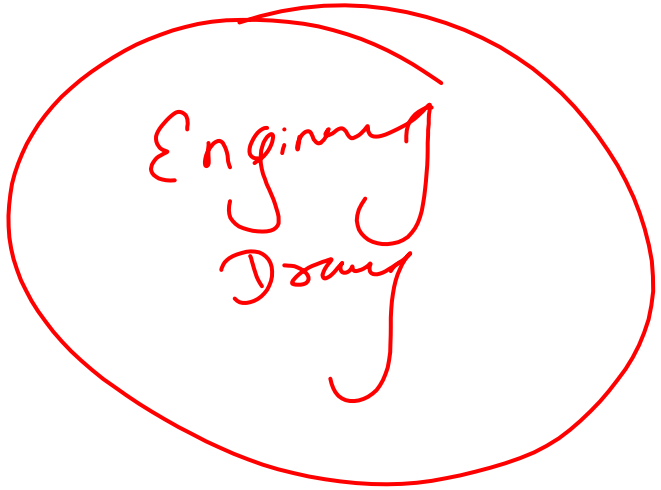
Nepal Engineering Council Licence Exam



Engineering Drawing

Tutor

Er. Amrit Tiwari

Mechanical Engineer

Syllabus

10.1 Engineering drawings and its concepts: Fundamentals of standard drawing sheets, dimensions, scale, line diagram, orthographic projection, isometric projection/view, pictorial views, and sectional drawing. (AALL1001)

Fundamental of Standard Drawing Sheets

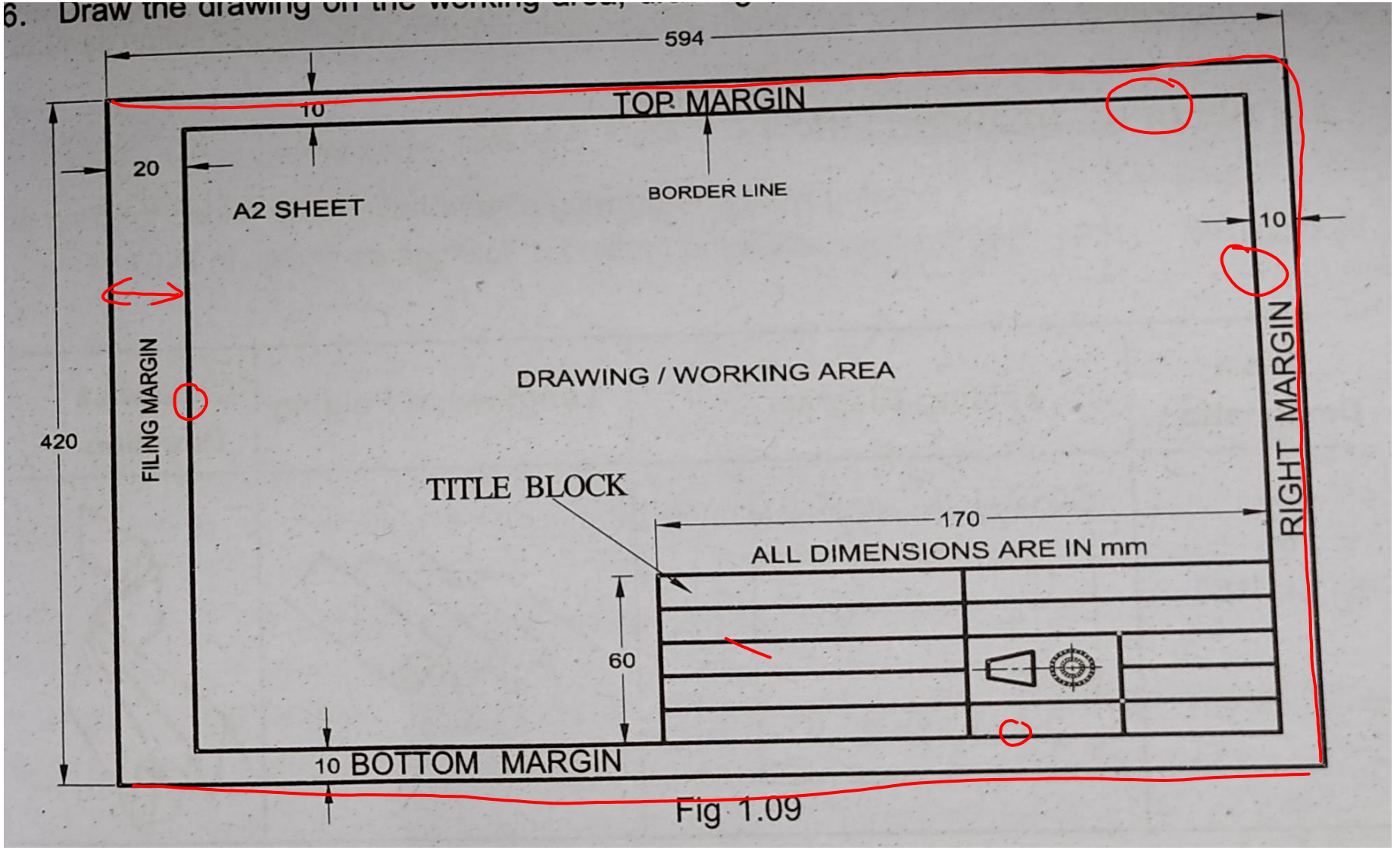
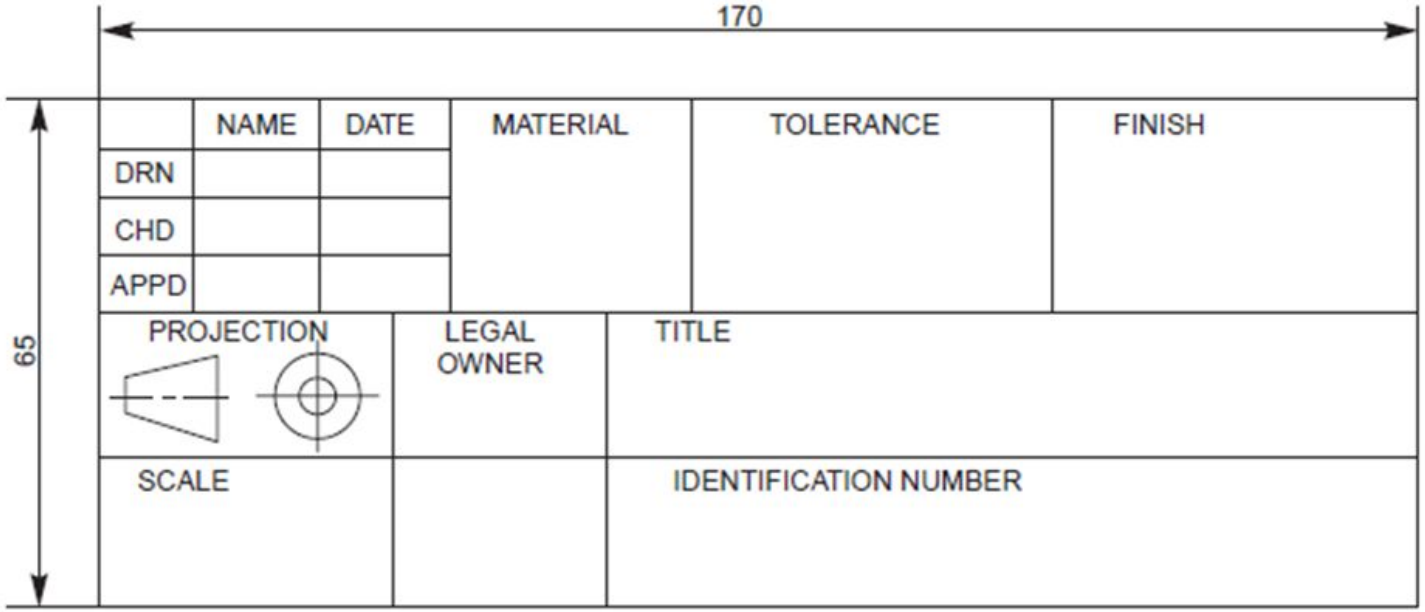


Fig 1.09

Tittle Block

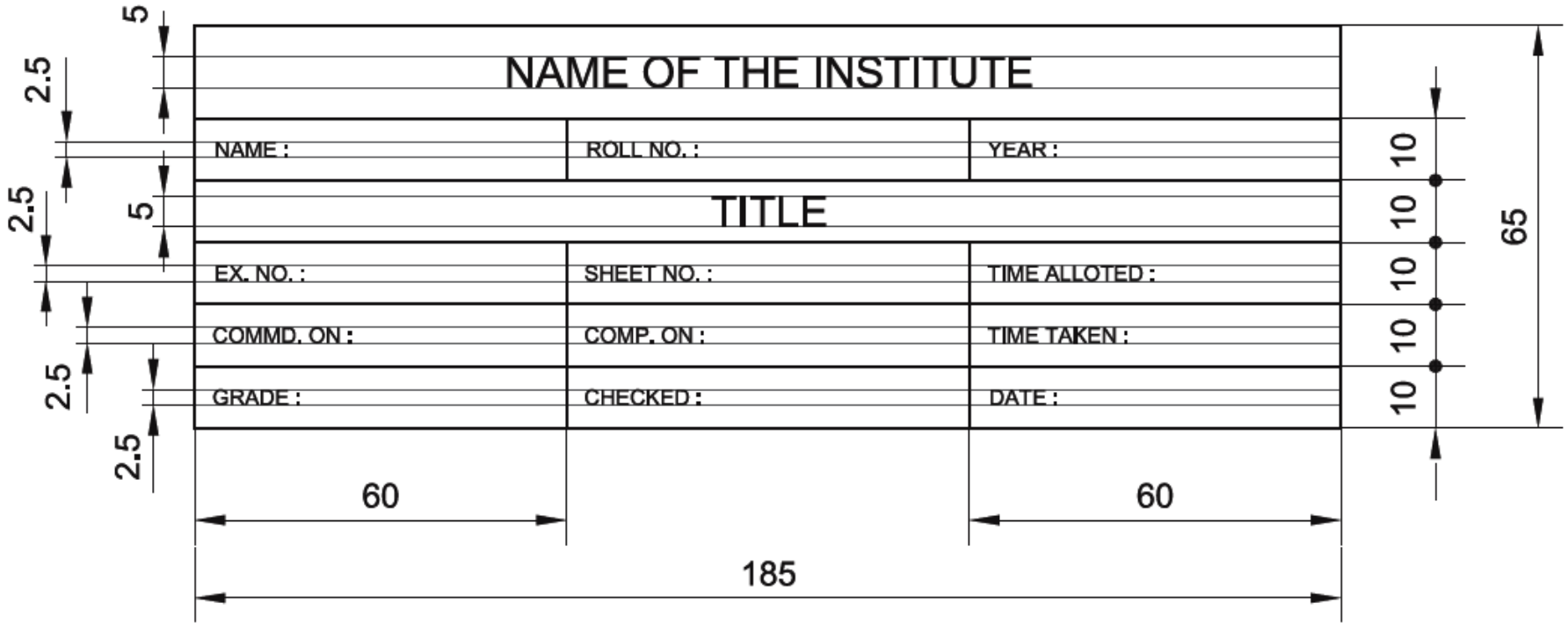
Drawing sheet-Title block



What are included?

- Name of the firm
- Tittle of Drawing
- Scale
- Projection Method
- Drawing Number
- Initials with dates of person who have designed, drawn , checked, standards and approved

Tittle Block



What are included?

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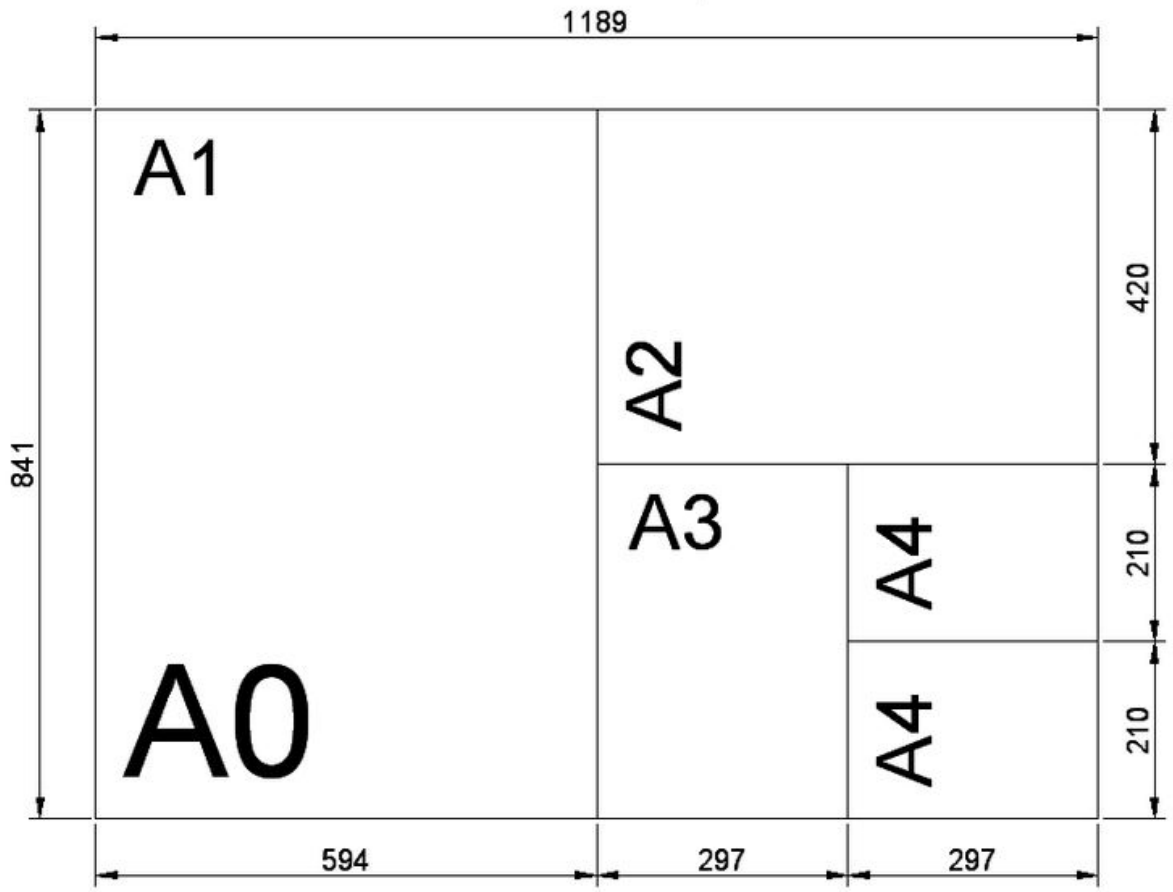
Standard Sheets (Imp)



Paper	Size (mm*mm)
A0	841*1189
A1	594*841
A2	420*594
A3	297*420
A4	210*297
A5	148*210

Some Questions

Ratio of Area of A0 to area of A1 is : **2:1**

$$\frac{A_0}{A_1} = \frac{2A_1}{A_1} = 2:1$$

Ratio of Area of A0 to area of A2 is : **4:1**

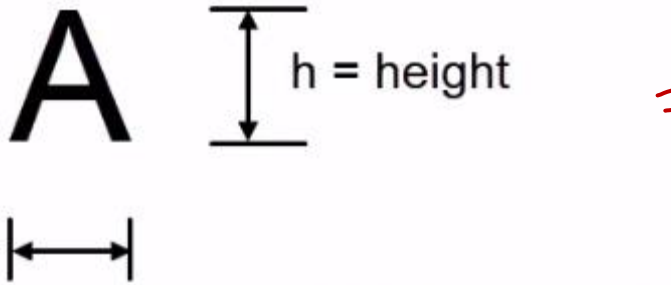
Ratio of Area of A4 to area of A0 is : **1:16**

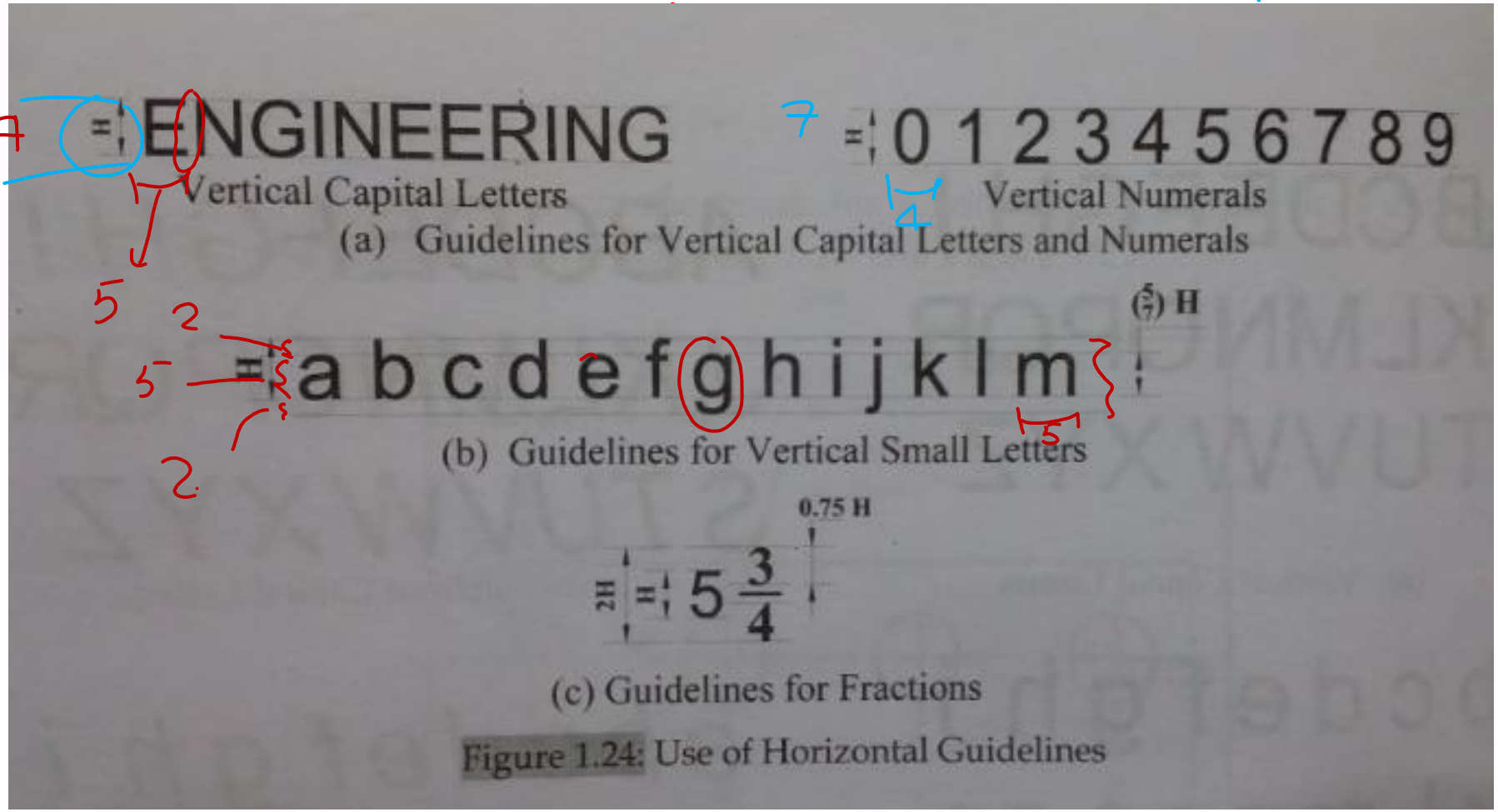
$$\frac{A_4}{A_0} = \frac{A_4}{2A_1} = \frac{A_4}{2 \times 2 \times 2 \times 2 A_4}$$

$$= 1:16$$

Lettering

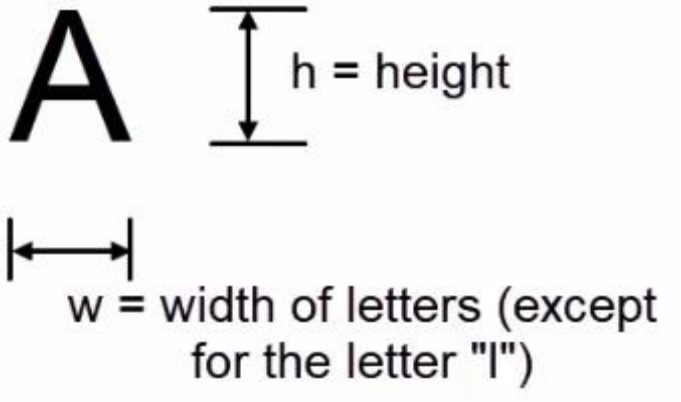
Proportion for Letters for Vertical Capital Letters (h:w = 7:5)

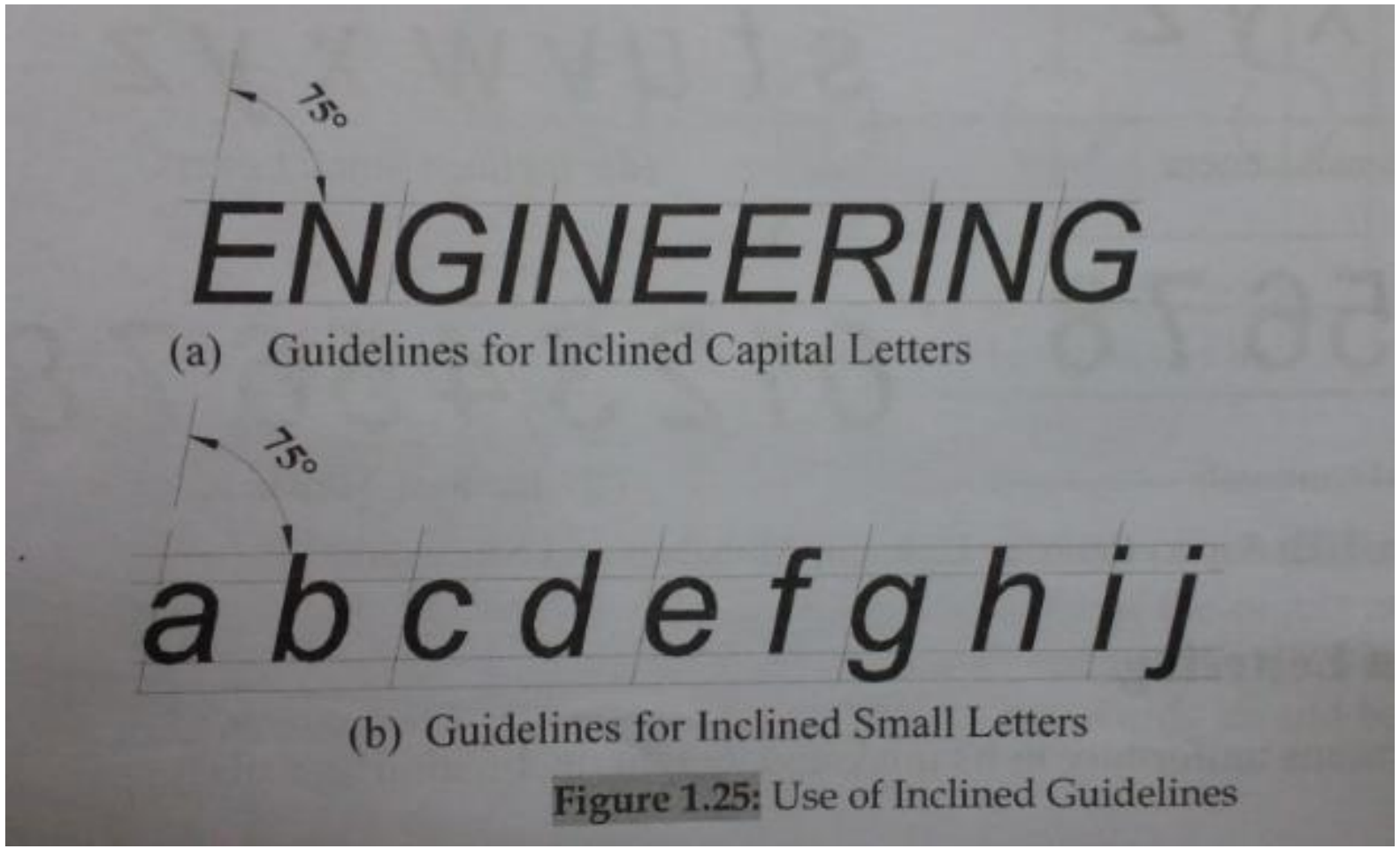




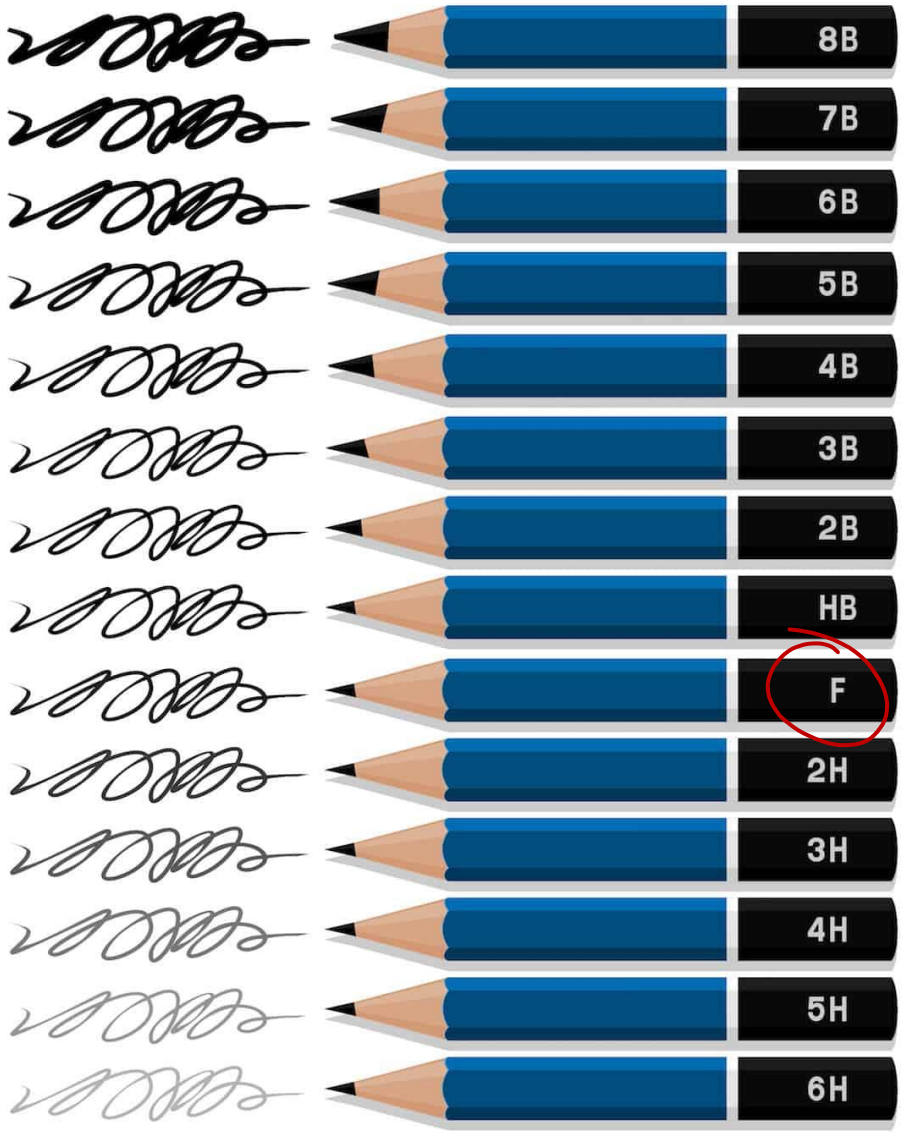
Lettering

Proportion for Letters for Vertical Capital Letters (h:w = 7:5)





Types of Pencils



Different Types of Lines and Their Uses

Visible Outlines

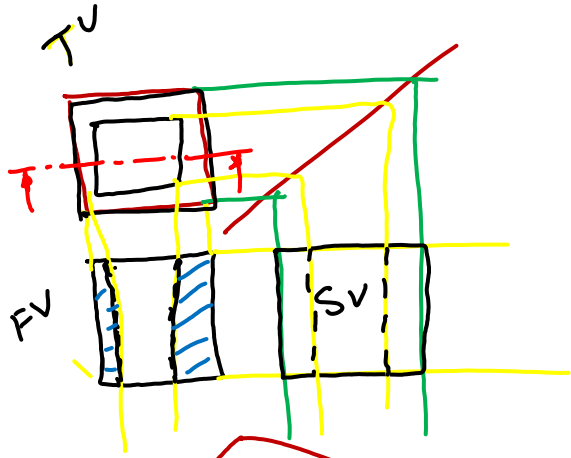
continuous, thick, black

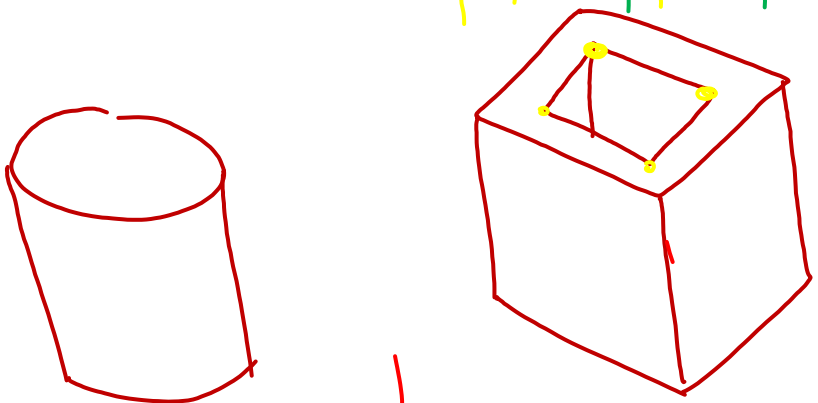
Hidden Edges Lines

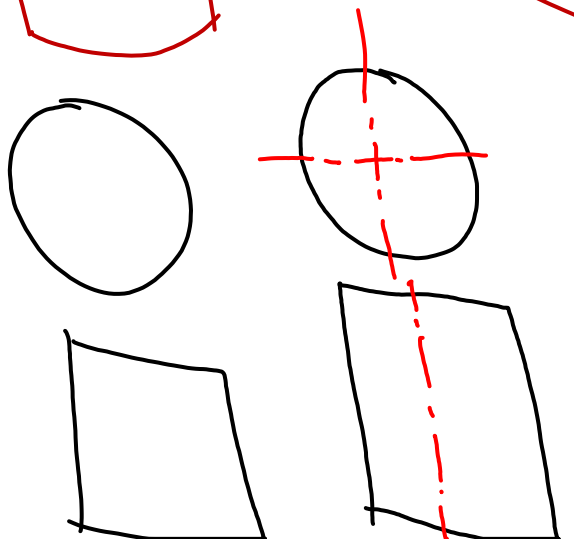
dashed thick

Center Lines

Cutting Plane







Different Types of Lines and Their Uses

Hatching line or Section line

HB 2H

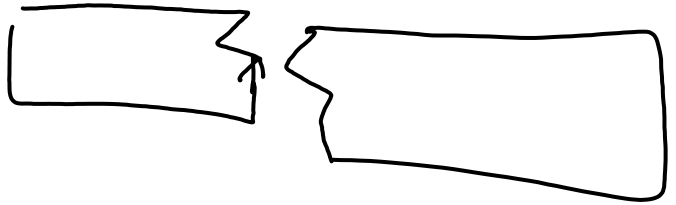
Construction Line

thin

Continuous, thin. 2H 3H 4H

Short Break Line

Long Break Line

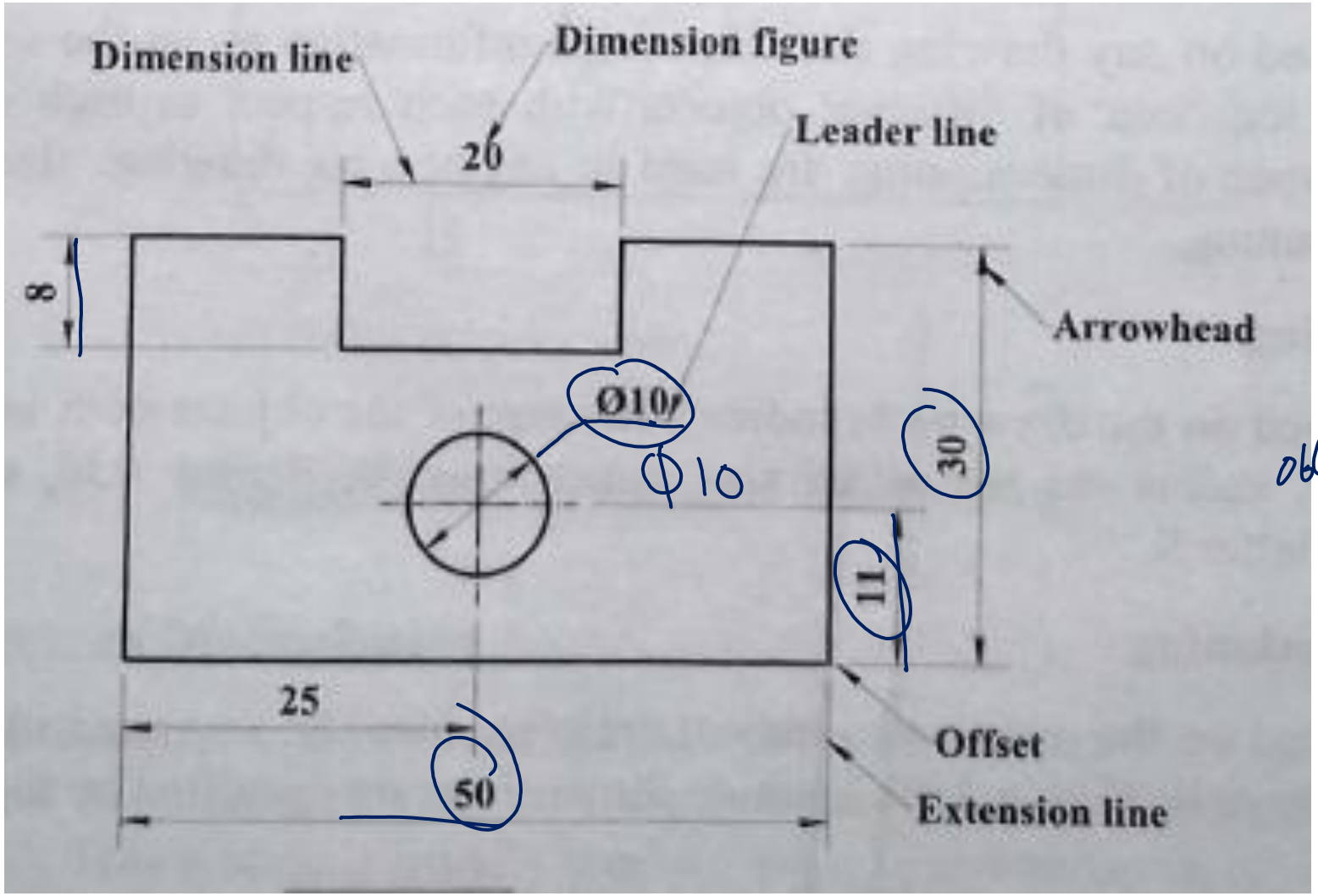


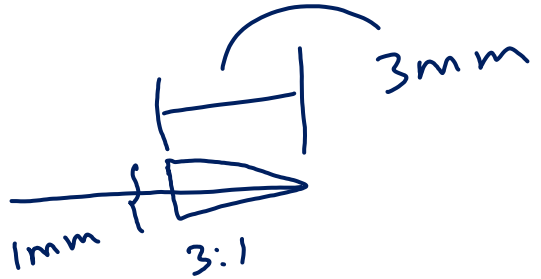
1:1

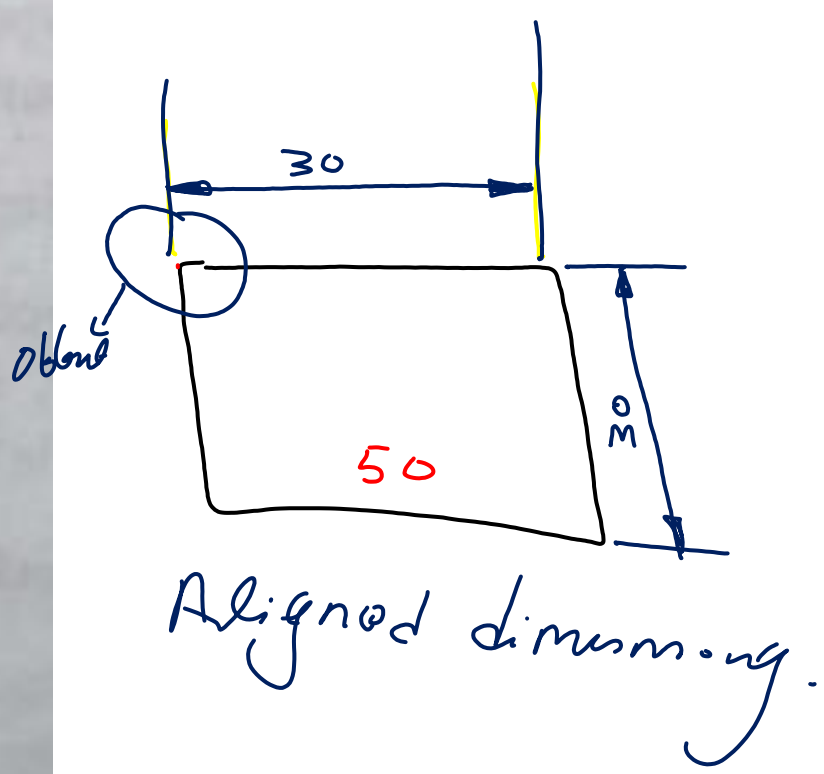
Different Types of Lines and Their Uses

Line	*Description*	*General Applications*
A	Continuous thick	A1 Visible outlines
B	Continuous thin (straight or curved)	B1 Imaginary lines of intersection B2 Dimension lines B3 Projection lines B4 Leader lines B5 Hatching lines B6 Outlines of revolved sections in place B7 Short centre lines
C 	Continuous thin, free-hand	C1 Limits of partial or interrupted views and sections, if the limit is not a chain thin
D 	Continuous thin (straight) with zigzags	D1 Line (see Fig. 2.5)
E 	Dashed thick	E1 Hidden outlines
G	Chain thin	G1 Centre lines G2 Lines of symmetry G3 Trajectories
H 	Chain thin, thick at ends and changes of direction	H1 Cutting planes

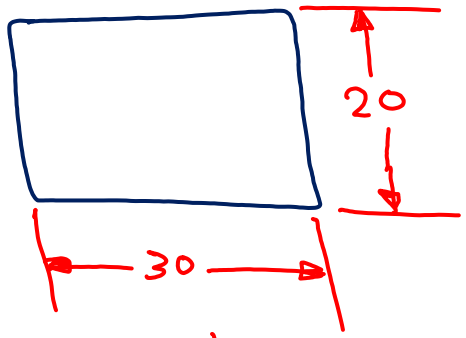
Dimensions


Dimension line
Dimension figure
Leader line
26
8
Arrowhead
Ø10
Ø10
30
11
25
50
Offset
Extension line


3mm
1mm
3:1


30
Ø6mm
50
40
Aligned dimensing.

Dimensions



Unidirectional dimen..

Scale

Full Scale :

1 cm rod is drawn. 1 cm in drawing.

$$\text{Scale} = \frac{\text{drawn}}{\text{Actual}} = \frac{1\text{ cm}}{1\text{ cm}}$$

Drawing / Actual.

Enlarging Scale:

$= 1:1$ → Full Scale.

Reducing Scale:

1 cm 1 m rod is drawn 1 cm in drawing.

$$\text{Scale} = \frac{D}{A} = \frac{1\text{ cm}}{1\text{ m}} = \frac{1\text{ cm}}{100\text{ cm}} = 1:100$$

→ Reducing Scale.

2:3

Ratio < 1 ↓ Reducing Scale.

1 mm rod is drawn 1 cm in drawing.

$$S = \frac{D}{A} = \frac{1\text{ cm}}{1\text{ mm}} = \frac{10\text{ mm}}{1\text{ mm}} = 10:1$$

→ Enlarging Scale

3:2

Ratio > 1 ↳ Enlarging Scale.

Scale

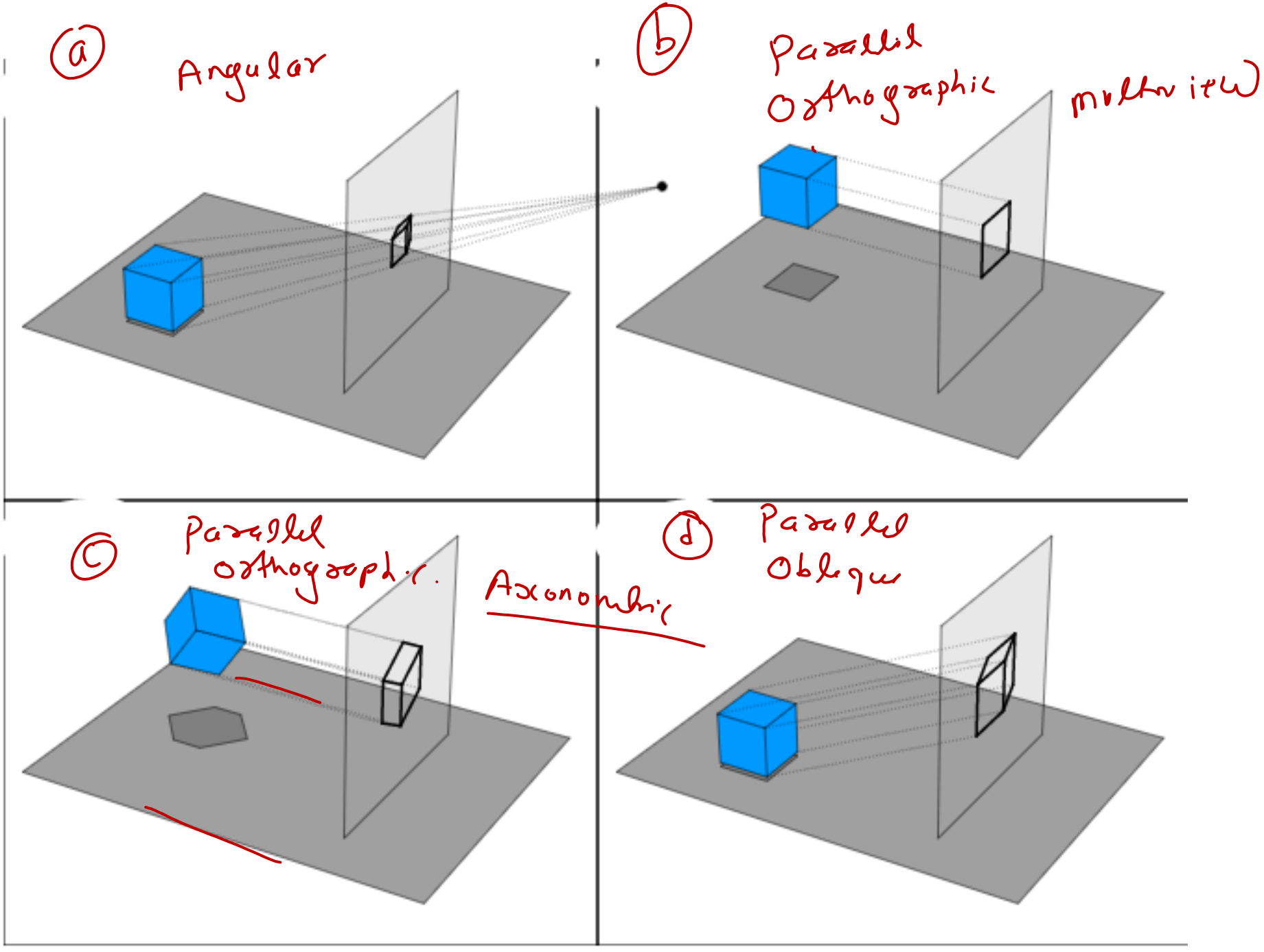
$$\text{REPRESENTATIVE FRACTION (R.F.)} = \frac{\text{LENGTH OF DRAWING in cm}}{\text{ACTUAL LENGTH in cm}}$$

$$= \sqrt{\frac{\text{AREA OF DRAWING in cm}^2}{\text{ACTUAL AREA in cm}^2}}$$

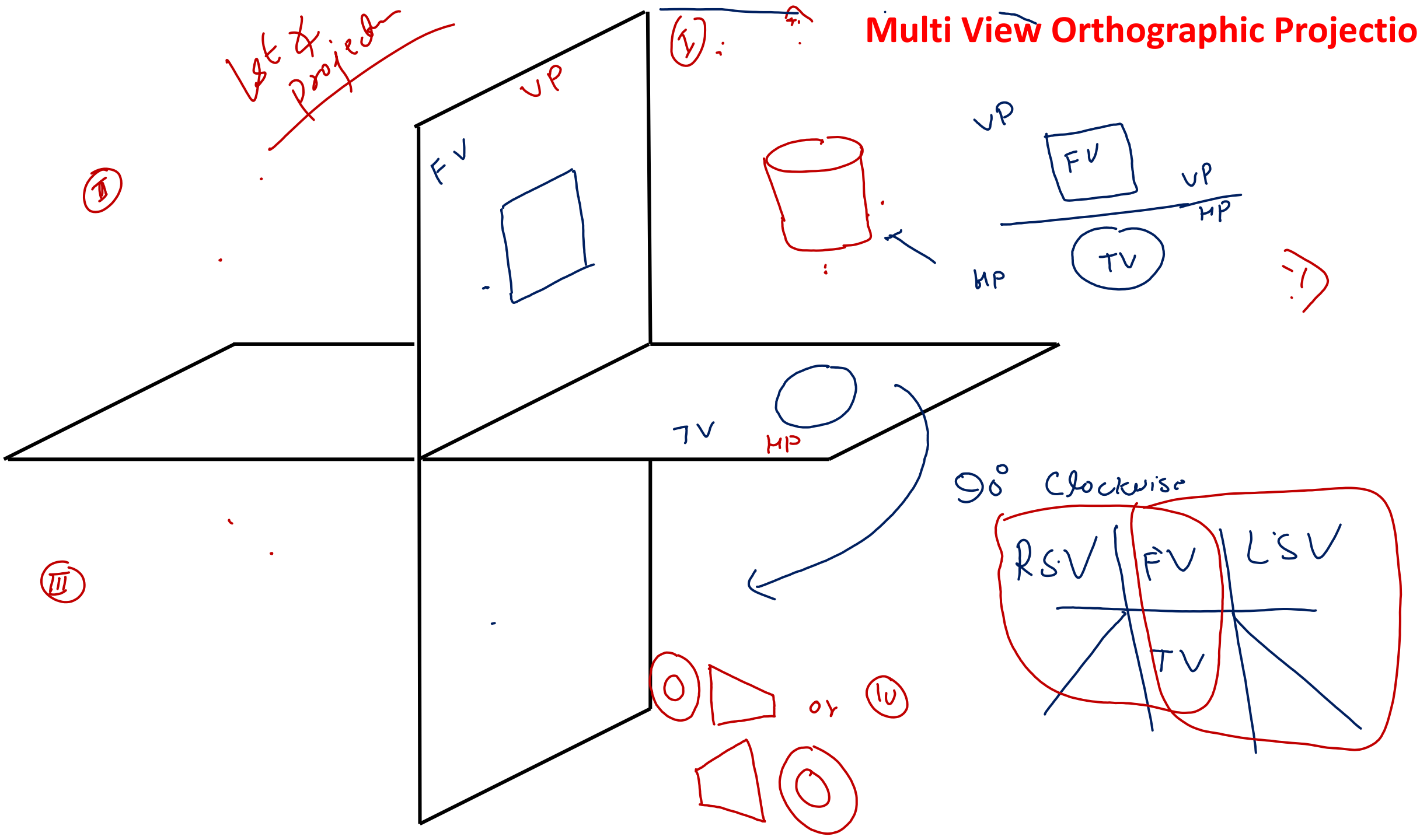
$$= \sqrt[3]{\frac{\text{VOLUME AS PER DRWG in cm}^3.}{\text{ACTUAL VOLUME in cm}^3}}$$

Types of projection

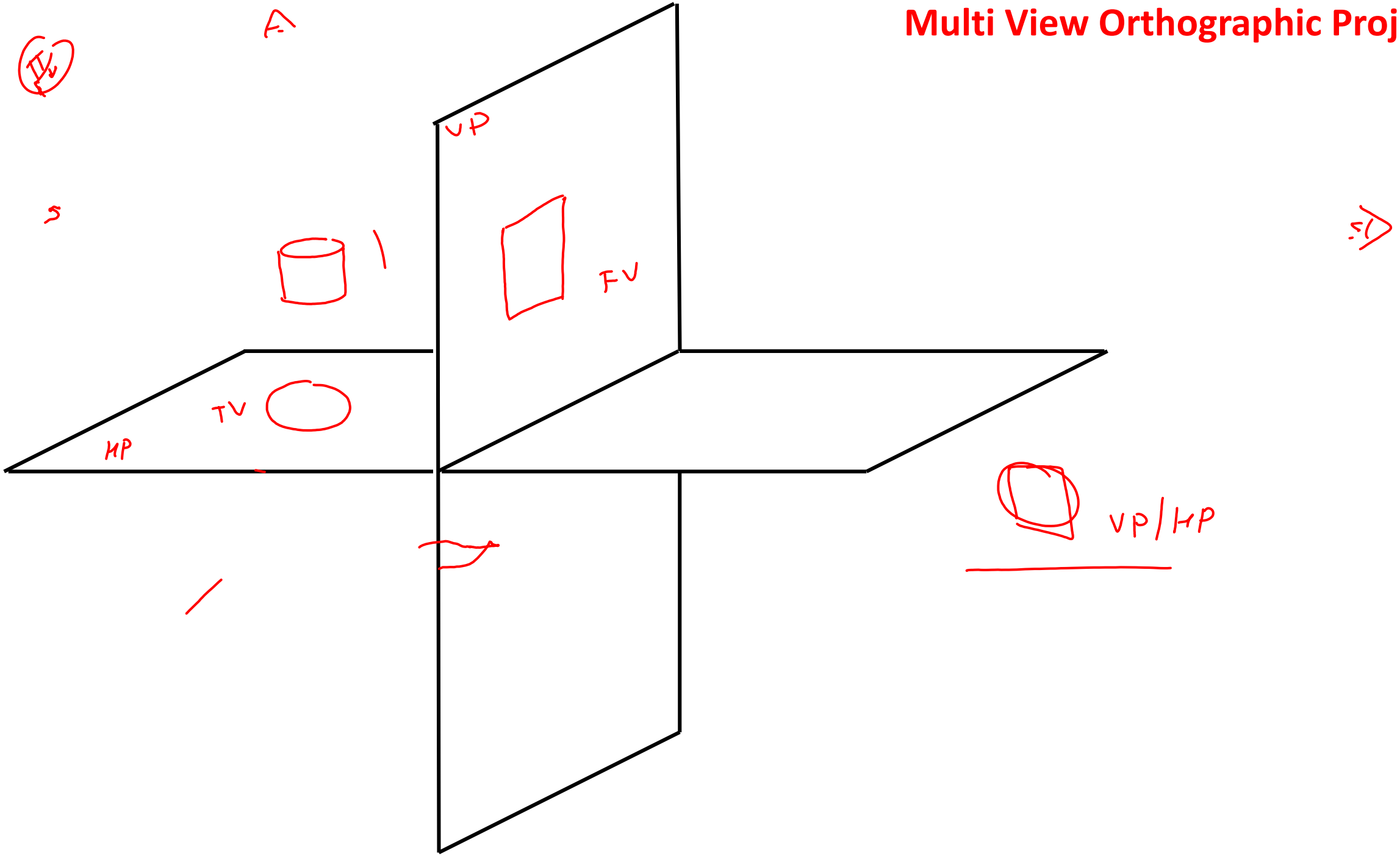
- Parallel
  - Orthographic
    - Axonometric
      - Isometric
      - Dimetric
      - Trimetric
    - multiview
      - FV
      - SV
      - TV
      - → 1st ✗
      - → 3rd ✗
  - Oblique
    - → Cavalier
    - → Cabinet
- Angular
  - → single point
  - → 2 point
    - on the basis of vanishing point.


(a)
Angular
(b)
Parallel
Orthographic
multiview
(c)
Parallel
orthographic
Axonometric
(d)
Parallel
Oblique

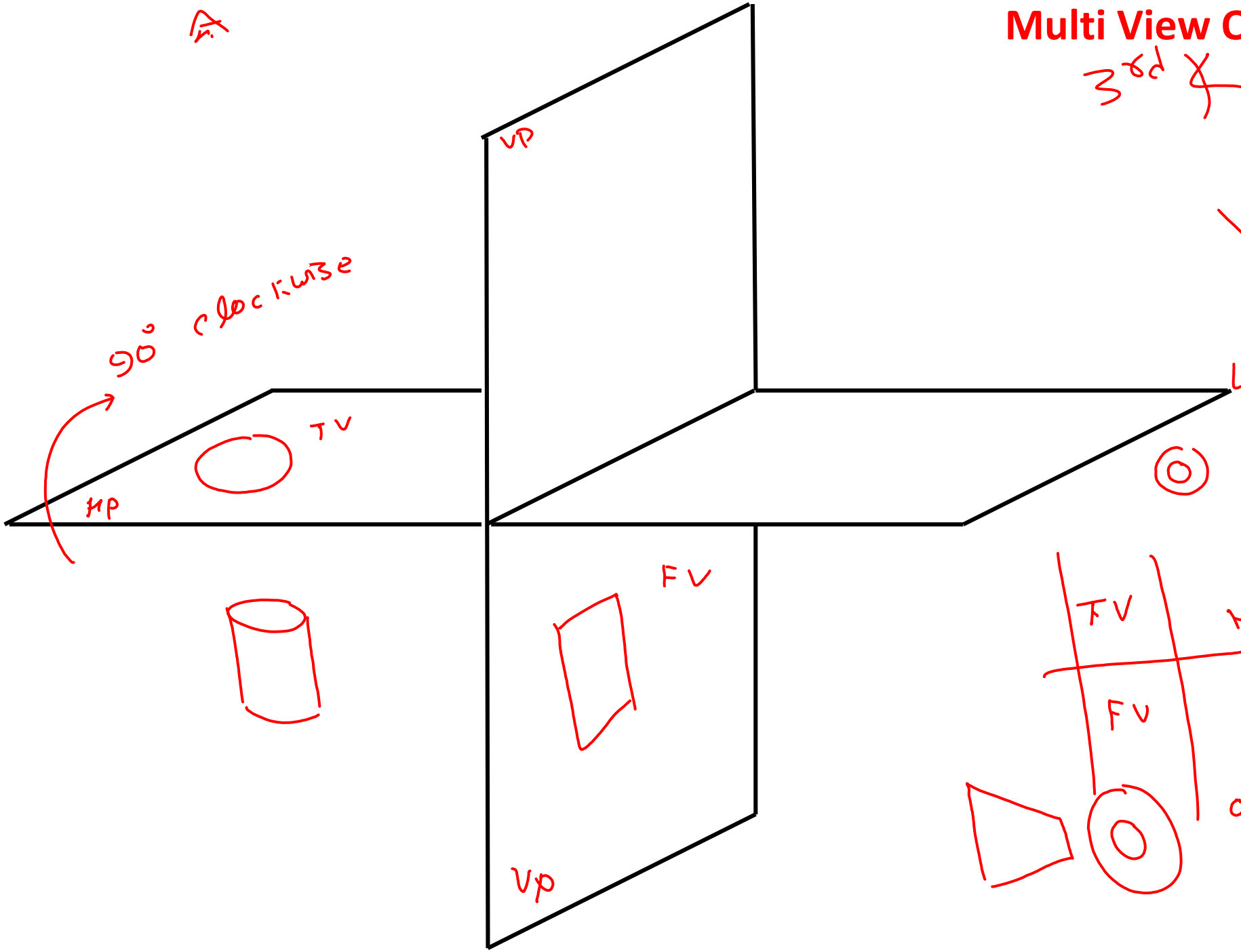
Multi View Orthographic Projection

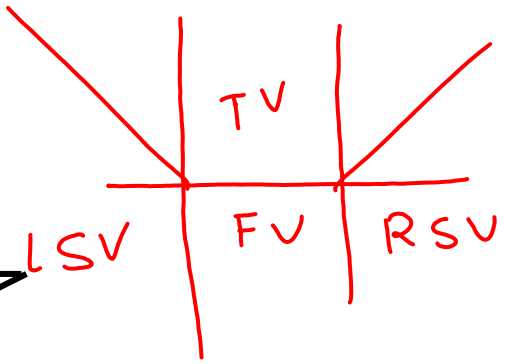


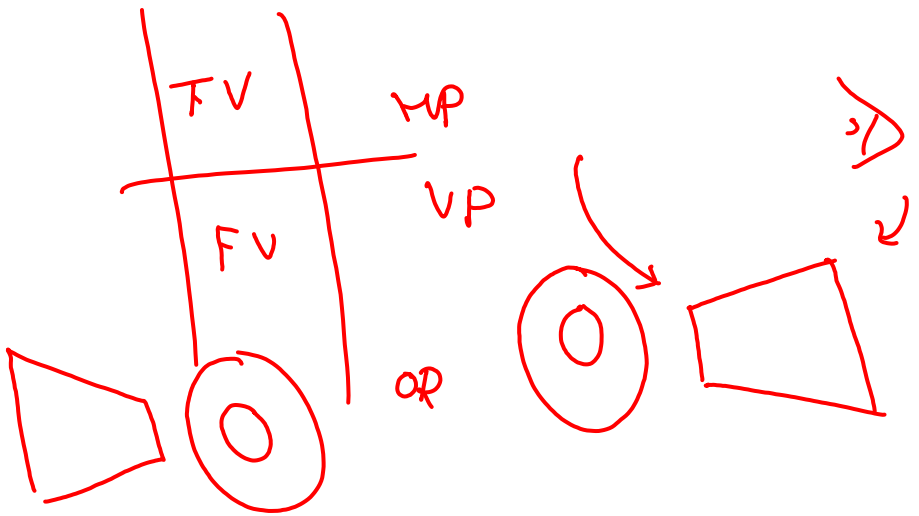
Multi View Orthographic Projection



Multi View Orthographic Projection

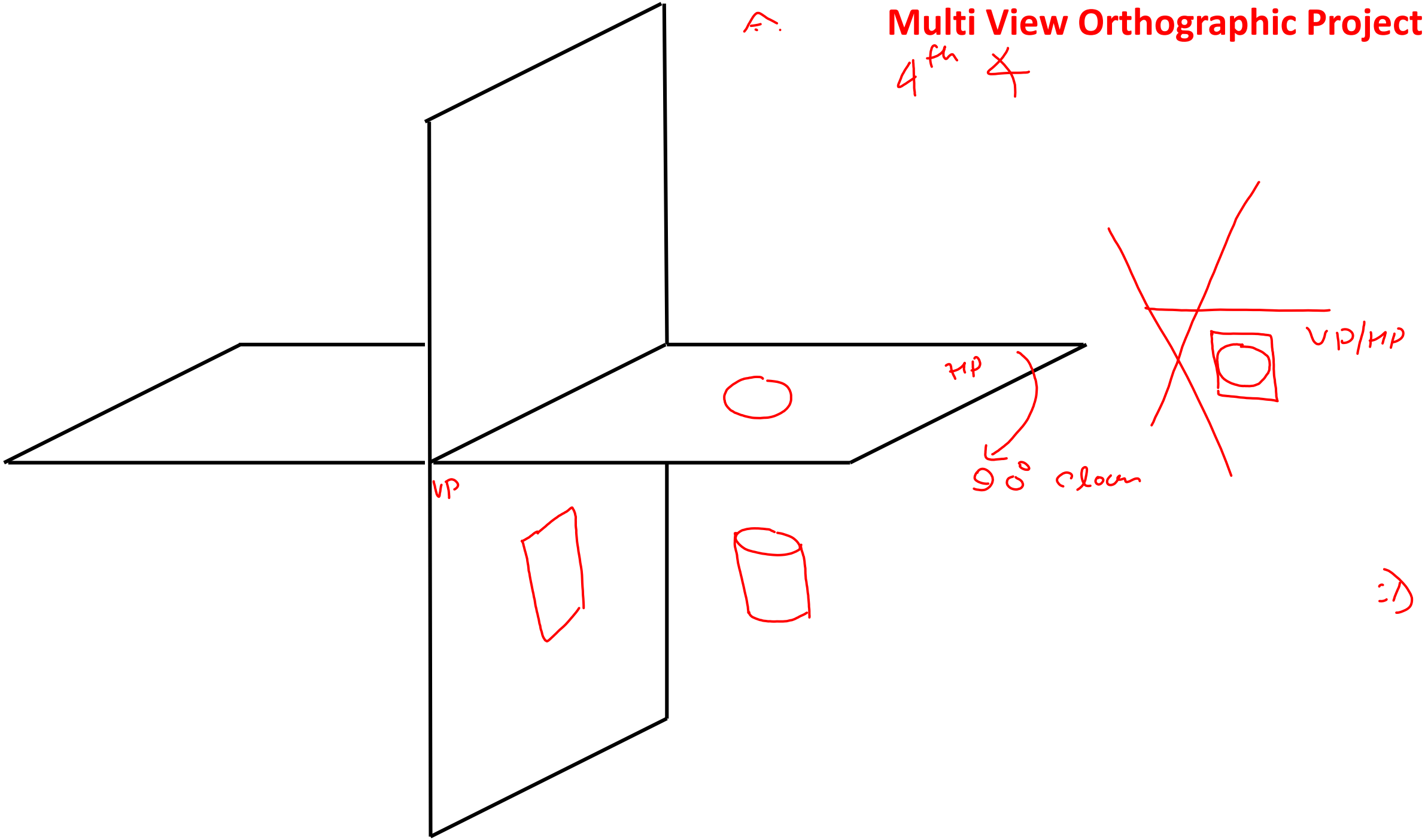






Multi View Orthographic Projection

4th Q

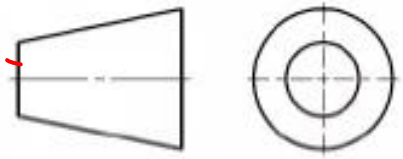
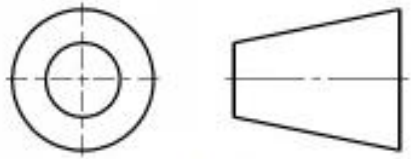
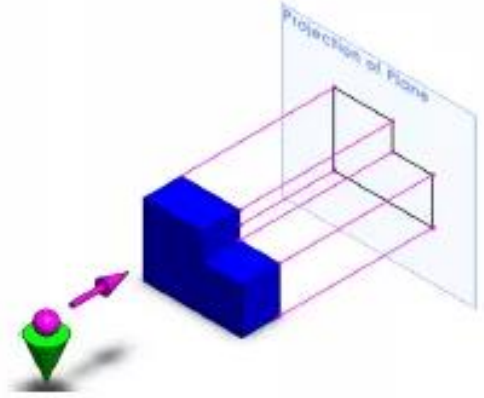
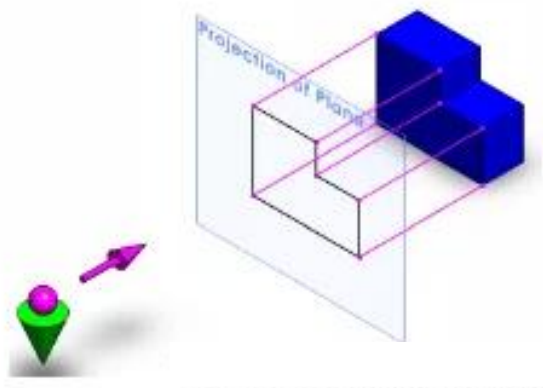


:)

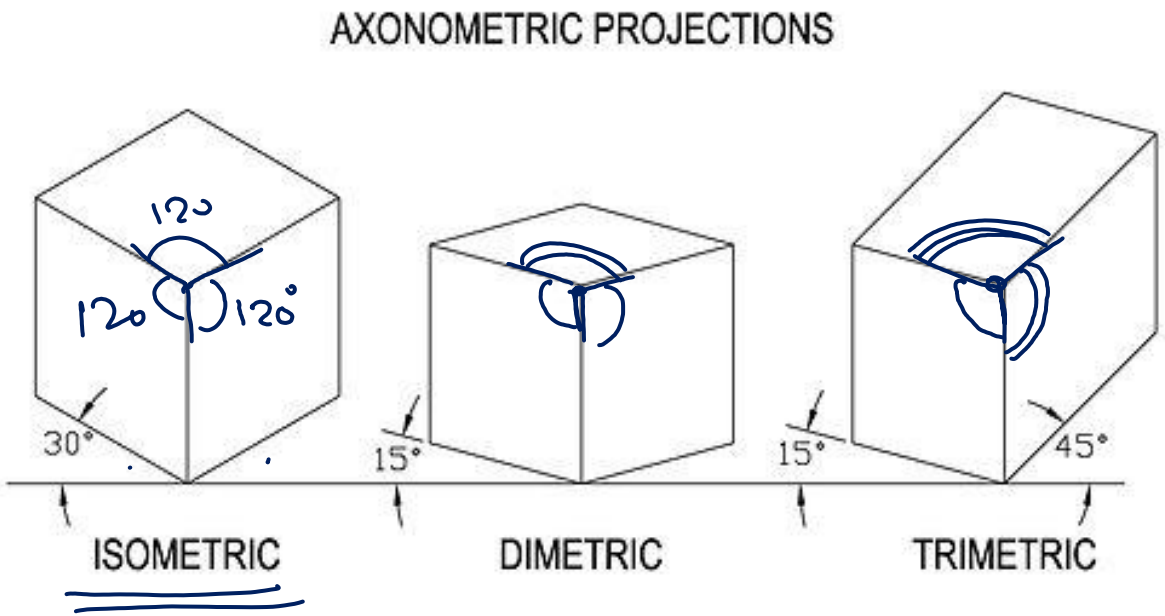
First Angle Projection

Third Angle Projection

Multi View Projection- First angle and Third angle projection at a glance

First Angle Projection	Third Angle Projection
The object is imagined to be in first quadrant.	The object is imagined to be in third quadrant.
The object is lies between the observer and plane of projection.	The plane of projection lies between the observer and object.
The plane of projection is assumed to be non transparent.	The plane of projection is assumed to be transparent.
When view are drawn in their relative position Top view comes below Front view, Right side view drawn to the left side of elevation.	When view are drawn in their relative position Top view comes above Front view, Right side view drawn to the right side of elevation.
 SYMBOL	 SYMBOL
	

Axonometric Projection/ Drawing



Remember : 81.65 %

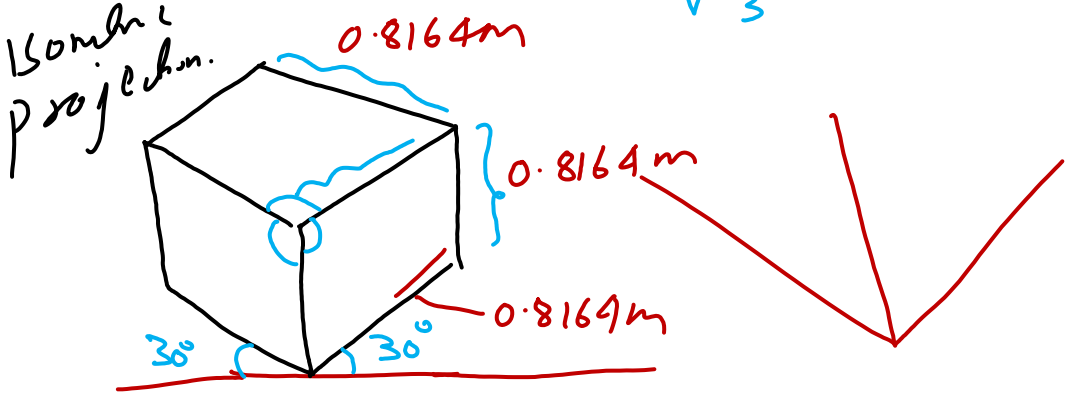
$l = b = h = 1m$

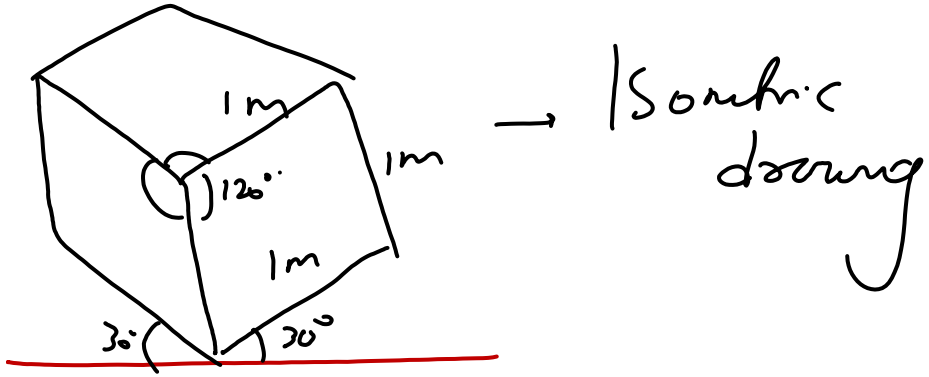
Isometric Drawing and Isometric Projection ?

V.A → 45

H.A → 35.2°

$\sqrt{\frac{2}{3}} = 0.8164$





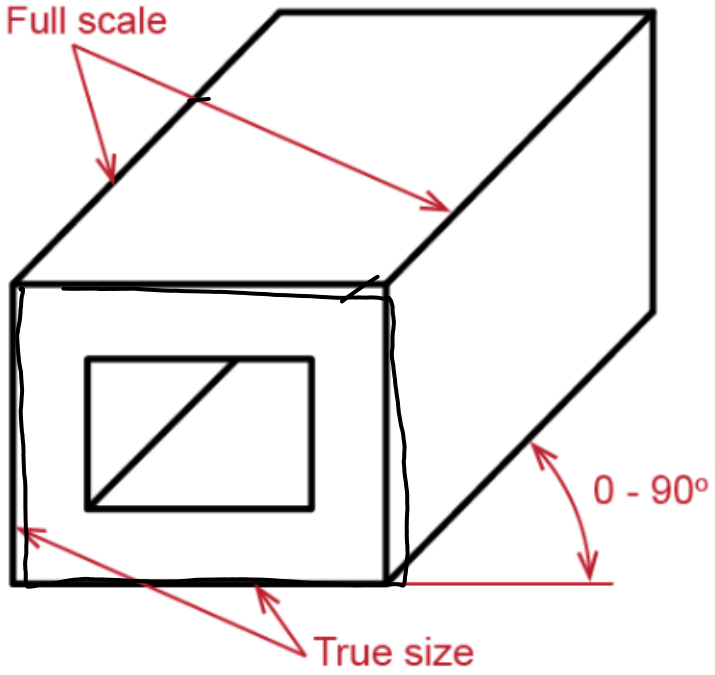
→ Isometric drawing

Axonometric Projection/ Drawing

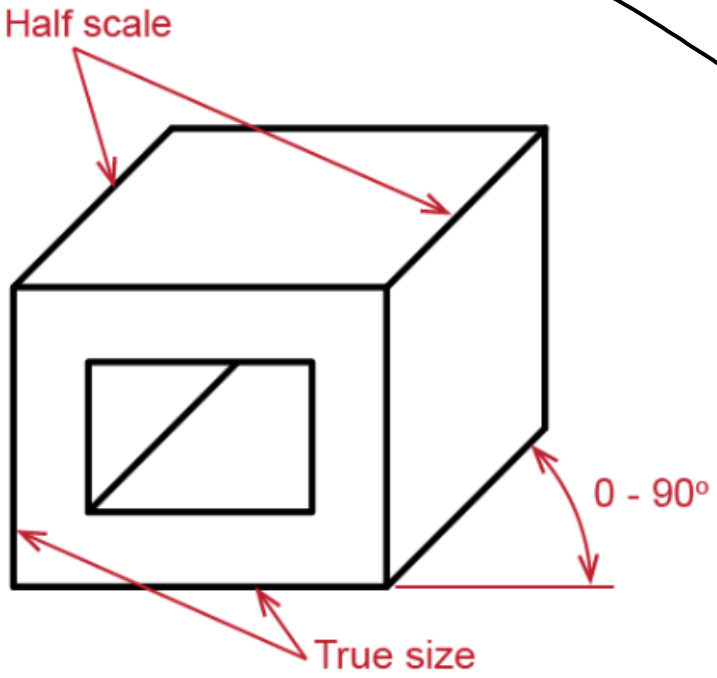
Remember : 81.65 %

Isometric Drawing and Isometric Projection ?

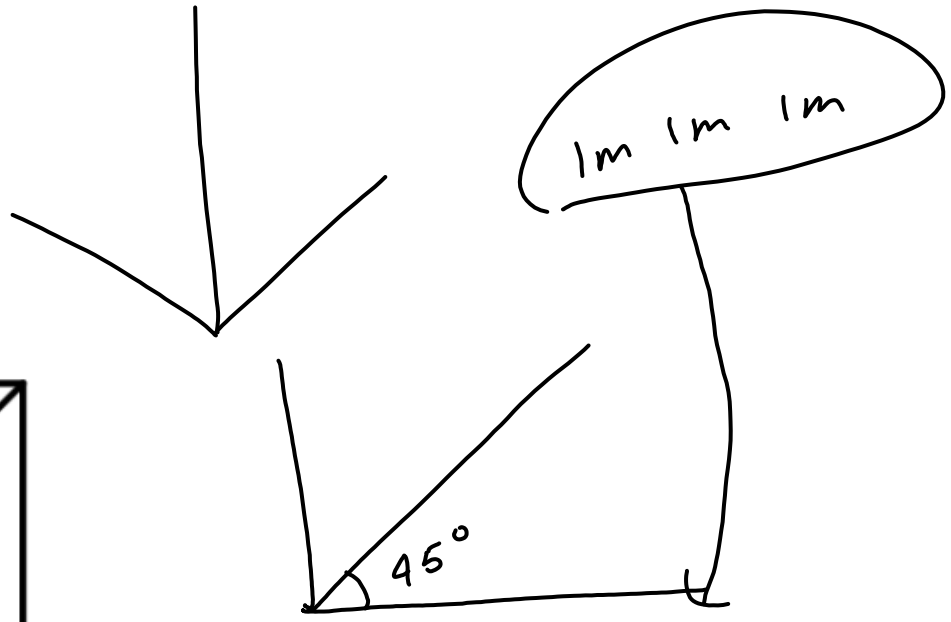
Oblique Drawing

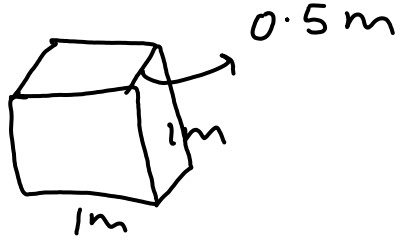


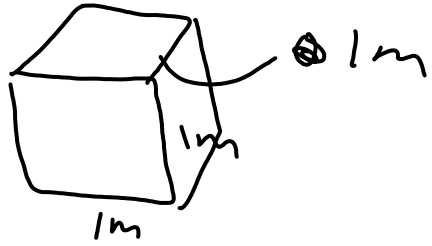
Cavalier



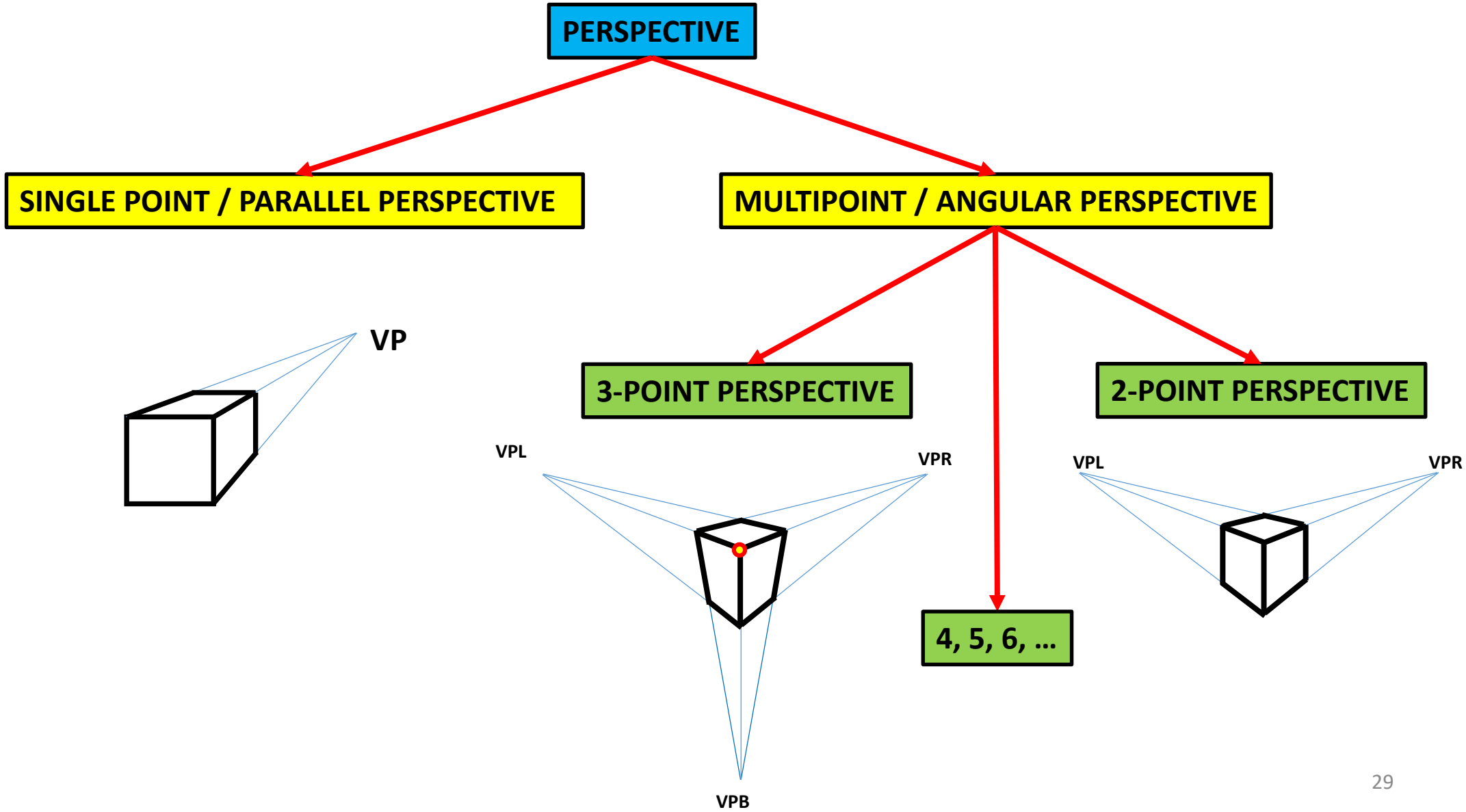
Cabinet



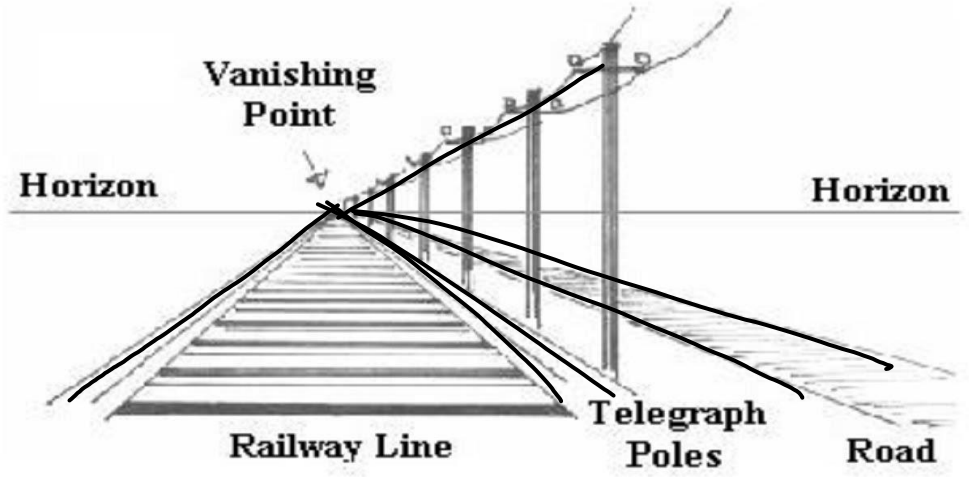


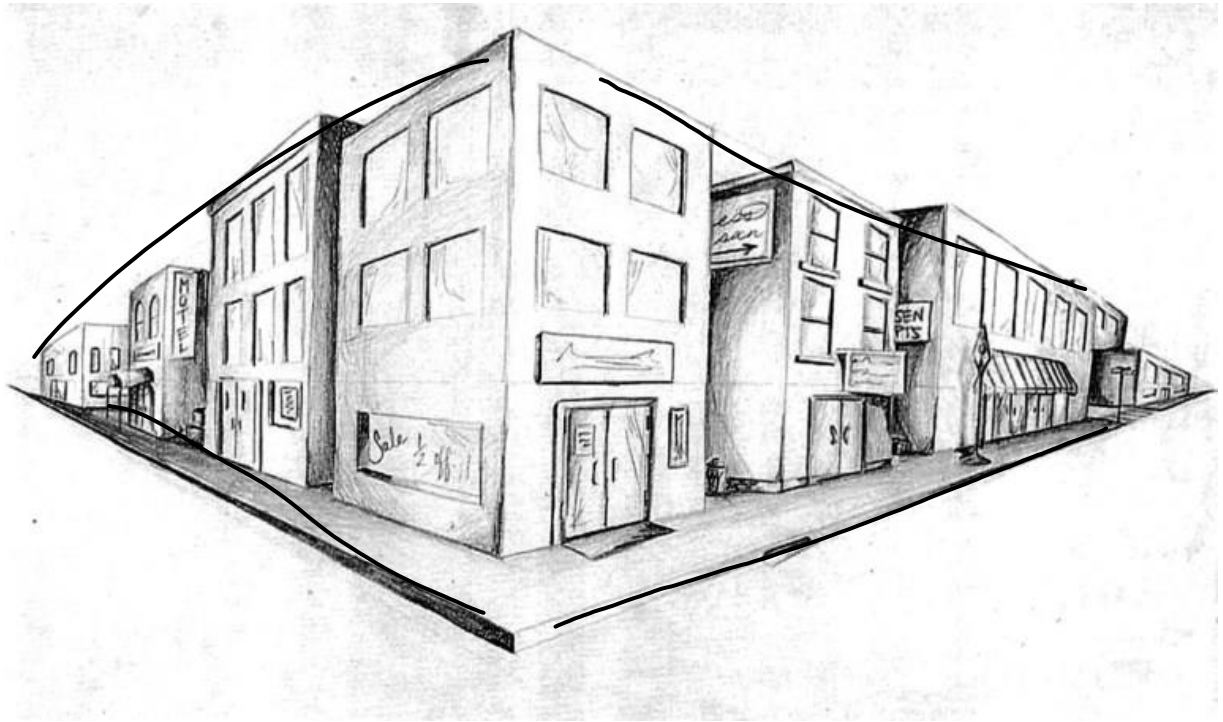


Perspective Projection

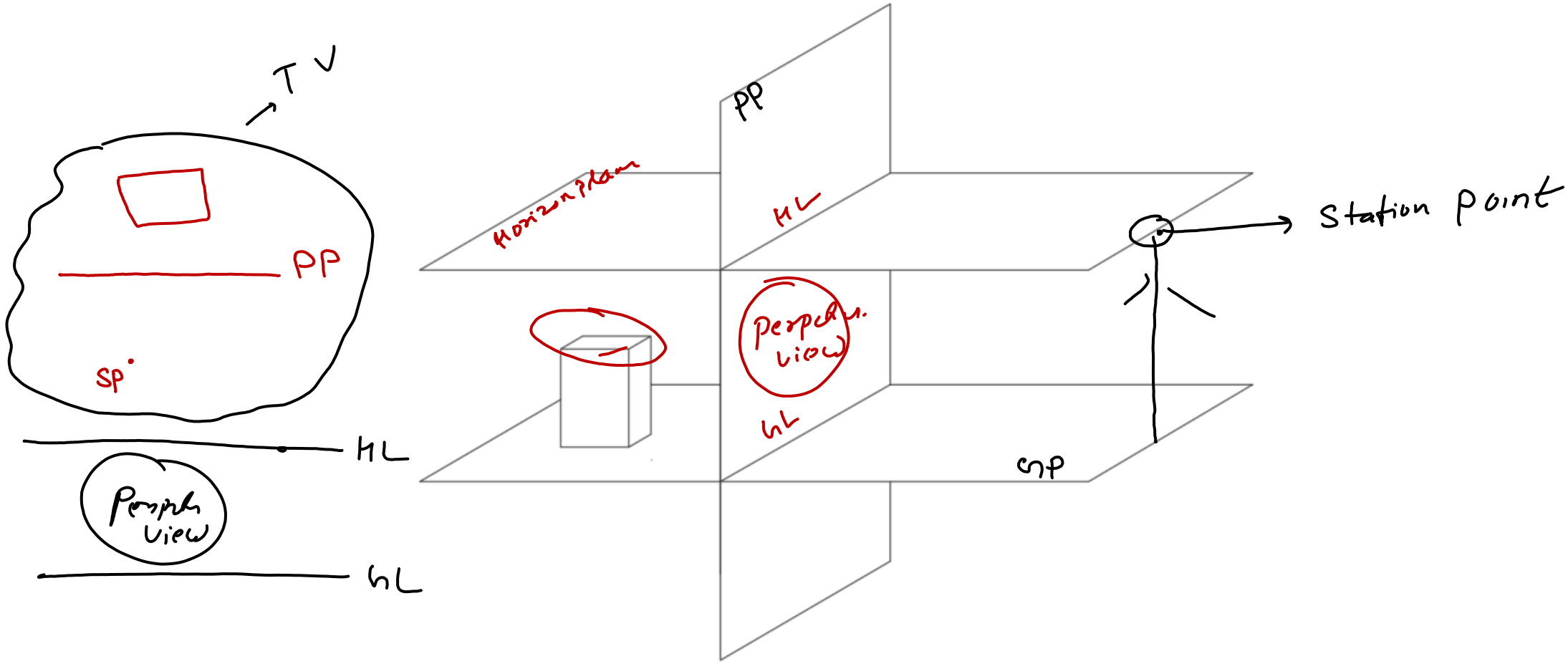


PERSPECTIVE DRAWING



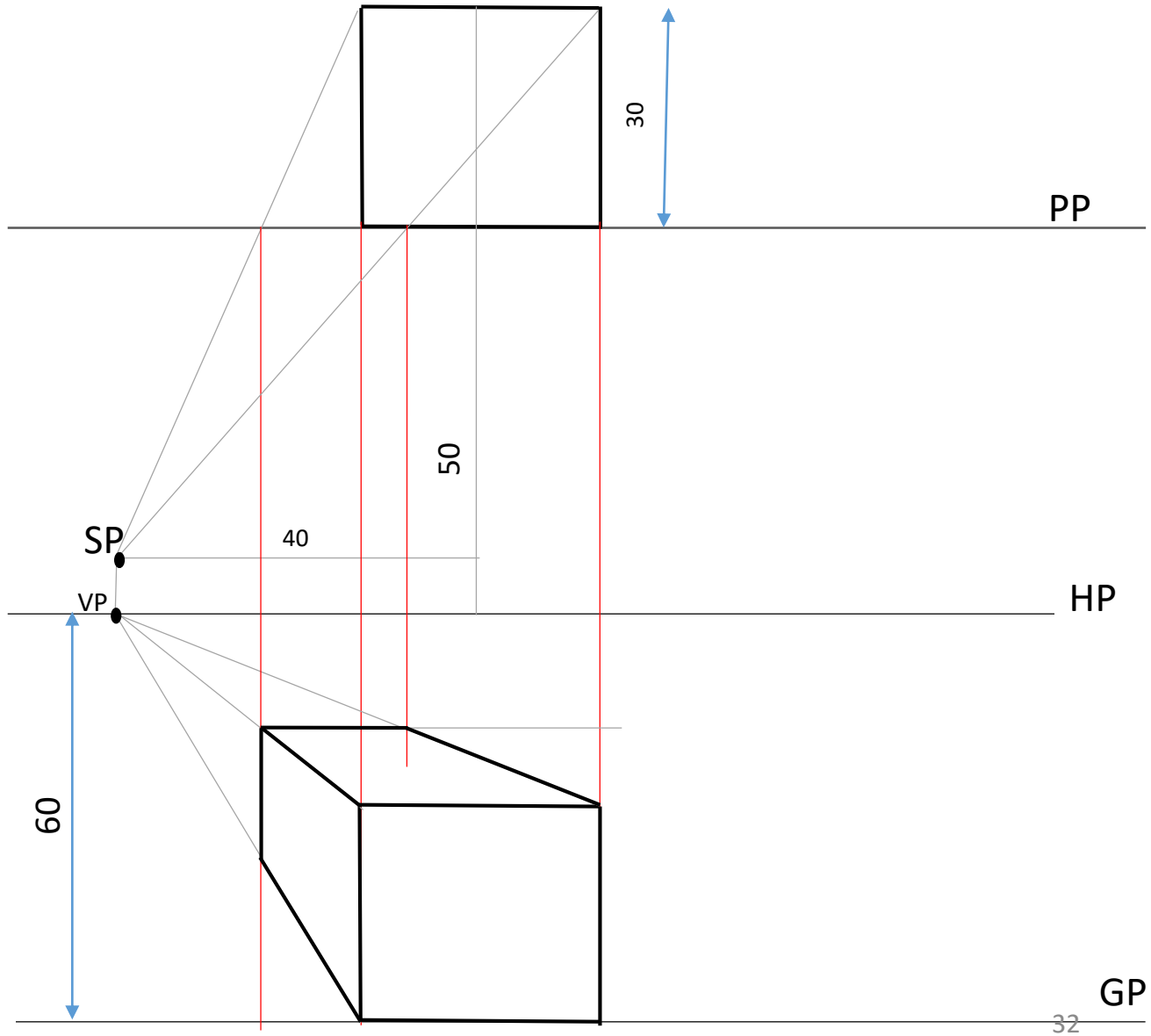


PERSPECTIVE DRAWING

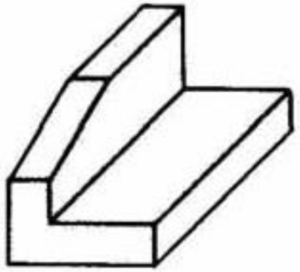


PERSPECTIVE DRAWING

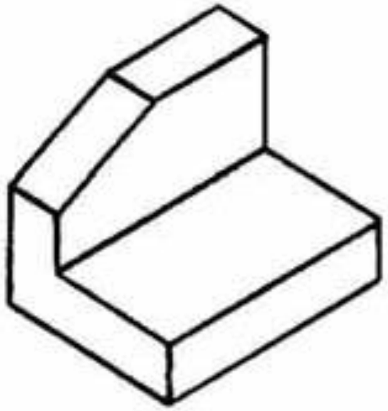
1. A cube of side base 30 mm rests with it base on the ground and one of its faces lies in the PP. The station point is 50mm in front of the PP, 60 mm above the ground. The central plane is 40mm away from the axis of cube towards the left. Draw the perspective view.



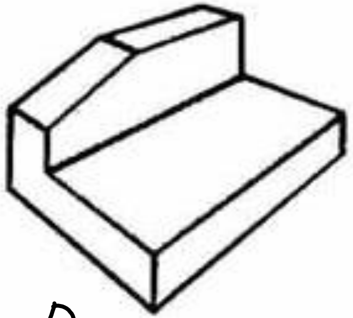
PICTORIAL



Oblique

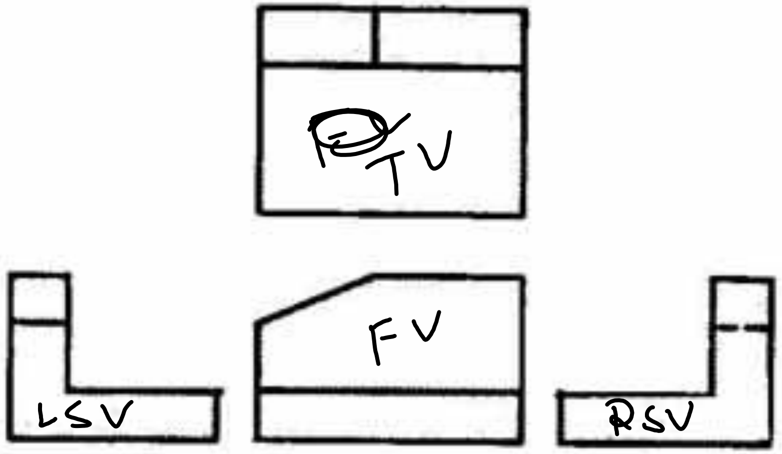


Isometric



Perspective

MULTIVIEW

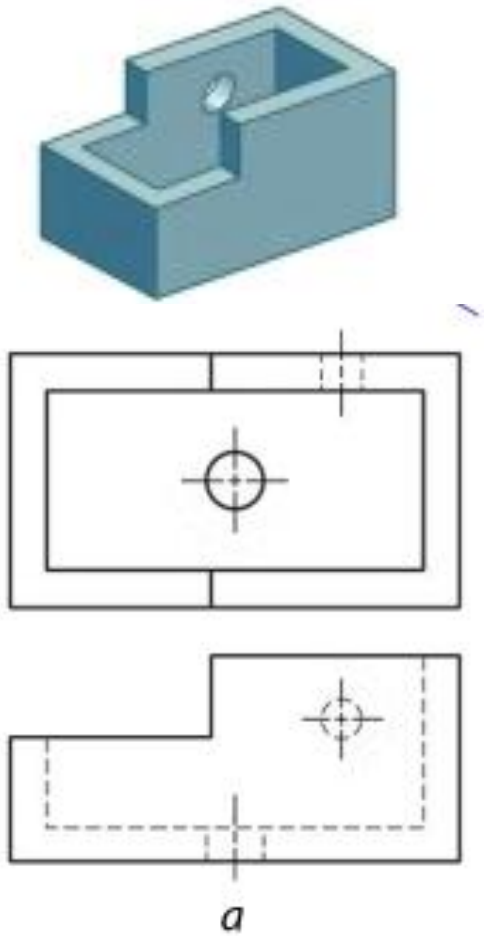


3rd ∠

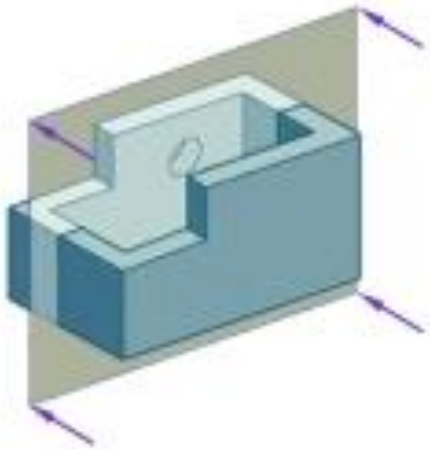
Sectional Drawing

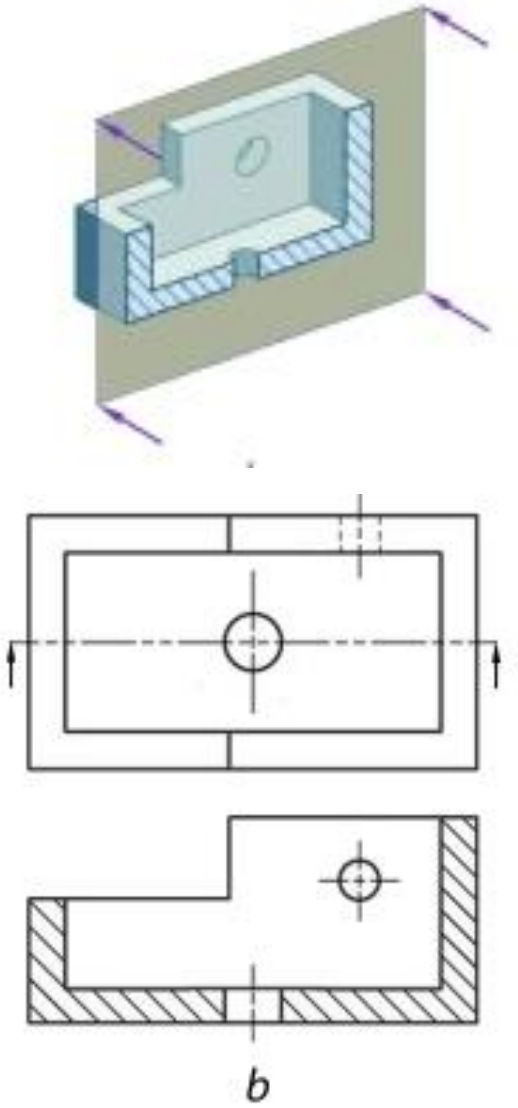
The technique called **section views** is a very important aspect of design and documentation. It is used to

- improve the visualization and clarity of new designs,
- clarify multiview drawings,
- reveal interior features of parts, and
- facilitate the dimensioning of drawings.

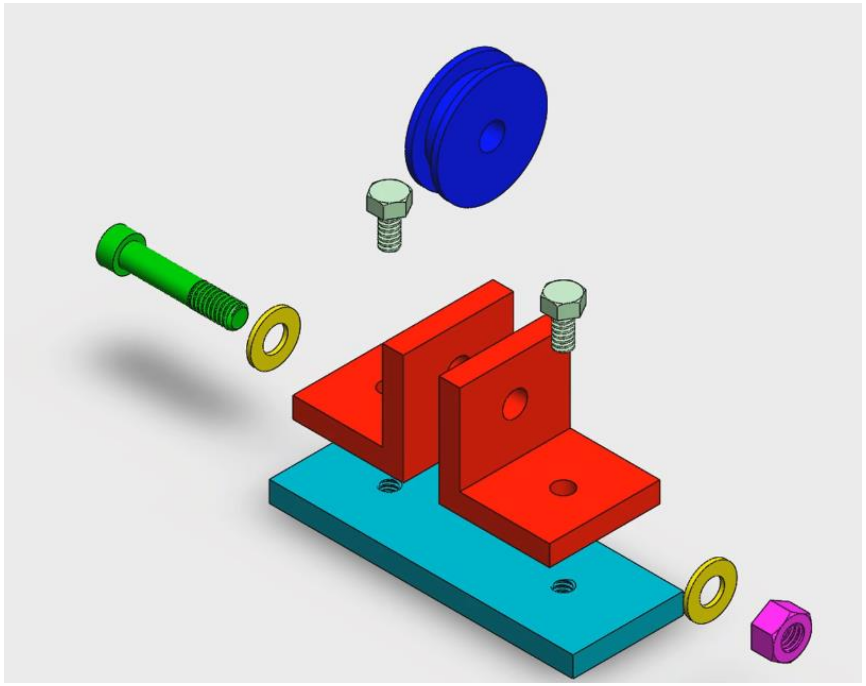


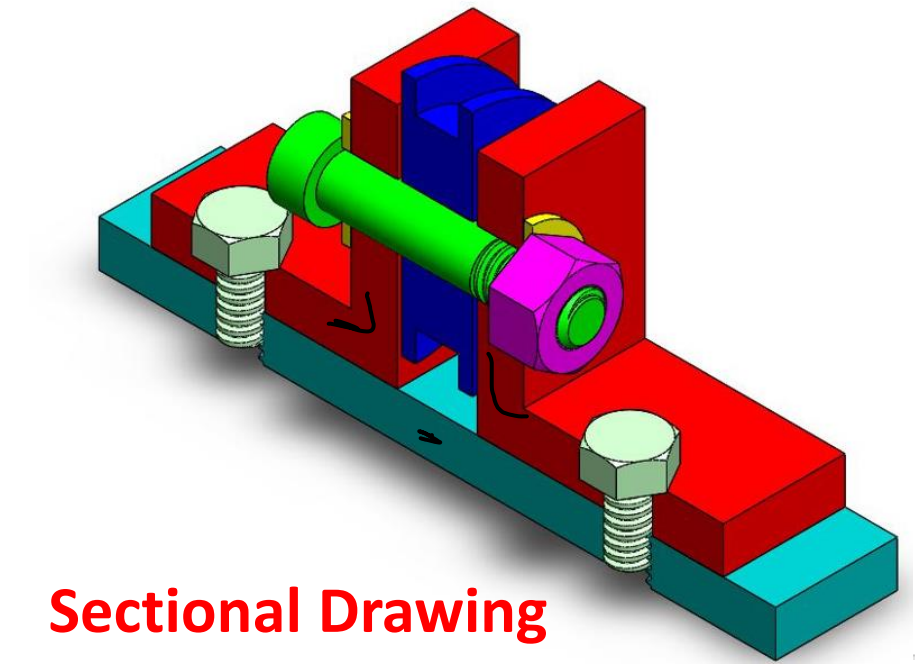
a





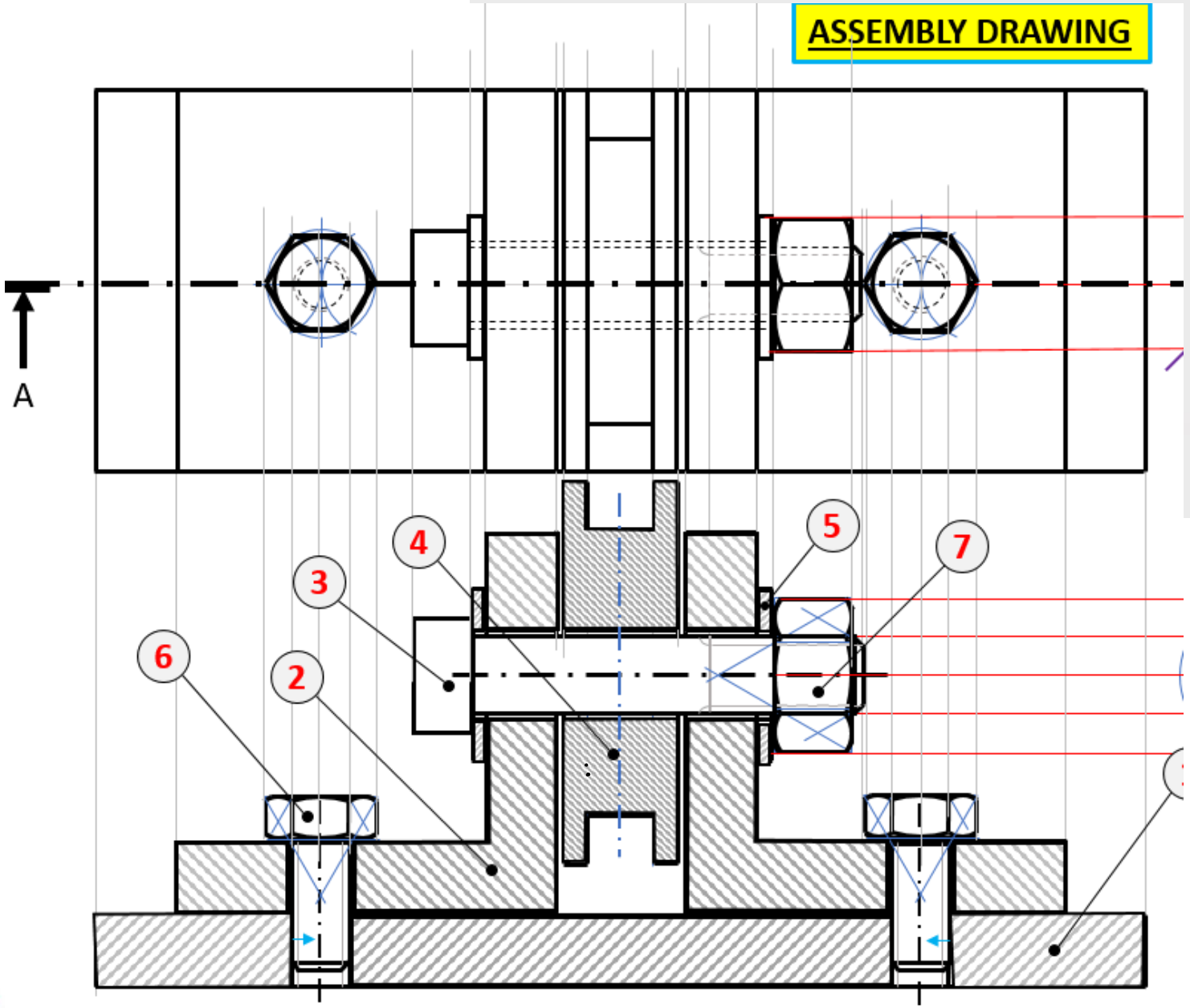
b





Sectional Drawing

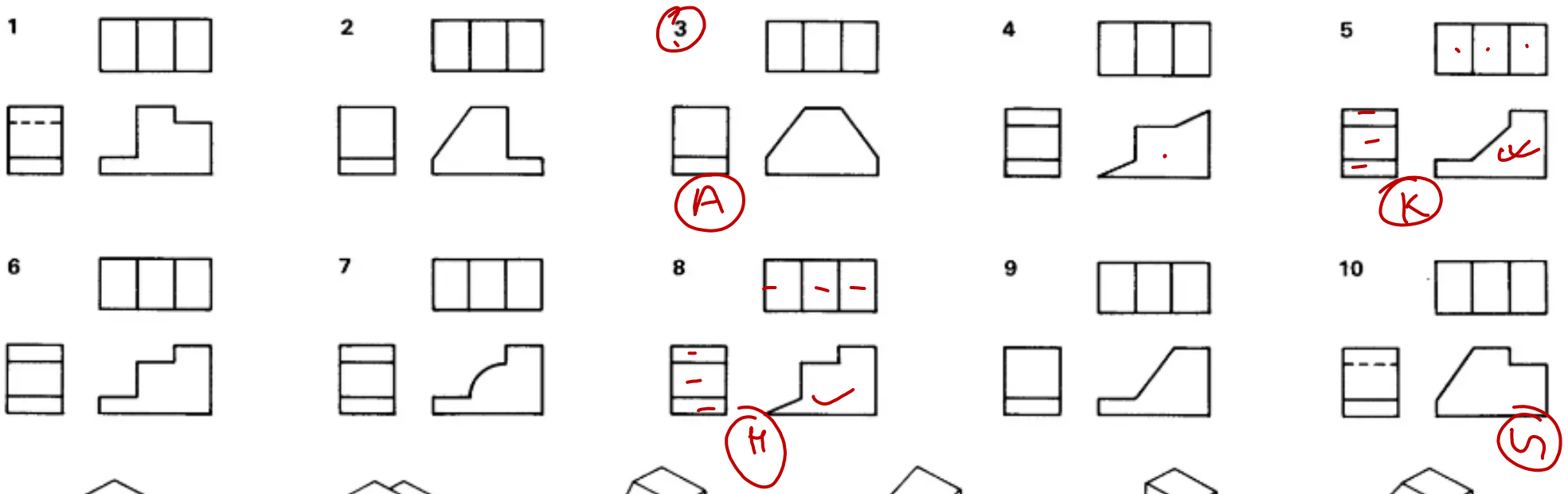
ASSEMBLY DRAWING



SECTION A-A

Practice Yourself - A

EXERCISES. Study the two types and complete the table by matching the numbered orthogonal drawings with the same isometric view.



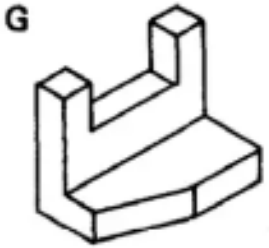
1	2	3	4	5	6	7	8	9	10

DRG.	ORTHOGRAPHIC PROJECTION	EXERCISE 5

Practice Yourself - B

EXERCISES. Study the two types and complete the table by matching the numbered orthogonal drawings with the same isometric view.

G



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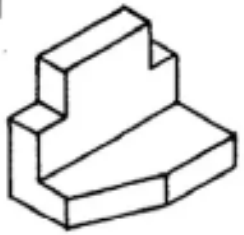

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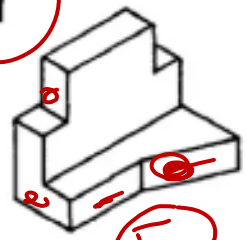

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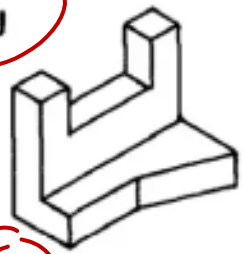

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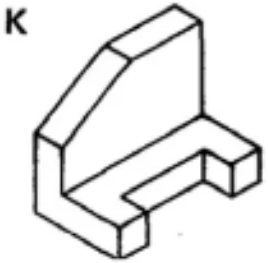

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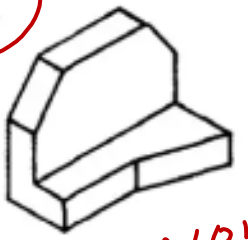

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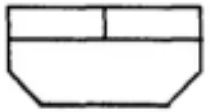
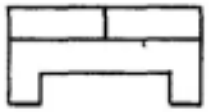
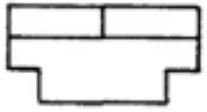
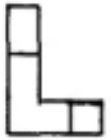
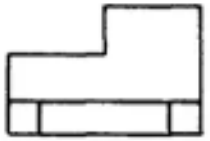
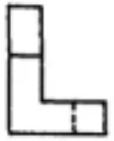
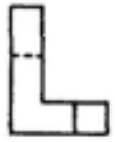
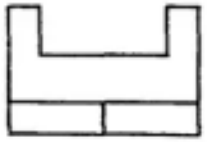
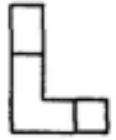
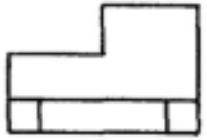
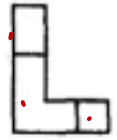
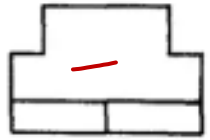
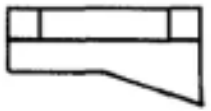
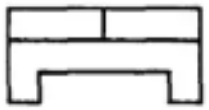
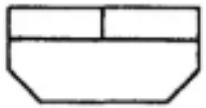
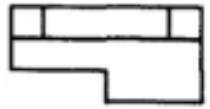
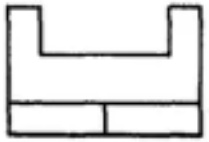
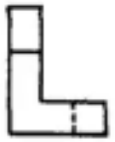
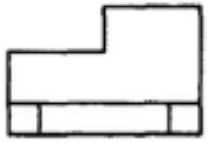
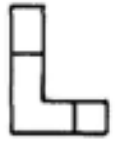
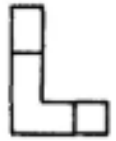
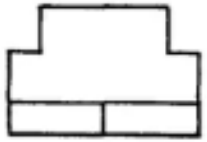
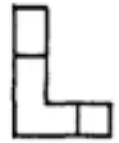
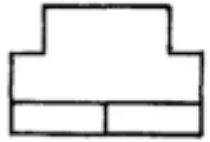
1		2		3		4		5	
	 		 		 		 		 
6		7		8		9		10	
	 		 		 		 		 

Answers –A

1	B
2	J
3	A
4	I
5	K
6	L
7	E
8	H
9	C
10	G

B

G	3
H	9
I	5
J	6
K	2
L	None

Practice Questions

1. This type of projection is when projectors are parallel to each other, but are at an angle other than 90 degrees to the plane of projection:
(A) Oblique projection
(B) Perpendicular projection
(C) Aesthetic projection
(D) Angular projection

2. The type of line that projects from an object for the express purpose of locating a dimension is a -------- line.
A. Visible
B. Hidden
C. Extension
D. Dimension

3. In isometric Drawing
(A) All axes are equally Inclined → Isometric
(B) Two axes are equally inclined → Dimetric
(C) None of the axes re equally inclin → Trimetric.
(D) None of the above

4. When the receding lines are true length, and the projectors are at 45 degrees to the plane of projection, the oblique drawing is called this:

A. Cabinet projection
B. Cavalier projection
C. Axonometric projection
D. Isometric projection

5. Architectural drafters generally prefer to use _____ drawings to help illustrate 3-dimensional views of a structure.

A. isometric
B. perspective
C. orthographic
D. auxiliary

6. The type of line that projects from an object for the express purpose of locating a dimension is a _____ line.

A. Visible
B. Hidden
C. Extension
D. Dimension

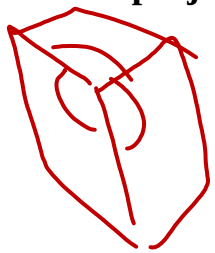
7. This is the plane upon which the top view is projected:

A. Horizontal
B. Frontal
C. Profile
D. Base

8. This type of axonometric drawing has equal foreshortening along two axis directions and a different amount on the third axis:

A. Diametric
B. Multi view
C. Isometric
D. Trimetric

9. The edges of a cube in isometric projection make angles of this any degrees with each other:



A. 30
B. 60
C. 90
D. 120

10. In perspective drawings this is placed between the observer and the object:

A. Vanishing point / horizon
B. Station point
C. Ground line
D. Plane of projection / picture plane

11. Two-point perspective is also known as:

A. Two-view perspective
B. Regular perspective
C. Parallel perspective
D. Angular perspective

12. Perspective drawings are classified according to their number of these features:

A. Station points
B. Picture planes
C. Vanishing points
D. Ground lines

13. In isometric projection, all distances are approximately this percentage of their true size:

A. 120 percent
B. 80 percent
C. 50 percent
D. 100 percent

14. The principle reason for using an auxiliary view is _____.

A. to eliminate hidden lines
B. to create a true projection plane from an inclined plane in one of the primary views
C. to show cylinders as ellipses
D. to locate center marks

15. The principle views associated with orthographic projection are _____.

A. Front view
B. Right side view
C. Top view
D. All of the above

16. A full scale technical drawing will have a scale factor of _____.

A. 1:1
B. 1:2
C. 2:1
D. 1:4

17. A typical set of mechanical working drawings includes _____.

A. exploded assembly
B. part details
C. parts list
D. all of the above

18. If a plane is parallel to the plane of projection, it appears:

A. True size
B. As a line or edge
C. Foreshortened
D. As an oblique surface

20. There are two main types of projection:

A. Parallel and Orthographic
B. Station-point and Perspective
C. Parallel and Perpendicular
D. Perspective and Parallel

21. The following is not included in the tittle of the drawing sheet?

A. Sheet No.
B. Scale
C. Method of Projection
D. Size of sheet

22. Which of the following line is used for visible outlines

A. Continuous Thick
B. Continuous Thin
C. Chain Thin Line
D. Short Zig Zag Line

23. Which of the following line is used for dimension lines

A. Continuous Thick
B. Continuous Thin
C. Chain Thin Line
D. Short Zig Zag Line

25. Which the following is represented by dotted line

A. Hidden Edges
B. Projection Line
C. Visible outlines
D. Hatching Line

26. A line of 1 metre is shown by 1 cm on a scale its representative factor (RF) is:

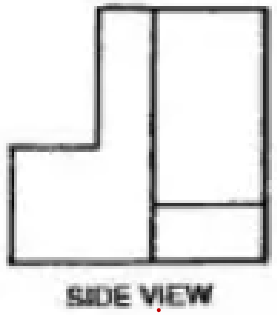
A. 1
B. 100
C. 1/100
D. 1/50

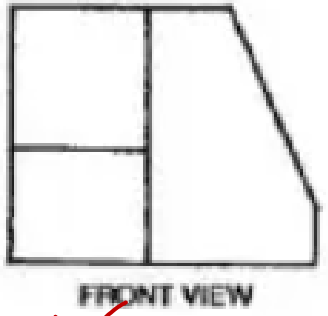
$$\frac{D}{R} = \frac{1\,cm}{1\,m} = \frac{1\,cm}{100\,cm} = \frac{1}{100}$$

27. The value of ratio of isometric projection length to true length is

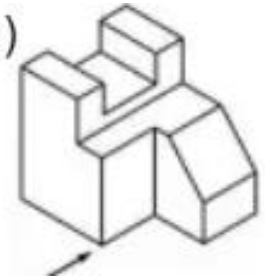
A. 0.141
B. 0.372
C. 0.815
D. 0.642

28. For the given orthographic views,
Which of the following is the correct isometri view ??





(a)



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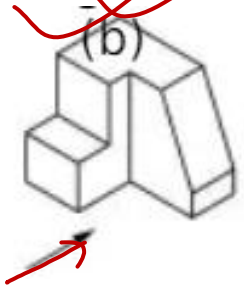

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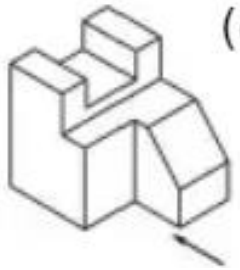

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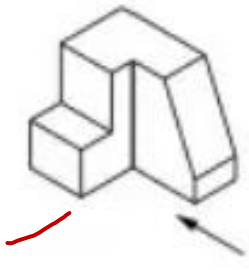


29. The internal angle of regular pentagon is ___ degree.

a) 72
b) 108
c) 120
d) 150

$$I.A = \frac{n-2}{n} \times 180^{\circ}$$

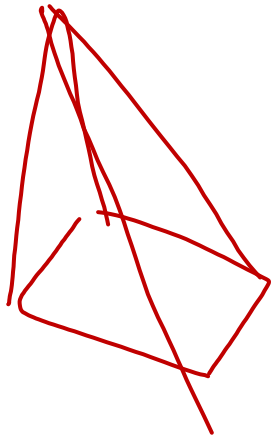
$$S.of\ IA = (n-2) \times 180$$

30. The following is (are) the method(s) of projecting the pictorial views.

a) Axonometric projection
b) Oblique projection
c) Perspective projection
d) All of the above

31. The following are the Polyhedron except

a) Triangular Prism
b) Square based Pyramid
c) Cube
d) Cylinder



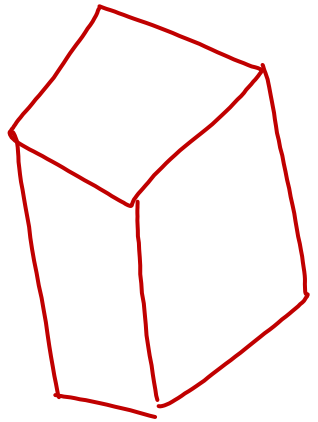
A three-dimensional shape with flat polygonal faces, straight edges, and sharp corners or vertices is called a polyhedron

32. Which of the following position is not possible for a plane?

a) Perpendicular to both HP and VP
b) Parallel to both HP and VP
c) Perpendicular to HP and parallel to VP
d) Perpendicular to VP and parallel to HP

33. Rectangular prism is an example of

a) Objects having isometric lines
b) Object having non-isometric lines
c) Object having curved surfaces
d) None of the above

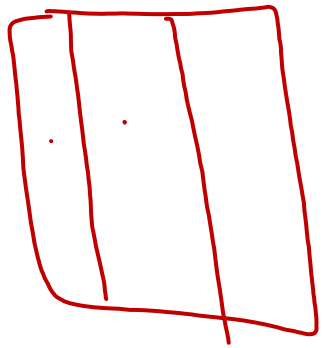


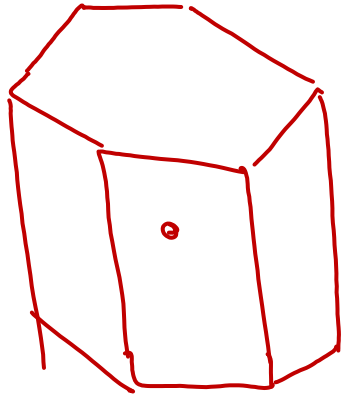
34. The Length: Width in case of an arrow head is

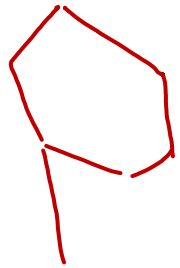
a) 1:1
b) 2:1
c) 3:1
d) 4:1

35. A right regular hexagonal prism in resting on HP on its base, its top view is a

a) Square
b) Rectangle
c) Hexagon
d) Pentagon







36. For the given isometric views,
Which of the following is the correct Front view??

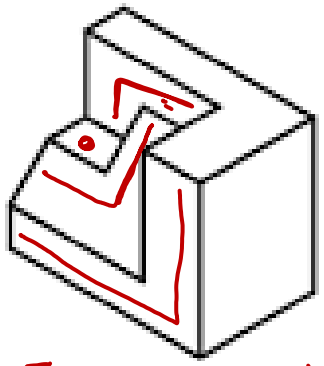
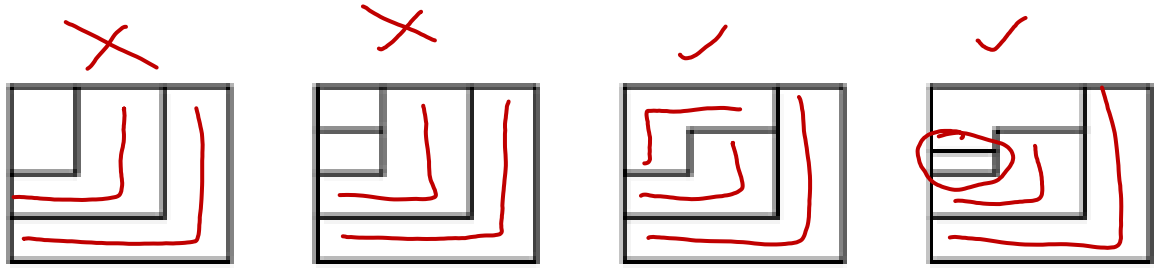


Fig. 7.23



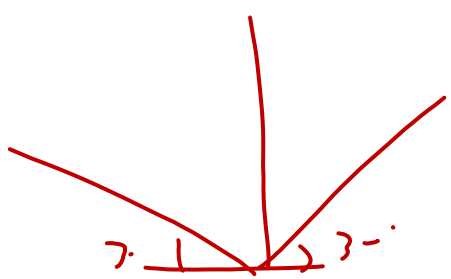
(a) (b) (c) (d)

37. The development of cylinder is a

a) Rectangle
b) Circle
c) Ellipse
d) None of the above

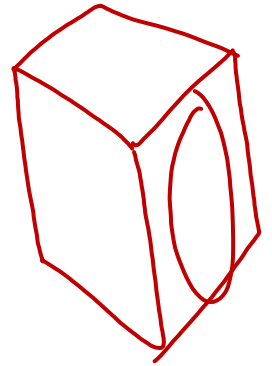
37. What is the dimension of A1 size drawing sheet?

a) 1189 mm x 841 mm
b) 594 mm x 841 mm
c) 1230 mm x 880 mm
d) 880 mm x 625 mm

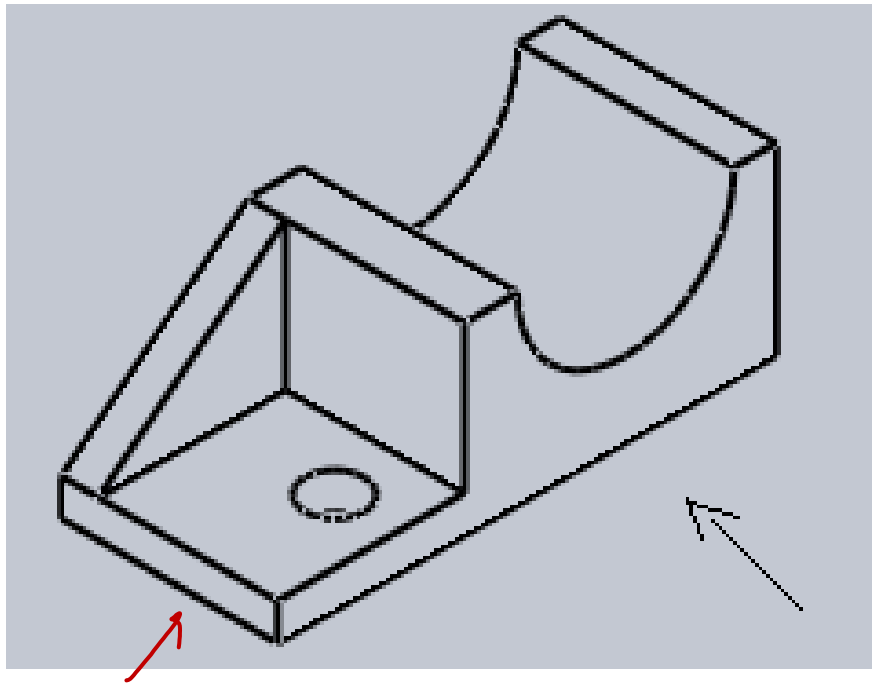


38. In an isometric sketch of a cube:

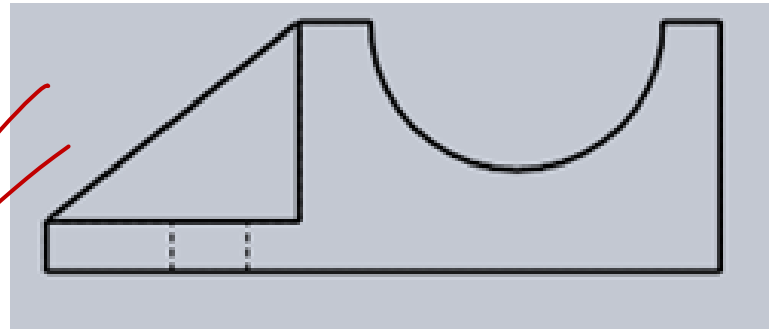
a. The frontal face appears in its true shape
b. The receding axes are at 45 degree to the horizontal
c. All the faces are equally distorted
d. Only the depth distance must be removed



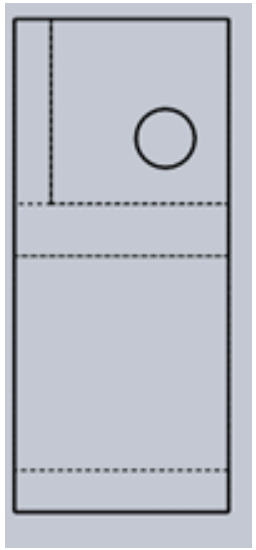
39. Identify the front view of the below isometric view.



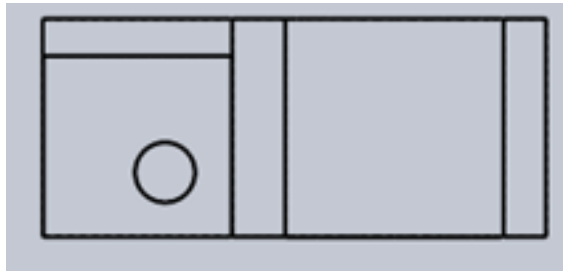
a.



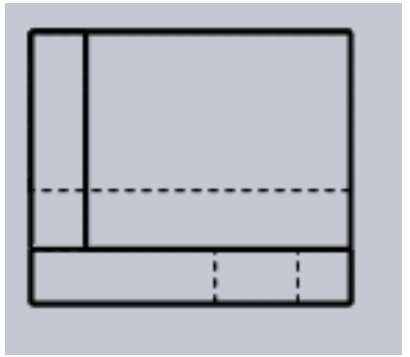
b.



c.



d.



40 Which of the following angle cannot be drawn by using set square?

a. 15^{0}

b. 20^{0}

c. 60^{0}

d. 150^{0}