TECHNICAL DRAWING

Chapter IV : Orthographic Projection

Views — Glass Box — Cylinders — Inclined Surfaces

Mr. ZENNADI Karim

ENP

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Section 1

Introduction

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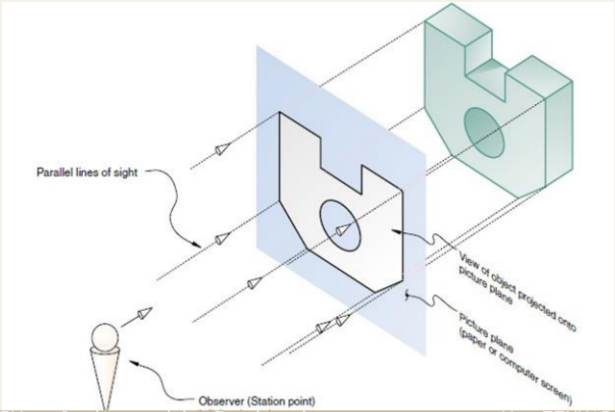
- **Orthographic Projection** uses parallel projection for the preparation of technical drawings. The projectors are perpendicular to the projection plane. The object is assumed to be at infinity, so its shape appears in actual size.

- **Orthographic Projection** uses parallel projection for the preparation of technical drawings. The projectors are perpendicular to the projection plane. The object is assumed to be at infinity, so its shape appears in actual size.
- A **projection plane** is an imaginary surface on which the picture is prepared, then transferred to paper. This plane faces the side of the object whose view is to be represented, as shown in the figure.

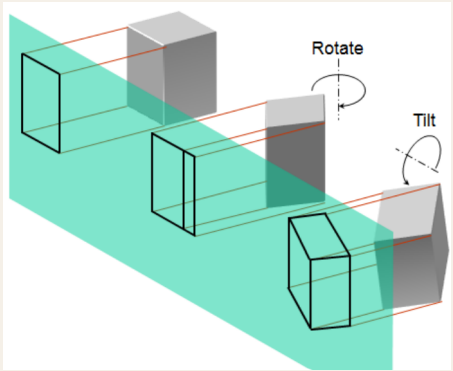
- **Orthographic projections** overcome the limitations of 3-D projections by providing a collection of flat 2-D drawings that show the different sides of an object clearly and to true scale.



Section 2

Orthographic View

- An **orthographic view** depends on the relative position of the object to the line of sight. It uses multiple views of the object, from points of view rotated about the object's center through increments of 90°.

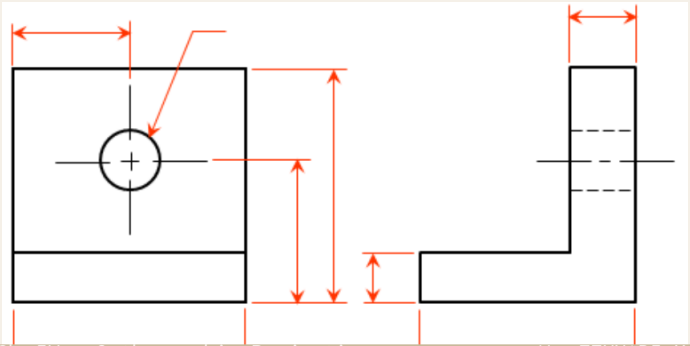


Advantage

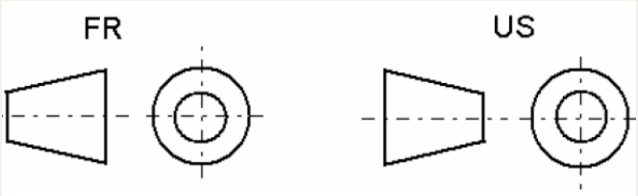
Represents accurate shape and size.

Disadvantage

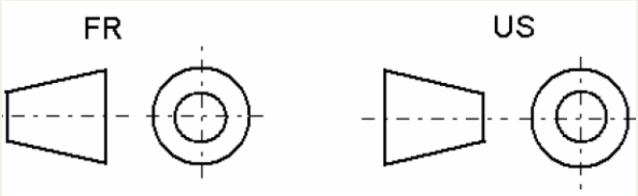
Requires practice in writing and reading.

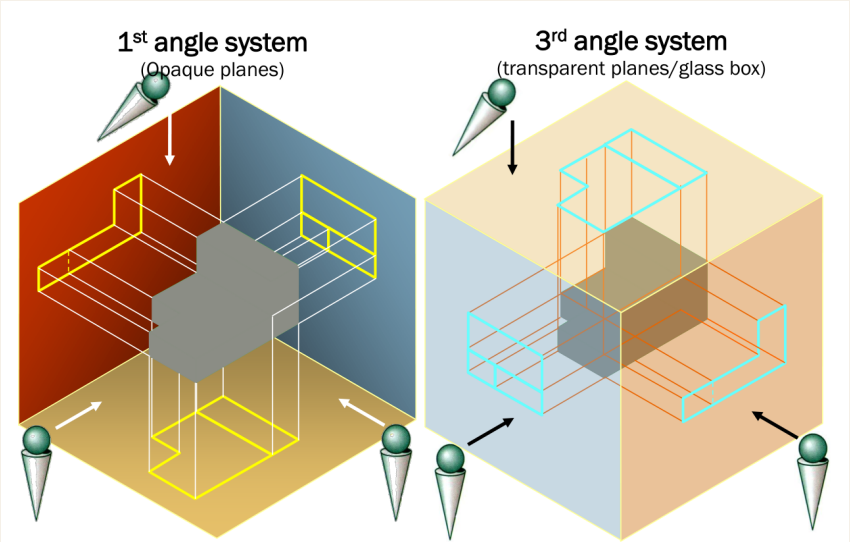


- Only two forms of orthographic projections are used: **first-angle projection** (*European ISO-E*) and **third-angle projection** (*American ISO-A*).



- Only two forms of orthographic projections are used: **first-angle projection** (*European ISO-E*) and **third-angle projection** (*American ISO-A*).
- On engineering drawings, the projection angle is denoted by an international symbol consisting of a truncated cone — one symbol for first-angle (FR) and another for third-angle (US).




1st angle system
(Opaque planes)
3rd angle system
(transparent planes/glass box)

Section 3

Methods of Orthogonal Projection

3

Two principal methods

- **Natural Method** — the object revolves with respect to the observer.

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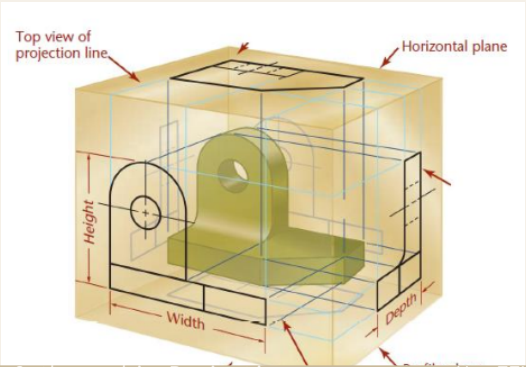
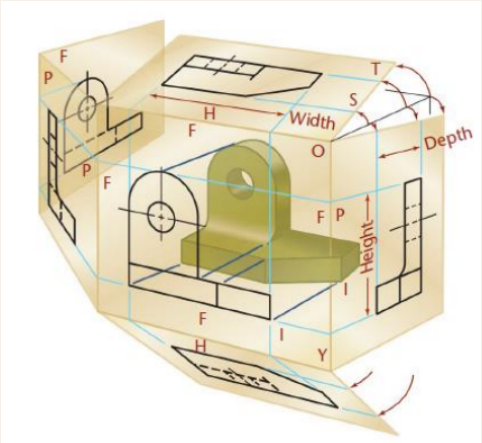
- **Natural Method** — the object revolves with respect to the observer.
- **Glass Box Method** — the observer moves around the object.

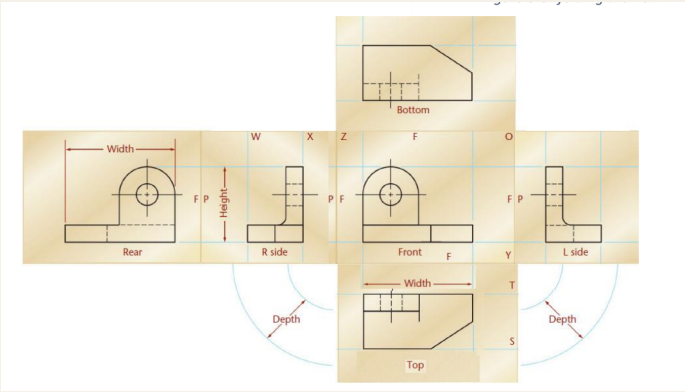
- One way to understand the standard arrangement of views on a sheet of paper is to envision a **glass box**.
- If planes of projection are placed parallel to each principal face of the object, they form a box, as shown in the figure.

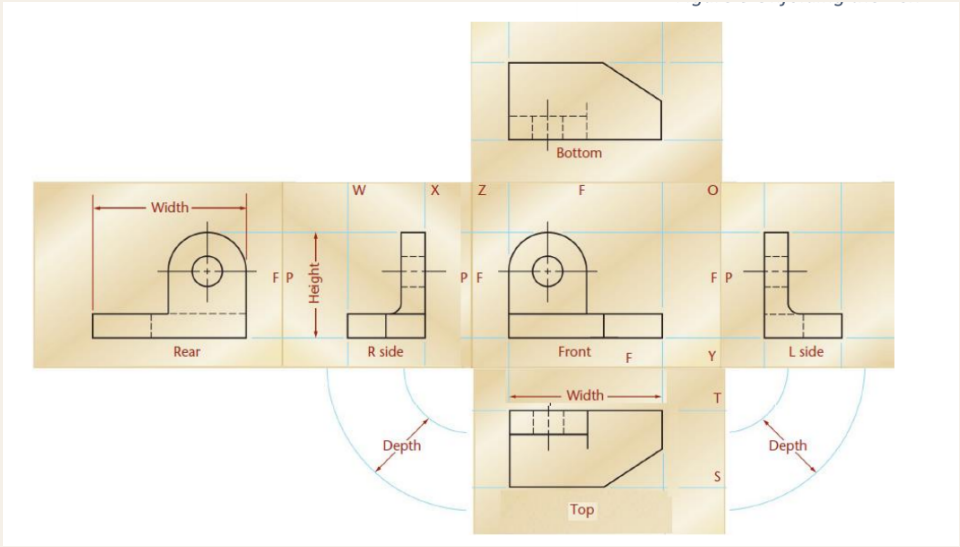


To organise the views of a 3-D object on a flat sheet of paper, imagine the six planes of the glass box being **unfolded** to lie flat, as shown in the figure.



- Each plane folds out away from the frontal plane. The hinge lines of the glass box, represented in the drawing, are known as **folding lines**.
- The positions of the six planes after unfolding are shown in the figure.




Bottom
Width
W
X
Z
F
O
Height
F P
P F
F P
Rear
R side
Front
L side
F
Y
Width
T
Depth
Depth
S
Top

Section 4

Necessary Views

4

- A drawing should contain only the views needed to clearly and completely describe the object — these are called the **necessary views**. Choose views with the fewest hidden lines that show essential contours most clearly.

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- Many objects need only **two views**. If the left-side and right-side views show the object equally well, use the **right-side view**.

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- Complicated objects may require more than three views or special partial views.
- Many objects need only **two views**. If the left-side and right-side views show the object equally well, use the **right-side view**.
- If only two views are needed and the top and bottom views are equivalent, choose the **top view**.

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- Complicated objects may require more than three views or special partial views.
- Many objects need only **two views**. If the left-side and right-side views show the object equally well, use the **right-side view**.
- If only two views are needed and the top and bottom views are equivalent, choose the **top view**.
- If only two views are necessary, choose the combination that **fits best on the paper**.

Section 5

Projection of Cylinders

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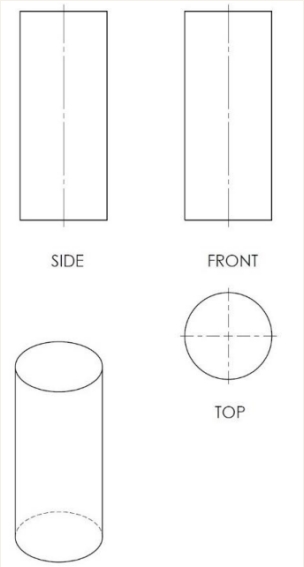
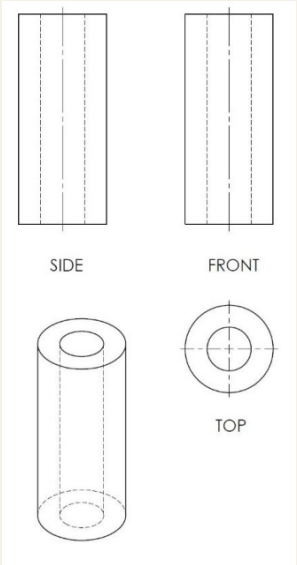
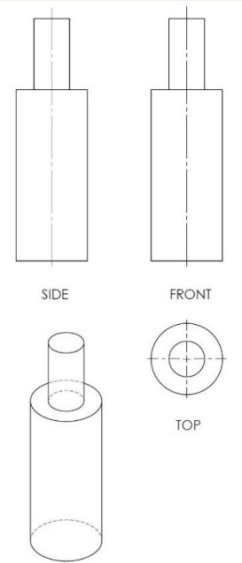
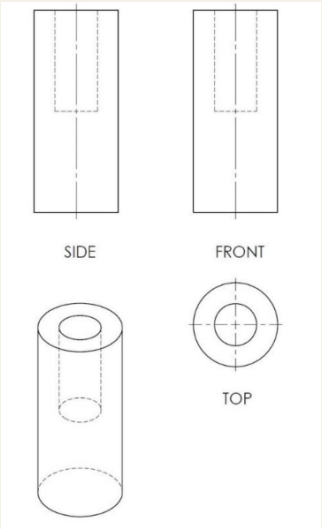

SIDE
FRONT
TOP


SIDE
FRONT
TOP

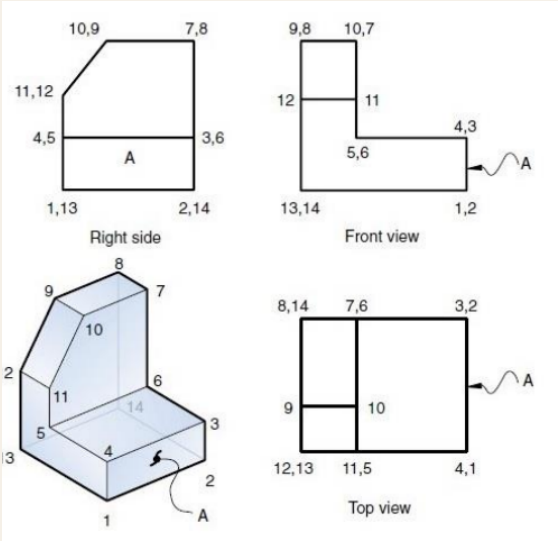

SIDE
FRONT
TOP

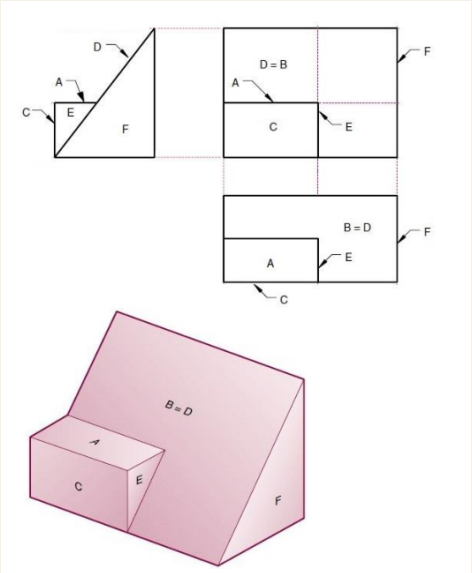

SIDE
FRONT
TOP

Section 6

Projection of Inclined Surfaces

6


10,9
7,8
11,12
4,5
A
3,6
1,13
2,14
Right side
9,8
10,7
12
11
4,3
5,6
A
13,14
1,2
Front view
8
9
7
10
2
6
11
14
5
3
4
3
2
1
A
8,14
7,6
3,2
A
9
10
12,13
11,5
4,1
Top view

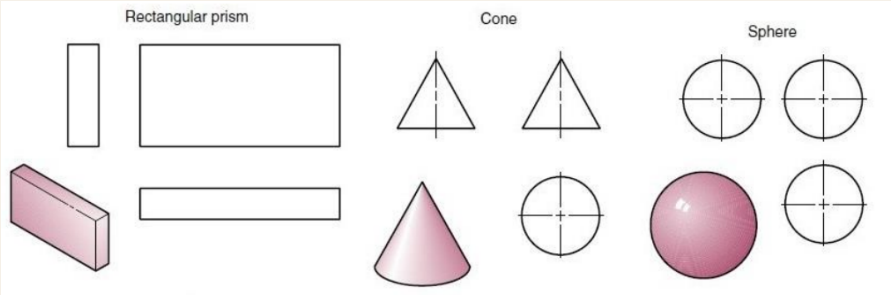

D
A
C
E
F
D = B
A
C
E
F
B = D
A
E
F
C
B = D
A
C
E
F

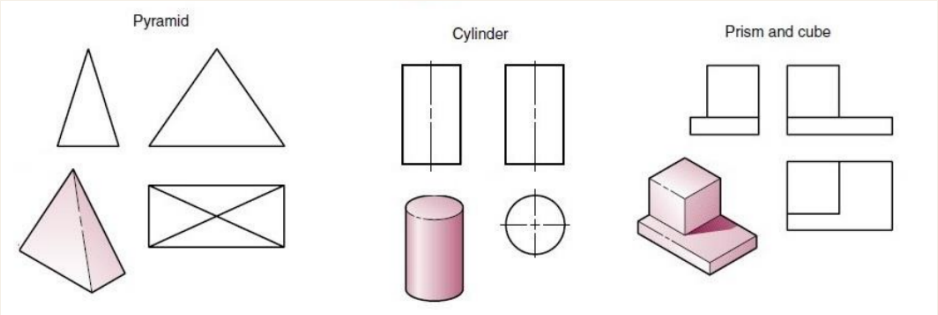
Section 7

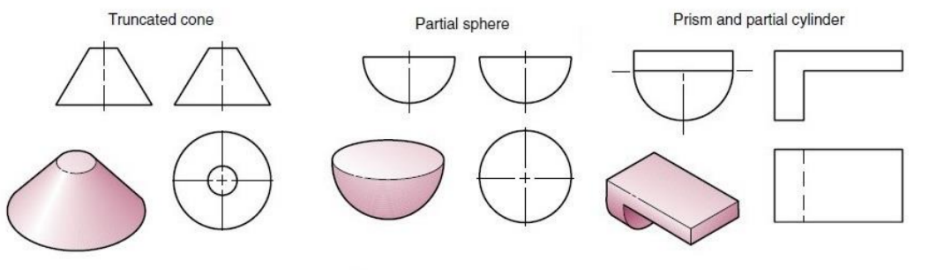
Basic Shapes

1. Introduction
2. Orthographic View
3. Methods of Orthogonal Projection
4. Necessary Views
5. Projection of Cylinders
6. Projection of Inclined Surfaces
7.

7


Rectangular prism
Cone
Sphere

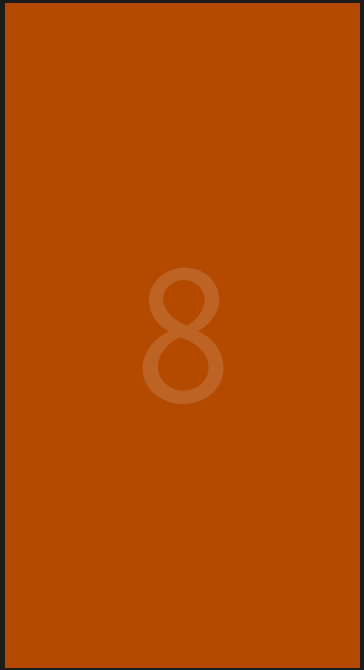

Pyramid
Cylinder
Prism and cube


Truncated cone
Partial sphere
Prism and partial cylinder

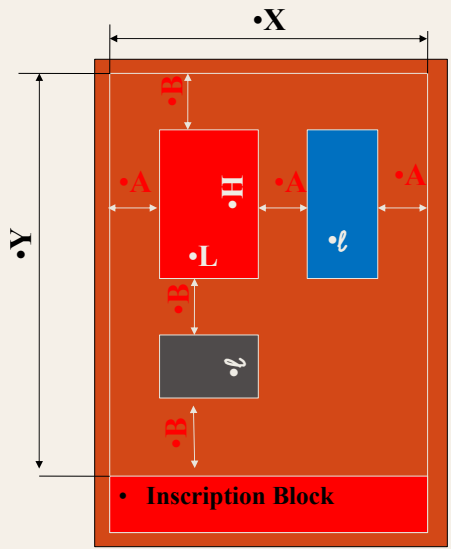
Section 8

Page Layout

1. Introduction
2. Orthographic View
3. Methods of Orthogonal Projection
4. Necessary Views
5. Projection of Cylinders
6. Projection of Inclined Surfaces
7. Basic Shapes



Page Layout



•A = [X - (L+ℓ)] / 3

•B = [Y - (H+ℓ)] / 3

X=190 et Y=247

Section 9

Symmetrical Parts

1. Introduction
2. Orthographic View
3. Methods of Orthogonal Projection
4. Necessary Views
5. Projection of Cylinders
6. Projection of Inclined Surfaces
7. Basic Shapes

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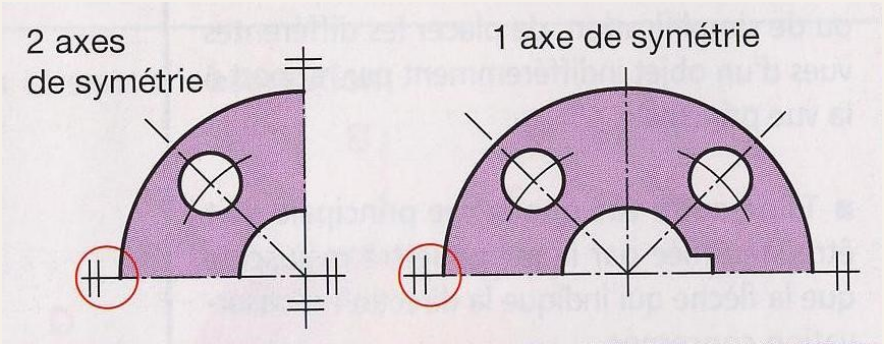
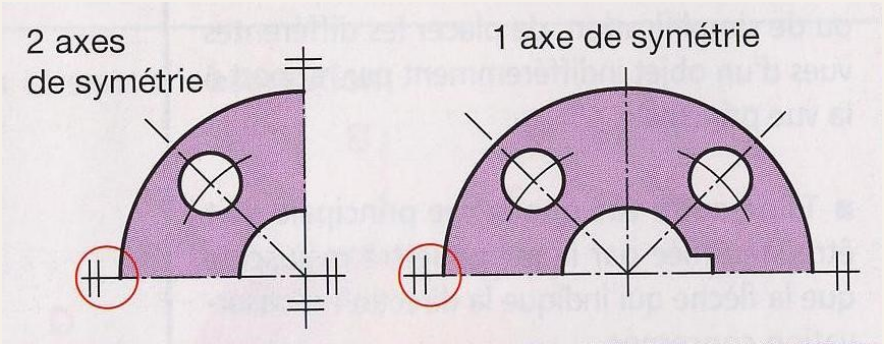
- For simplicity, a view with axes of symmetry can be represented as a **half-view** or **quarter-view**.



- For simplicity, a view with axes of symmetry can be represented as a **half-view** or **quarter-view**.
- In this case, mark the ends of the axes of symmetry with two thin lines perpendicular to these axes.



Section 10

TP 002

1. Introduction
2. Orthographic View
3. Methods of Orthogonal Projection
4. Necessary Views
5. Projection of Cylinders
6. Projection of Inclined Surfaces
7. Basic Shapes

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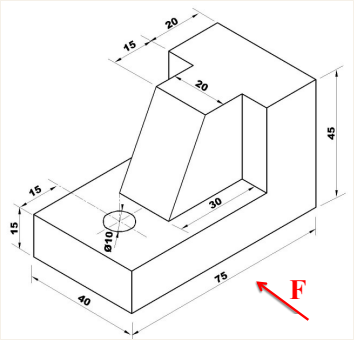
TP 002

Exercise – A4 format, scale 1:1

Draw the following views:

- Front View
- Left View
- Top View



Section 11

Home Work

1. Introduction
2. Orthographic View
3. Methods of Orthogonal Projection
4. Necessary Views
5. Projection of Cylinders
6. Projection of Inclined Surfaces
7. Basic Shapes

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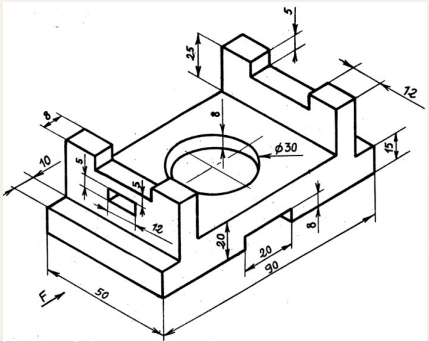
Home Work

Exercise – A4 format, scale 1:1

Draw the following views:

- Front View
- Right View
- Top View



Thank you for your attention.

Mr. ZENNADI Karim — ENP