COLLEGE OF ENGINEERING
Kwame Nkrumah University of Science & Technology

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

ME 160
ENGINEERING DRAWING

(2,2,3)

[Pre-requisites: ME 159]

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Department of Mechanical Engineering, KNUST

COURSE INTRODUCTION

- Engineering Drawings are a means of graphical communication in which ideas and information are exchanged.
- It is important that drawings are clear, unmistakable in meaning and not have room for more than one interpretation.
- This course builds on ME 159, Technical Drawing.
- Focus will be on acquiring some new skills and applying these in addition to what was learnt in ME 159, in preparing Detailed and Assembly drawings.

COURSE OBJECTIVES

- At the end of the course, students should be able to:
  - Produce and/or Interpret Detail Drawings of components.
  - Produce and/or Interpret Assembly Drawings.
  - Produce and/or Interpret Production/Working Drawing.
  - Develop Patterns from sheet Material.

COURSE OUTLINE

- A brief Overview of Dimensioning
- Review of Orthographic Projections
- Sectioning and Sectional Views of Objects
- Development from Sheet Metals
- Dimensioning, Tolerance and Fits, Geometric Tolerances
- Detailed drawing of components.
- Assembly drawing.
- ~~Intersection and Interpenetration of Surfaces.~~
- ~~Piping Drawings~~

RECOMMENDED READING MATERIALS

- Fundamentals of Graphics Communication, Bertoline & Wiebe
- Engineering Drawing for Diploma, K. C. John
- Drafting for Industry, Brown & Kicklighter.
- 2014 Lecture material on ME 160, Y.A.K Fiagbe

ASSESSMENT

Tutorial Assignments	20
Take Home Assignments	10
End of semester Exam	70
Total	**100**

Class attendance
(MAY be considered only if continuous assessment is less than 30) 5

A BRIEF OVERVIEW OF DIMENSIONING

Definition/Purpose of Dimensioning

Elements of a Dimension

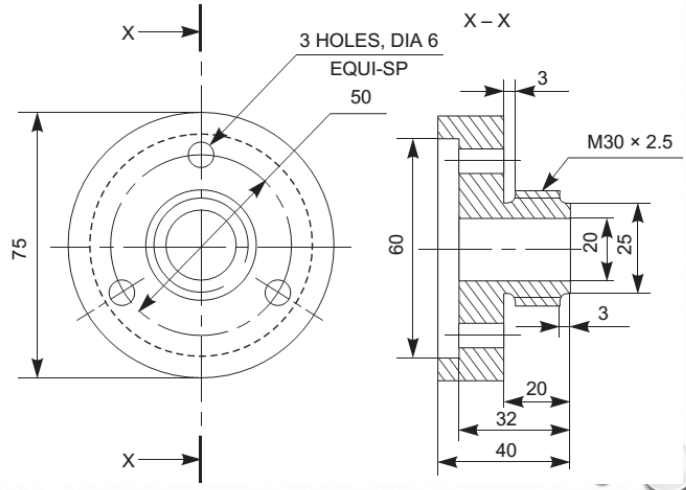
Some Size and Location Dimensioning Practices/Rules

A BRIEF OVERVIEW OF DIMENSIONING

- Engineering drawings can are a means of describing an object (graphic descriptions in this case).
- A complete description of an object requires information on its shape and size among other things.
- A drawing by itself often gives a good enough description of how an object looks like (its shape).
- Information on an objects size however has to be added to the drawing with dimensions.
- Dimensions can also be used to add other information such as such as, locations of features, tolerance (accuracy) required of sizes/locations , required surface finishes among other information.
- The practice of adding dimensions to a drawing can be called Dimensioning.

A BRIEF OVERVIEW OF DIMENSIONING

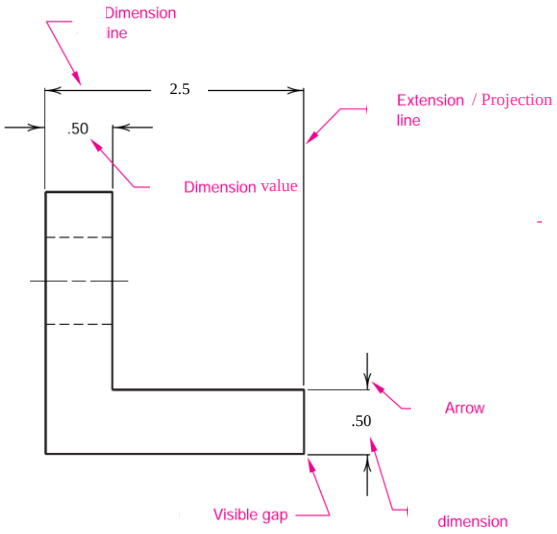
- Discussions for now, will be limited to the size and location specification in dimensioning

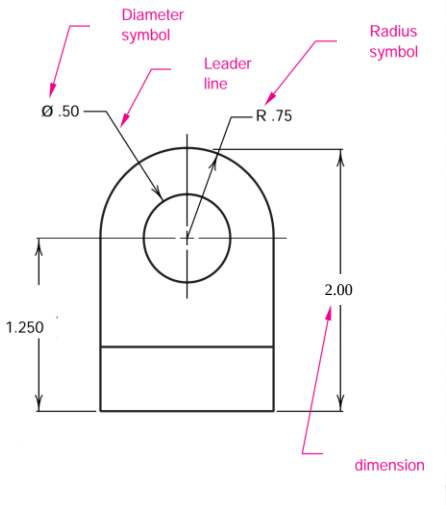


A fully dimensioned drawing

A BRIEF OVERVIEW OF DIMENSIONING

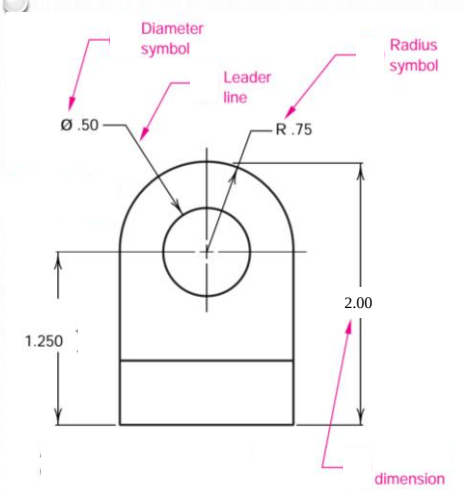
Elements/Components of a Dimension

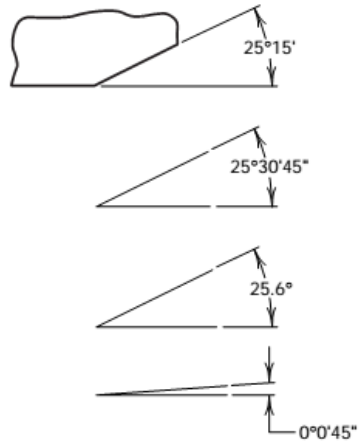




A BRIEF OVERVIEW OF DIMENSIONING

- Size and location dimensions are normally linear, circular, or angular.





A BRIEF OVERVIEW OF DIMENSIONING

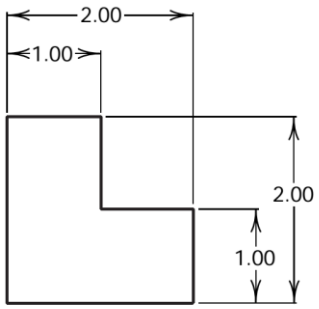
Some Dimensioning Practices/Rules

- These often vary from Standard to Standard.
- However some of the practices seem to be widely accepted.
- Some of these include:

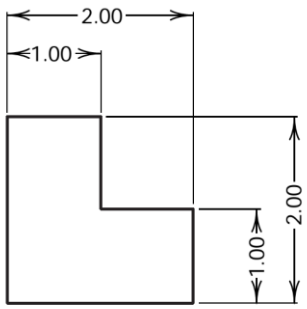
A BRIEF OVERVIEW OF DIMENSIONING

Some Dimensioning Practices/Rules

Dimension values may be aligned or unidirectional (preferred). Either way, they may or may not be placed inside the dimension line.

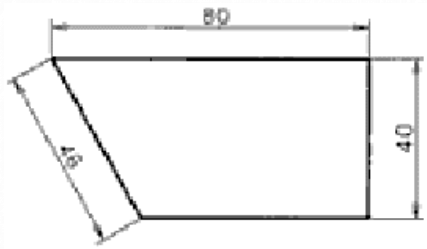


Unidirectional



Aligned

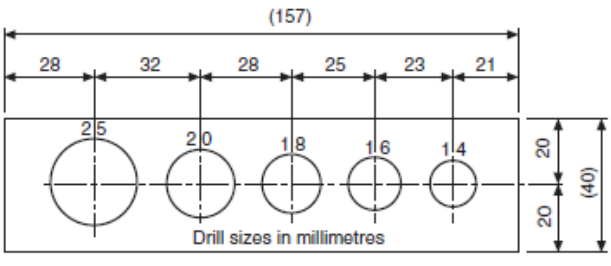
Dimension values placed inside dimension lines



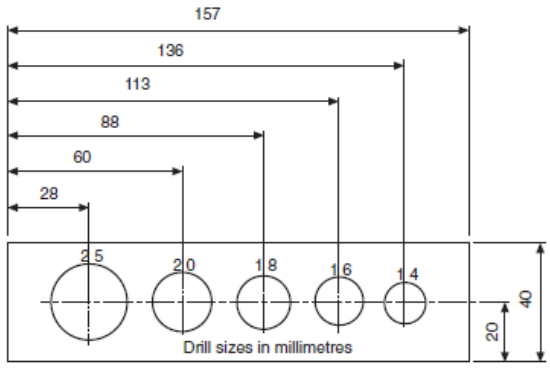
Aligned Dimension values placed outside dimension lines

A BRIEF OVERVIEW OF DIMENSIONING

- Linear dimensions may also be parallel/co-ordinate (ordinate) or chain



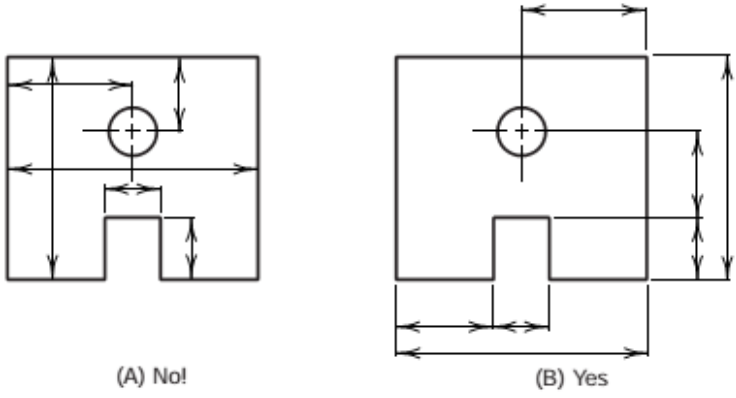
Chain dimensioning



Parallel Dimensioning

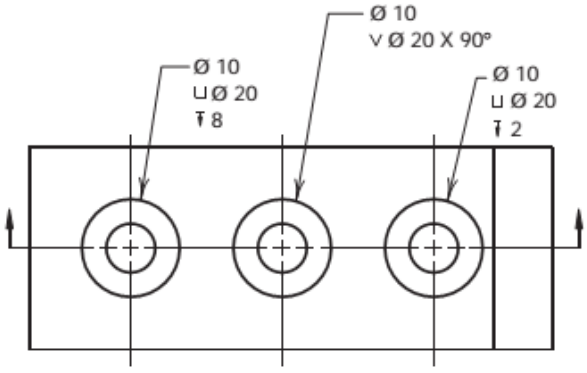
A BRIEF OVERVIEW OF DIMENSIONING

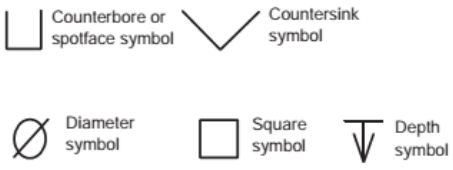
- It is preferred that dimension lines are kept outside drawing views and dimension lines do not intersect each other.



A BRIEF OVERVIEW OF DIMENSIONING

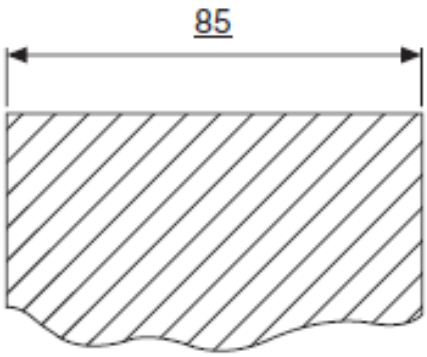
- Features such as holes, squares among others can be dimensioned with symbols.





A BRIEF OVERVIEW OF DIMENSIONING

- A drawing that is not being dimensioned to scale should have it's dimension value underlined



A BRIEF OVERVIEW OF DIMENSIONING

- Some Other Selected Rules
  - Double dimensioning of a feature is not permitted
  - Dimensions should be placed in the view that most clearly describes the feature being dimensioned.
  - As much as possible, avoid dimensioning hidden lines.
  - As much as possible, diameters, radii, squares, counterbores, spotfaces, countersinks, and depths should be specified with the appropriate symbol preceding the numerical value.
  - Leader lines for diameters and radii should be radial lines.

A BRIEF OVERVIEW OF DIMENSIONING

An Overview of Rules from the British Standard 308

1. Dimension and projection lines are narrow continuous lines 0.35 mm thick, if possible, clearly placed outside the outline of the drawing. NB: Outline is 0.7mm

2. The projection lines should not touch the drawing but a small gap should be left, about 2 to 3 mm, depending on the size of the drawing.

3. Arrowheads should be approximately triangular, must be of uniform size and shape and in every case touch the dimension line to which they refer.
Arrowheads drawn manually should be filled in. Arrowheads drawn by machine need not be filled in.

4. adequate space must be left between rows of dimensions and a spacing of about 12 mm is recommended. (Bearing in mind the size of the actual dimensions and the fact that there may be two numbers together where limits of size are quoted)

A BRIEF OVERVIEW OF DIMENSIONING

Rules from the British Standard 308

5. Centre lines must never be used as dimension lines but must be left clear and distinct. They can be extended, however, when used in the role of projection lines.

6. Dimensions are quoted in millimetres to the minimum number of significant figures. For example, 19 and not 19.0.

7. To enable dimensions to be read clearly, figures are placed so that they can be read from the bottom of the drawing, or by turning the drawing in a clockwise direction, so that they can be read from the right hand side.

8. Leader lines are used to indicate where specific indications apply. The leader line to the hole is directed towards the centre point but terminates at the circumference in an arrow. A leader line for a part number terminates in a dot within the outline of the component

REVIEW OF ORTHOGRAPHIC PROJECTION

Definition and Systems of Projection

Planes and Quadrants in Multiview Projections

Pattern Of Planes & Views for First Angle Projections

Pattern Of Planes & Views for First Third Projections

Symbolic Representation of First and Third Angle Projections

Some Solved Examples

PROJECTIONS

- A projection in engineering drawing normally refers to a 2D representation of a 3D object.

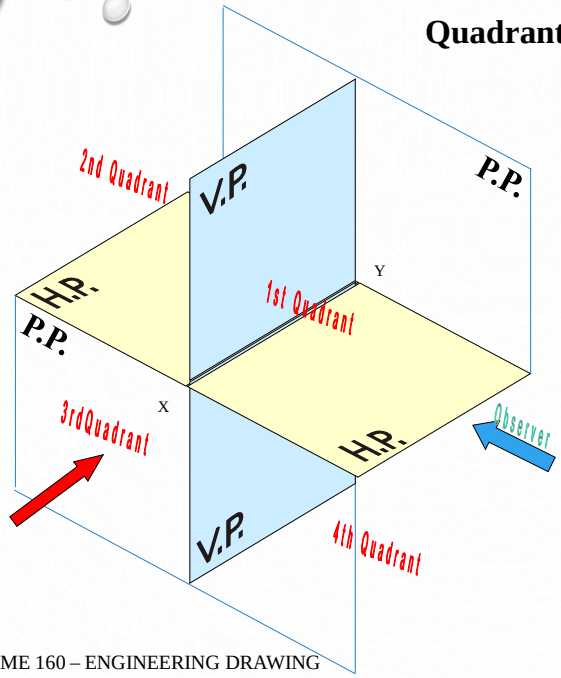
- Can be described as a drawing of an object as viewed from a certain direction or in a certain manner.

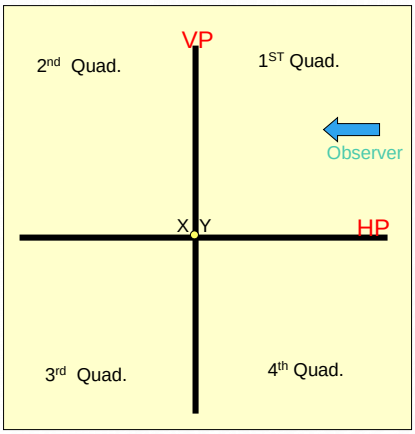
REVIEW OF ORTHOGRAPHIC PROJECTION

- **Projection**
  - Perspective
    - Linear
      - One-Point Perspective
      - Two-Point Perspective
      - Three-Point Perspective
    - Aerial
  - **Parallel**
    - Oblique
      - Cabinet Projection
      - Cavelier Projection
      - Clinographic Projection
      - Planographic Projection
    - **Orthographic**
      - Axonometric Projection
        - ***Isometric***
        - Dimetric
        - Trimetric
      - Multi-view Projection
        - ***First Angle Projection***
        - Second Angle Projection
        - ***Third Angle Projection***
        - Fourth Angle Projection

REVIEW OF ORTHOGRPAHIC PROJECTIONS

Quadrants



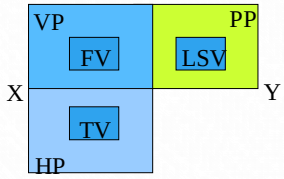


REVIEW OF ORTHOGRPAHIC PROJECTIONS

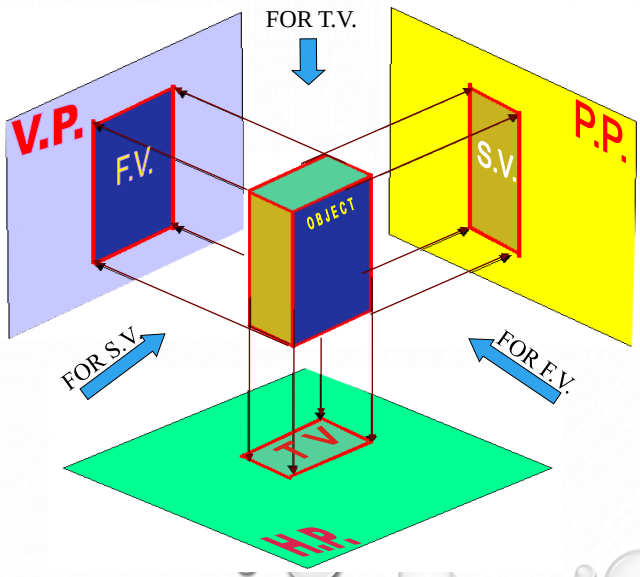
Pattern Of Planes & Views for First Angle Projections

FIRST ANGLE PROJECTION

OBJECT IS ASSUMED TO BE SITUATED IN FIRST QUADRANT, IN BETWEEN OBSERVER & PLANES



ACTUAL PATTERN OF PLANES & VIEWS IN FIRST ANGLE PROJECTIONS

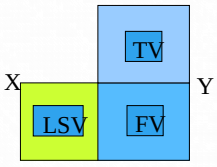


REVIEW OF ORTHOGRPAHIC PROJECTIONS

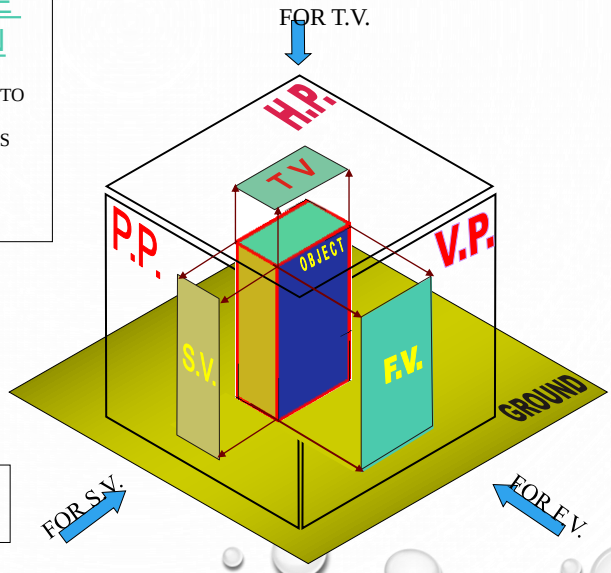
Pattern Of Planes & Views for Third Angle Projections

THIRD ANGLE PROJECTION

THE OBJECT IS ASSUMED TO BE SITUATED IN THIRD QUADRANT, THE PLANES BEING TRANSPERENT AND IN BETWEEN OBSERVER & OBJECT.



ACTUAL PATTERN OF PLANES & VIEWS IN THIRD ANGLE PROJECTIONS

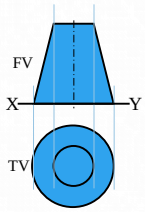


REVIEW OF ORTHOGRPAHIC PROJECTIONS

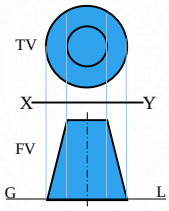
Symbolic Representation of First and Third Angle Projections

Methods of Drawing Orthographic Projections

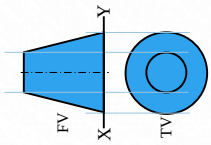
First Angle Projections
Views are drawn by placing object
in 1st Quadrant
(Fv above X-y, Tv below X-y)



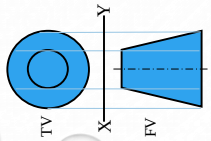
SYMBOLIC
PRESENTATION
OF BOTH METHODS
WITH AN OBJECT
STANDING ON HP (GROUND)
ON IT'S BASE.



Third Angle Projections
Views are drawn by placing object
in 3rd Quadrant.
(Tv above X-y, Fv below X-y)

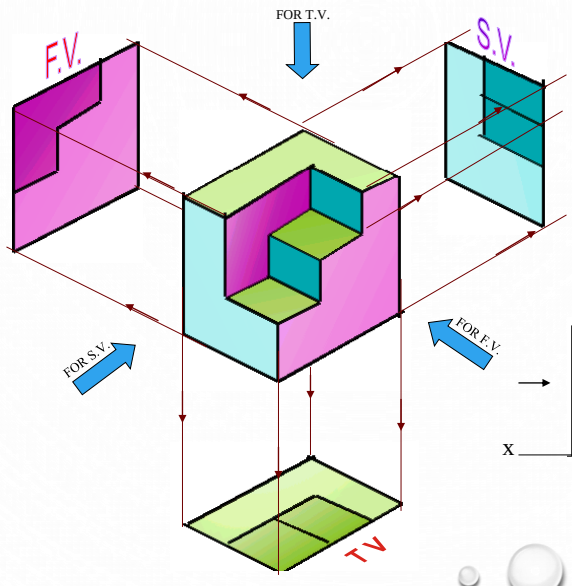


NOTE:-
HP term is used in 1st Angle method
&
For the same
Ground term is used
in 3rd Angle method of projections

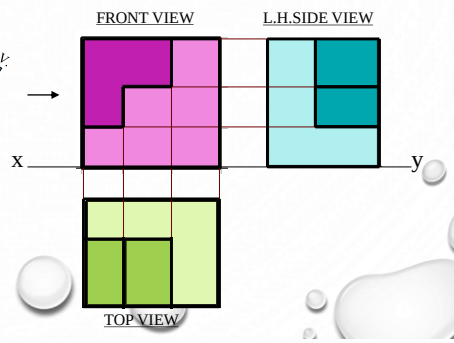


REVIEW OF ORTHOGRPAHIC PROJECTIONS

Orthographic Projection of Solids

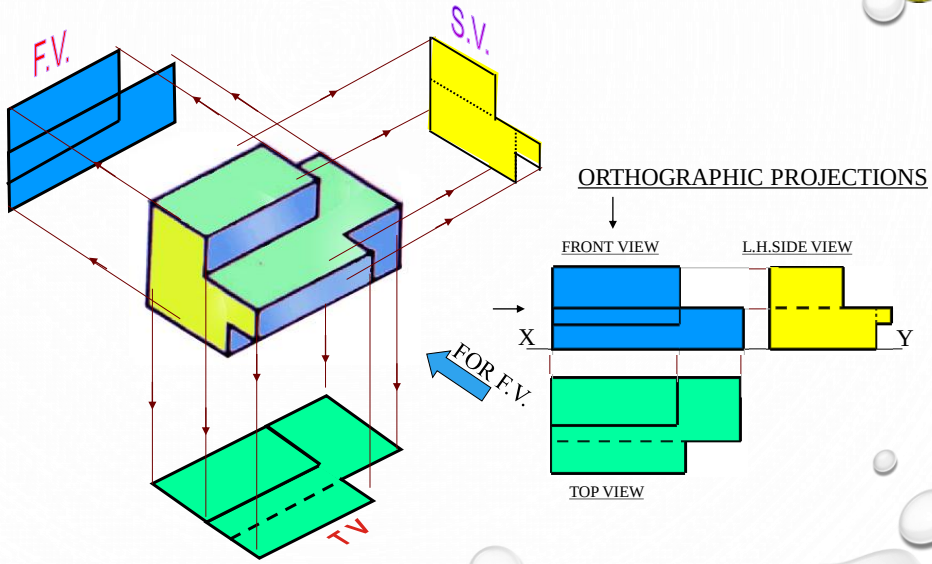


ORTHOGRAPHIC PROJECTIONS



REVIEW OF ORTHOGRPAHIC PROJECTIONS

Orthographic Projection of Solids



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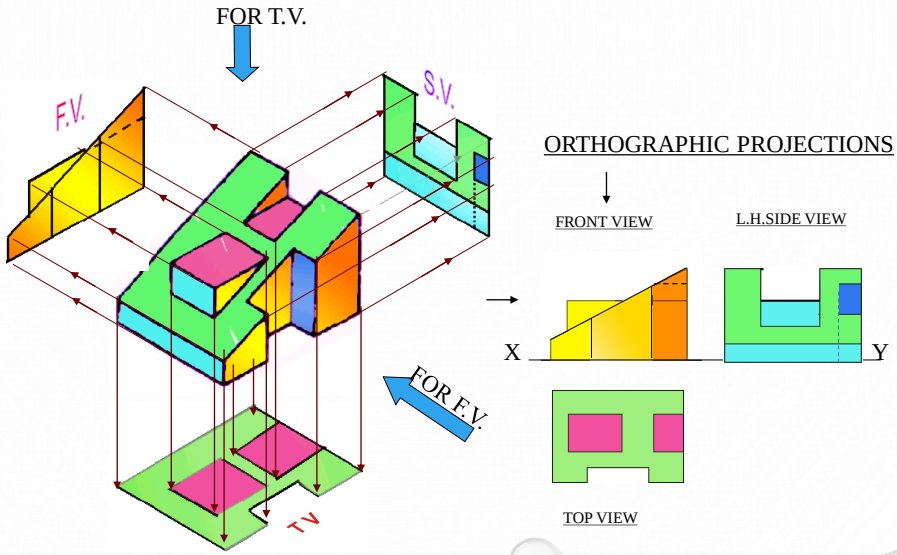

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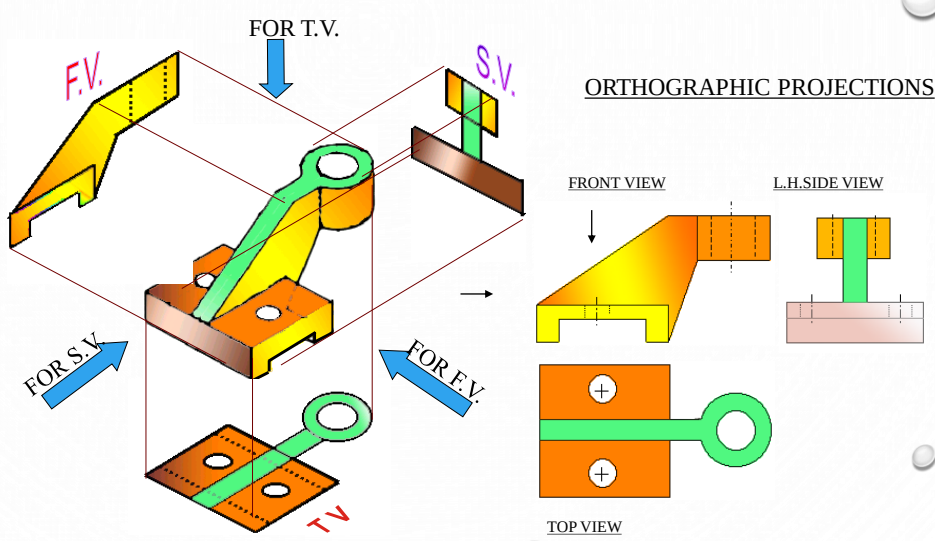
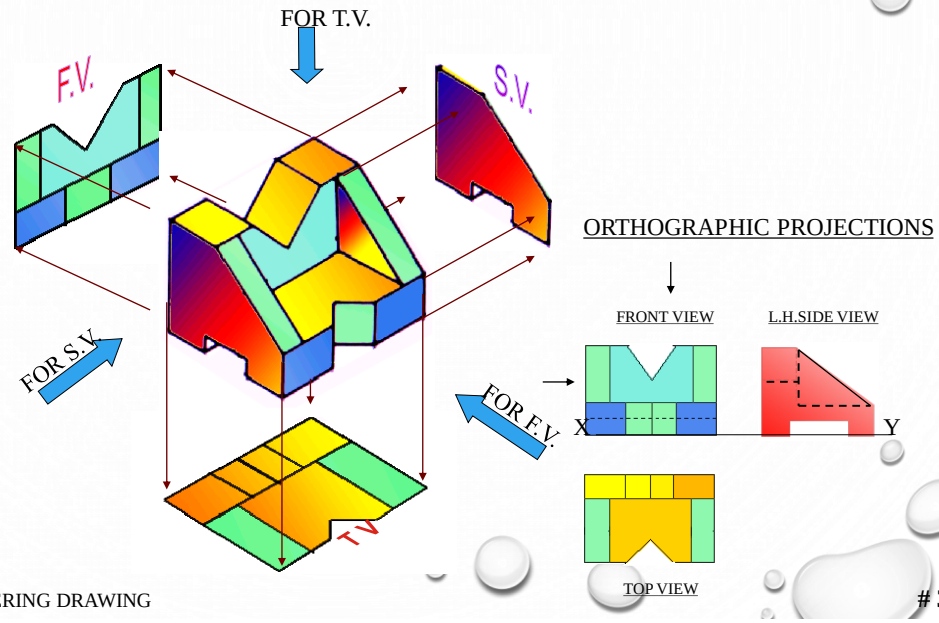
Orthographic Projection of Solids



REVIEW OF ORTHOGRPAHIC PROJECTIONS

Orthographic Projection of Solids



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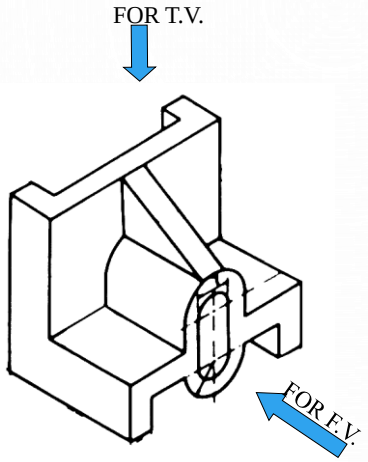
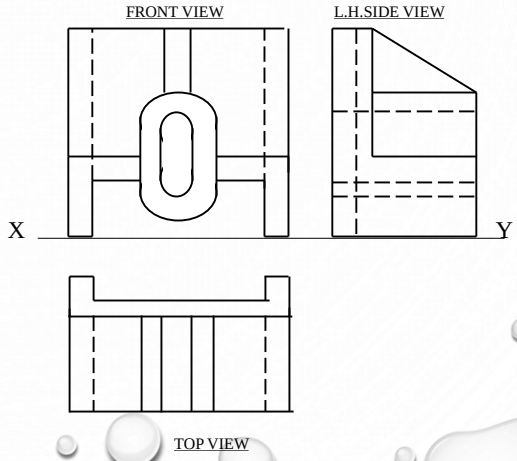
Orthographic Projection of Solids



ORTHOGRAPHIC PROJECTIONS



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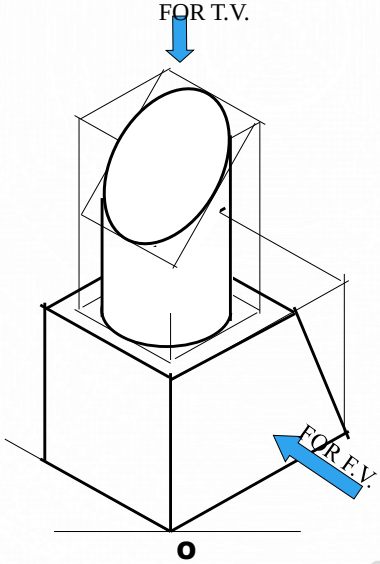
Orthographic Projection of Solids



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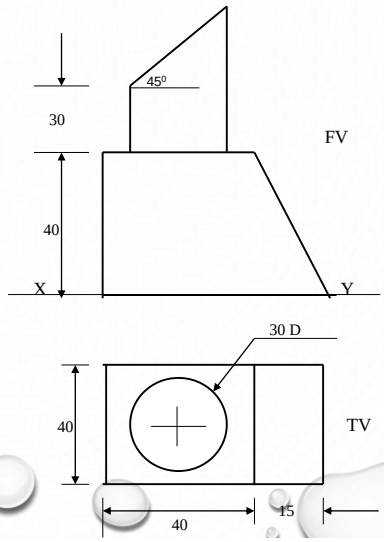

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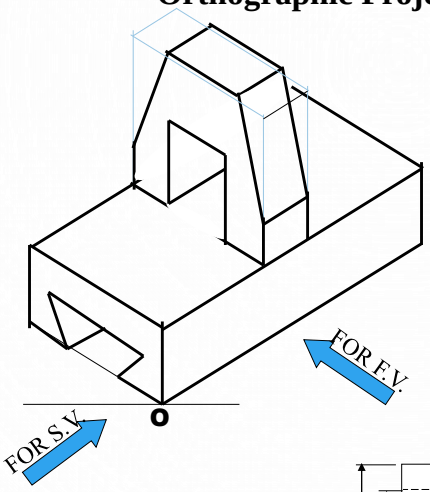
Orthographic Projection of Solids



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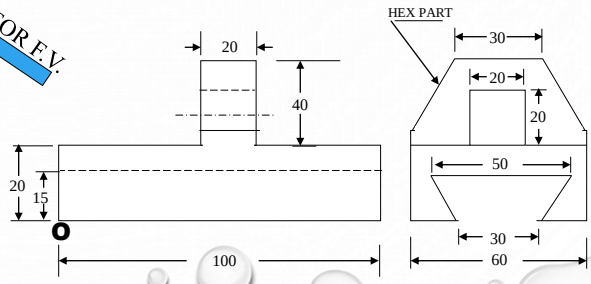
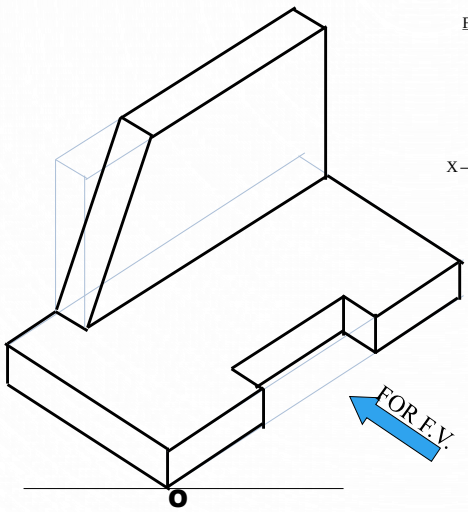


FRONT VIEW L.H.SIDE VIEW

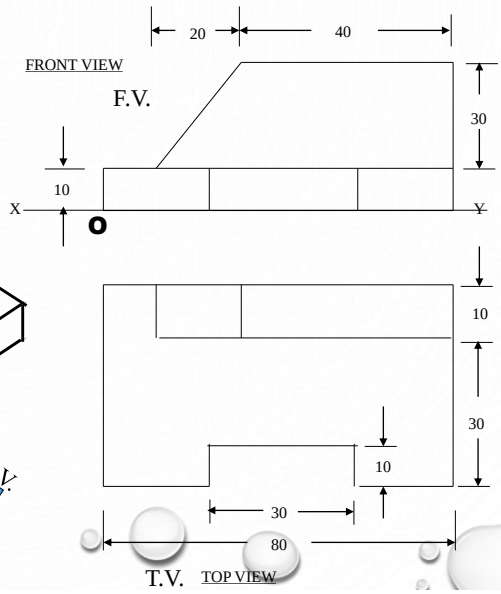
REVIEW OF ORTHOGRPAHIC PROJECTIONS

Orthographic Projection of Solids

FOR T.V.

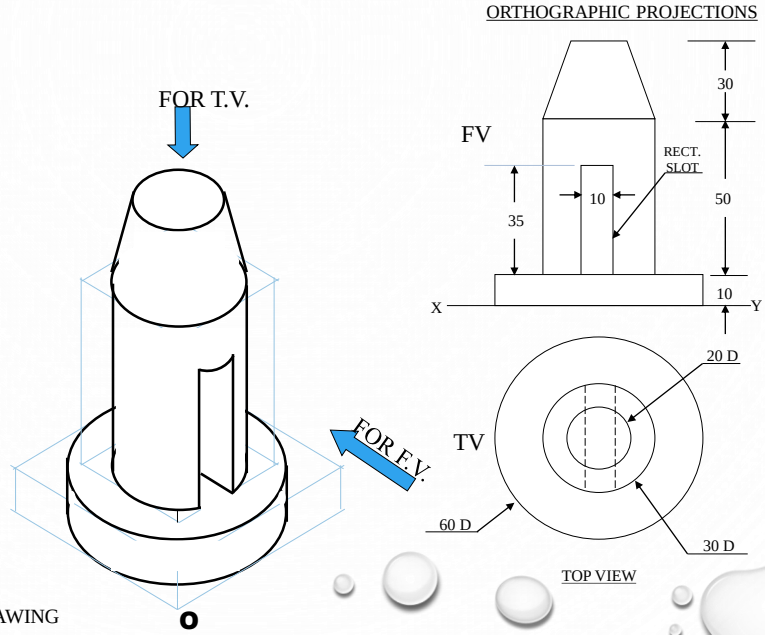


ORTHOGRAPHIC PROJECTIONS



REVIEW OF ORTHOGRPAHIC PROJECTIONS

Orthographic Projection of Solids



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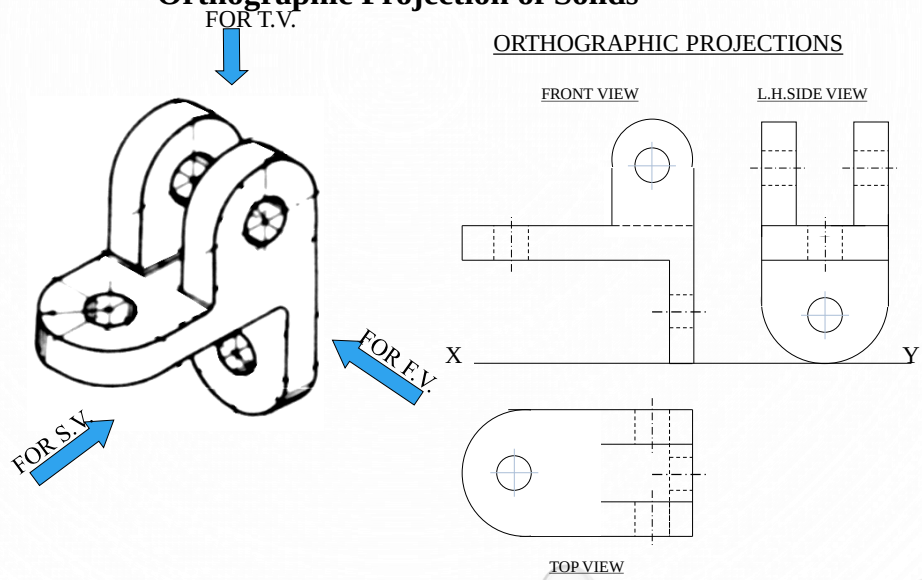
Orthographic Projection of Solids

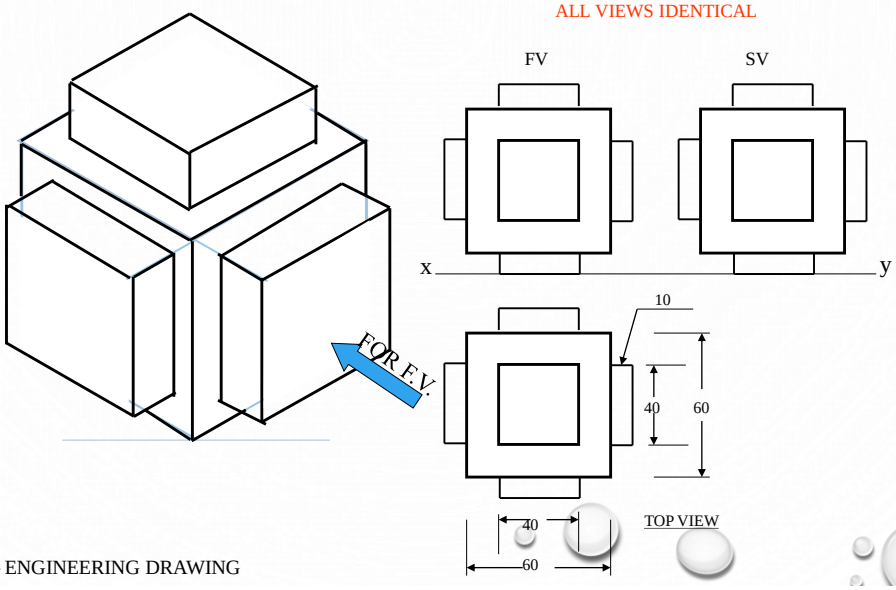


REVIEW OF ORTHOGRPAHIC PROJECTIONS

Orthographic Projection of Solids

ORTHOGRAPHIC PROJECTIONS

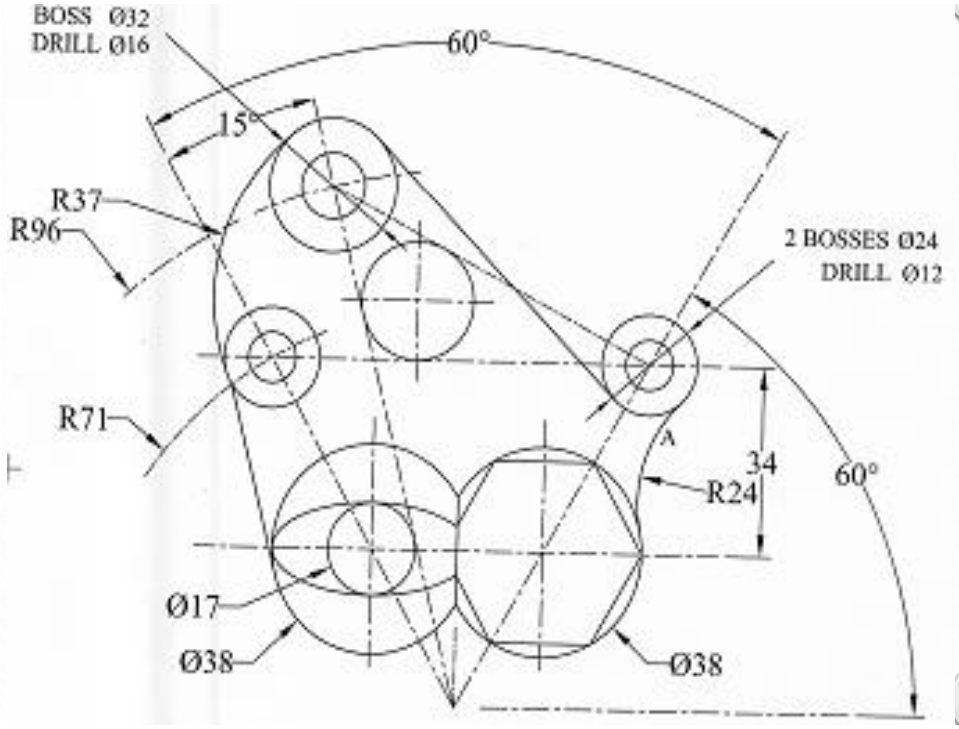
ALL VIEWS IDENTICAL



ASSIGNMENT 1

(Due Friday, 30/01/2015, 14:00 GMT)

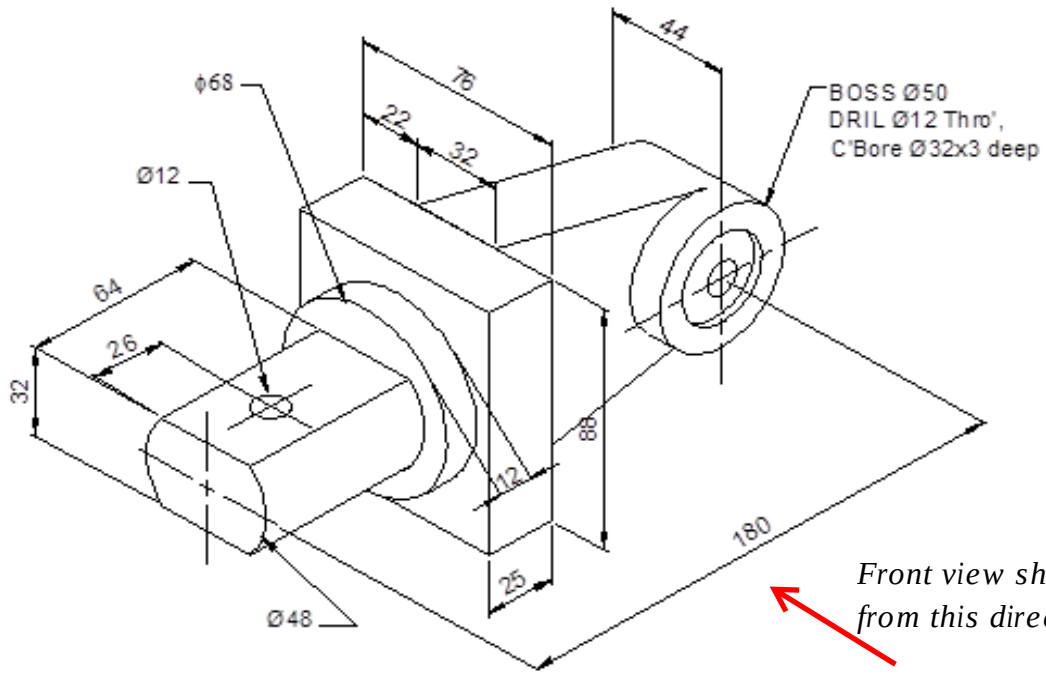
Reproduce and fully dimension the figure on the next slide.



TUTORIAL EXERCISE - to be drawn during tutorial session.
(Mechanical - 29/01/2015)
(Materials/Metallurgical- 30/01/2015)

Produce three fully dimensioned views of the object on the next slide in

a. *First Angle Projection*
b. *Third Angle Projection*

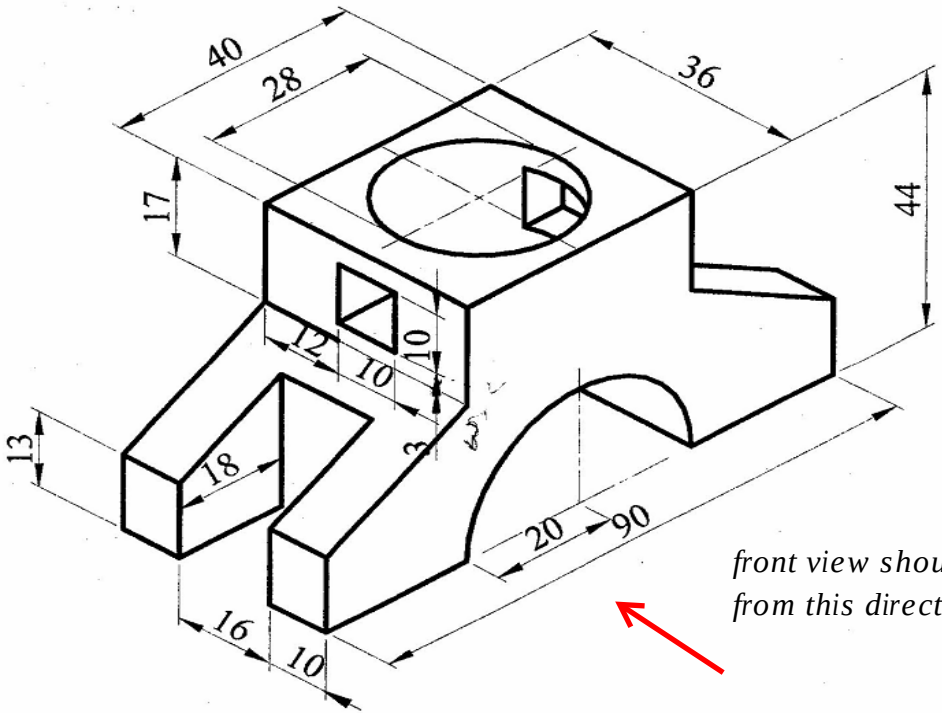


ASSIGNMENT 2

(Due Wednesday, 30/01/2015, 16:00 GMT)

Produce three fully dimensioned views of the object on the next slide using any system of projection of your choice.

The system of projection used must be shown using the appropriate symbol


40
28
36
17
44
12
10
10
13
18
3
20
90
16
10
front view should be
from this direction