

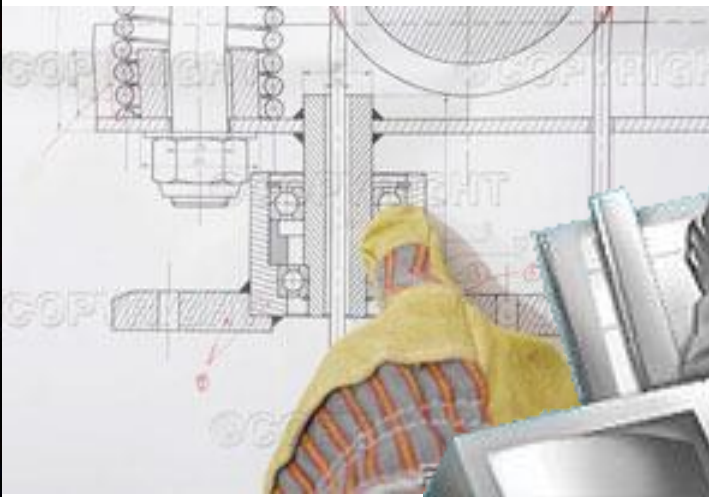
# TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY

## ENGINEERING DRAWING

**PRESENTATION BY: Narendra Singh**

For Techno India NJR Institute of Technology  
पंकज पौरवाल  
Dr. Pankaj Kumar Porwal  
(Principal)

# Engineering Drawing-I



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# CLASSIFICATION OF DRAWING

DRAWING

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graph TD; A[DRAWING] --> B[ARTISTIC DRAWING]; A --> C[ENGINEERING DRAWING]
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ARTISTIC  
DRAWING

ENGINEERING  
DRAWING

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# DRAWING

- Graphical representation of an object is called drawing.
- Representing an object using lines, arcs, circles, etc which gives some meaning to the reader is called drawing.
- Universal language of Engineers.
- Graphic language of Engineers.
- Mode of communication through sketches is called Graphic language.

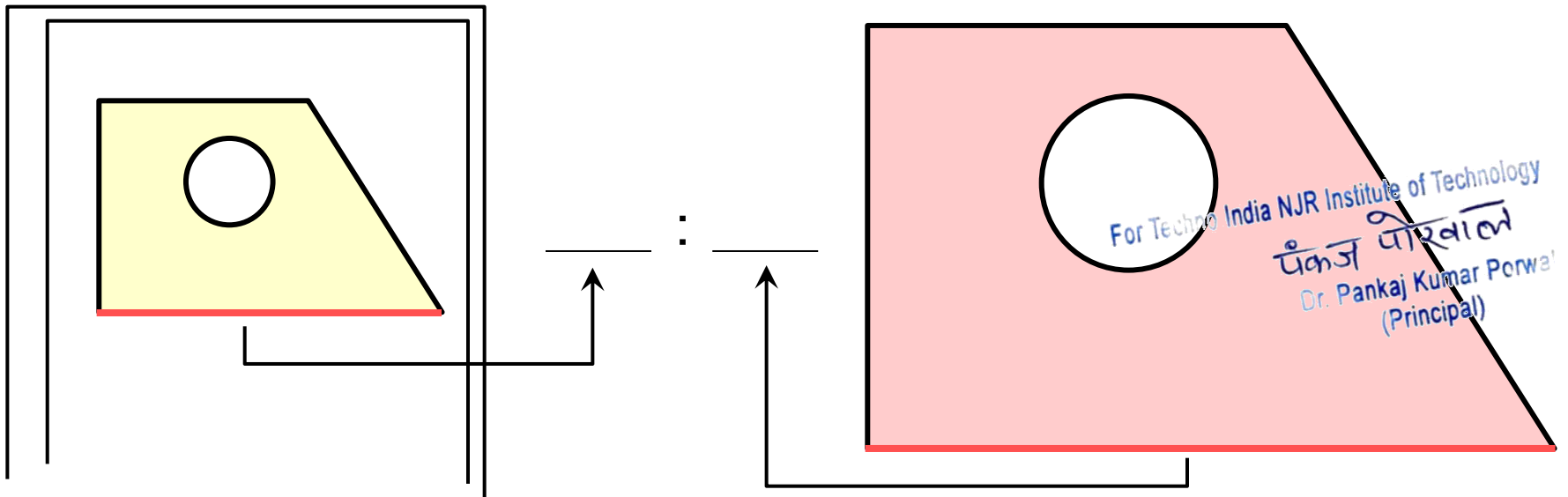
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# Drawing Scales

**Scale** is the ratio of the linear dimension of an element of an object shown in the drawing to the real linear dimension of the same element of the object.

Size in drawing

Actual size



# Drawing Scales

- Designation of a scale consists of the word “SCALE” followed by the indication of its **ratio**, as follow

SCALE 1:1 for full size

SCALE **X**:1 for **enlargement** scales ( $X > 1$ )

SCALE 1:**X** for **reduction** scales ( $X > 1$ )

- Dimension numbers shown in the drawing are correspond to “**true size**” of the object and they are **independent** of the scale used in creating that drawing.

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# Meaning of Lines

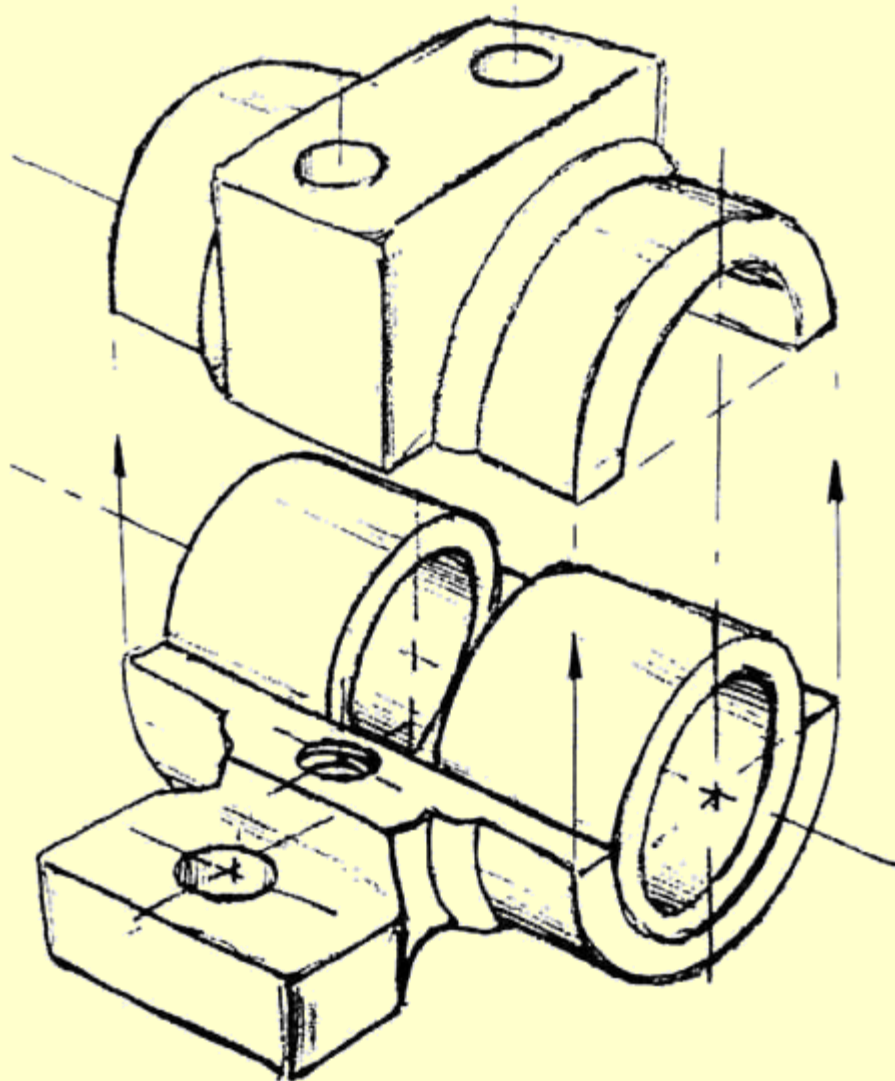
**Visible lines** represent features that can be seen in the current view

**Hidden lines** represent features that can not be seen in the current view

**Center line** represents symmetry, path of motion, centers of circles, axis of axisymmetrical parts

**Dimension and Extension lines** indicate the sizes and location of features on a drawing

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# Dimensioning

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# Dimensioning Guidelines

The term “feature” refers to surfaces, faces, holes, slots, corners, bends, arcs and fillets that add up to form an engineering part.

Dimensions define the **size** of a feature or its **location** relative to other features or a frame of reference, called a datum.

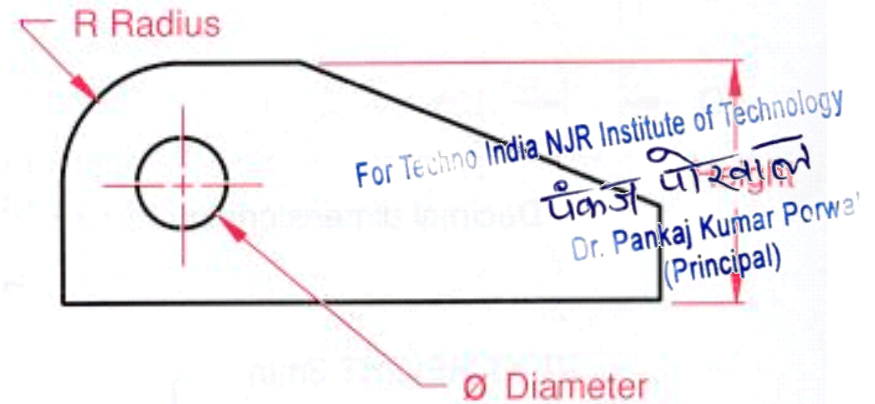
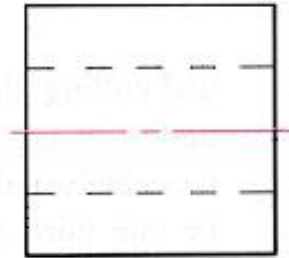
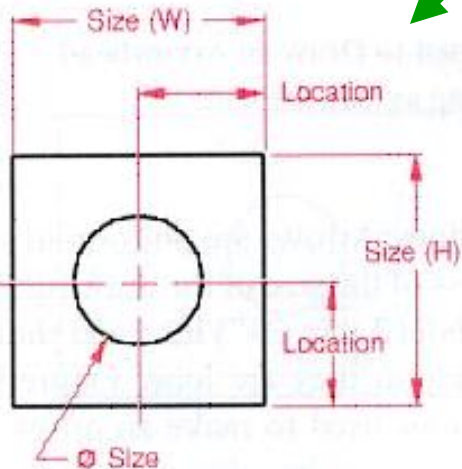
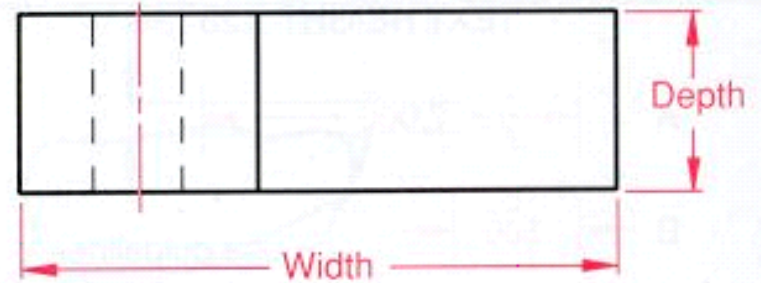
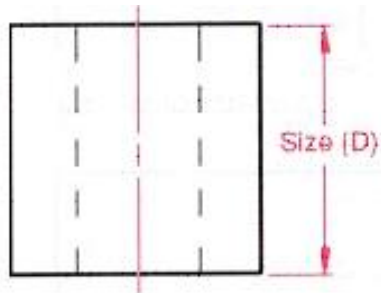
The basic rules of dimensioning are:

1. Dimension where the feature contour is shown;
2. Place dimensions between the views;
3. Dimension off the views;
4. Dimension mating features for assembly;
5. Do not dimension to hidden lines;
6. Stagger dimensioning values;
7. Create a logical arrangement of dimensions;
8. Consider fabrication processes and capabilities;
9. Consider inspection processes and capabilities.

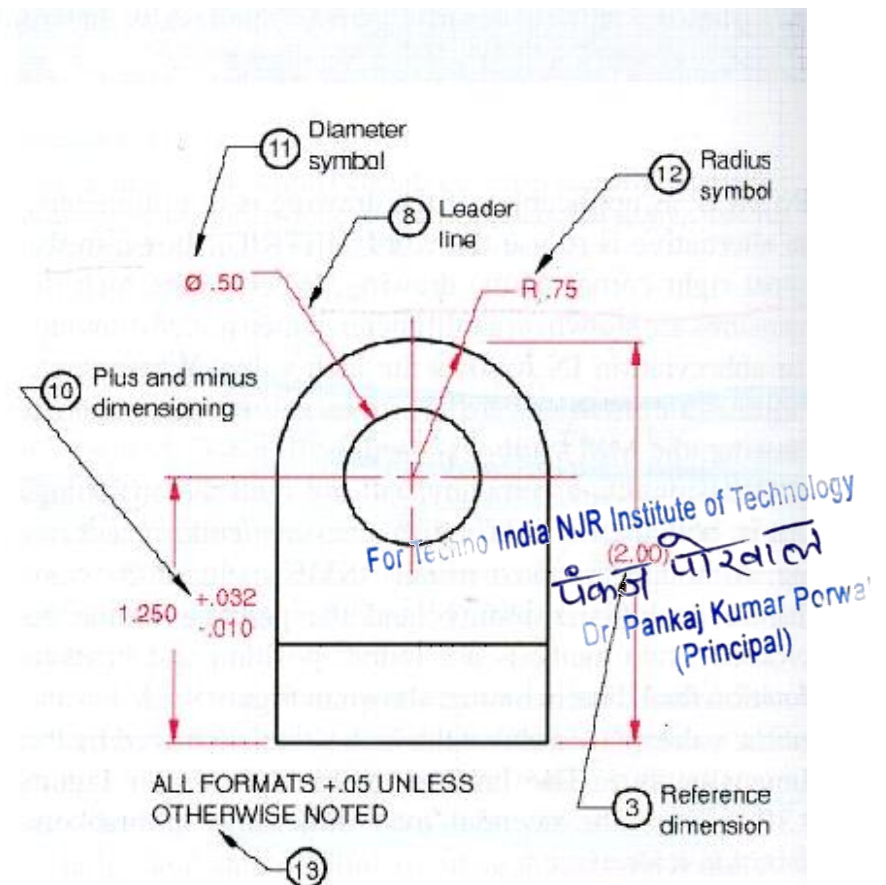
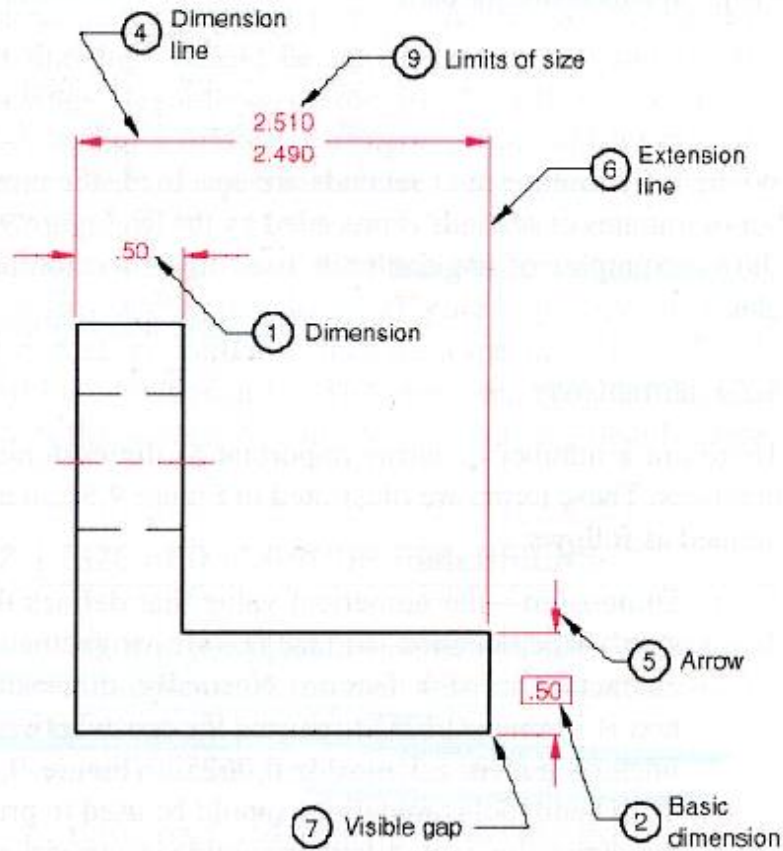
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# Important elements of dimensioning

Two types of dimensioning: (1) Size and location dimensions and (2) Detail dimensioning



# Elements of a dimensioned drawing (Be familiar with these terms)



# Arrangement of Dimensions

- Keep dimension off of the part where possible.
- Arrange extension lines so the larger dimensions are outside of the smaller dimensions.
- Stagger the dimension value labels to ensure they are clearly defined.

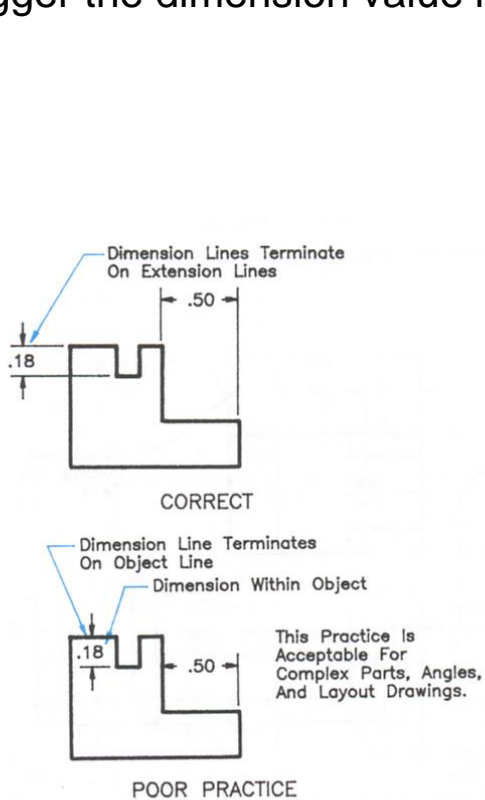


Figure 3-26. Dimensions are normally placed off the object. Avoid placing dimensions on the object.

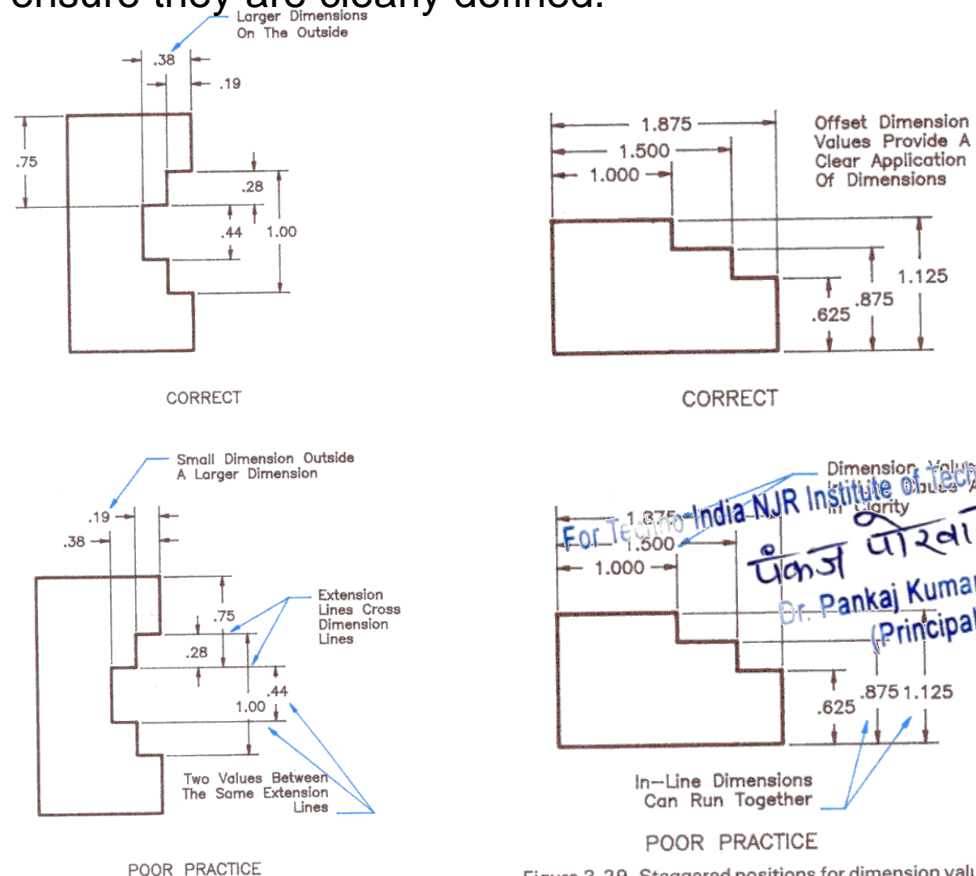


Figure 3-28. Dimensions are arranged to avoid crossing dimension and extension lines. This normally requires that the large dimensions be placed outside smaller ones.

Figure 3-29. Staggered positions for dimension values make it easier to read the dimensions.

# Dimensioning Holes

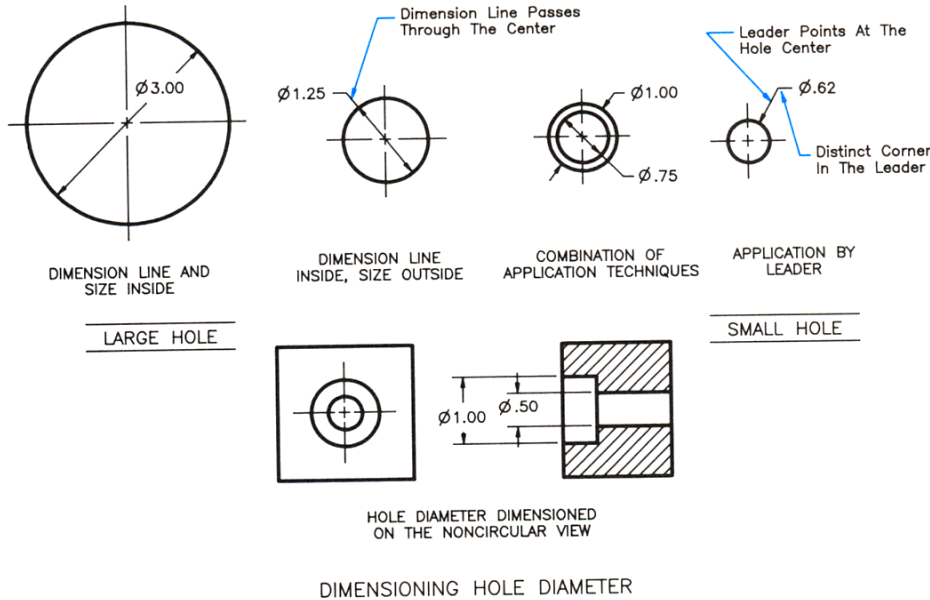


Figure 4-6. The diameter must be specified for holes.

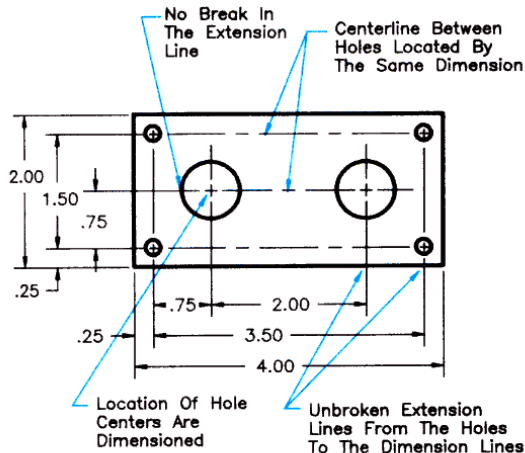


Figure 4-7. Hole locations must be dimensioned to the centers.

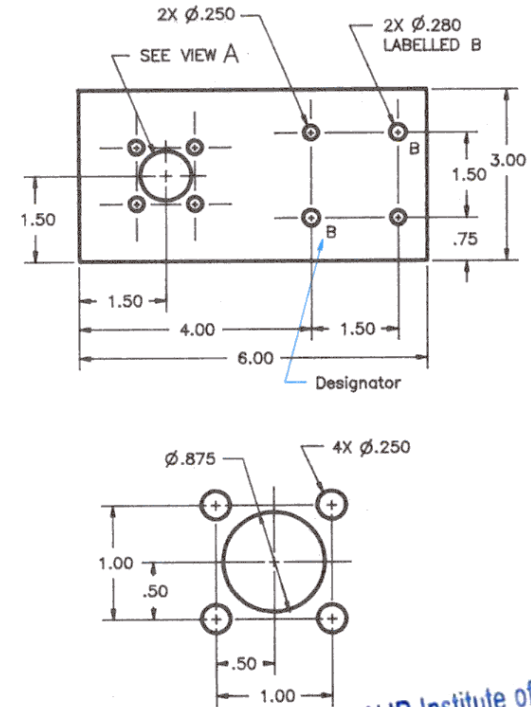


Figure 4-8. Complex features or patterns of features may be dimensioned in removed views.

- Dimension the diameter of a hole.
- Locate the center-line.
- Use a notes and designators for repeated hole sizes

# Dimensioning the Radius of an Arc

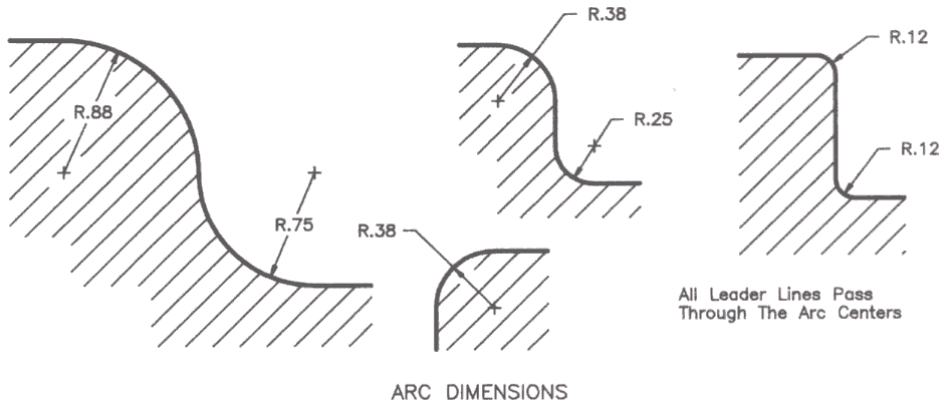


Figure 4-17. Arcs are always dimensioned by giving the radius.

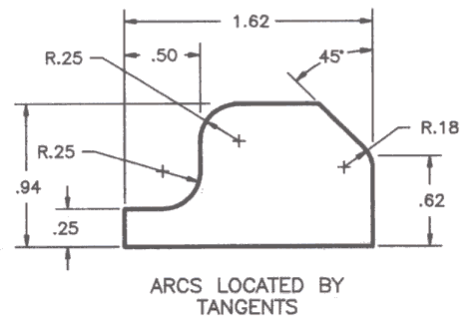
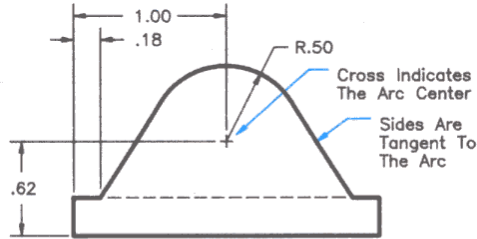


Figure 4-18. Arc location must be defined.

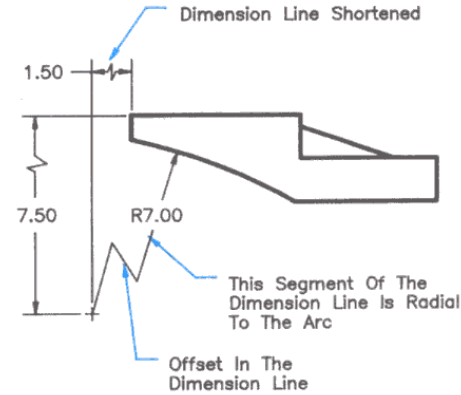


Figure 4-19. The true dimensions defining arc center location must be shown even when the center point is not shown in its true location.

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Dimension an arcs by its radius.  
 Locate the center of the radius or two tangents to the arc.

# Drilled Holes, Counter bores and Countersinks

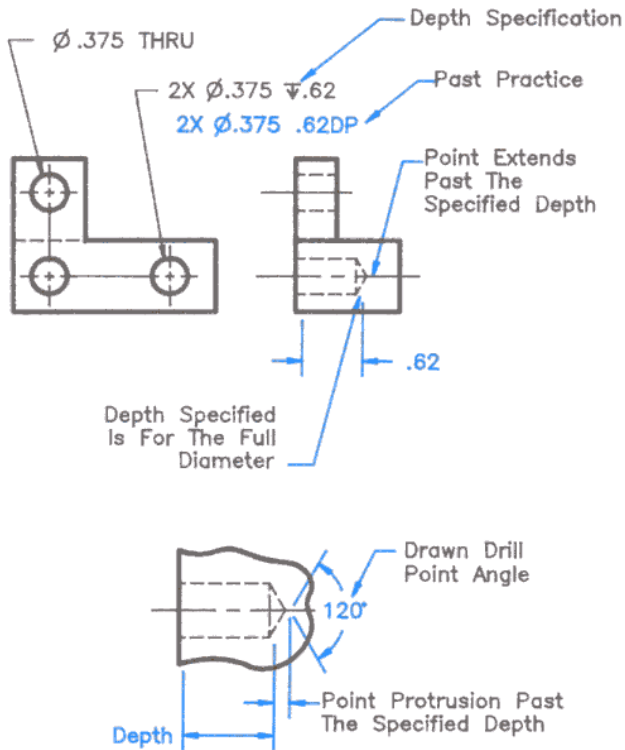


Figure 4-9. Hole depth must be specified if the hole does not go through the part.

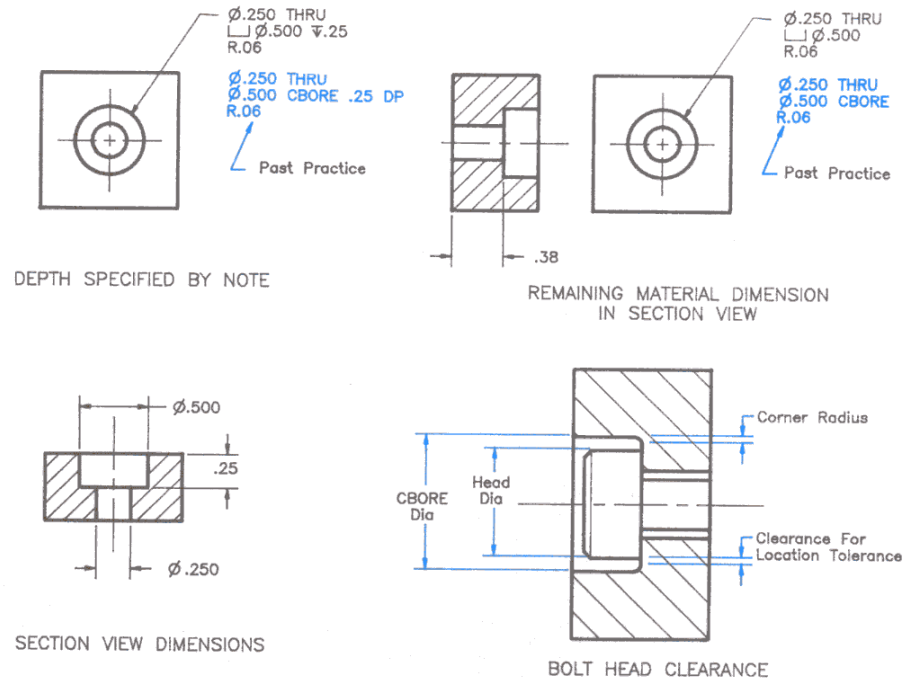
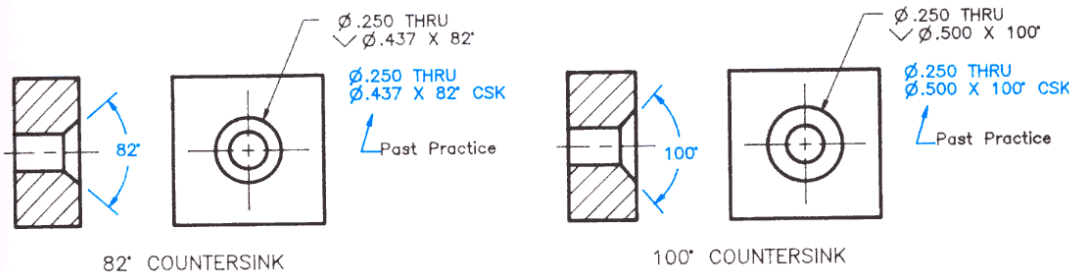


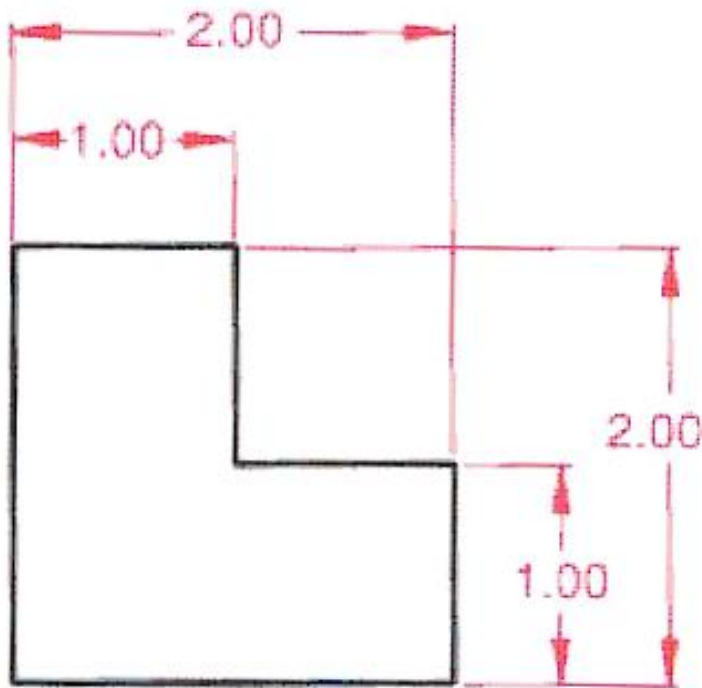
Figure 4-10. Counterbore dimensions provide a controlled depth.



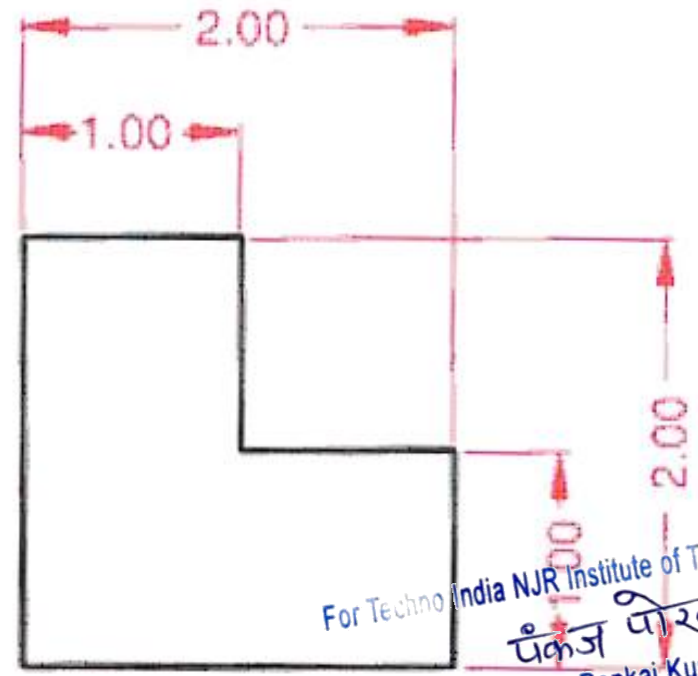
- Use the depth symbol to define the depth of a drilled hole.
- Use the depth symbol or a section view to dimension a counter bore.
- Countersinks do not need a section view.

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# Unidirectional or aligned dimensioning?



Unidirectional  
Current standard



Aligned  
Old standard

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# Orthographic Projection

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# GEOMETRICAL OBJECTS

- Dimensionless objects
- One dimensional objects
- Two dimensional objects
- Three dimensional objects

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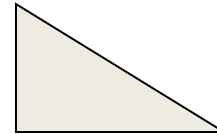
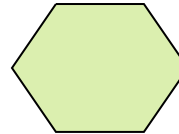
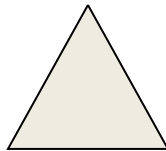
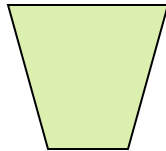
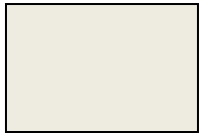
# EXAMPLES



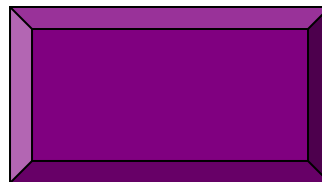
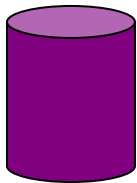
**POINT IS A DIMENSIONLESS OBJECT**



**LINE IS A ONE DIMENSIONAL OBJECT**

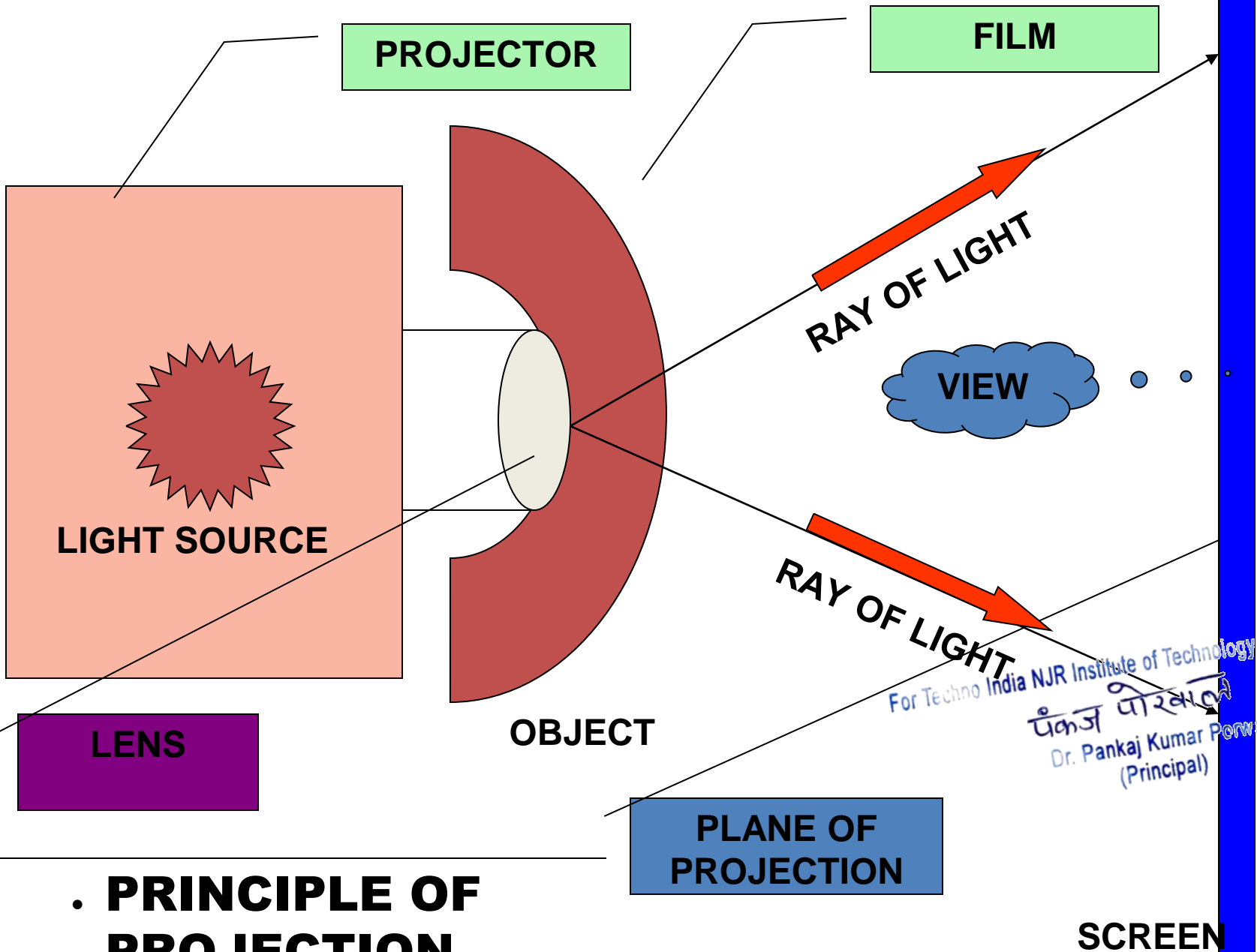


**PLANE/ LAMINA IS A TWO DIMENSIONAL OBJECT**



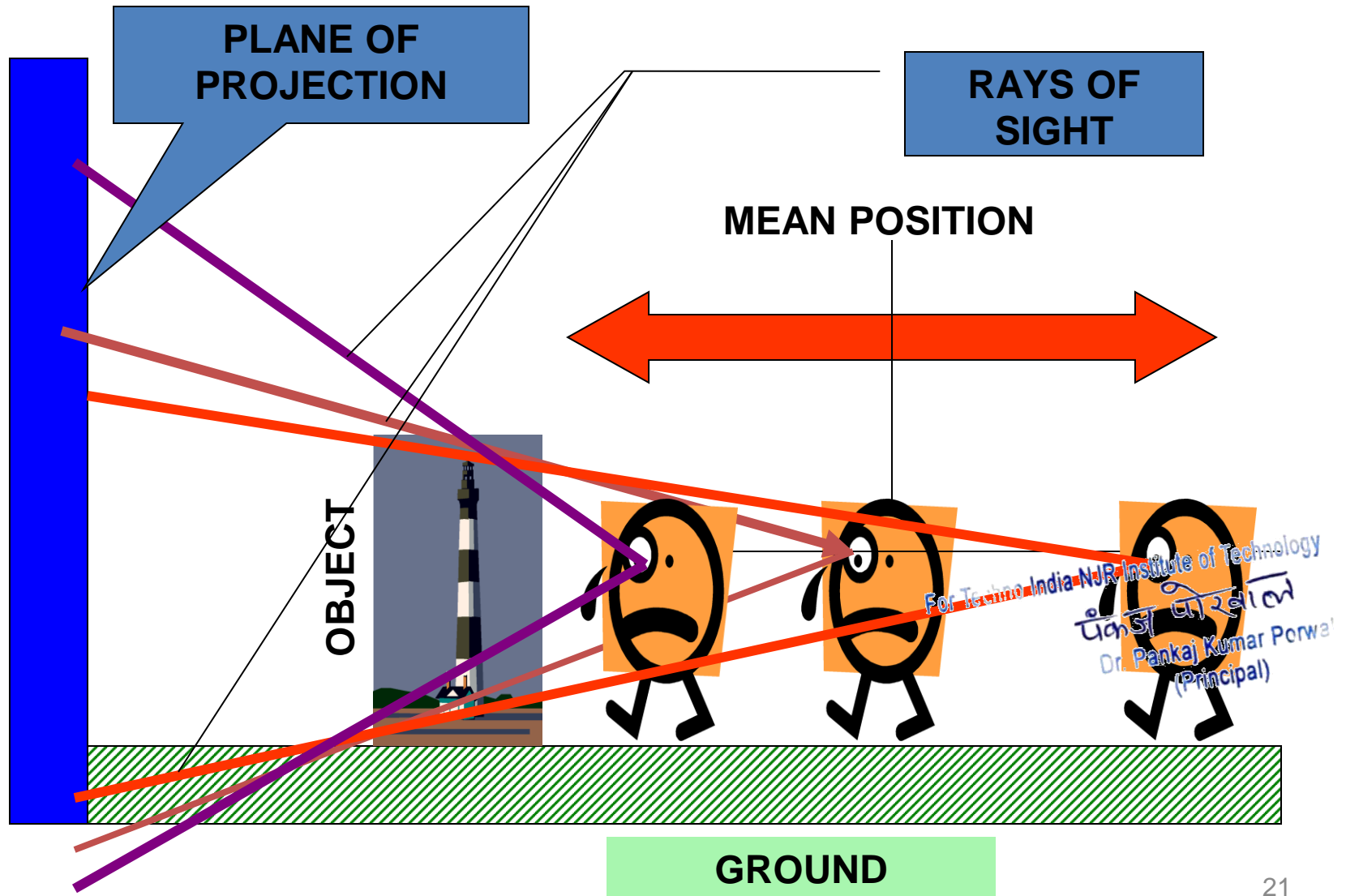
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**SOLID IS A THREE DIMENSIONAL OBJECT**

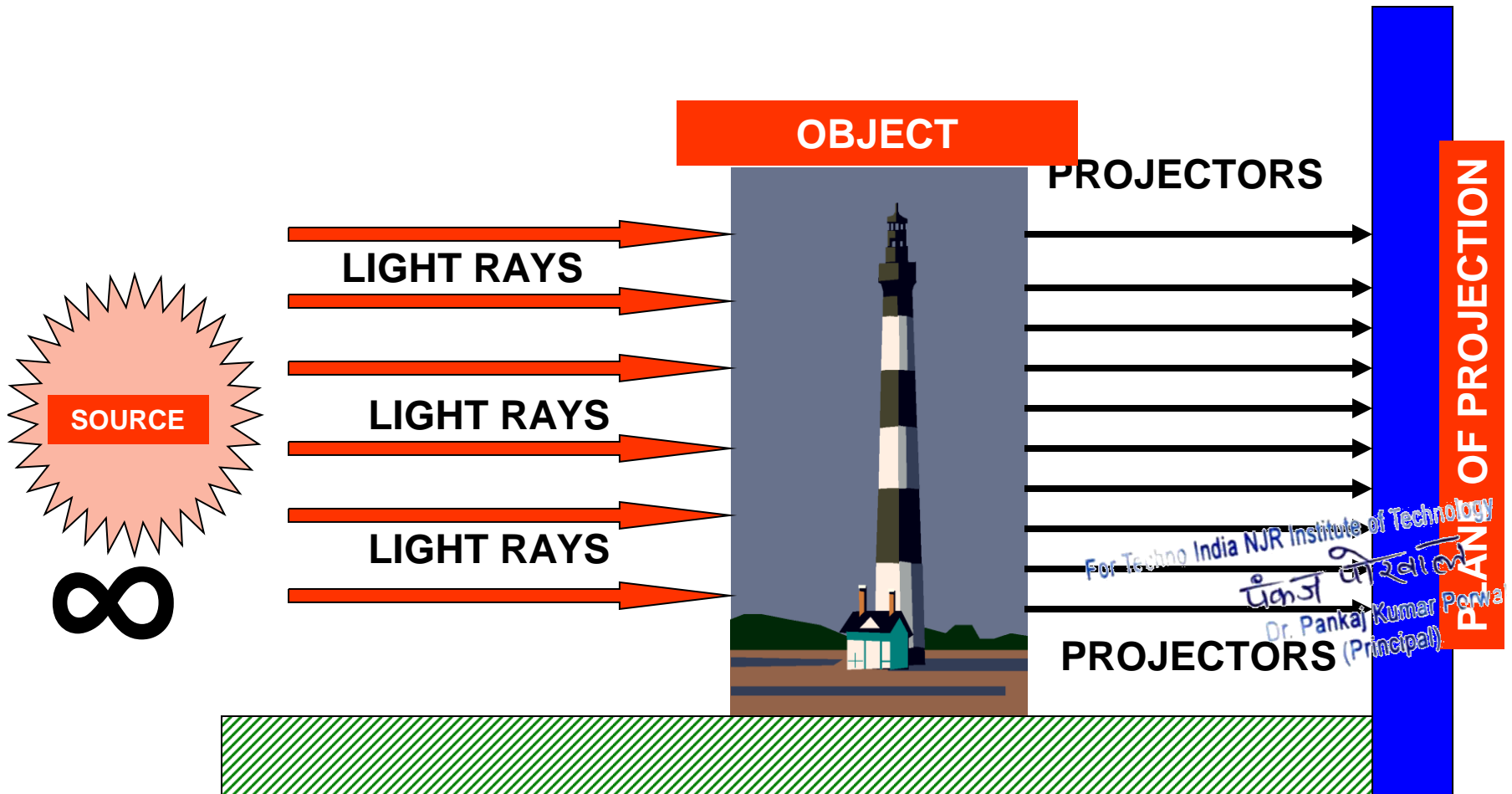


**. PRINCIPLE OF PROJECTION**

# . PRINCIPLE OF PROJECTION



# ORTHOGRAPHIC PROJECTION



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# ORTHOGRAPHIC PROJECTION

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- **Orthographic projection** is a means of representing a three-dimensional (3D) object in two dimensions (2D). It uses multiple views of the object.
  1. First angle projection
  2. Second angle projection (overlapping)
  3. Third angle projection
  4. Fourth angle projection (overlapping)

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## **Drawings convey the following critical information:**

**Geometry** – the shape of the object; represented as views; how the object will look when it is viewed from various angles, such as front, top, side, etc.

**Dimensions** – the size of the object is captured in accepted units.

**Tolerances** – the allowable variations for each dimension.

**Material** – represents what the item is made of.

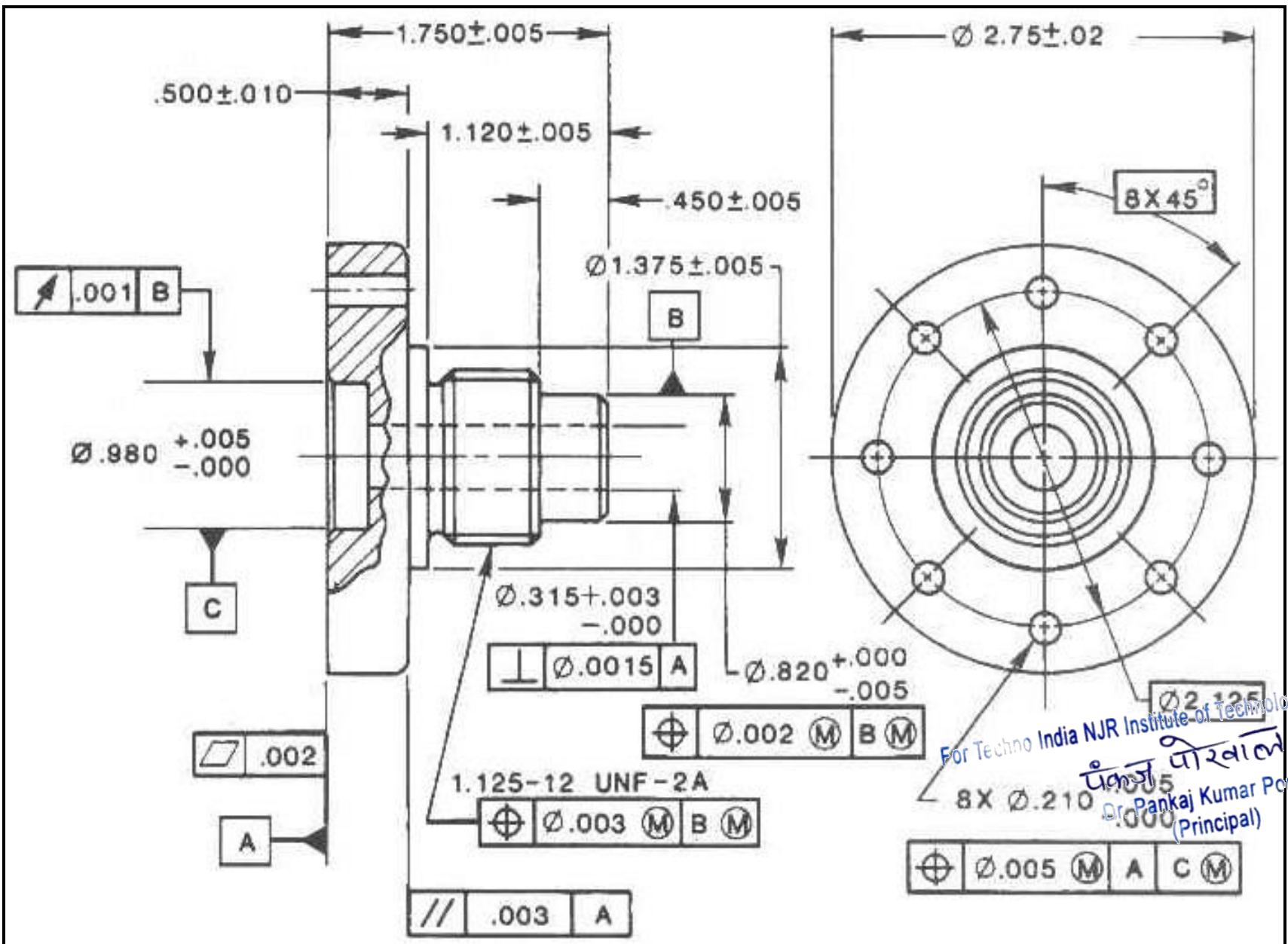
**Finish** – specifies the surface quality of the item, functional or cosmetic. For example, a mass-marketed product usually requires a much higher surface quality than, say, a component that goes inside industrial machinery.

**Information box or Title block** containing who drew the drawing, who approved it, units of dimensions, meaning of views, the title of the drawing, revision number, drawing number etc.

**And many more like Important notes.**

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**NEXT SEMINAR'S TOPIC**