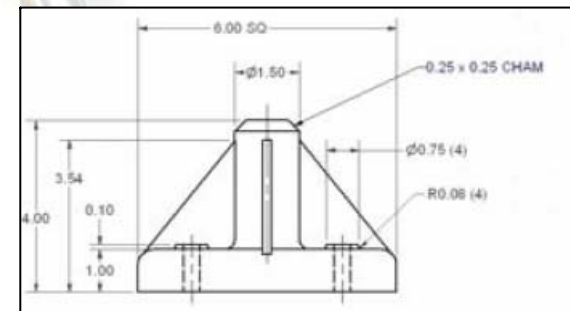


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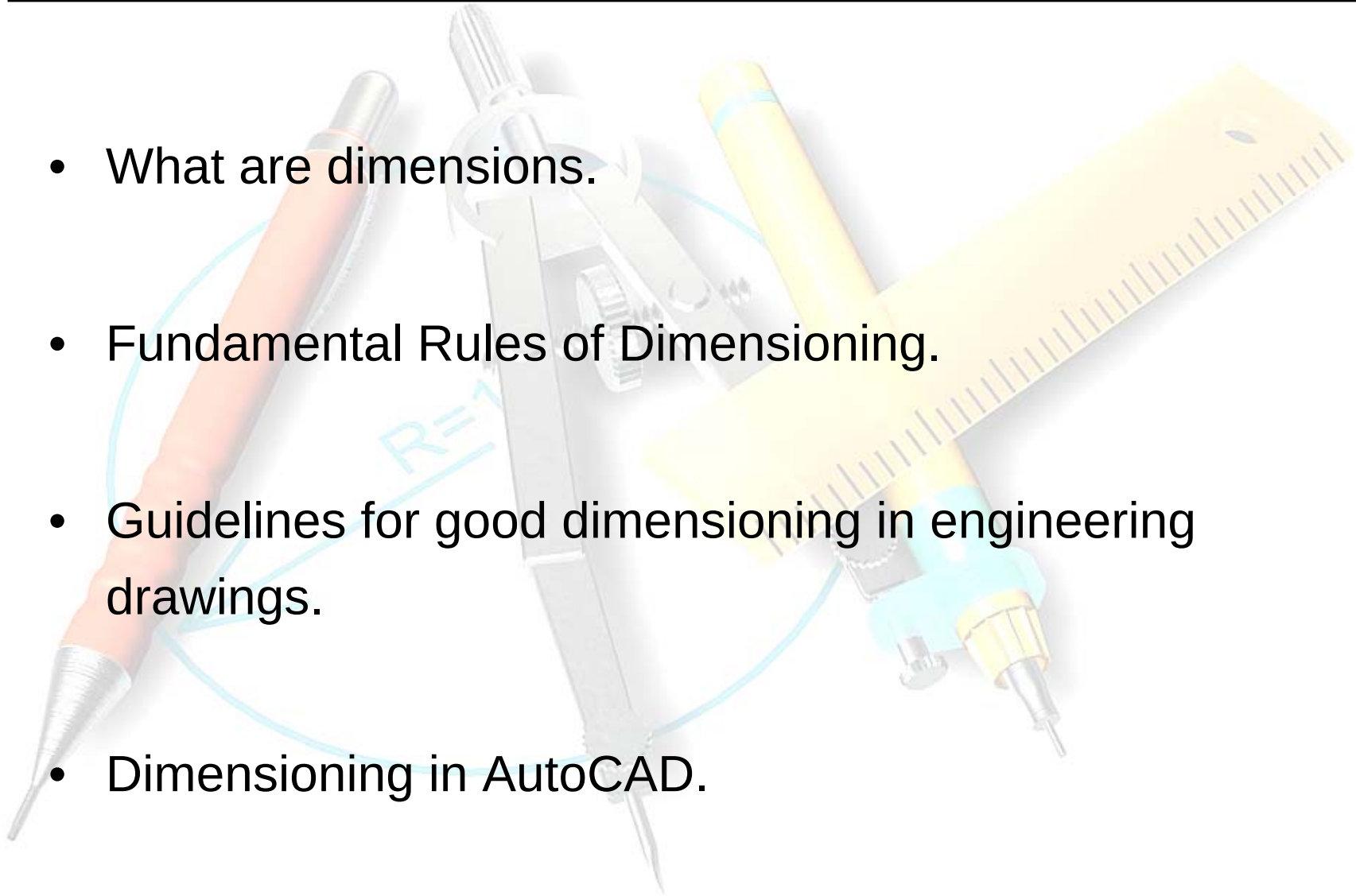
Fundamentals of Computer Aided Design

Dimensions in Engineering Drawings



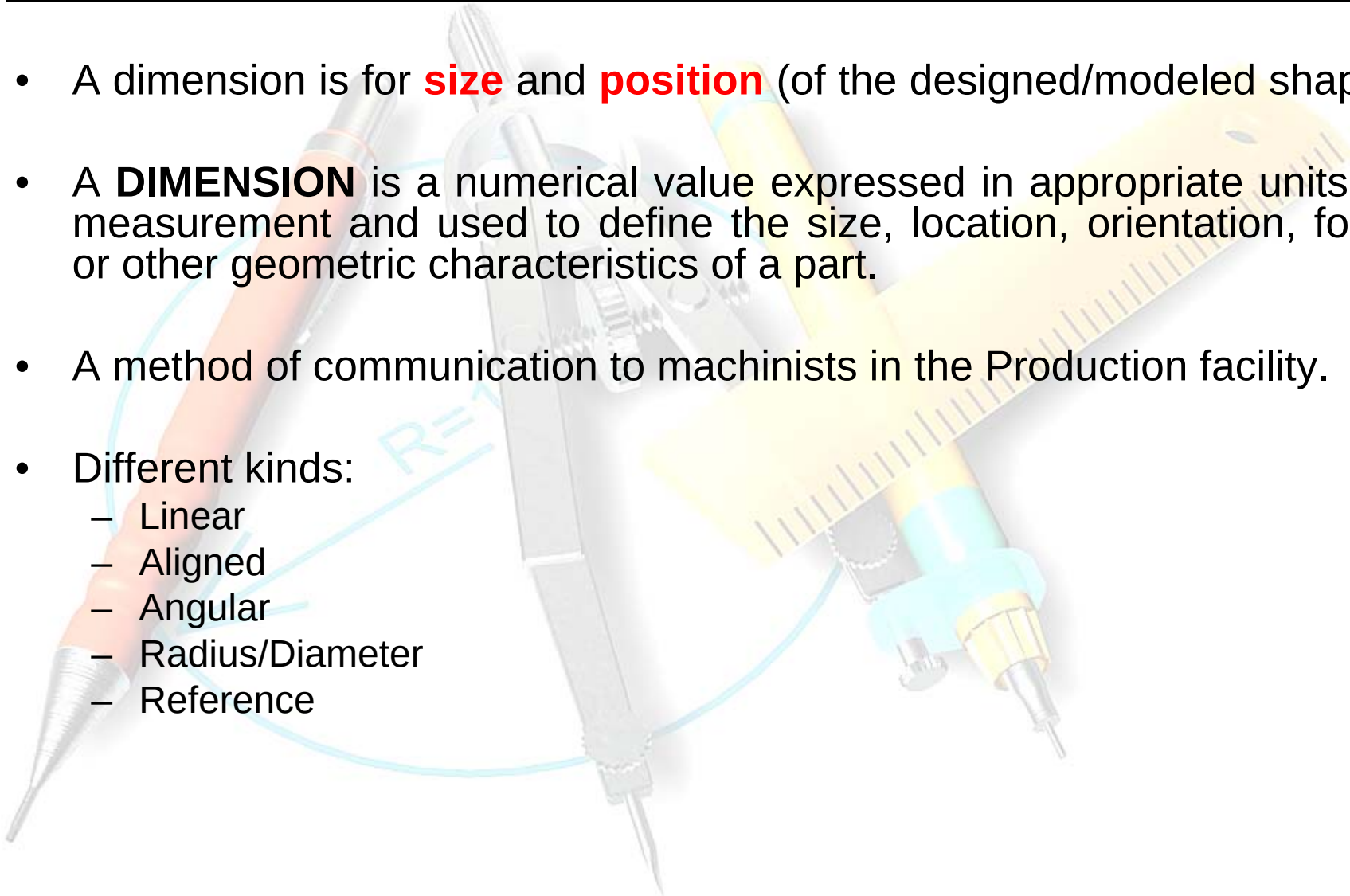
Today's Learning Objectives...

- What are dimensions.
- Fundamental Rules of Dimensioning.
- Guidelines for good dimensioning in engineering drawings.
- Dimensioning in AutoCAD.

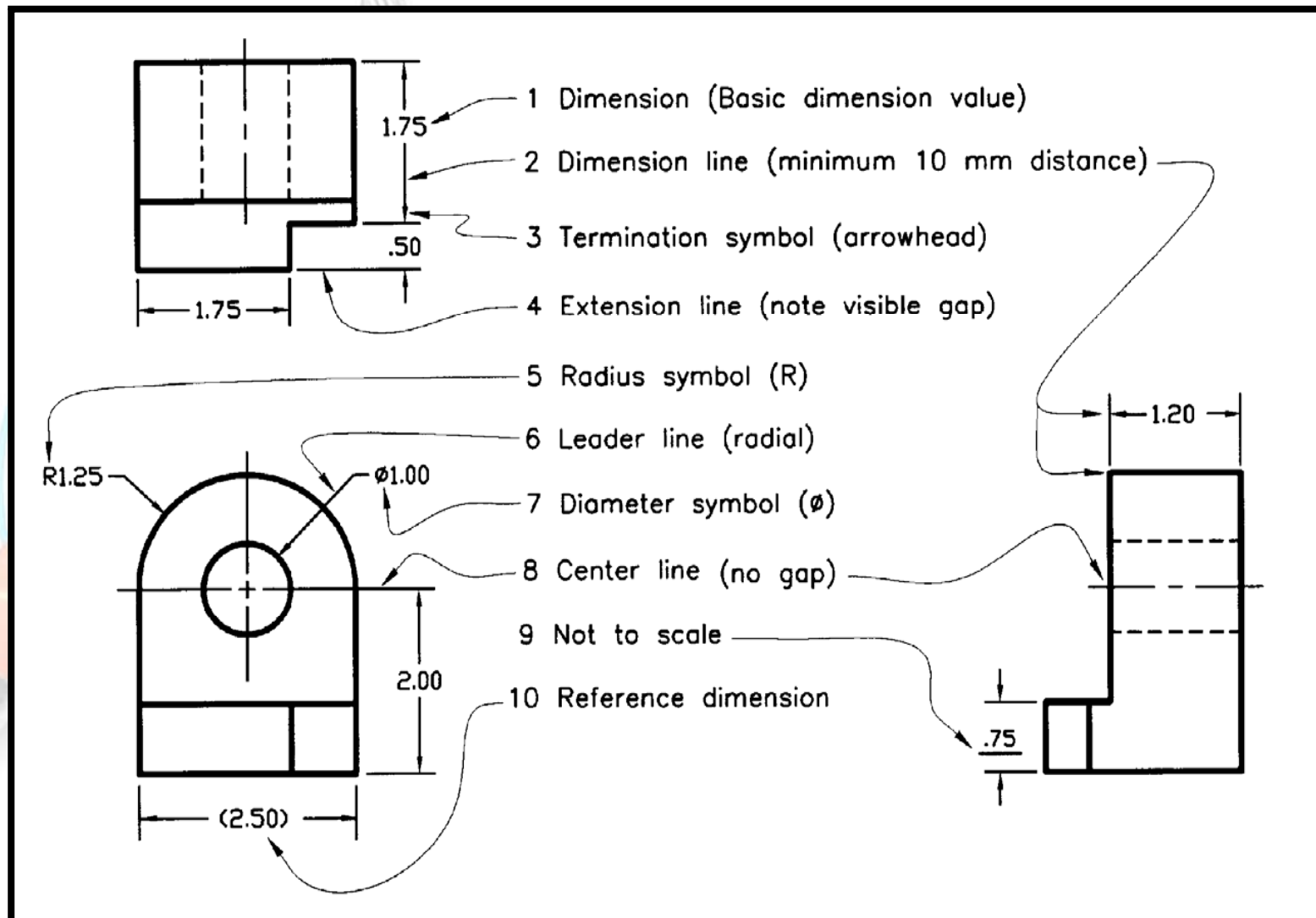


Dimensions

- A dimension is for **size** and **position** (of the designed/modeled shape).
- A **DIMENSION** is a numerical value expressed in appropriate units of measurement and used to define the size, location, orientation, form or other geometric characteristics of a part.
- A method of communication to machinists in the Production facility.
- Different kinds:
 - Linear
 - Aligned
 - Angular
 - Radius/Diameter
 - Reference



Dimension Basic Terminology

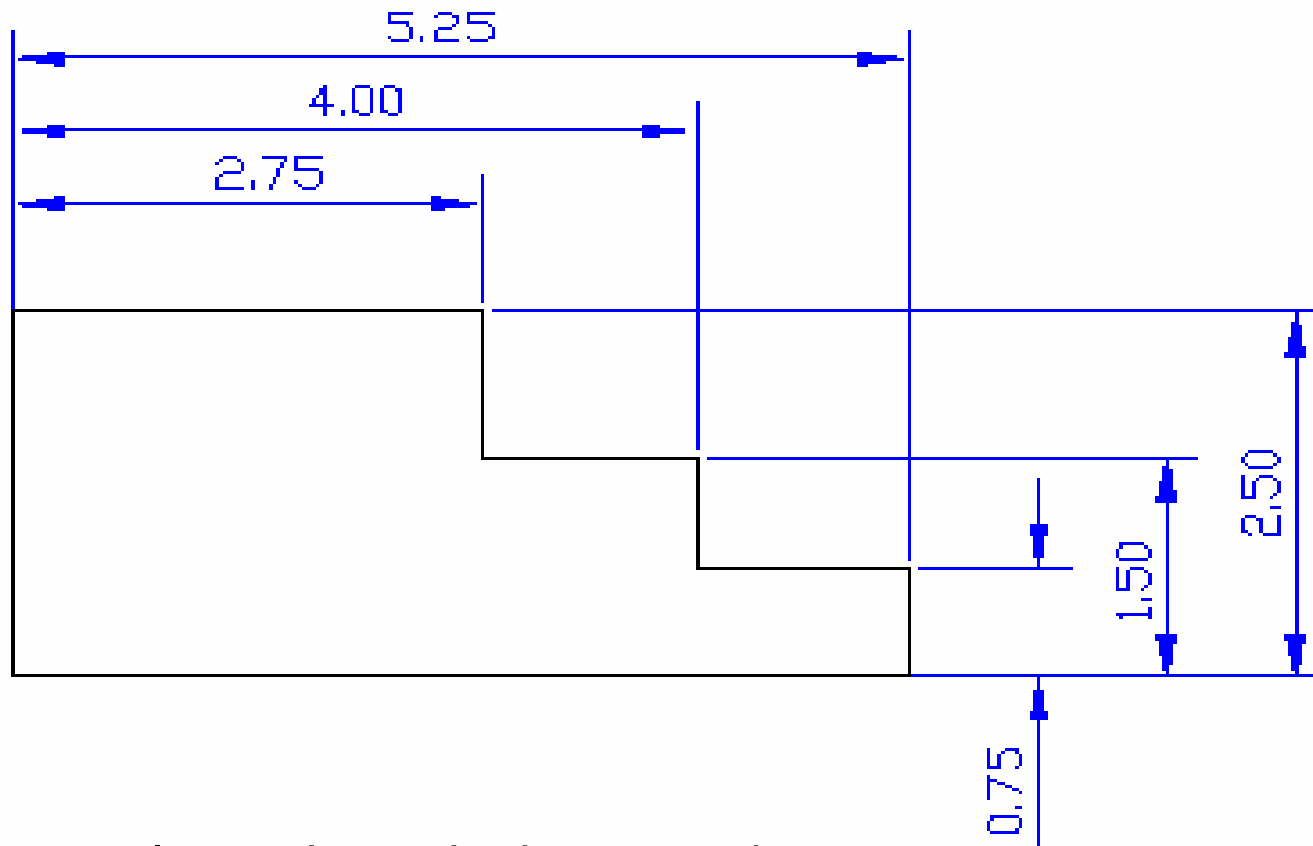


Units of Measure

- decimal inches (preferred), fractional inches, feet and fractional inches
- SI or metric – millimeter (mm)
- leading zero: metric – yes; inches – no
- If units (e.g., IN or mm) are not included with each dimension, specify the units used with a note on the drawing; for example

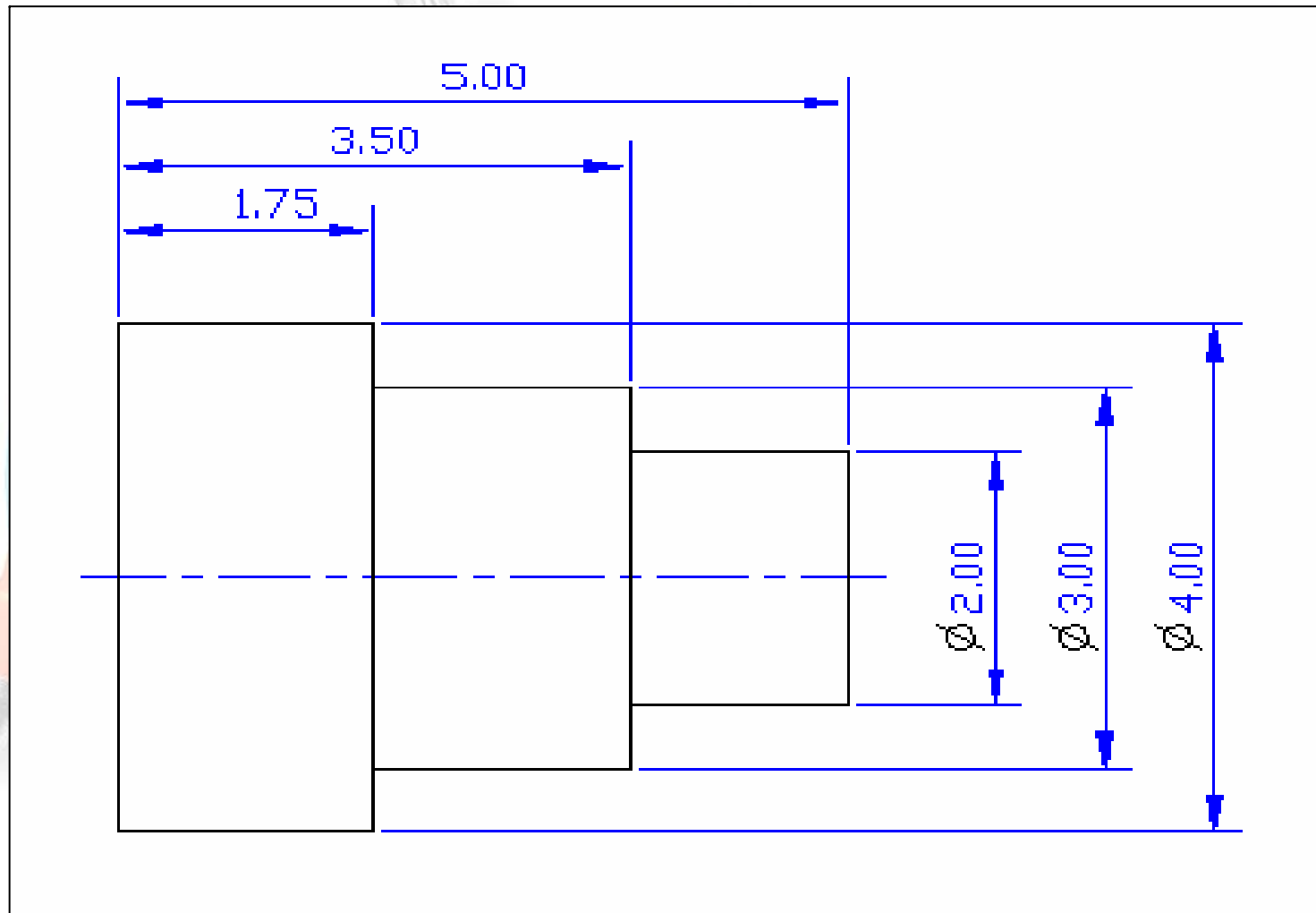
**UNLESS OTHERWISE SPECIFIED,
ALL DIMENSIONS ARE IN INCHES**

Dimensioning in General

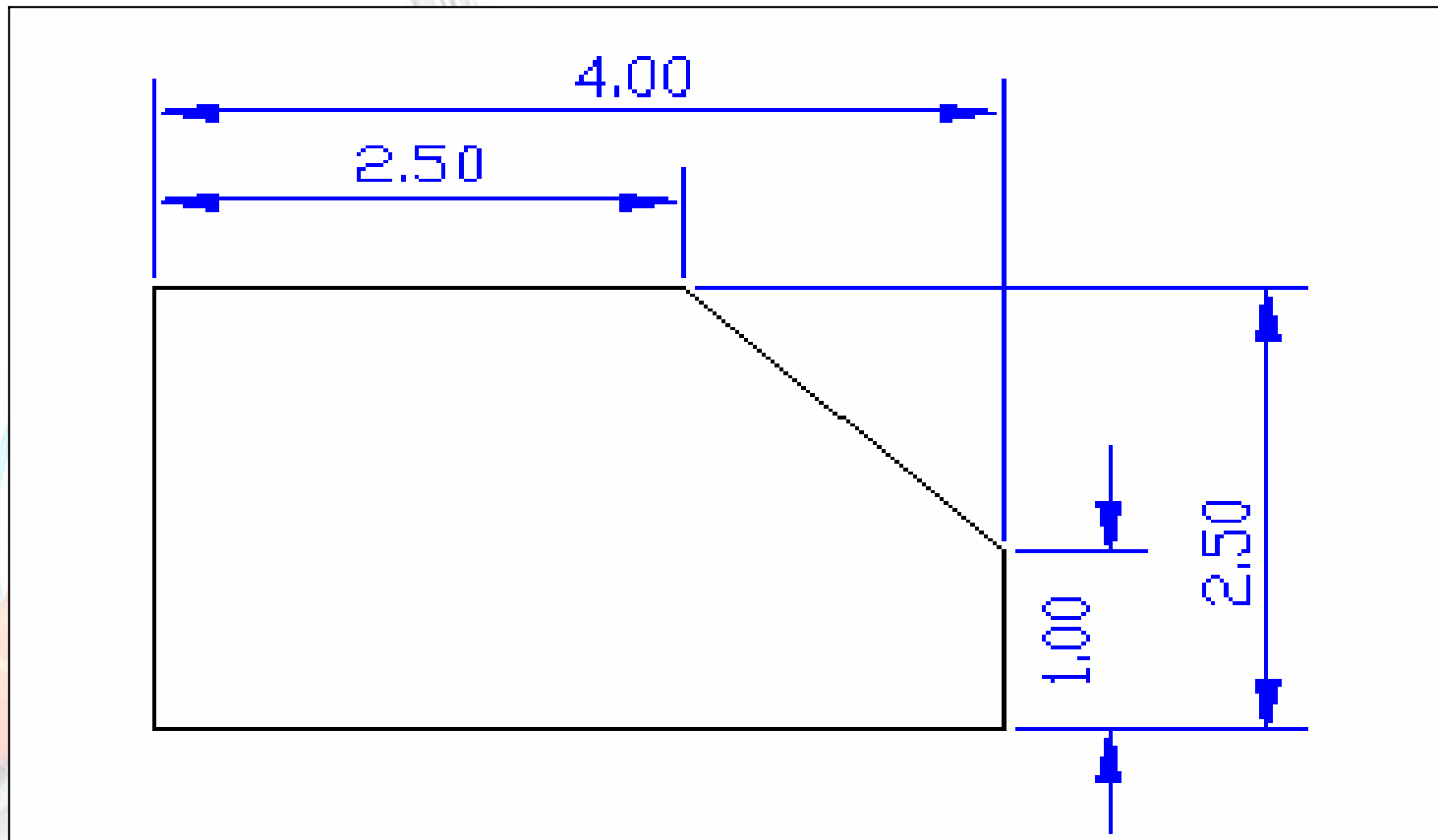


Datum Plane Dimensioning - Continuous

Dimensioning - Cylindrical

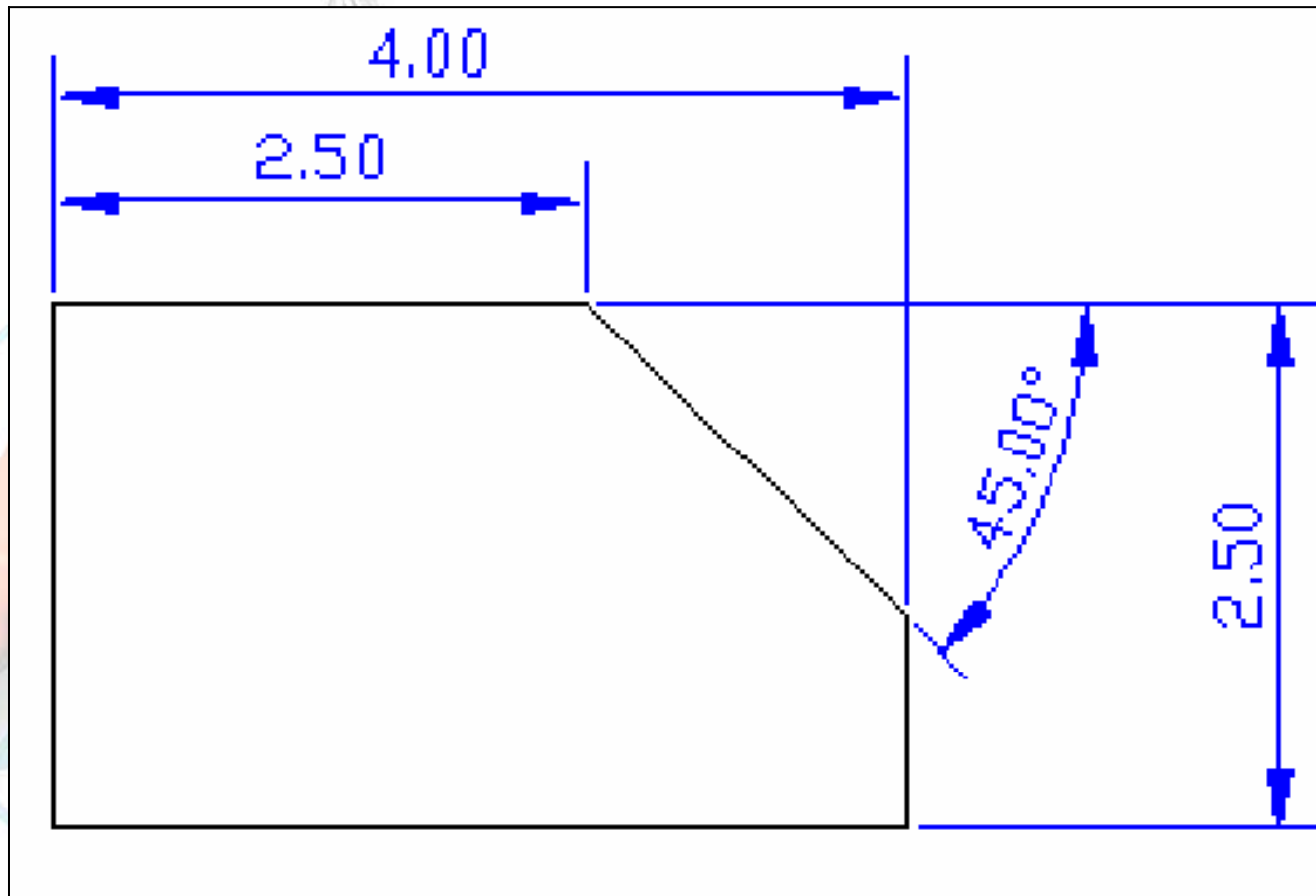


Dimensioning - Angles



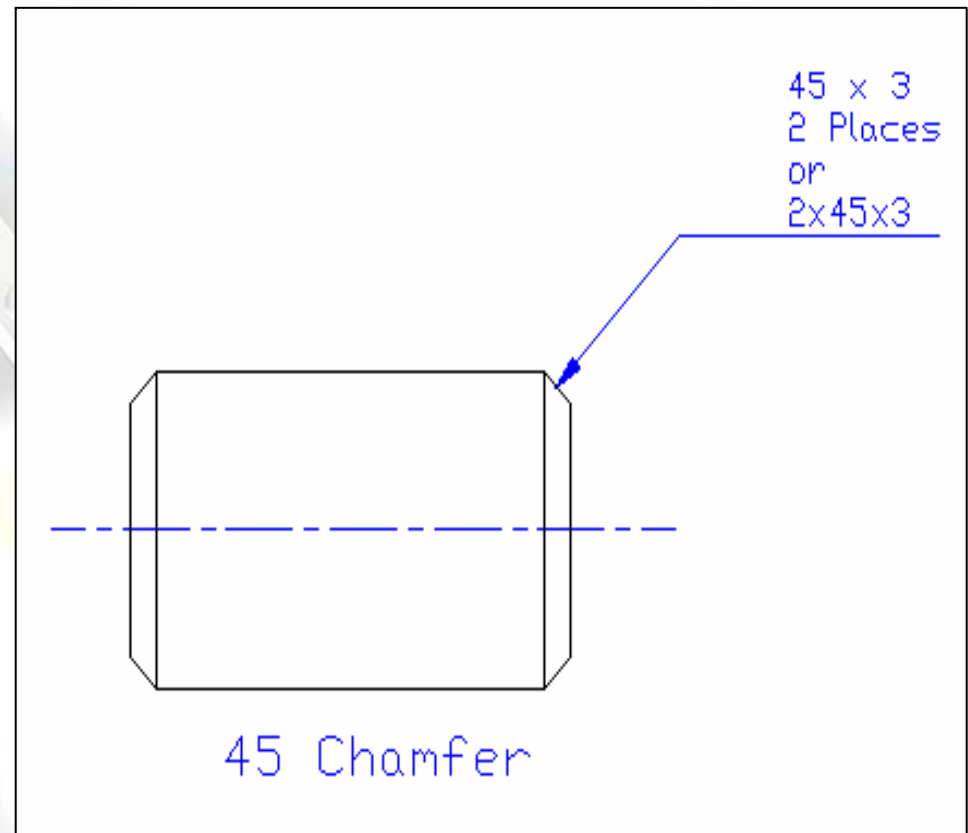
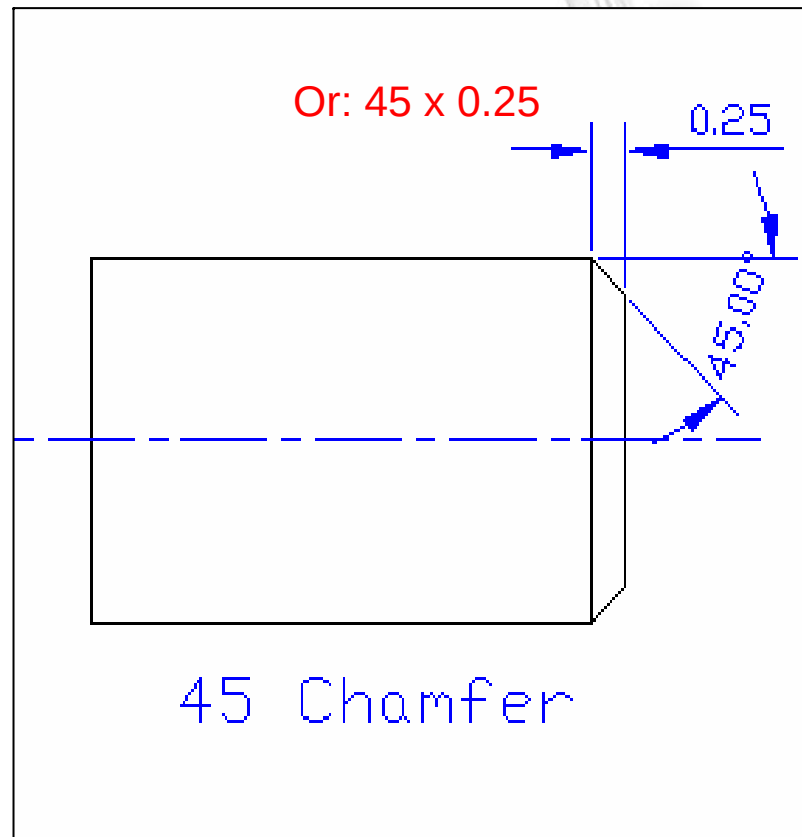
Dimensioning Angles in Views using COORDINATE method.

Dimensioning - Angles

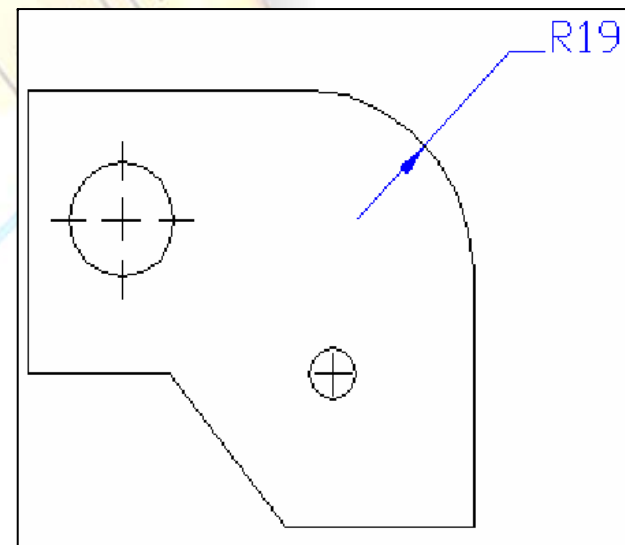
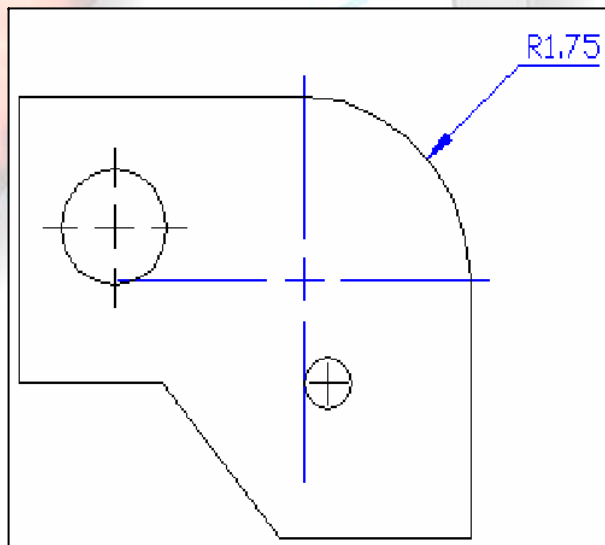
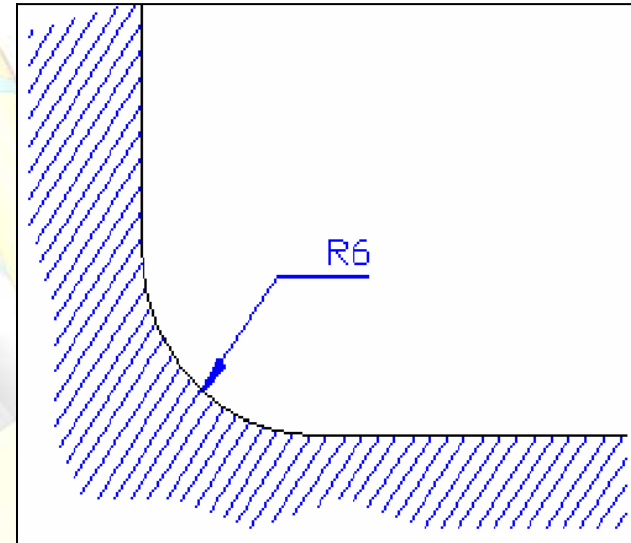
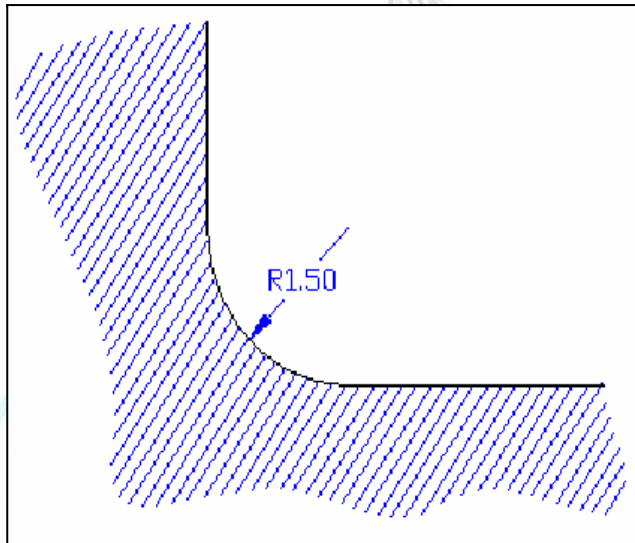


Dimensioning Angles in Views using ANGULAR method.

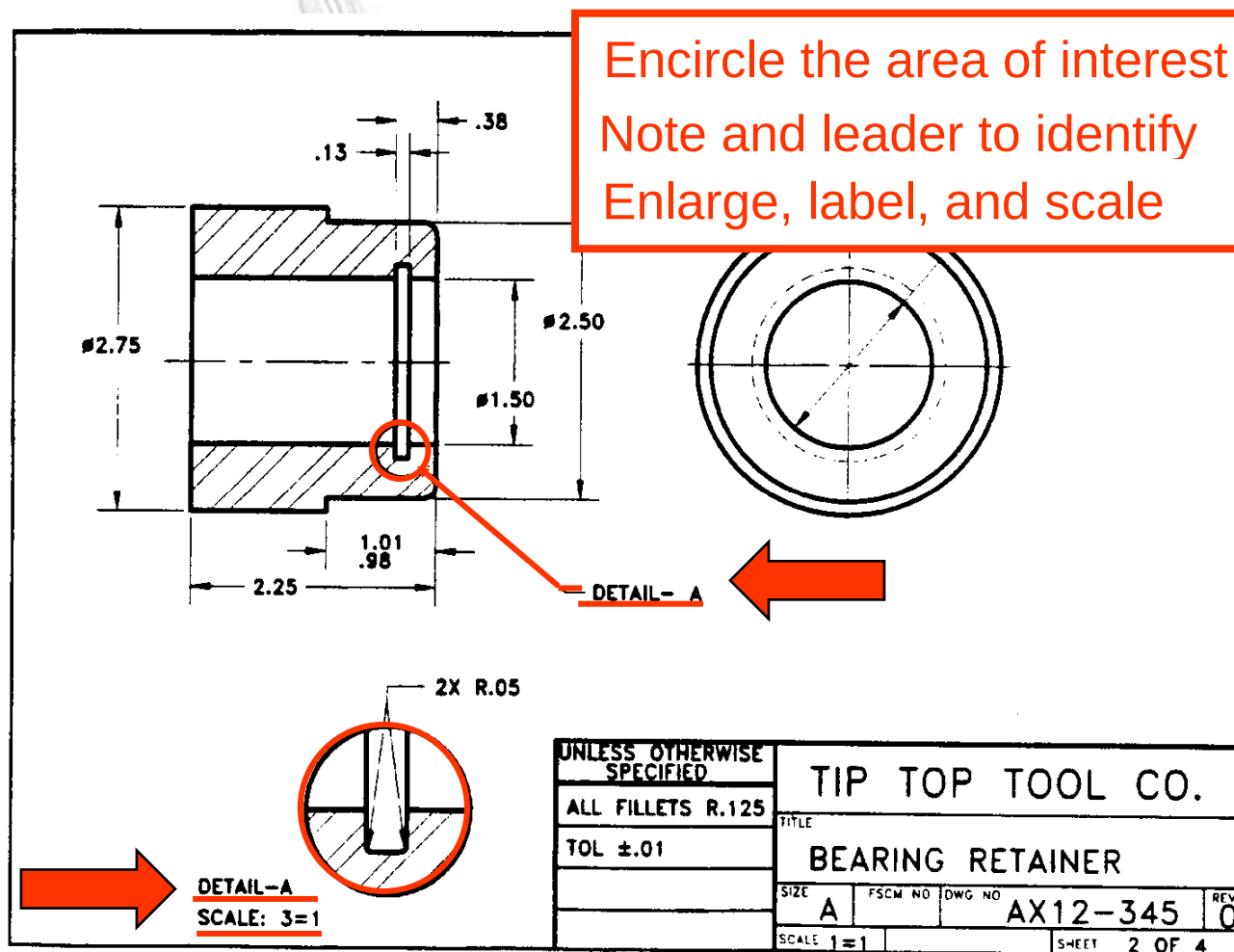
Dimensions - Chamfers



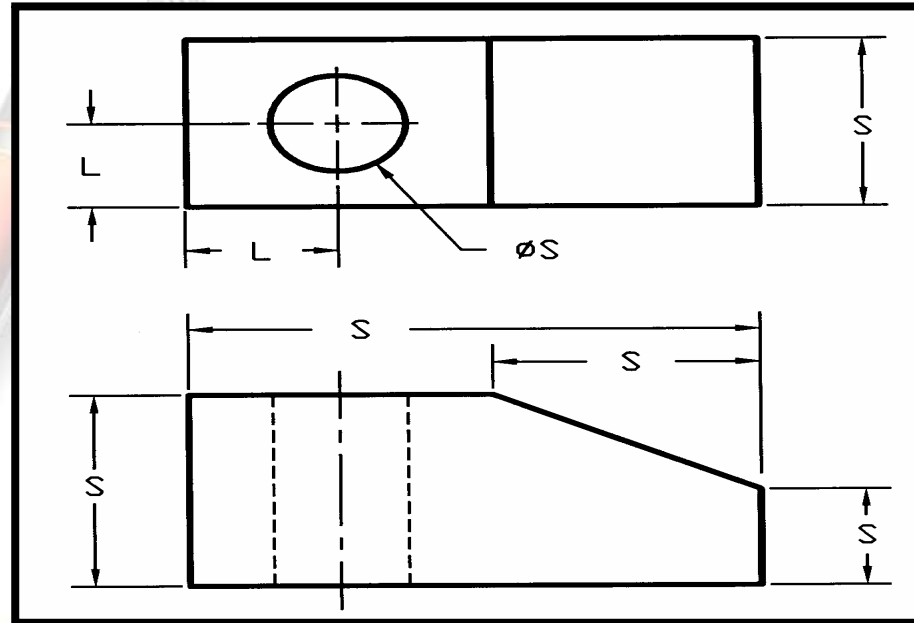
Dimensioning – Arcs



Detail Dimensioning in Views

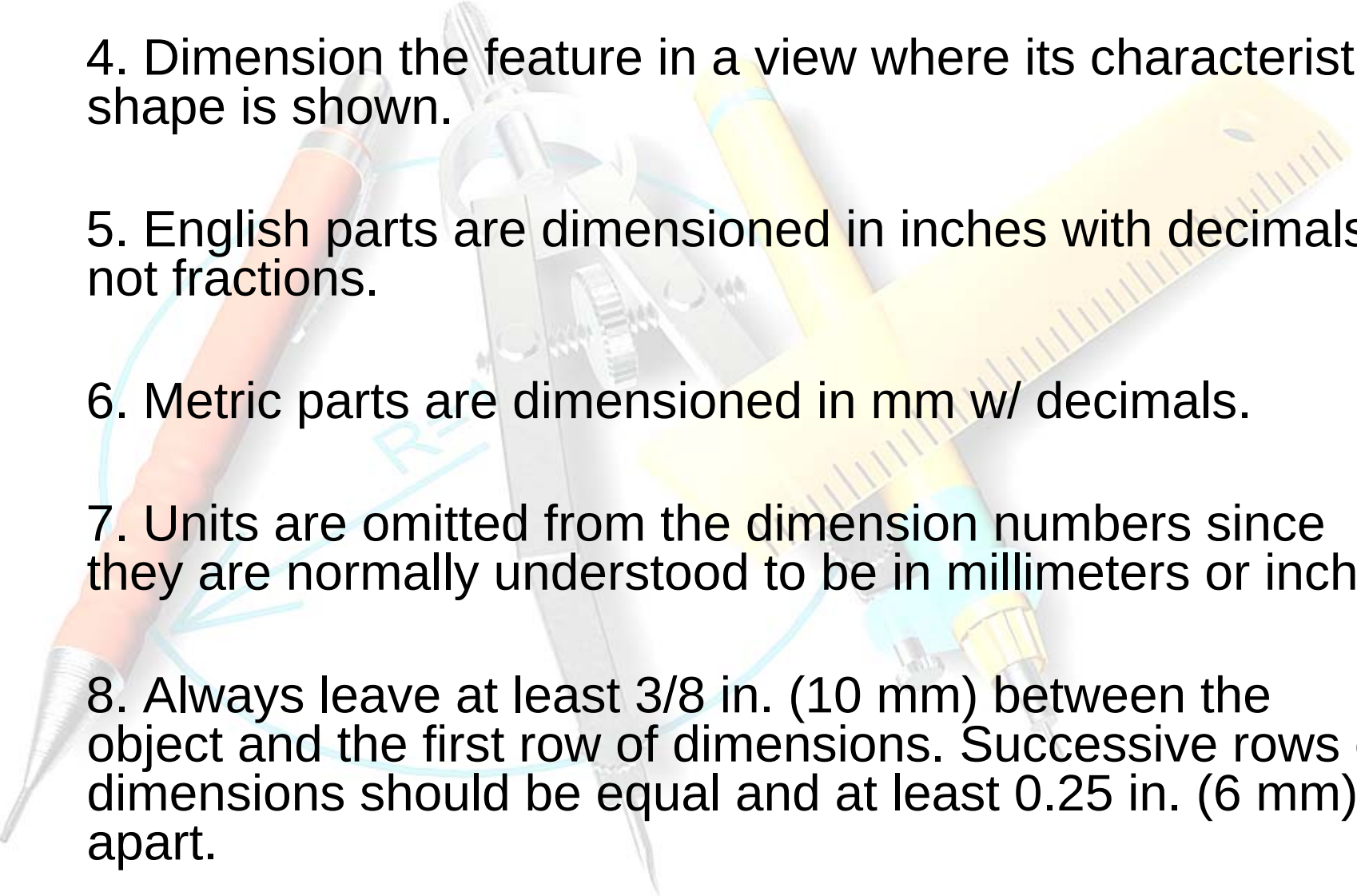


Fundamental Rules of Dimensioning

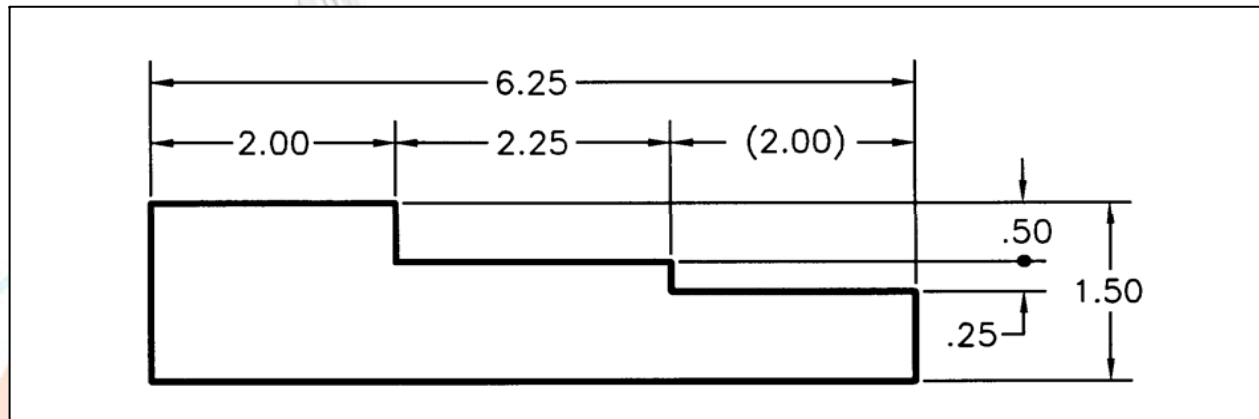


1. Size (S) dimensions are used to define length, width, height, diameter of circles and radius of arcs.
2. Position dimensions locate (L) the center of circles and other key features.
3. The size and position of each feature is defined only once.

Fundamental Rules of Dimensioning

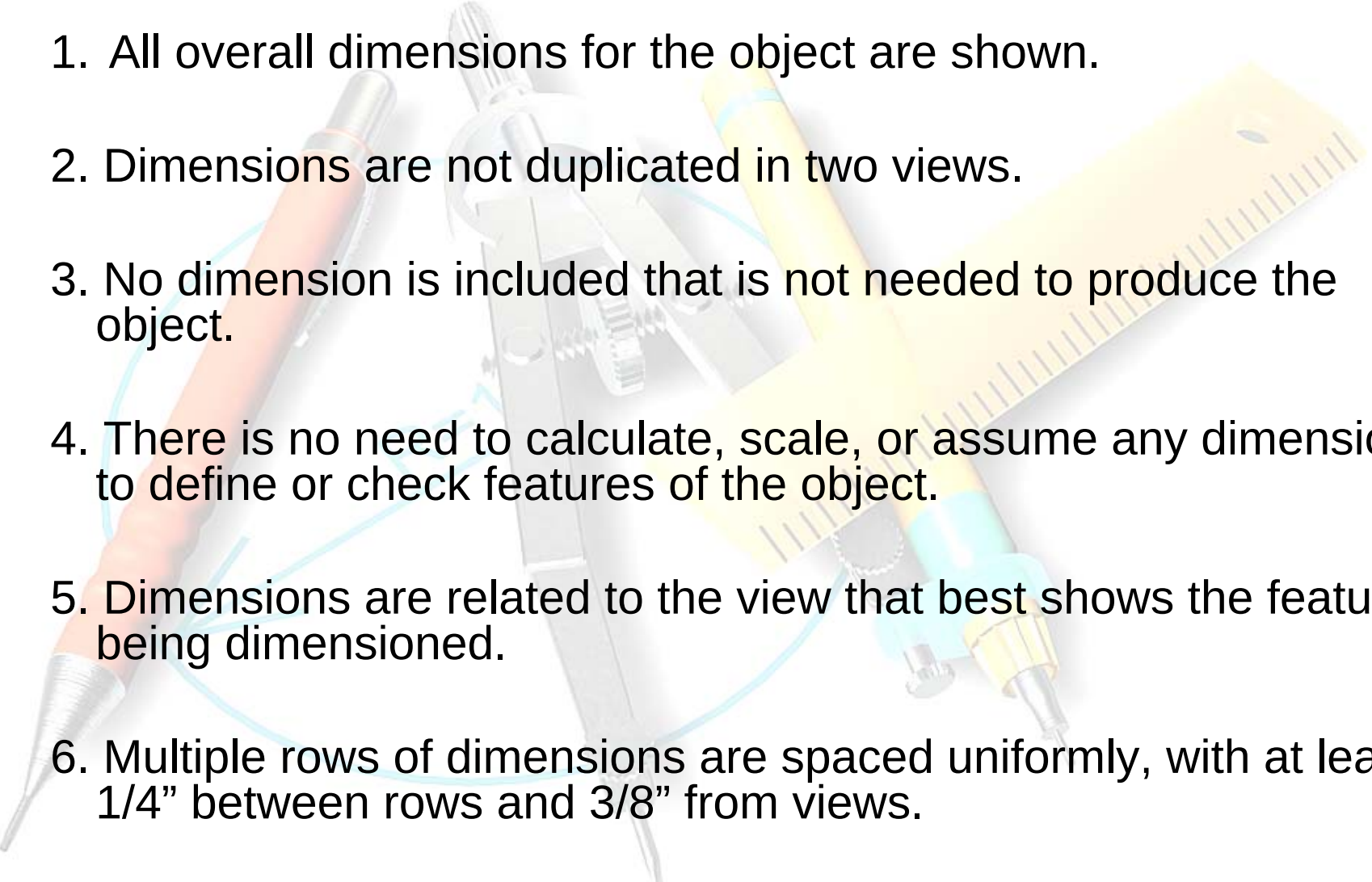
- 
4. Dimension the feature in a view where its characteristic shape is shown.
 5. English parts are dimensioned in inches with decimals, not fractions.
 6. Metric parts are dimensioned in mm w/ decimals.
 7. Units are omitted from the dimension numbers since they are normally understood to be in millimeters or inches.
 8. Always leave at least $\frac{3}{8}$ in. (10 mm) between the object and the first row of dimensions. Successive rows of dimensions should be equal and at least 0.25 in. (6 mm) apart.

Fundamental Rules of Dimensioning

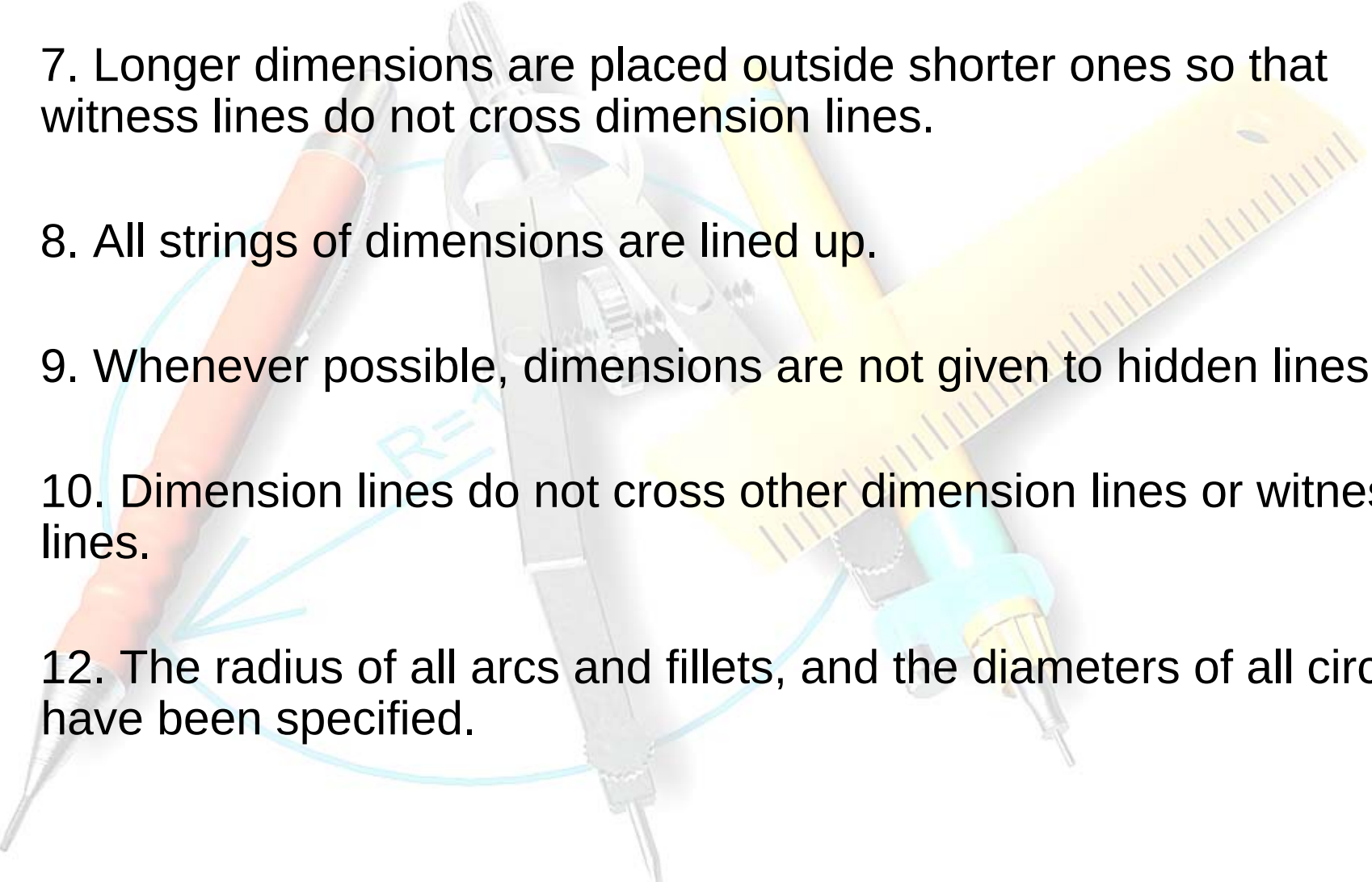


9. Place dimensions outside of the views except for large circles. Keep dimensions at least $\frac{3}{8}$ inches or 10 mm from the view.
10. Place longer dimensions outside of shorter ones.
11. Place the dimension text between the dimension lines.
12. Use arrow heads at the end of the dimension lines.
13. Inch drawings do not include a preceding zero for dimensions less than one. For example, use .50 to indicate $\frac{1}{2}$ inch. Metric dimensions require a preceding zero; e.g., use 0.50 to indicate $\frac{1}{2}$ millimeter.

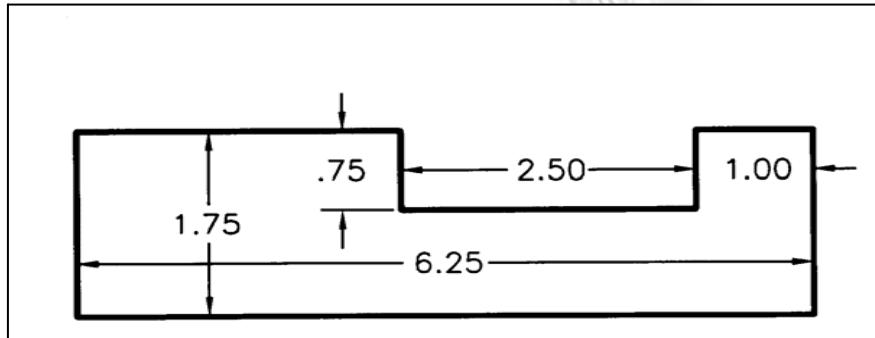
Guidelines for Dimensioning – A Check List

- 
1. All overall dimensions for the object are shown.
 2. Dimensions are not duplicated in two views.
 3. No dimension is included that is not needed to produce the object.
 4. There is no need to calculate, scale, or assume any dimension to define or check features of the object.
 5. Dimensions are related to the view that best shows the features being dimensioned.
 6. Multiple rows of dimensions are spaced uniformly, with at least 1/4" between rows and 3/8" from views.

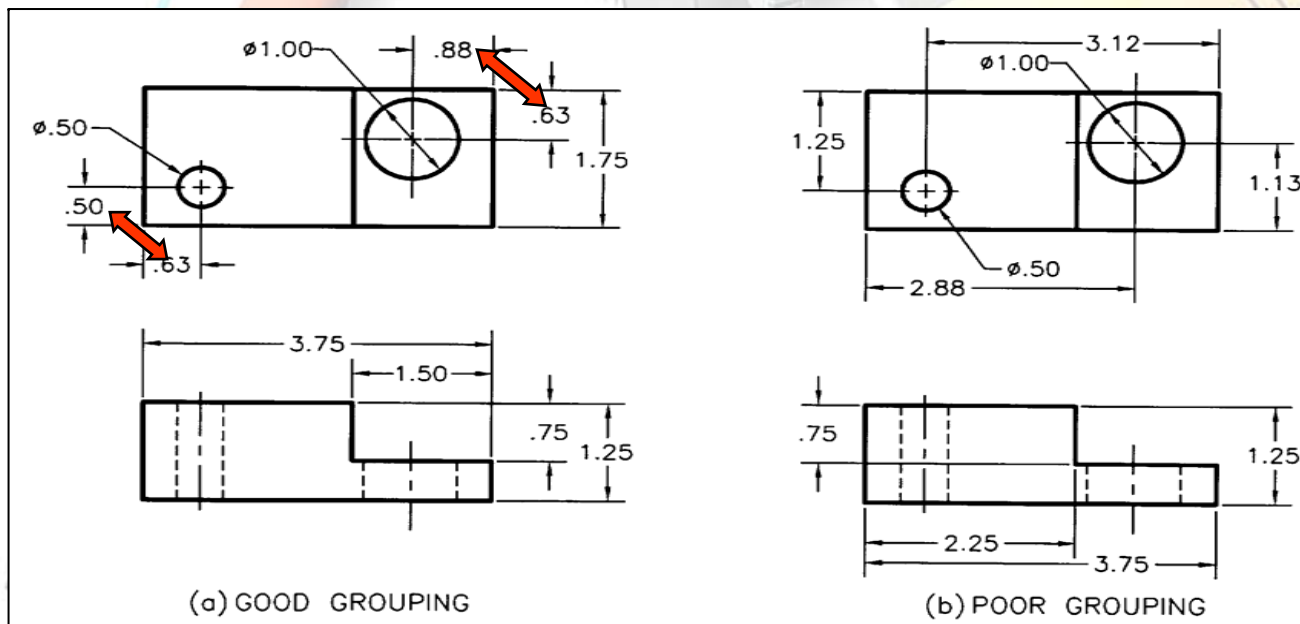
Guidelines for Dimensioning

- 
7. Longer dimensions are placed outside shorter ones so that witness lines do not cross dimension lines.
8. All strings of dimensions are lined up.
9. Whenever possible, dimensions are not given to hidden lines.
10. Dimension lines do not cross other dimension lines or witness lines.
12. The radius of all arcs and fillets, and the diameters of all circles have been specified.

Examples of Wrong Dimensioning

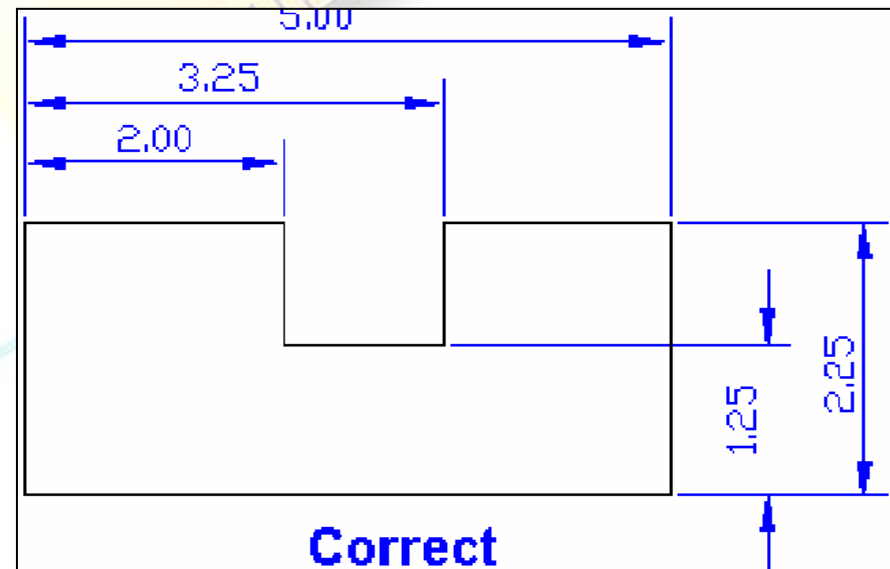
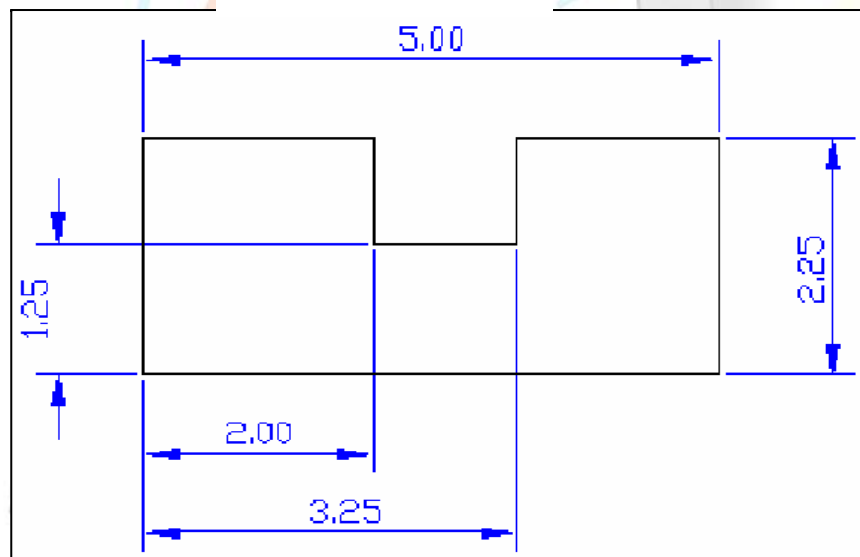
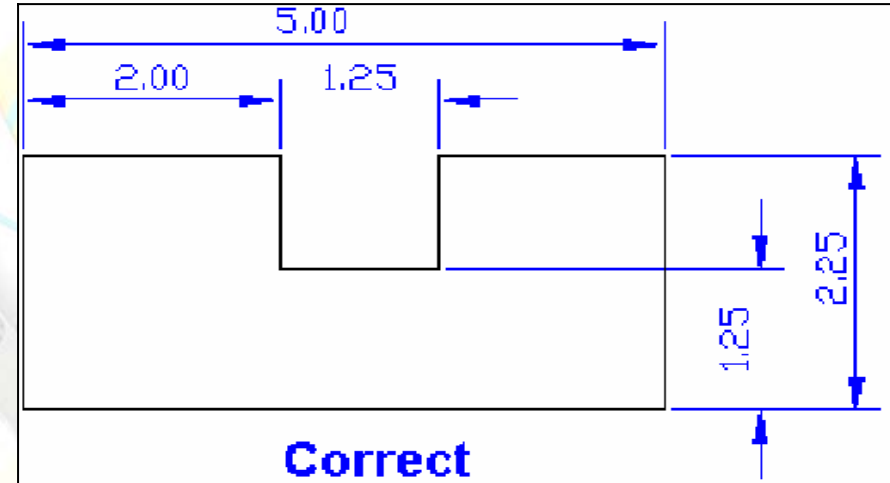
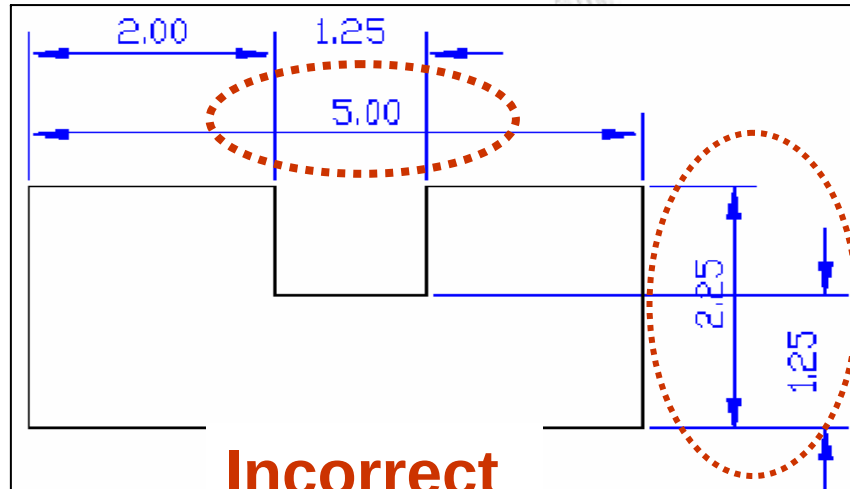


Do not use lines of the model as dimension extension lines.



**Group
Dimensions**

Examples of Wrong Dimensioning



Dimensioning in AutoCAD

