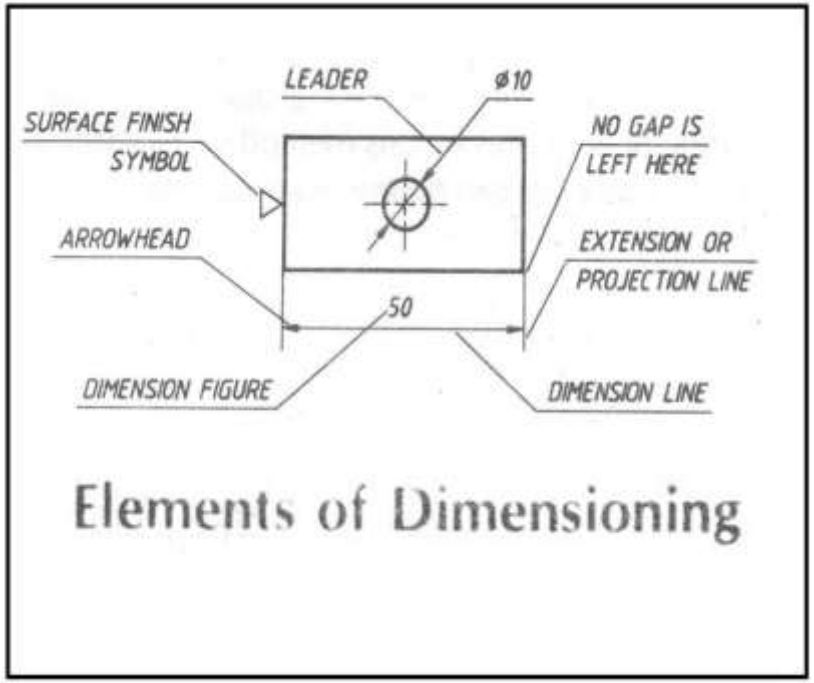
DIMENSIONING

What is Dimensioning?

- To Construct an object its shape and sizes must be known.
- Indicating on a drawing, the sizes of the object and other details essential for its construction and function using lines, numerals, symbol, notes & etc., is called dimensioning.
- Explain the machining operations like drilling, reaming, taping, etc., and other details such as material, number of pieces required, etc.

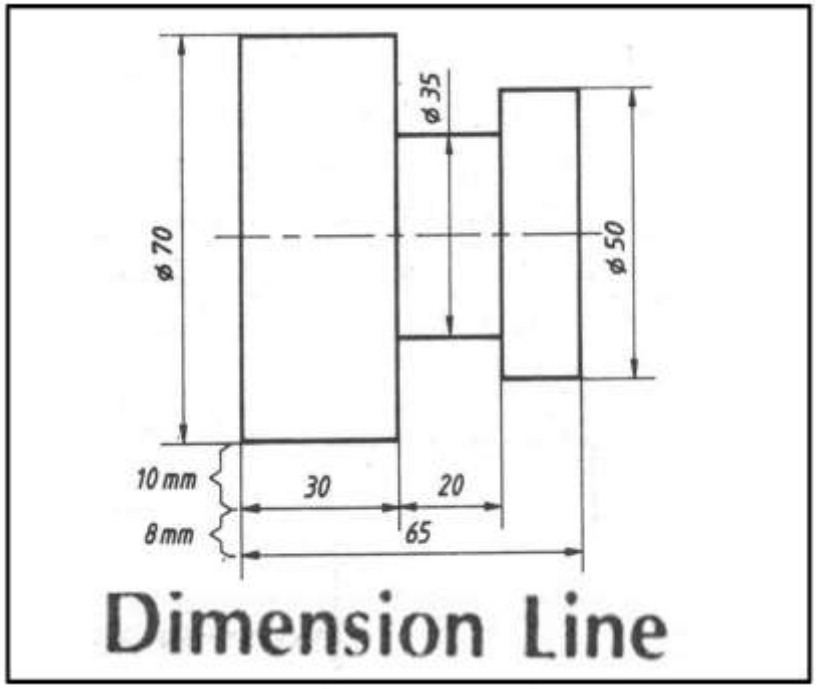
Elements of Dimensioning

- Dimension Line
- Projection Line or Extension Line
- Leader Line
- Origin Indication
- Simples & Dimension itself.



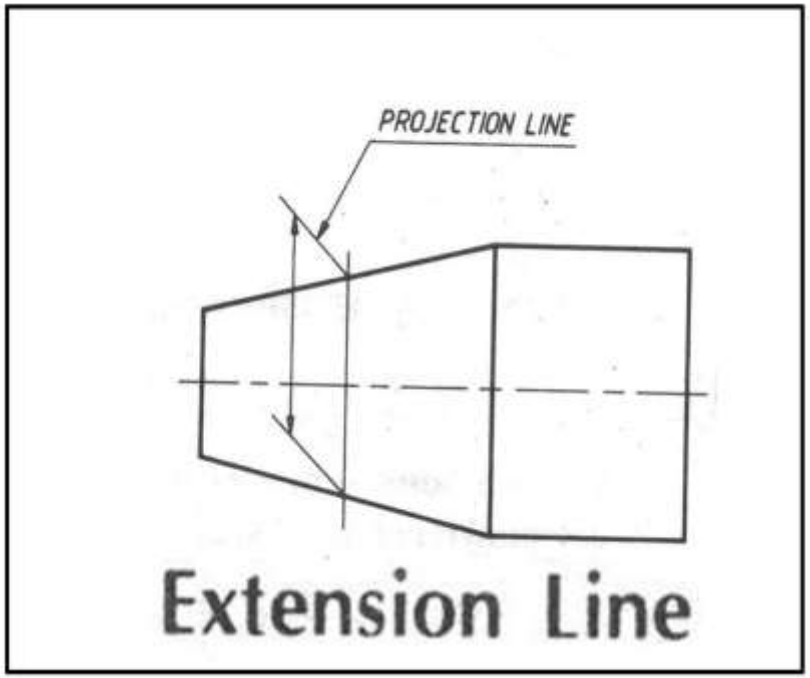
Dimension Line

- Measurement of two ends
- A Dimension line is a continuous thin line .
- The two ends arrowheads or oblique stroke.
- Draw **parallel** to the edge or surface placed outside the views, some times may be placed ***within*** the views, unless the drawing becomes very clearly.
- It should be placed atleast **10mm** away from the outlines of drawing and all other parallel dimension lines should be placed atleast **8mm**.



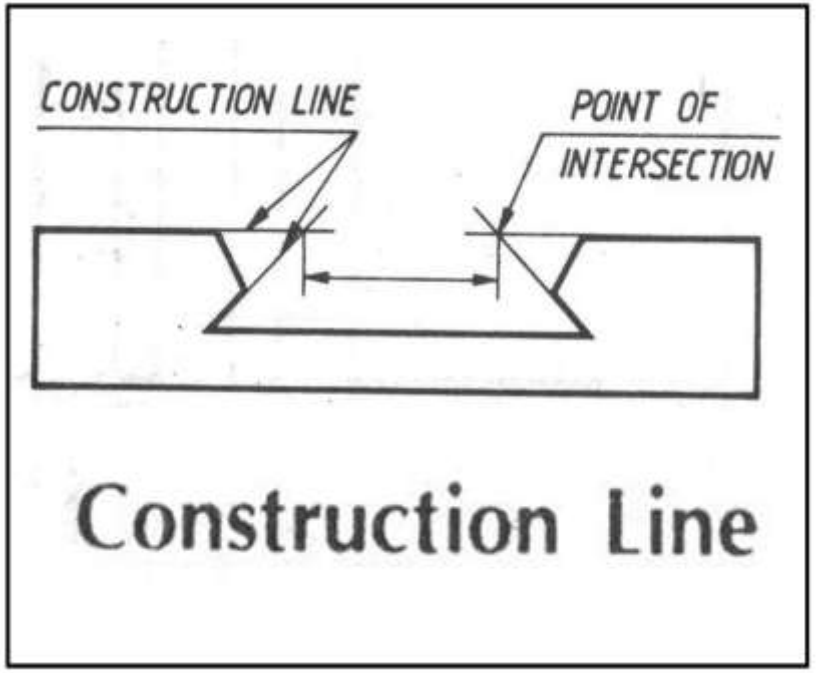
Projection or Extension Line

- Drawn Without leaving a gap from the outline to be dimensioned.
- A projection or an extension line, is a thin continuous line.
- It is drawn **perpendicular** to the outline which is to be dimensioned.
- It is drawn obliquely, but parallel to each other.
- The projection lines should extend slightly beyond the dimension line.



Construction Line

- The construction lines are extended slightly beyond the point of intersection.
- A construction line is a thin continuous line.

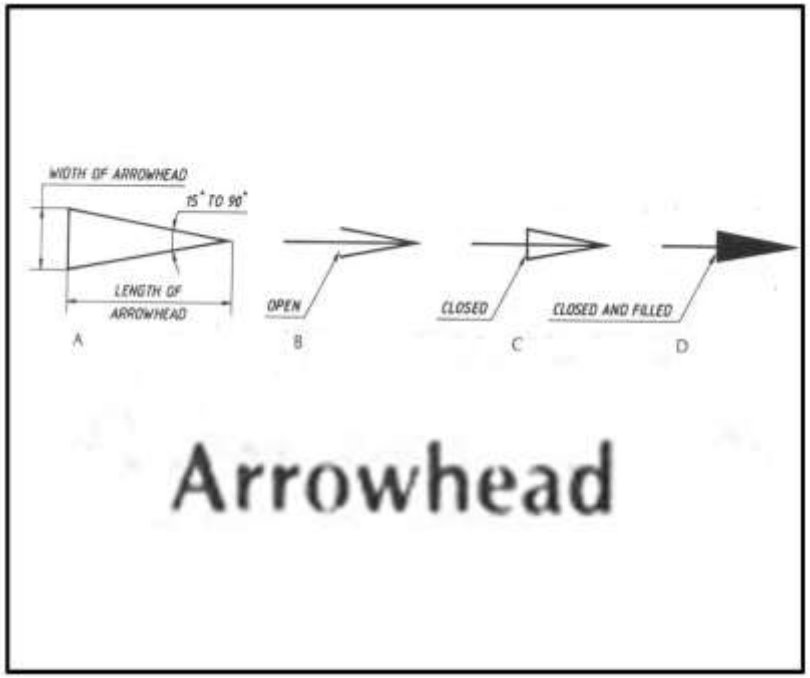


Arrowheads

- Arrowheads are used to terminate a dimension line.
- Included angle of minimum of 15^0 or more to produce an arrowhead of length at least three times the width (3:1).

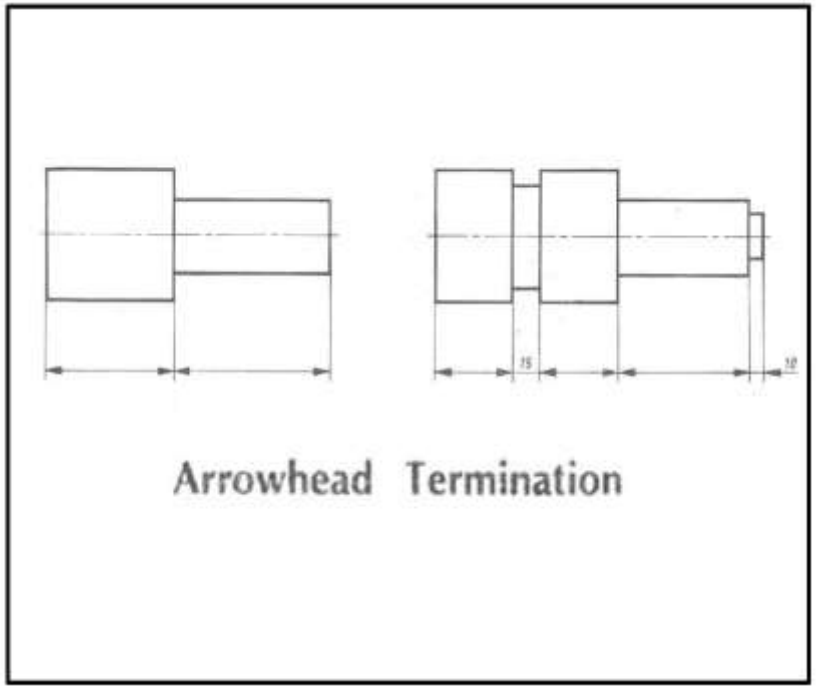
Types of Arrowheads:

- Open arrowheads (Suitable for pensile drawing)
- Closed arrowheads (Suitable for ink drawing)
- Closed & Filled arrowheads (Suitable for ink drawing)



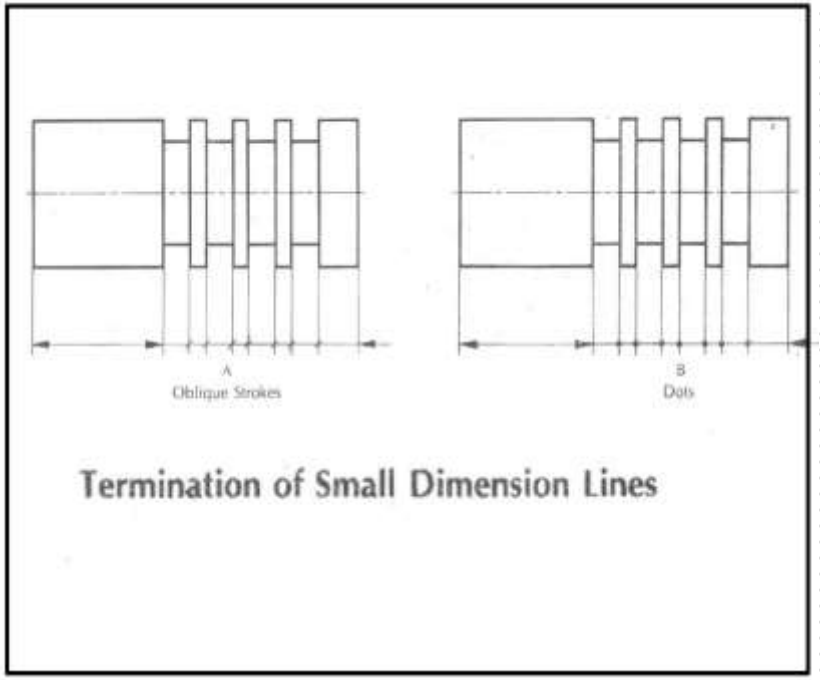
Arrowhead Termination

- Dimension lines are terminated by placing the arrowheads at their ends within the space.



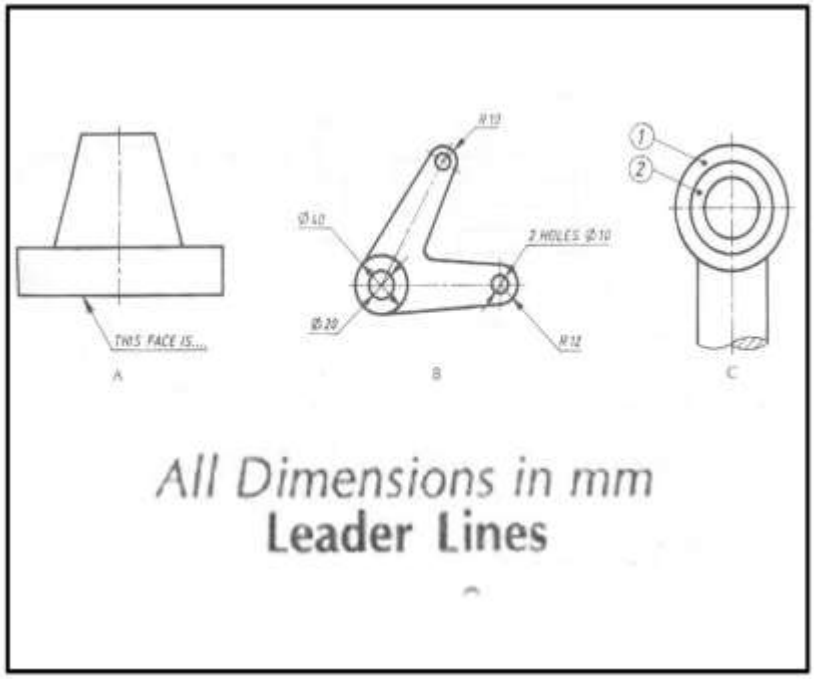
Oblique Strokes and Dots

- When a number of very small dimension lines lie one adjacent to the other, either oblique strokes.



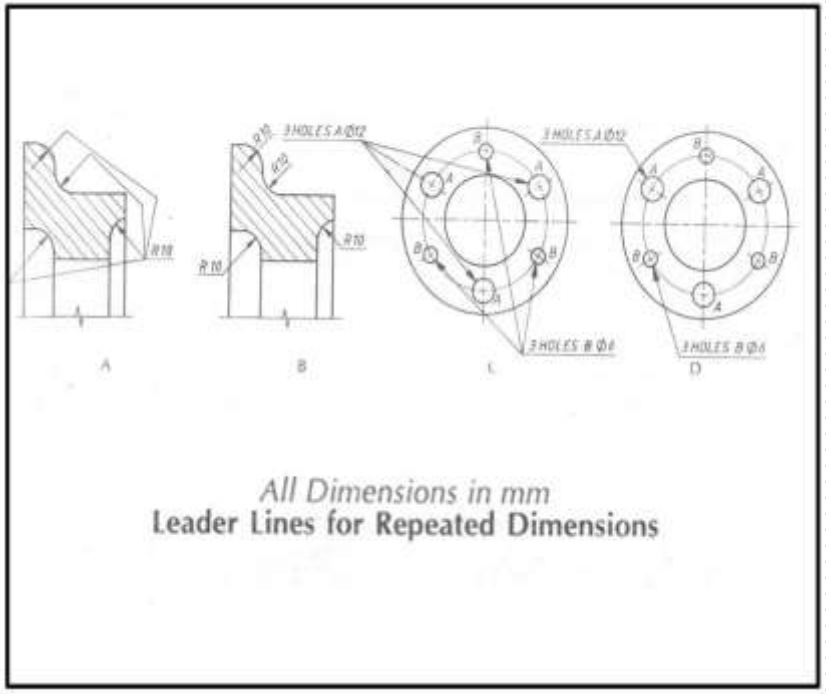
Leader or Pointer Lines

- Leader or pointer lines are thin continuous lines.
- The leader line drawn 30^0 or 45^0 to horizontal.
- The tail end of the leader line should terminate on a horizontal line drawn at he bottom of the dimension.



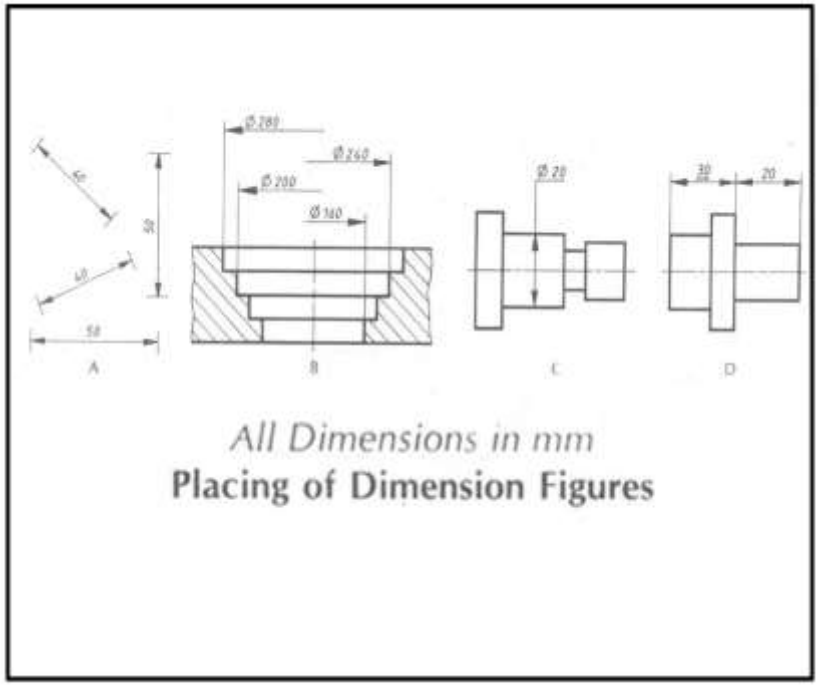
Leader Lines for Repeated Dimension

- Whenever a particular dimension is repeated at a number of places on a drawing, all the leader lines must not be connected to indicate the dimension at one place.



Dimension Figure

- Dimension figures may be drawn either of vertical or inclined type. For general work the height of dimension figures may be 3.5mm.
- The dimension figures are generally placed near the middle of the dimension line and clearly above.

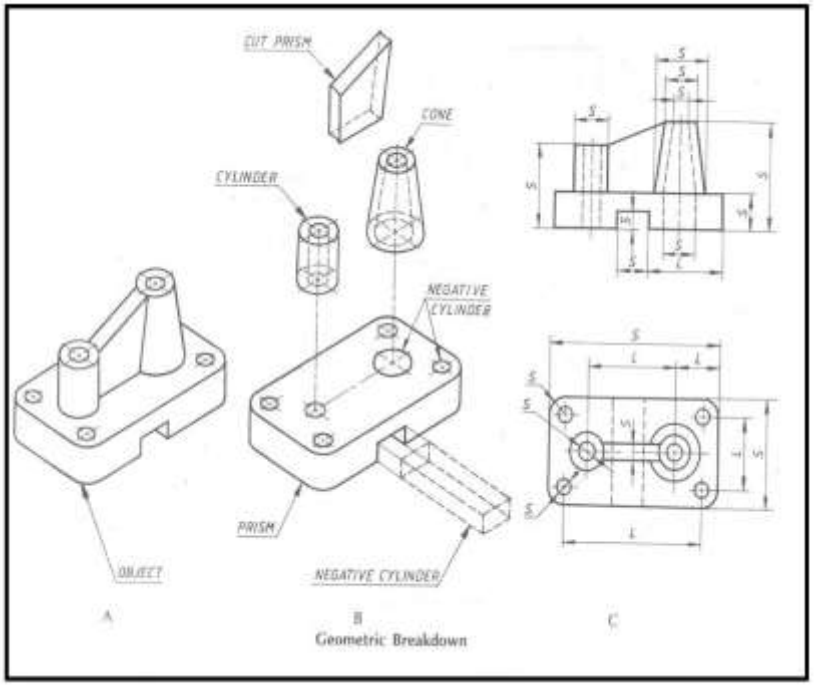


Units of dimensions

- Dimensions should as far as possible be expressed in one unit only. The recommended unit is millimeter. The unit of the dimension figure is omitted while writing the dimension figure, and a foot note stating ALL DIMENSIONS IN mm is written at the prominent place on the drawing sheet.

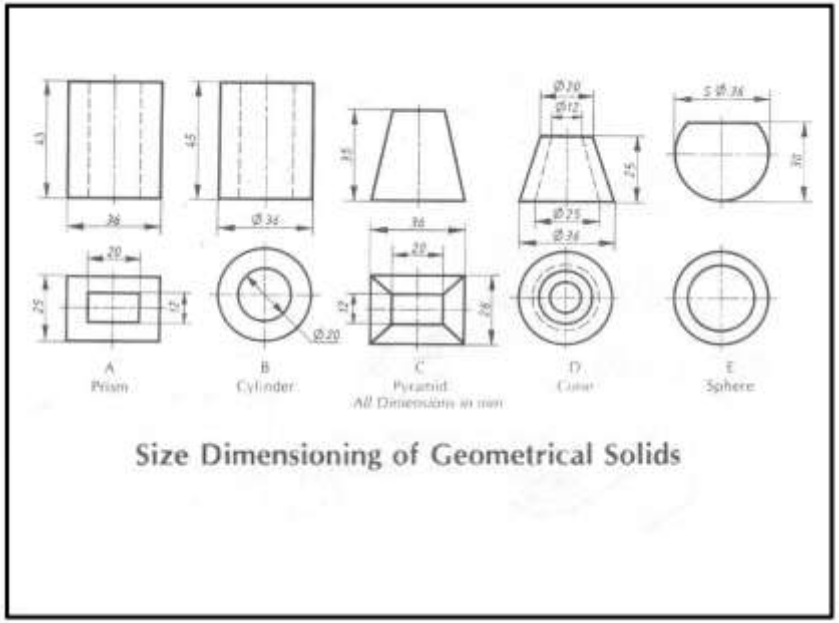
Theory of Dimensioning

The dimensions that have to be shown on a drawing are those that are required in the construction of the object. They have to be carefully selected the designer so as to avoid confusion, ambiguity, insufficiency, difficult to achieve while construction the object



Size Dimensions

The size dimension are given to indicate the sizes of the constituting features of he object. The general rule for placing the size dimensions is, to place two out of the three principle dimensions, viz., height, width and depth, on the principle view and the third dimension on any one of he remaining views.



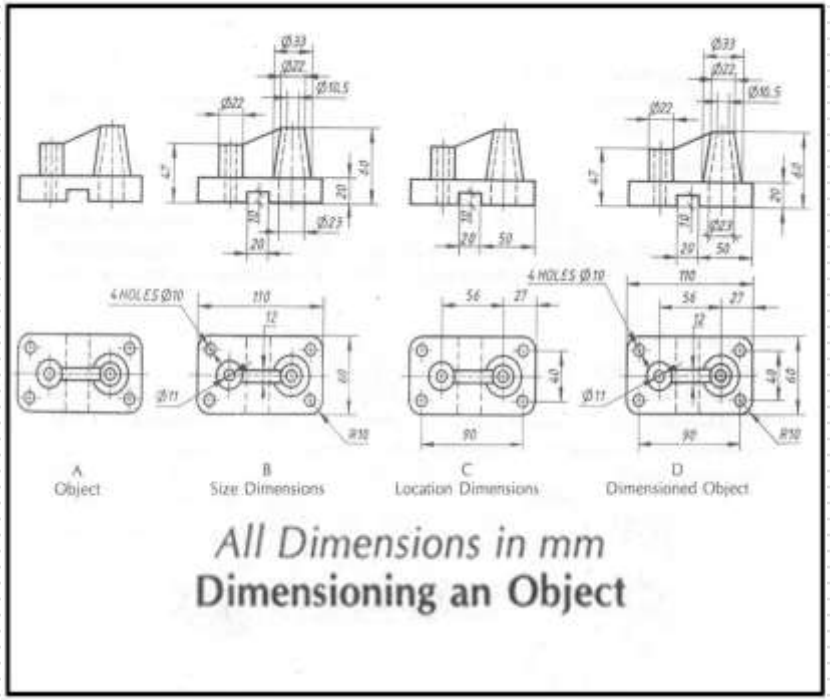
Size Dimensioning of Geometrical Solids

Location Dimensions

After dimensioning the object for its sizes, it should be dimensioned for the relative location of each of the different features. The location dimensions are very important because they fix the relationship between the constituting features like projection, holes, slots, grooves, etc.,

Combination of Size and Location Dimensions

- The appropriate dimensions that have to be shown on a drawing are obtained by combining the size and location dimensions.
- Only the size dimensions of the constituting parts are given as shown.
- The location dimensions of he various parts are given as shown.

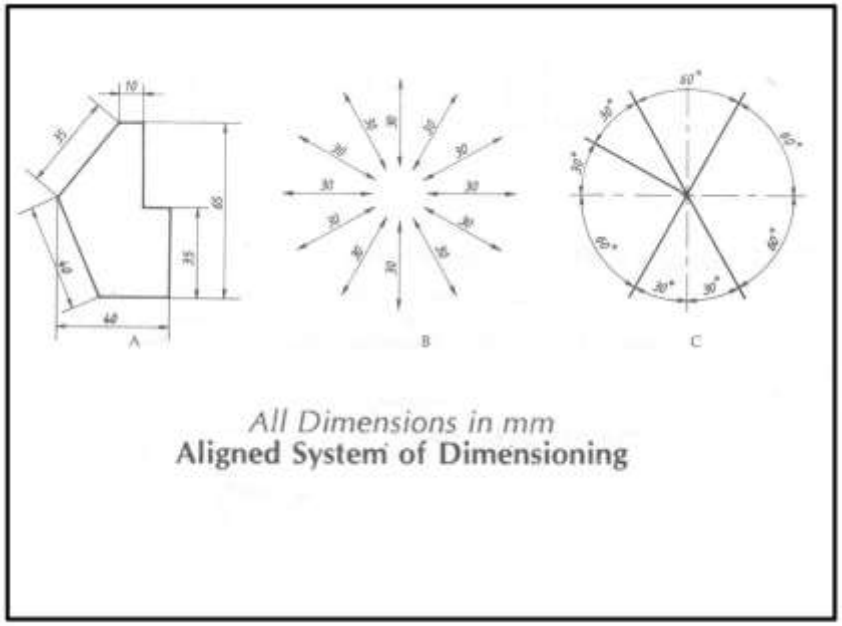


Systems of Dimensioning

The two systems of placing the dimension figures are aligned system and Unidirectional systems. Both the systems are recommended in SP:46-1988 by the Bureau of Indian Standards.

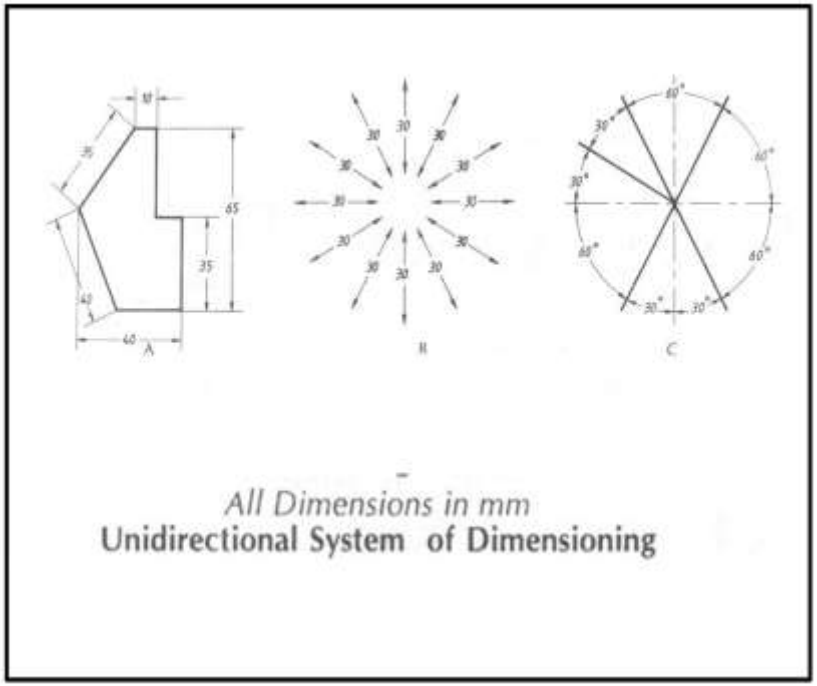
Aligned System

In the aligned systems of dimensioning all the dimension figures are placed above the dimension lines without breaking and written parallel to them, so that they can be read either from the bottom or any one of the sides of he drawing,.



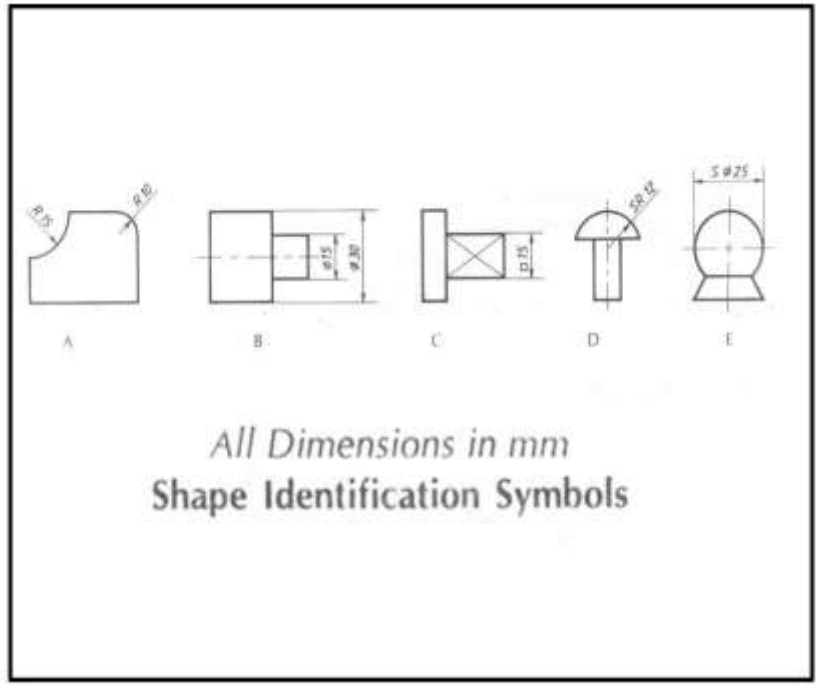
Unidirectional System

In the unidirectional system of dimensioning the dimension figures are placed in the space left at he centre of the dimension lines as shown, so as to be read from the bottom edge of the drawing sheet. The different positions of dimension lines. Angular dimensions are placed as shown.



Shape Identification Symbols in Dimensioning

To enable a better interpretation of the dimensions on the drawing, shape identification symbols are written before the dimension figure as shown.



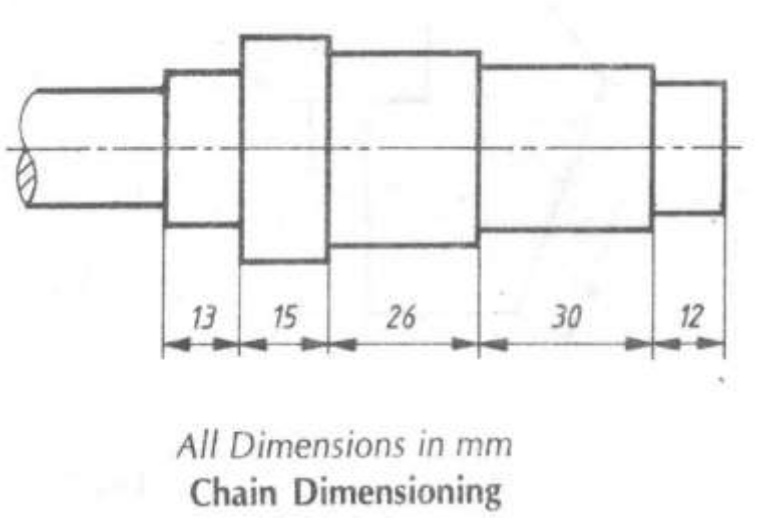
Arrangement and Indication of Dimensions

The selection of he appropriate dimensions that have to be indicated on the drawing of an object, and the method of arranging the dimension lines based on the construction, inspection and functional points of view is known as the arrangement of dimensions. The different methods of arrangement and indication of dimensions are

1. Chain Dimensioning
2. Parallel Dimensioning
3. Combined Dimensioning
4. Progressive Dimensioning
5. Dimensioning BY Co – Ordinate
6. Equidistant Dimensioning
7. Repeated Dimensioning

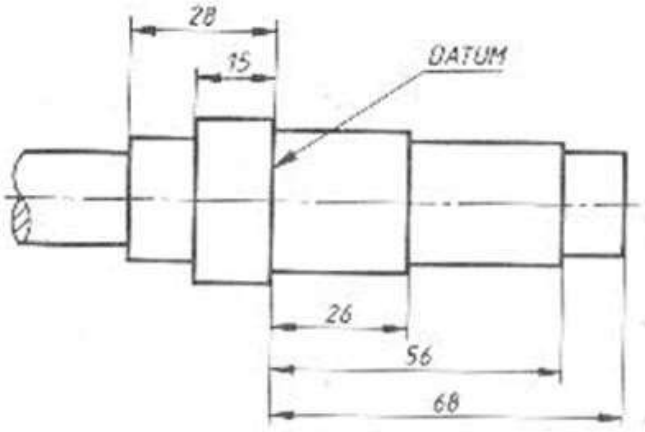
Chain Dimensioning

In this method of Dimensioning, a series of adjacent dimensions are arranged in one row as shown. The Dimensions, 13,15, 26, 30 and 12 are placed in series forming a chain of individual dimensions.



Parallel Dimensioning

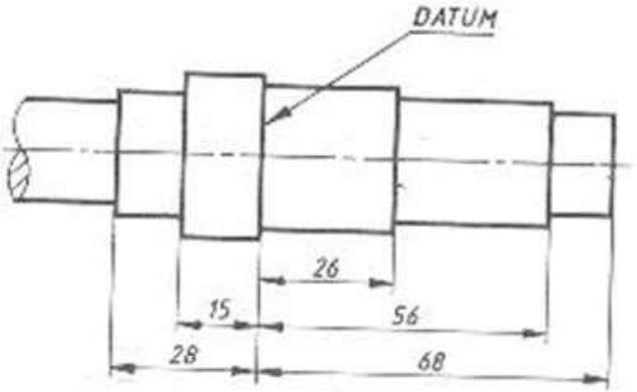
When a number of dimensions to be indicated from a common surface, or a line, called datum, each one of the dimensions are indicated by individual parallel dimension lines as shown.



All Dimensions in mm
Parallel Dimensioning

Combined Dimensioning

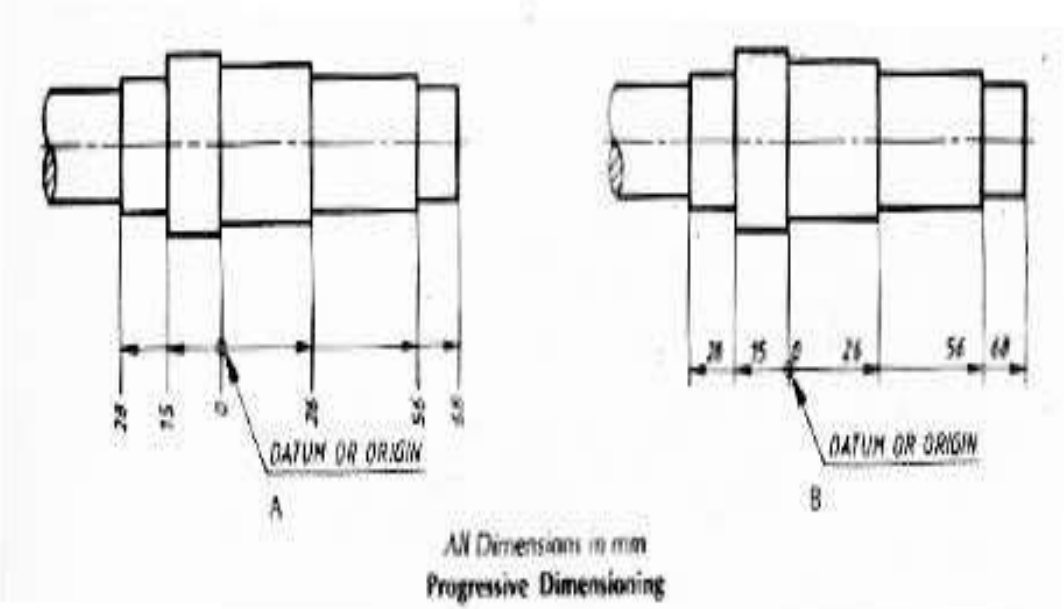
In this method, both the chain dimensioning and parallel dimensioning are combined on a drawing as shown.



All Dimensions in mm
Combined Dimensioning

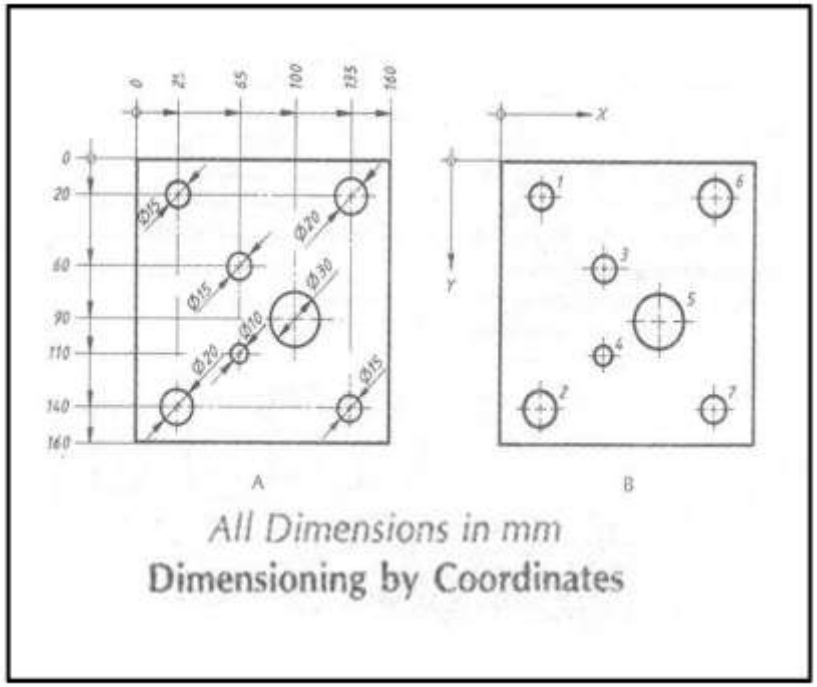
Progressive Dimensioning

As seen in drawing, since the dimension lines of each of the dimensions are drawn separately parallel to one another, a large space is required for dimensioning



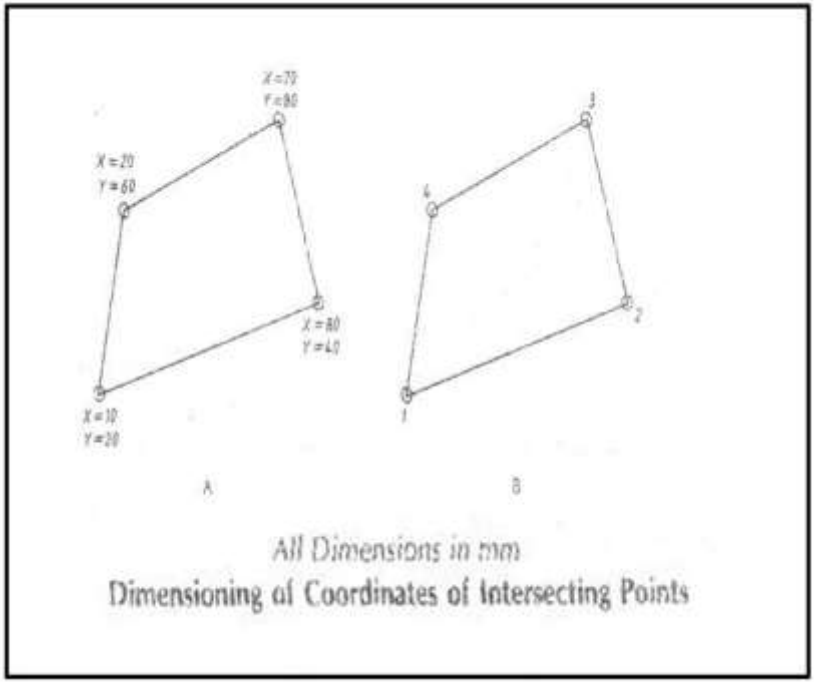
Dimensioning by Co - Ordinates

When a number of holes of different sizes have to be dimensioned, instead of dimensioning by the progressive method of dimensioning as shown.



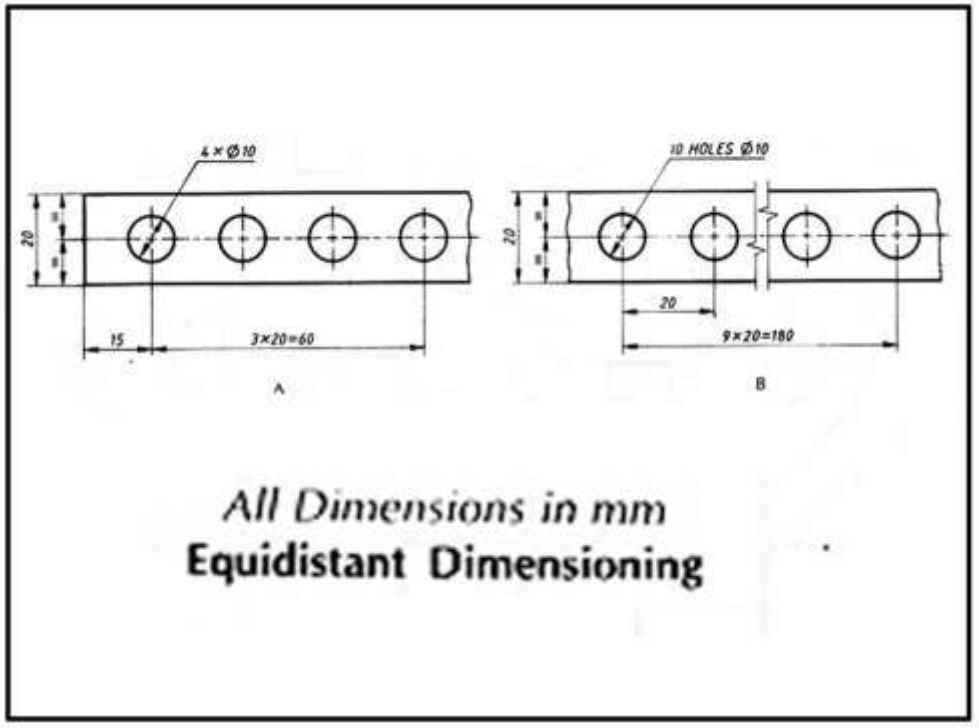
Dimensioning of Coordinates of Intersecting Points

The coordinates of arbitrary points may be placed adjacent to each point as shown.



Equidistant Dimensioning

When some elements such as holes, projections, etc., are uniformly arranged, or equidistant from one another, the dimensioning may be simplified by giving product of the number of spacing (i.e. pitch) and the dimension value for example, 3x20 =60 as shown.



Repeated Dimensions

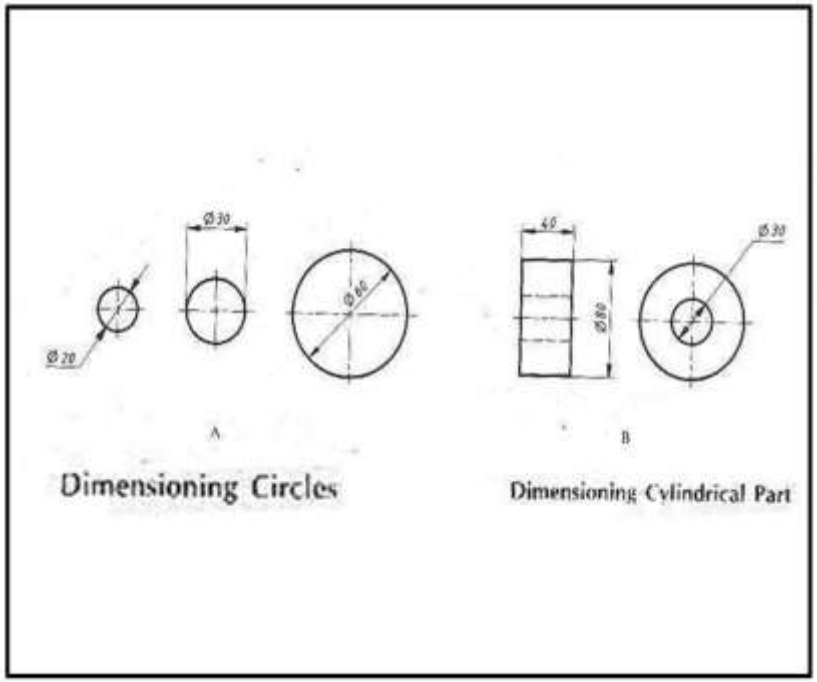
When a certain feature or element of same size are repeated number of times, to avoid repeating the same dimension everywhere, the product of number of repeated features and the

Dimensioning of Common Features and Machine Elements

Dimensioning Circles – Cylindrical Parts and Holes:

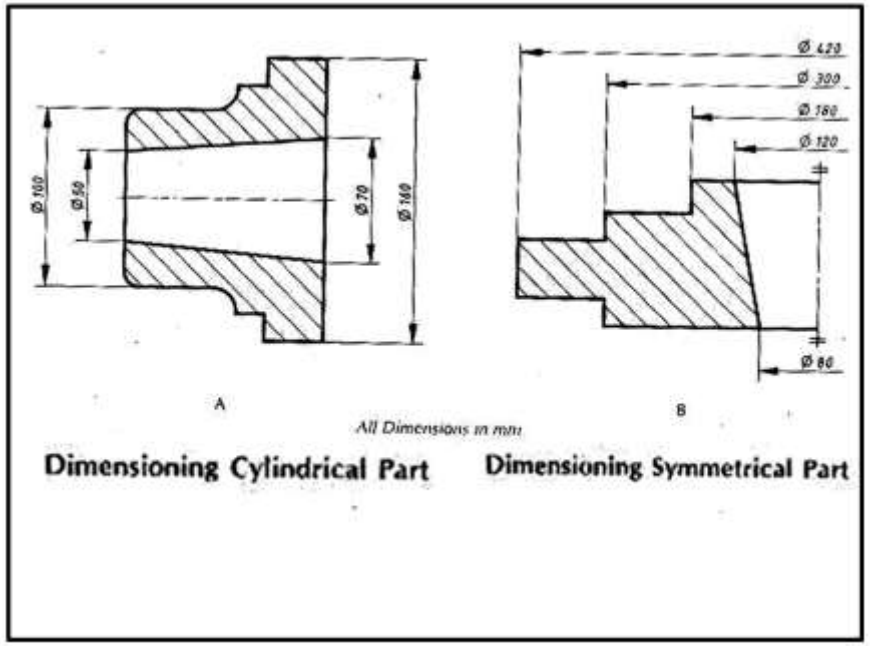
Circles are dimensioned by any one of the methods shown.

Cylindrical parts and holes are always dimensioned by indicating their diameter, and not the radii, since diameters are only measured while turning the cylindrical parts or drilling the holes.



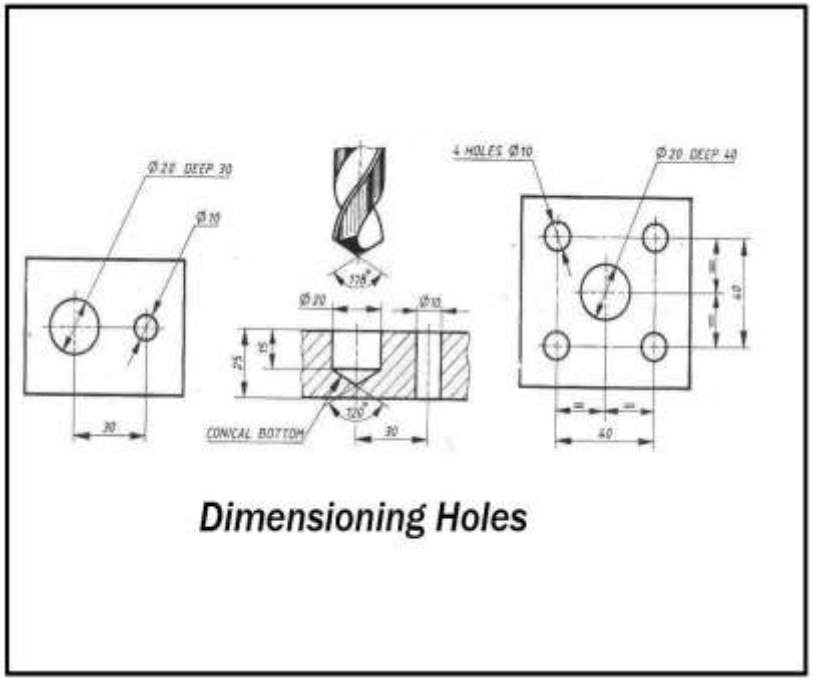
Dimensioning Symmetrical Part

Whenever the object have symmetrical details only one-half of the view may be drawn.



Dimensioning Holes

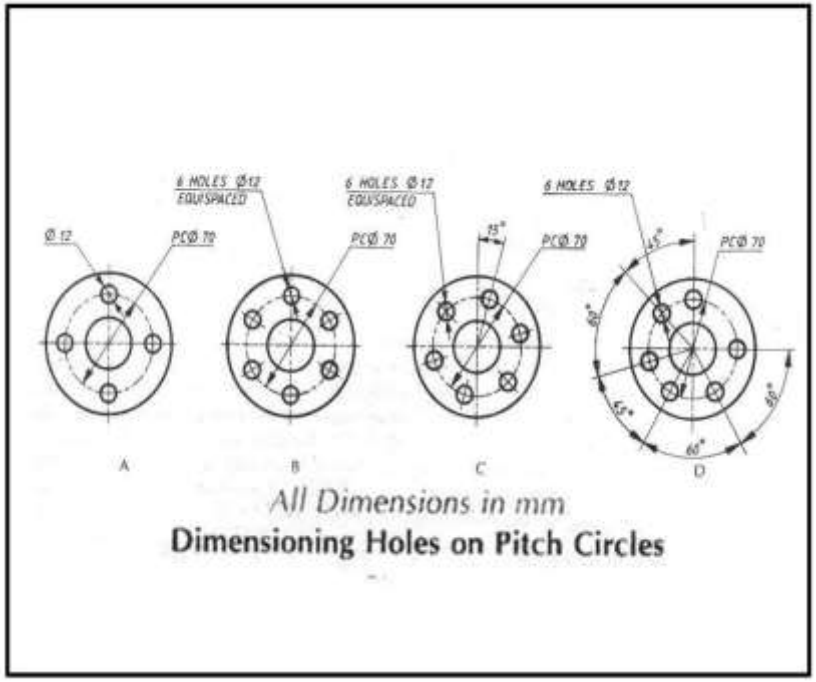
Typical methods of dimensioning of the drilled holes are shown. When a through hole is to be dimensioned on the circular view, only the diameter is indicated.



Dimensioning Holes

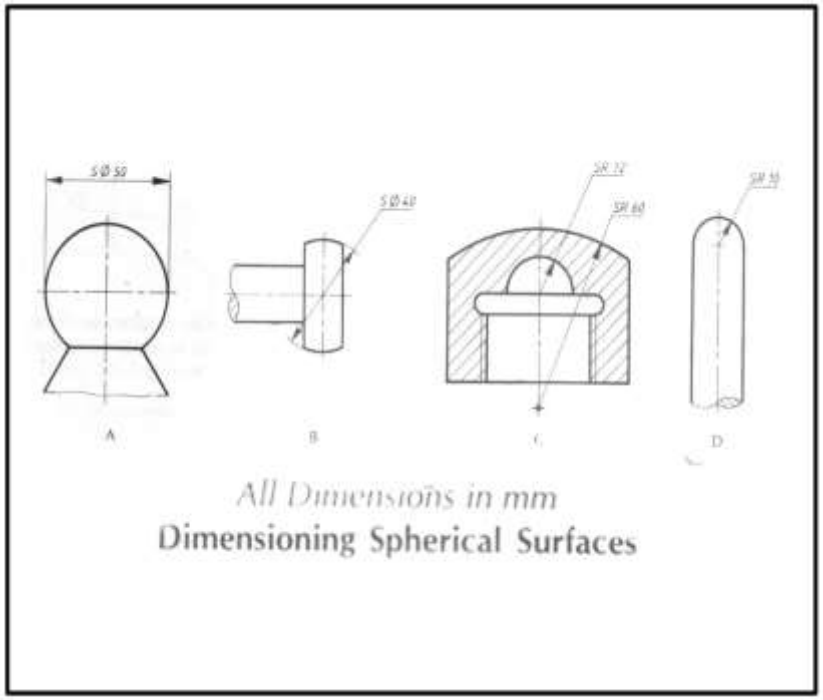
Dimensioning Holes on Pitch Circles

When a number of holes on a pitch circle are to be dimensioned, indicate the diameter of the pitch circle by the abbreviation PC Φ or PCD, the size and the number of holes as explained earlier.



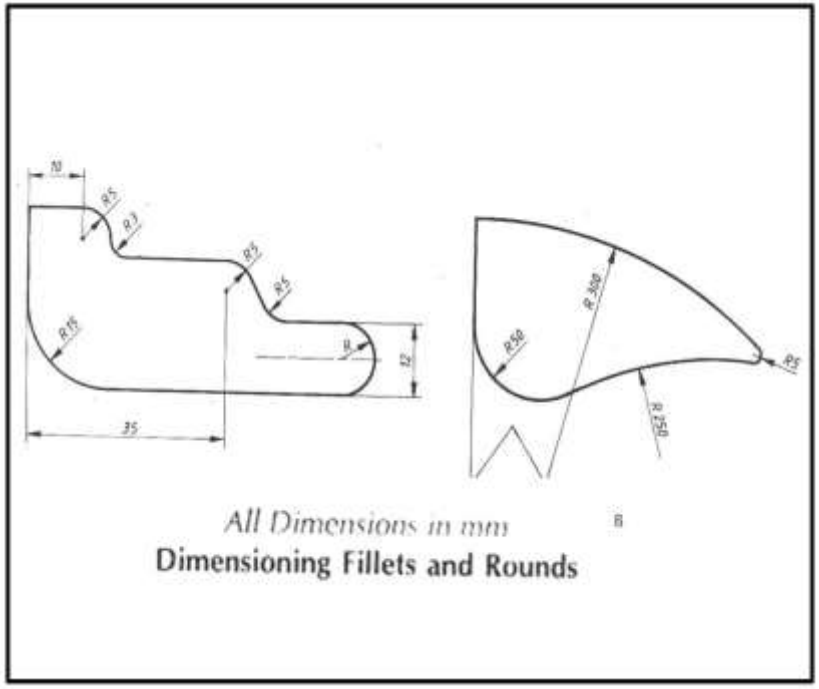
Dimensioning Spherical Object

The spherical objects are dimensioned by indicating the diameter or the radius as shown



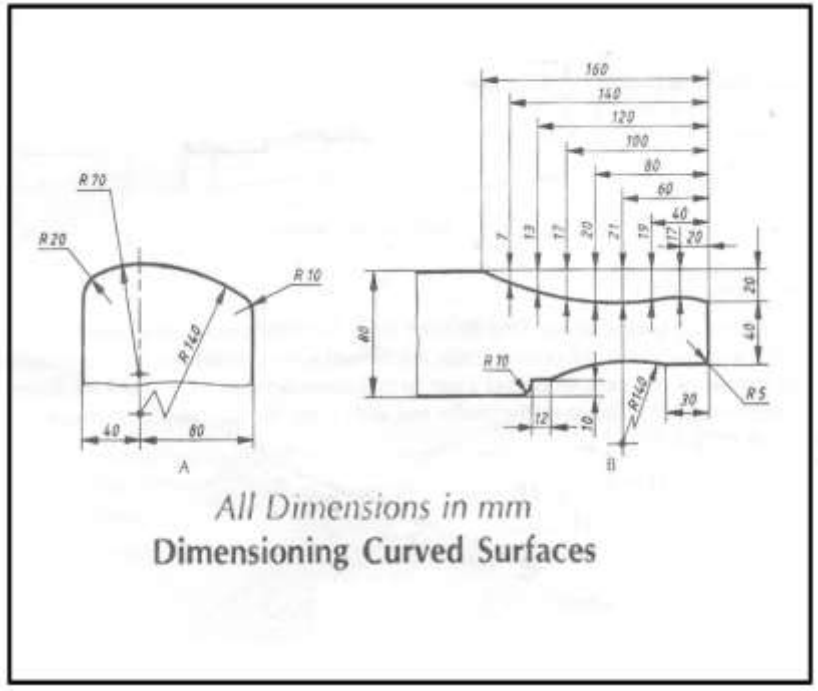
Dimensioning Radii of Fillets and Radius

- Fillet and round are shown on the drawing by arcs of circles.
- They are dimensioned by giving radius.



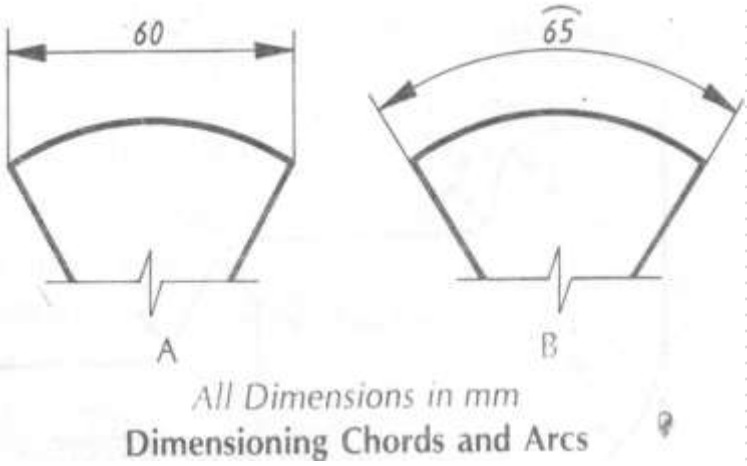
Dimensioning Curved Surfaces

If a curved surface consists of arcs of circles of different radii, hen it may be dimensioned by giving their radii as shown.



Dimensioning Chords and Arcs

A chord is their linear distance between any points on an arc and is dimensioned as shown.

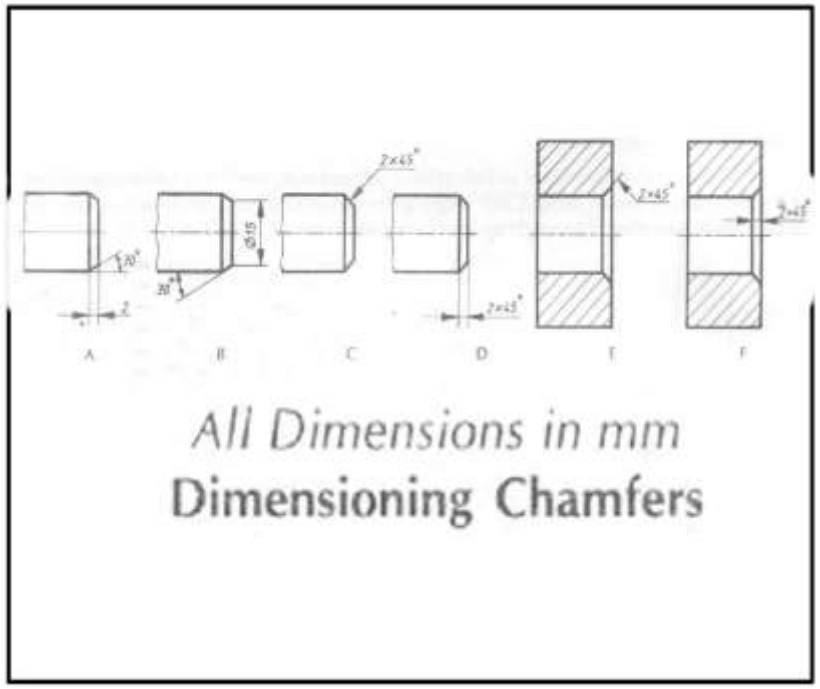


Dimensioning Angles

Angles are dimensioned in the same manner as that of linear dimensions. The dimension figure for angles are placed as shown.

Dimensioning Chamfers

The ends of bolts, shafts and the edges of the holes in nuts, bushes, etc., are provided with a beveled edge in order to facilities easy entry of the cylindrical parts into the holes.

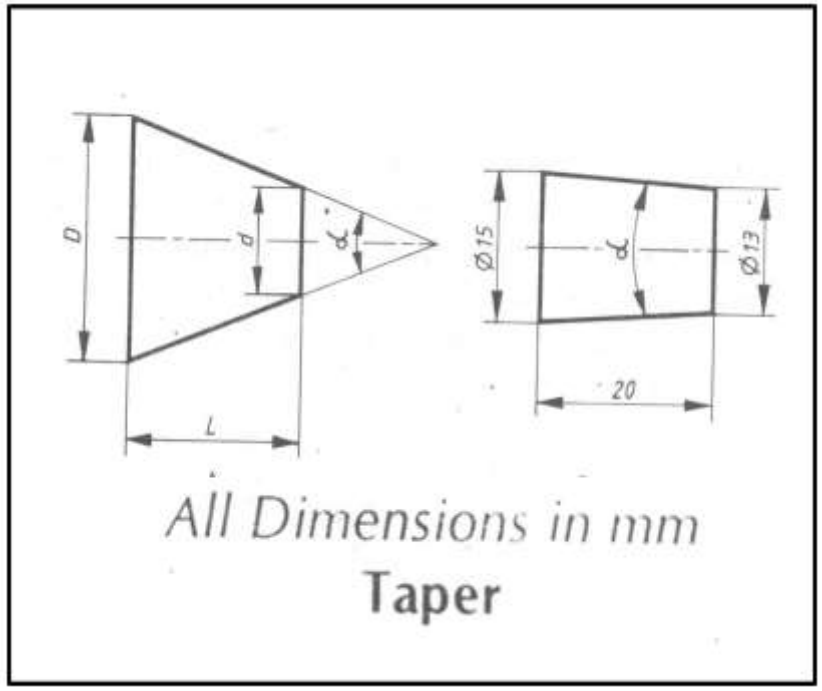


Dimensioning Tapers

A taper is a gradual and uniform decrease in the size of the cross section of a part. The cross section may be either circular or non – circular.

Taper = {(D – D) / (L) }

= {(2 tan α) / (2)}



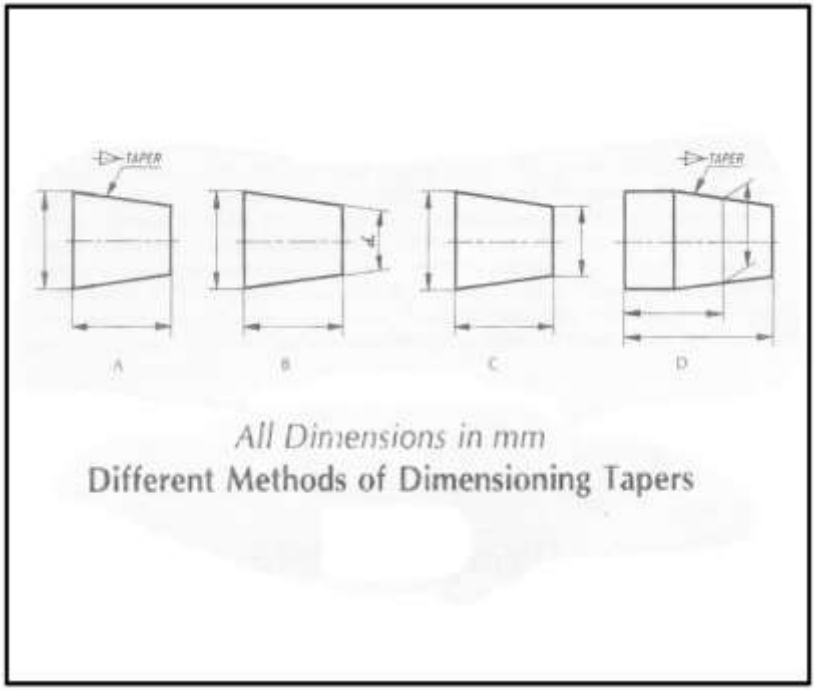
Different Methods of Dimensioning Tapers

The taper is specified by any one of the following ways:

1. Included angle α
2. Ratio – 1:10 or 0.1:1
3. Percentage – 10%

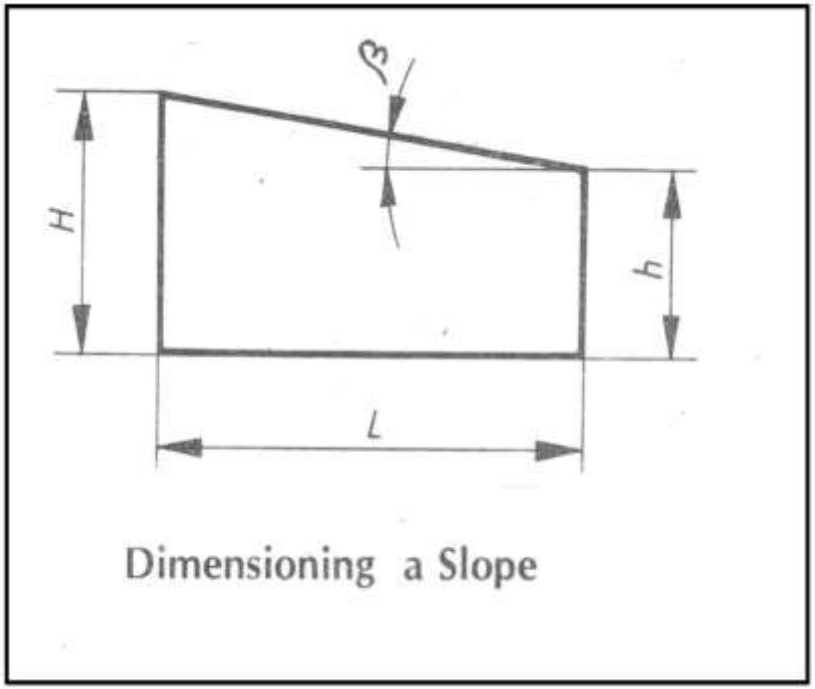
The following dimensions in suitable combinations may be used to specify the taper.

1. Taper as ratio or percentage
2. The diameter at the large end
3. The diameter at the small end
4. The diameter at a selected cross section, this cross section may be within or outside the tapered portion
5. The dimension location a cross section at which the diameter is specified
6. The length of the tapered portion



Dimensioning Slope

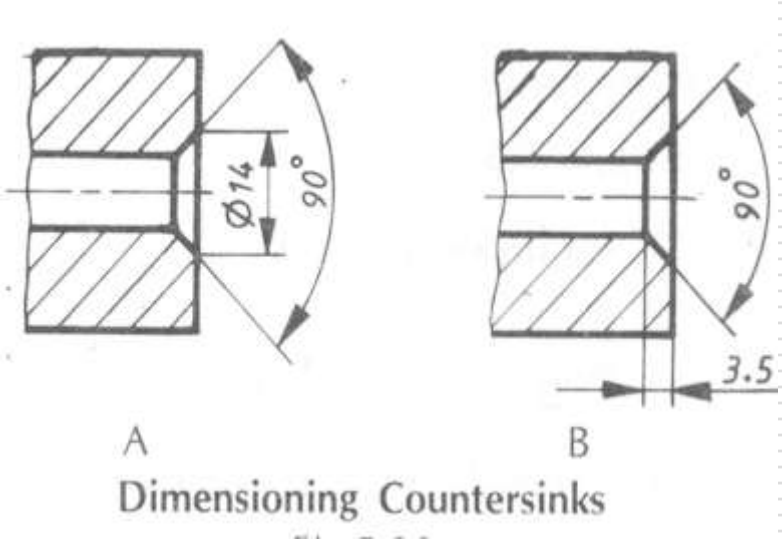
A slope is the inclination of he line representing the inclined surface of a wedge expressed as the ratio of the difference in the heights at right angles to the base line, at a specified distance apart, to that distance.



Dimensioning a Slope

Dimensioning Countersinks

A countersink is a conical hole which provides a seating for the countersink screw. The countersink are dimensioned by showing either the required diametral dimension at the surface and the included angle as shown, or the depth and the inclined angles as shown.



Dimensioning Countersinks