UNIT – 2

Dimensioning and Scale

Dimensioning is the process of specifying part's information by using of figures, symbols and notes

- **This information are such as:**

- Sizes and locations of features
- Material's type
- Number required
- Kind of surface finish
- Manufacturing process
- Size and geometric tolerances

Types of Dimensioning:

- **Size or Functional Dimensions (S):** It indicates sizes. e.g. length, breadth, height, diameter, etc.
- **Location or Datum Dimensions (L):** It shows location or exact position of various constructional details within the object like holes, cuts etc.

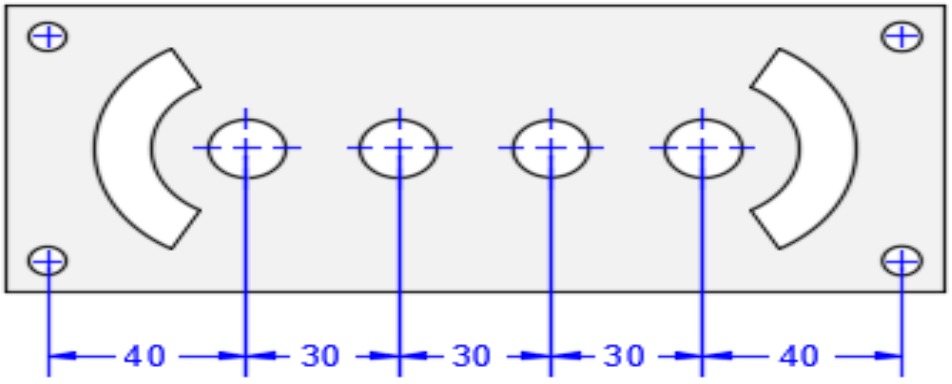
Importance of Dimensioning

- Dimensioning rules is very important for drawing standards.
- Proper dimensioning will help to manufacturers, engineers etc. to get better understanding of the designed parts.
- Will help in quality check.
- Essential for production.

Types of Dimensioning

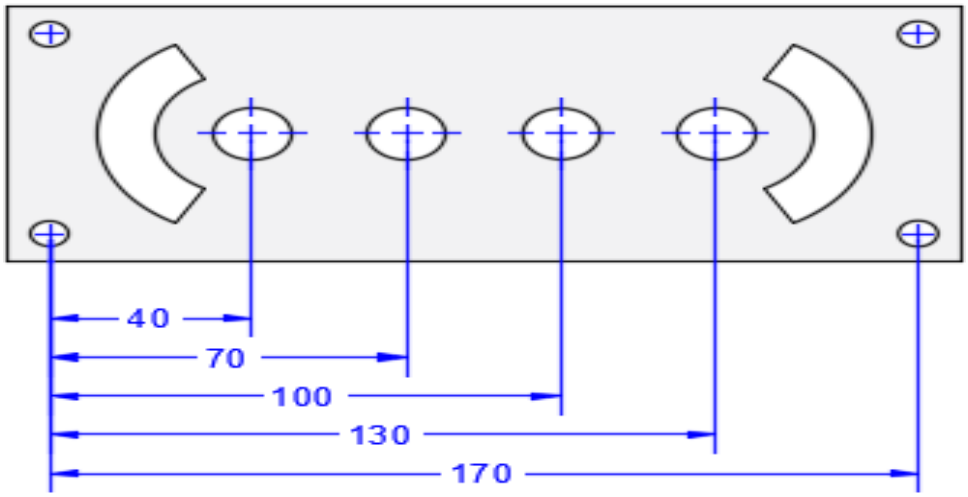
➢ Chain Dimensioning:

Dimensions are arranged in a straight line.



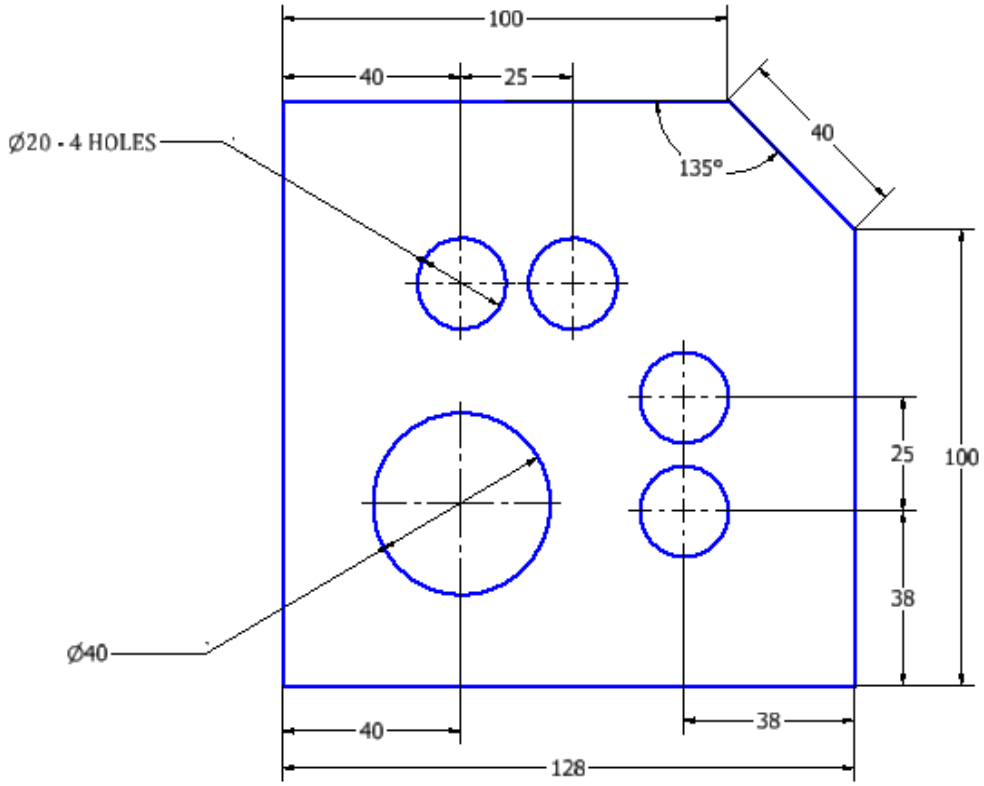
➢ Parallel Dimensioning:

- All the dimensions are shown from a common base line.
- The smaller dimension is placed nearer the view.



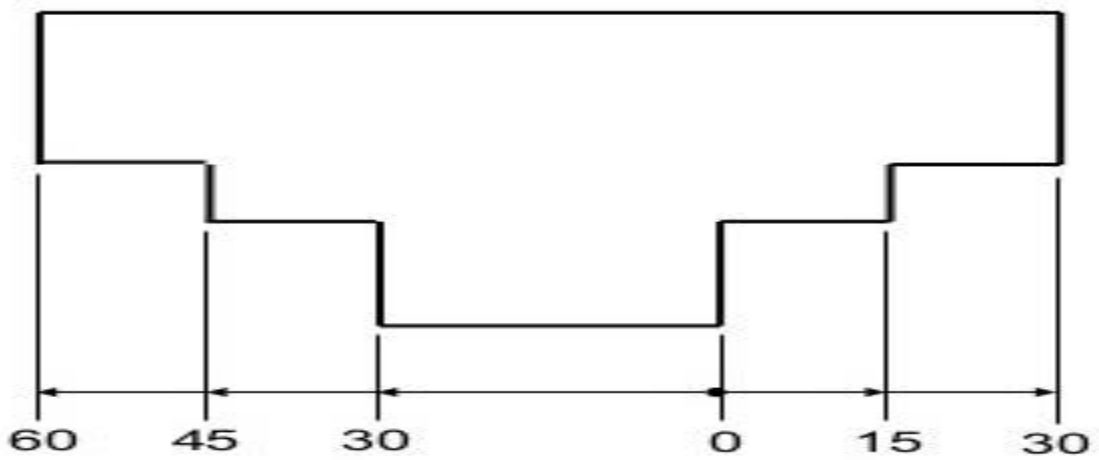
➢ Combined Dimensioning:

- Chain and parallel dimensioning used simultaneously.



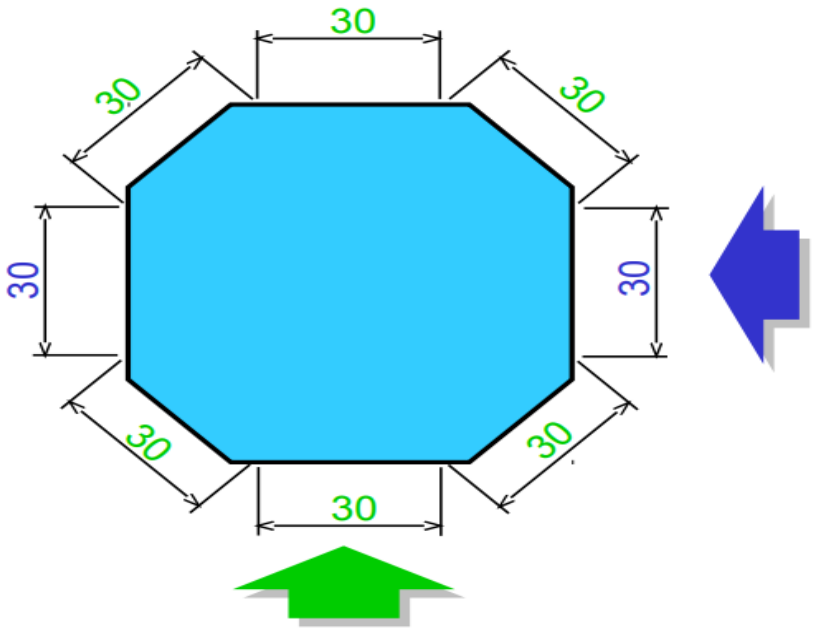
➢ Progressive Dimensioning:

- One datum or surface is selected which reads as zero. All the dimensions are referred to that point or surface.



➢ Methods of placing dimensioning

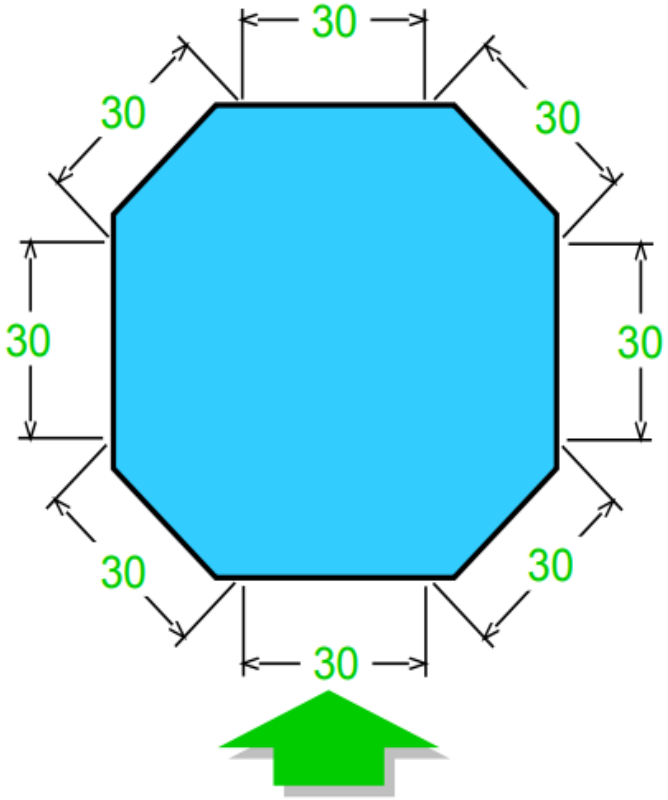
- **Aligned method**
  - Dimensions are being aligned with the dimensions being measured.
  - They are placed perpendicular to dimension line such that they may be readable from the bottom and right side of the drawing.
  - Dimensions are placed in the middle and top of the dimension line.



➢ Unidirectional method

- The dimension figures are placed so that they can be read from the bottom of the drawing.
- Dimensions are placed by breaking the line in the middle.

- **Do not use both system on the same drawing or on the same series of drawing .**

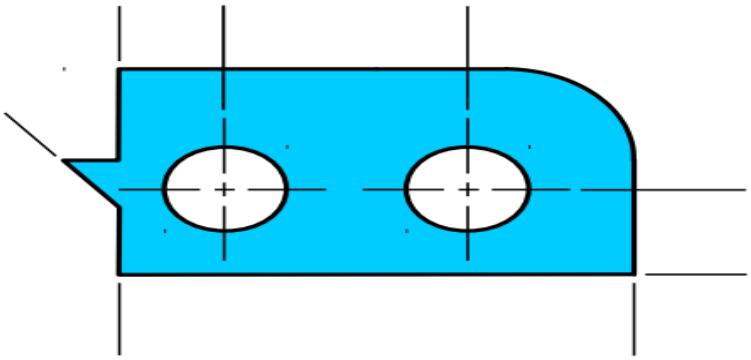


Principles of dimensioning and practice dimensioning technique as BIS: SP: 46-2003

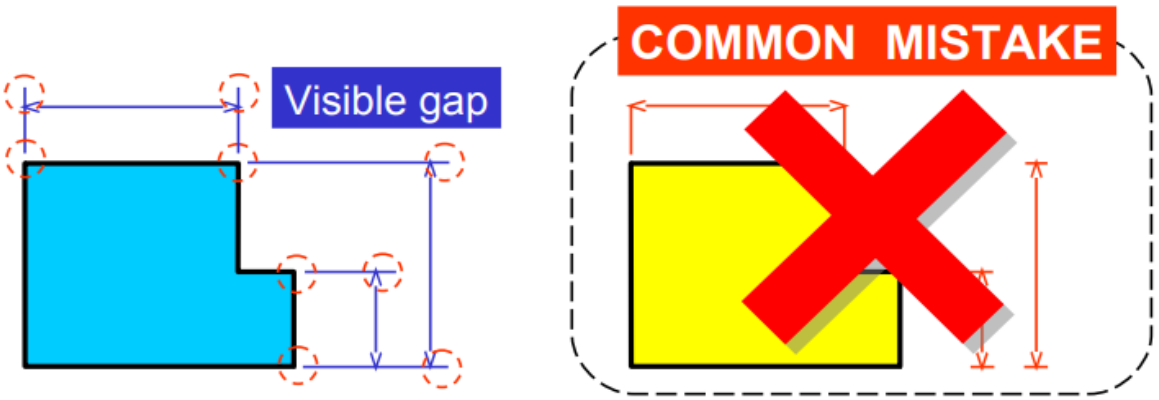
- The most important element to good placement is consistent spacing. This translates to easy readability and fewer mistakes. Some other placement techniques are:
- All dimension, extension, and leader lines should be thin, sharp, dark lines.

EXTENSION LINES

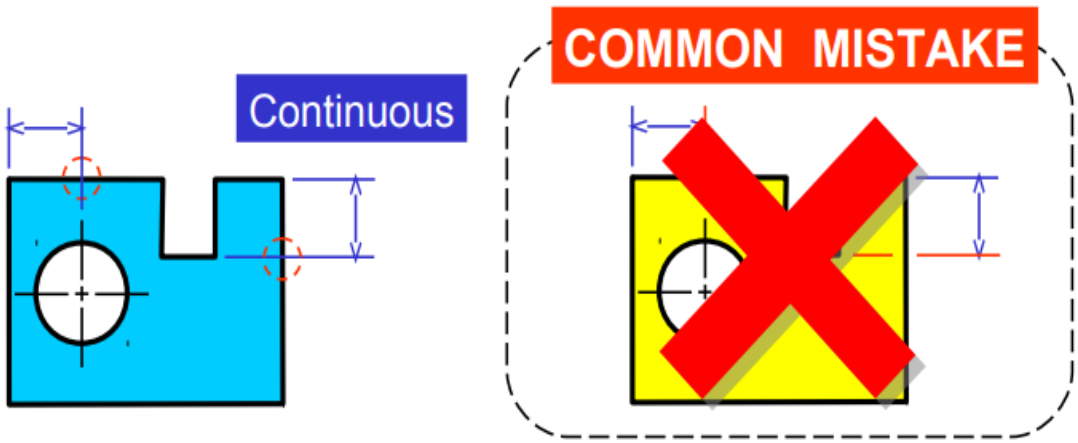
- Indicate the points between which the dimension figures apply.
- Leave a visible gap (≈ o.5 mm) from a view and start drawing an extension line.
- Extend the lines beyond the (last) dimension line 1-2 mm.
- Do not break the lines as they cross object lines.
  The practices have been shown in the figures



Extension lines



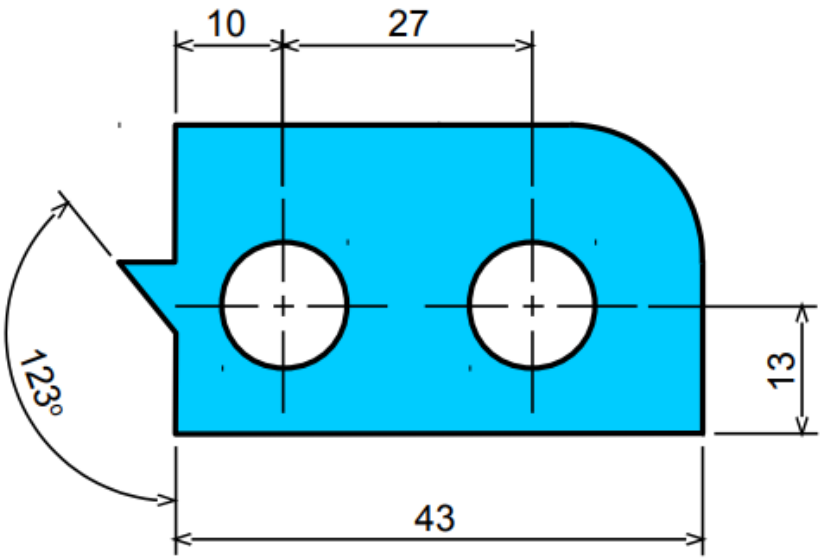
Visible gap from body line



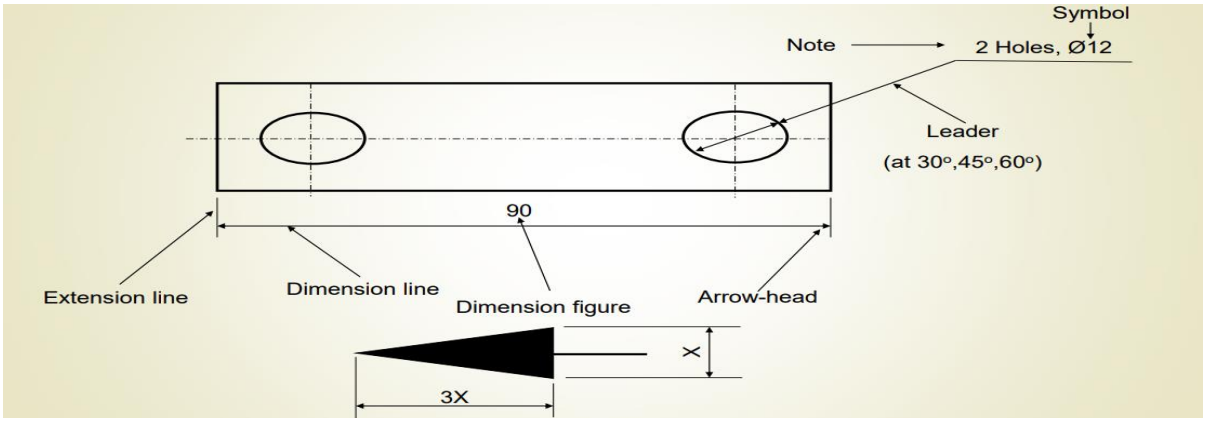
Continuous Extension Lines.

DIMENSION LINES

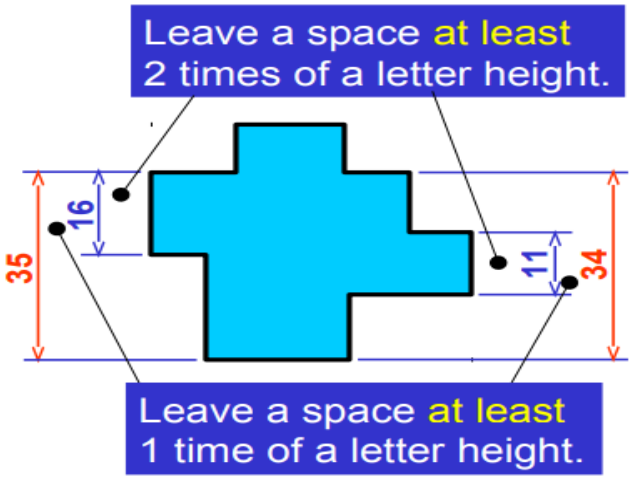
- Indicate the direction and extent of a dimension, and inscribe dimension figures.



- **Each** dimension should be terminated by arrowheads touching the extension lines and pointing in opposite directions.

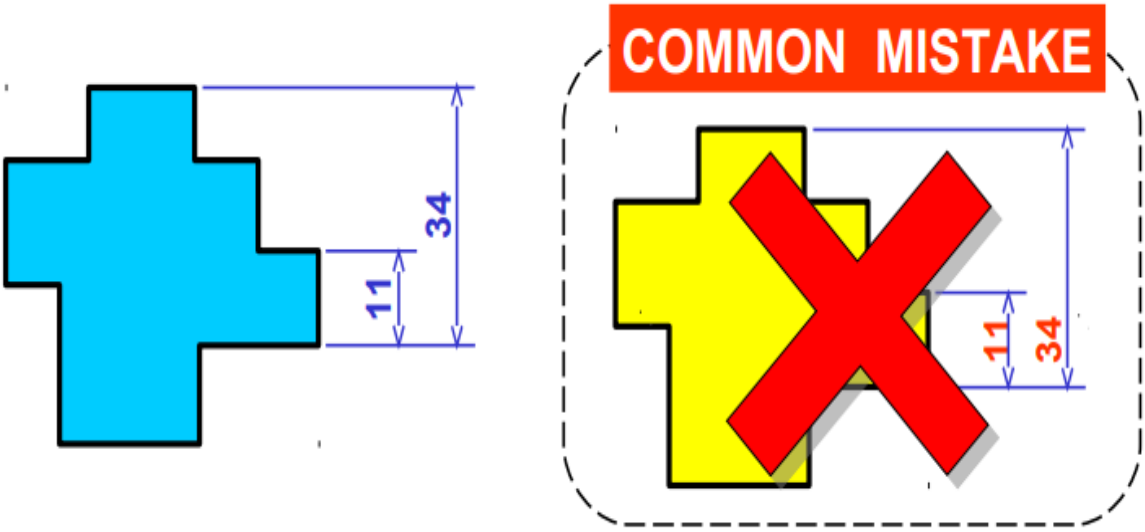


- Dimension lines should not be spaced too close to each other and to the view.

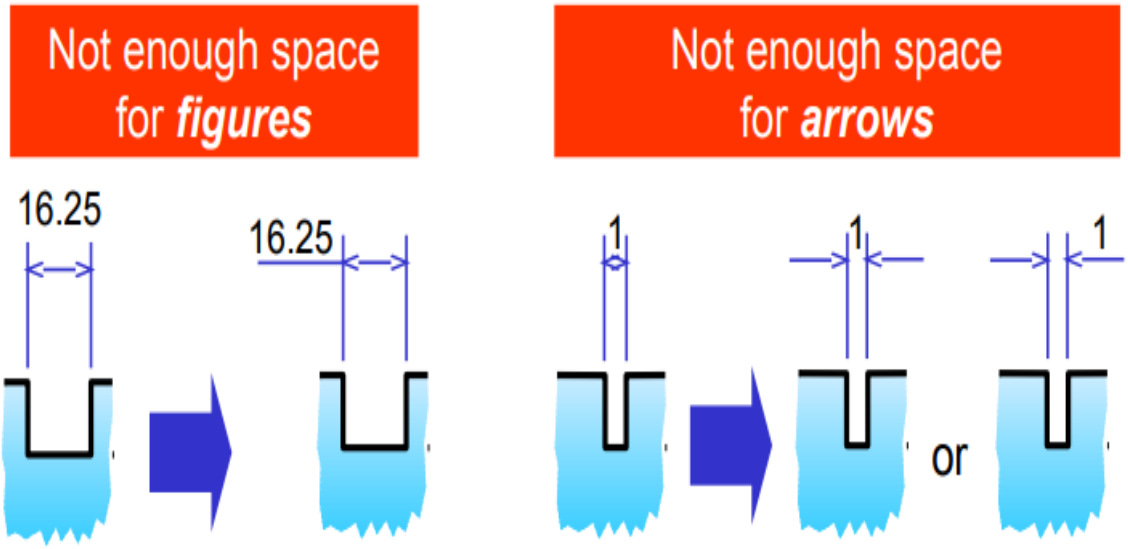


DIMENSION FIGURES

- The height of figures is suggested to be 2.5~3 mm.
- Place the numbers at about 1 mm above dimension line and between extension lines



- When there is not enough space for figure or arrows put it outside either of the extension lines.

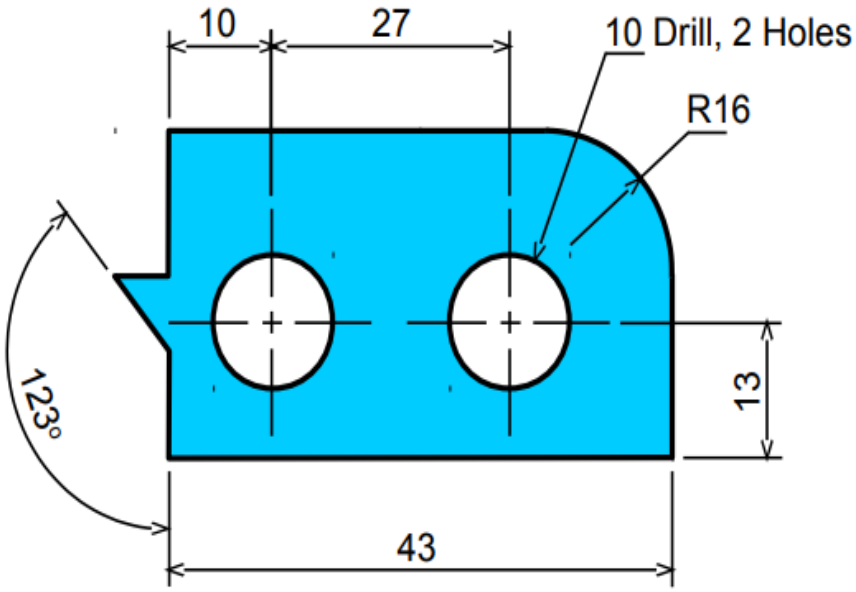


- All dimensions should be given in decimal format.

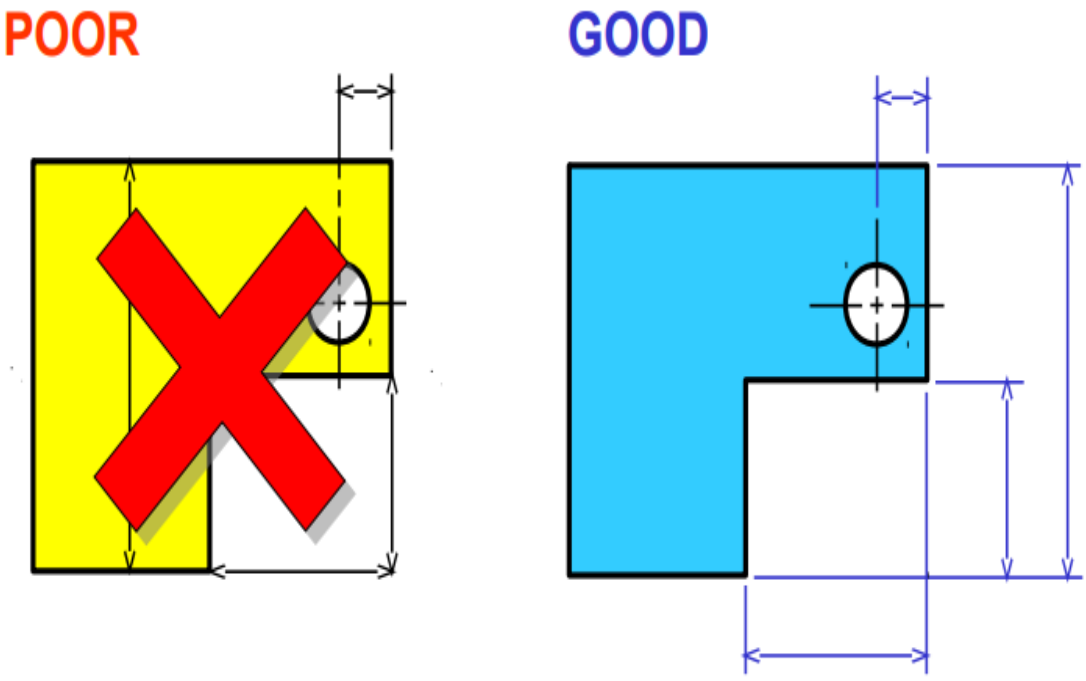
- When all dimensions on a drawing are given in inches, the inch marks (") are omitted, the same applies to millimetres. If metric units are used, the word METRIC will appear boxed in a spot toward the lower portion of the drawing sheet.

LEADER LINES

- Indicate details of the feature with a local note.

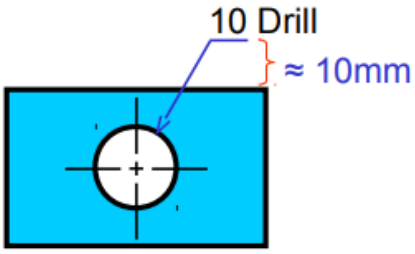


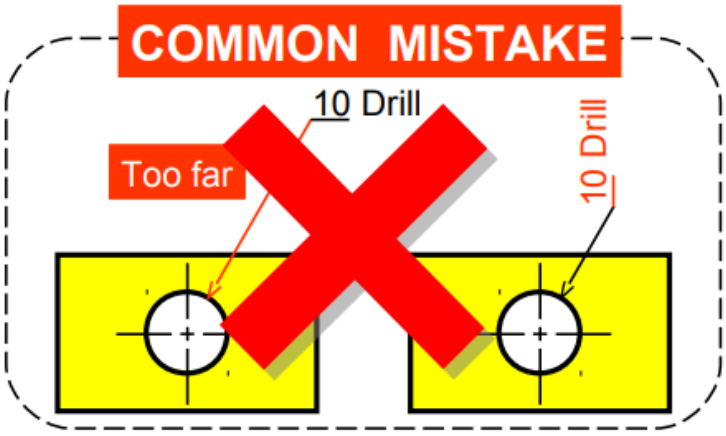
- A dimension line should never coincide with an object line or a centre line, nor should it be an extension of these lines.



LOCAL NOTES

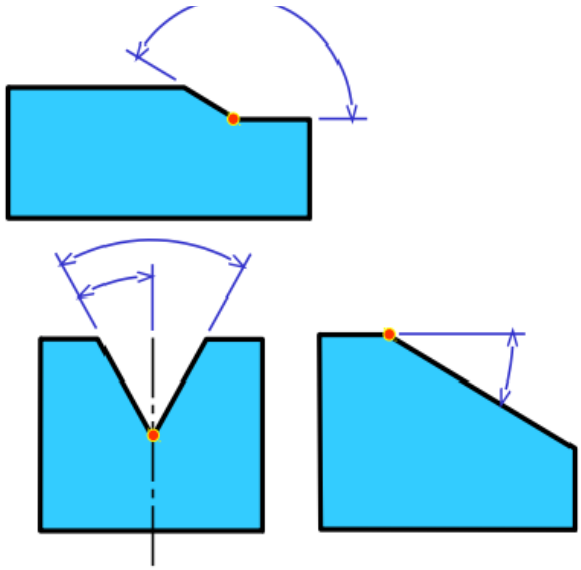
- Place the notes near to the feature which they apply, and should be placed outside the view.
- Always read horizontally.





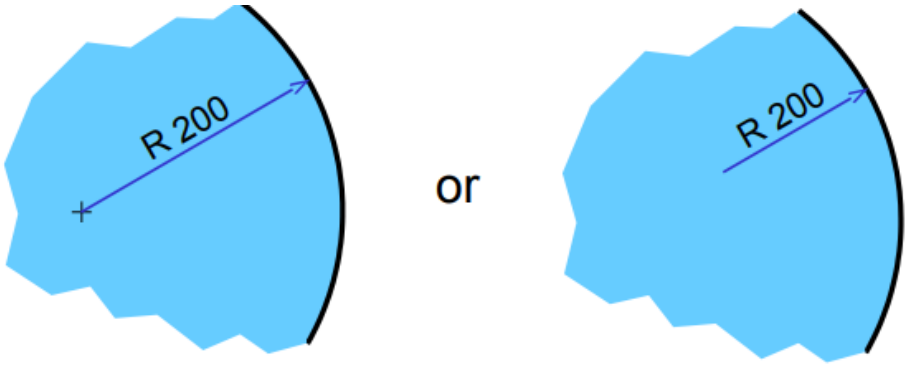
ANGLE

- To dimension an angle use circular dimension line having the centre at the vertex of the angle.

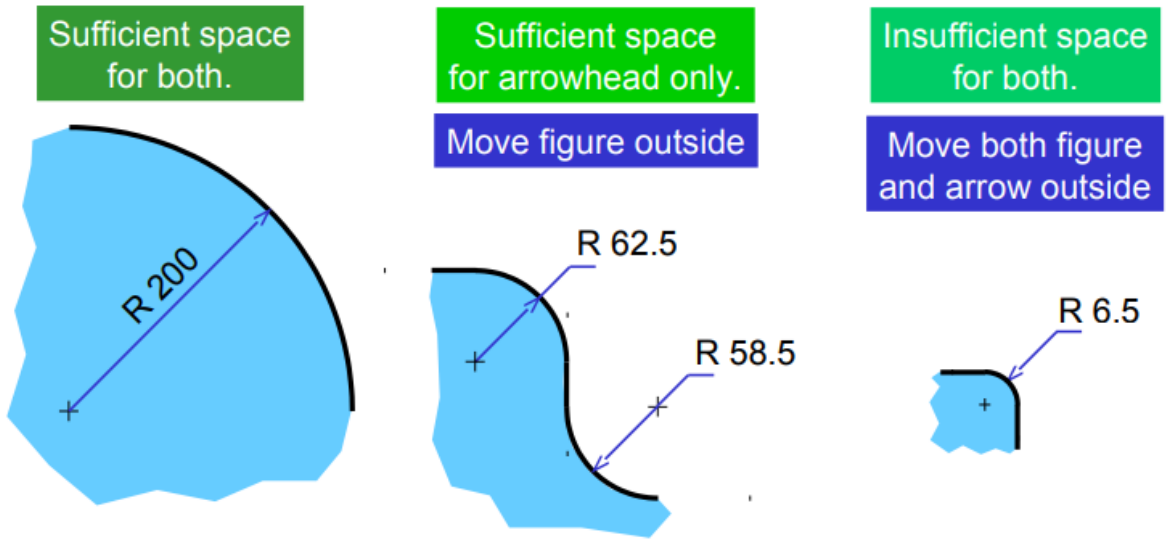


ARC

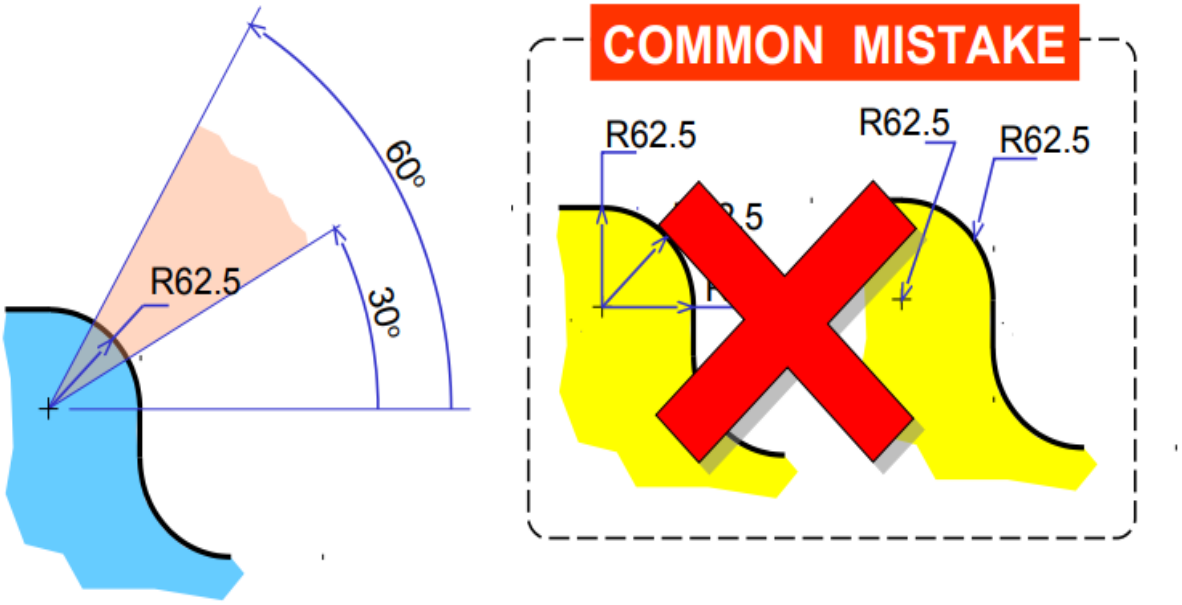
- Arcs are dimensioned by giving the radius, in the views in which their true shapes appear.
- The letter "R" is always lettered before the figures to emphasize that this dimension is radius of an arc.



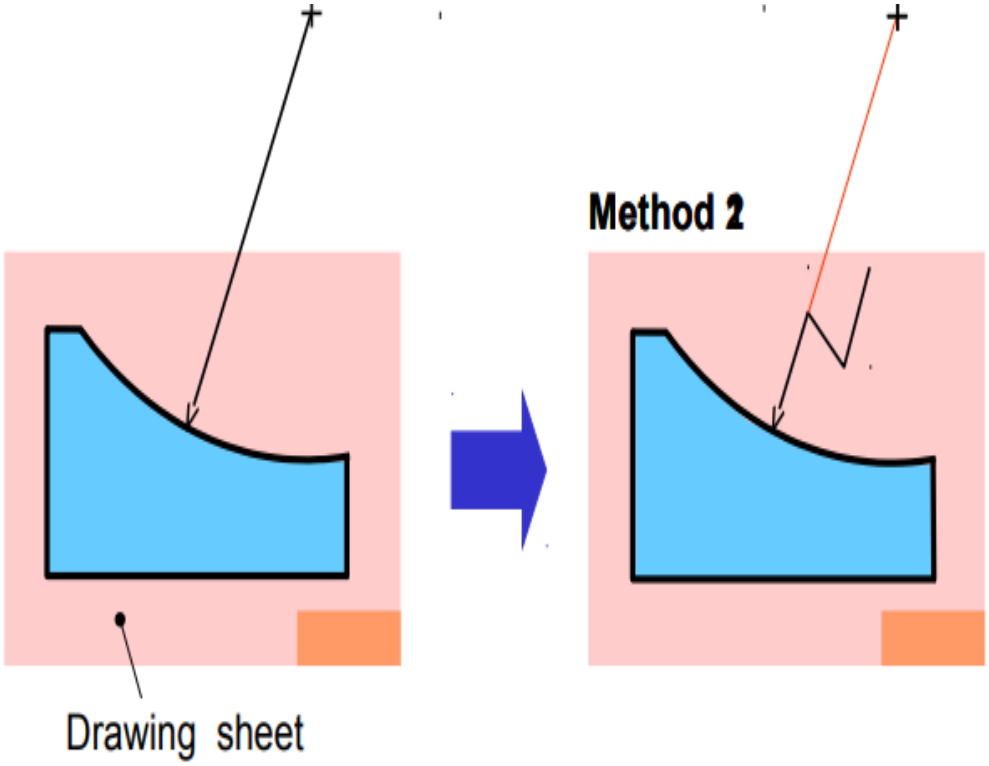
- The dimension figure and the arrowhead should be inside the arc, where there is sufficient space.



- Leader line must be radial and inclined with an angle between 30 ~ 60 degs to the horizontal.

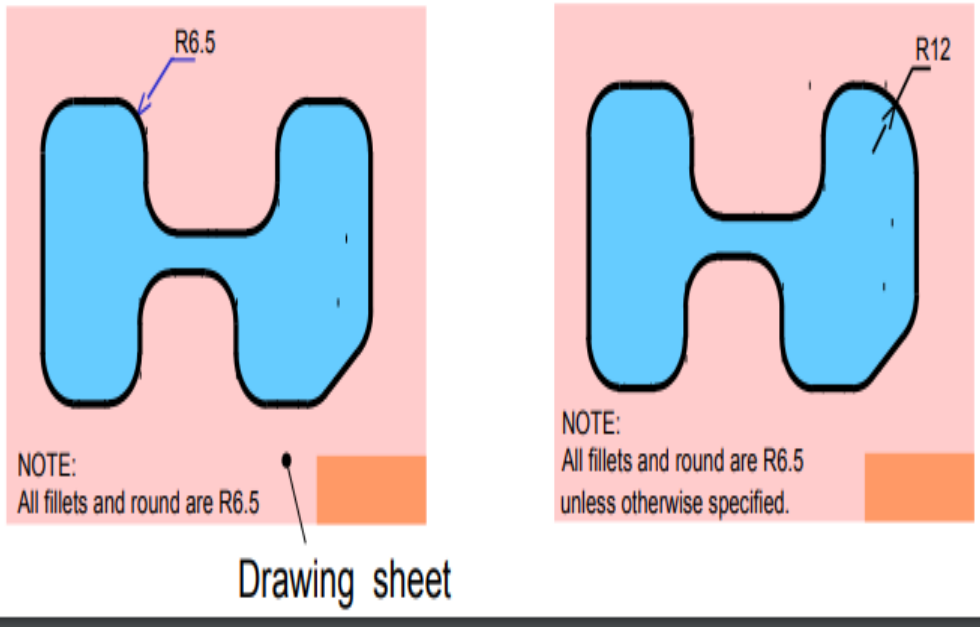


- Use the foreshortened radial dimension line, when arc' s center locates outside the sheet or interfere with other views.



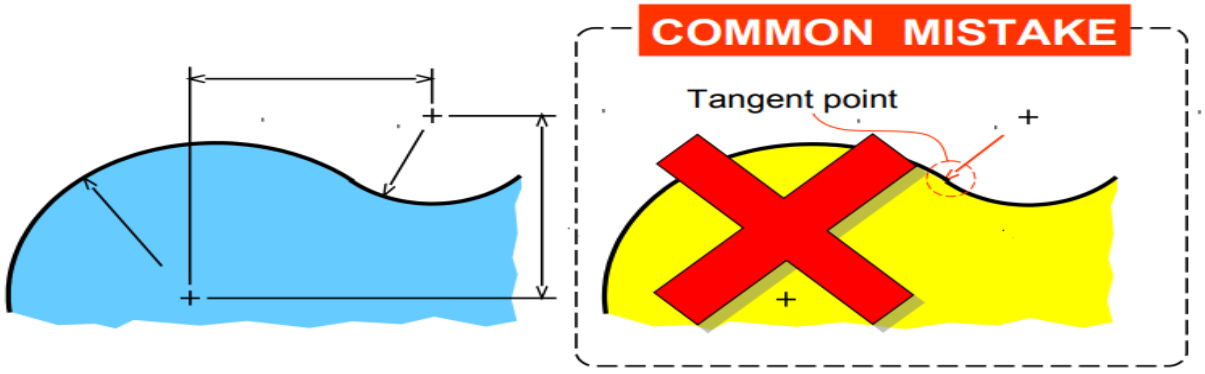
FILLETS AND ROUNDS

- Give the radius of a typical fillet only by using a local note.
- If all fillets and rounds are uniform in size, dimension may be omitted, but it is necessary to add the note " All fillets and round are Rxx.



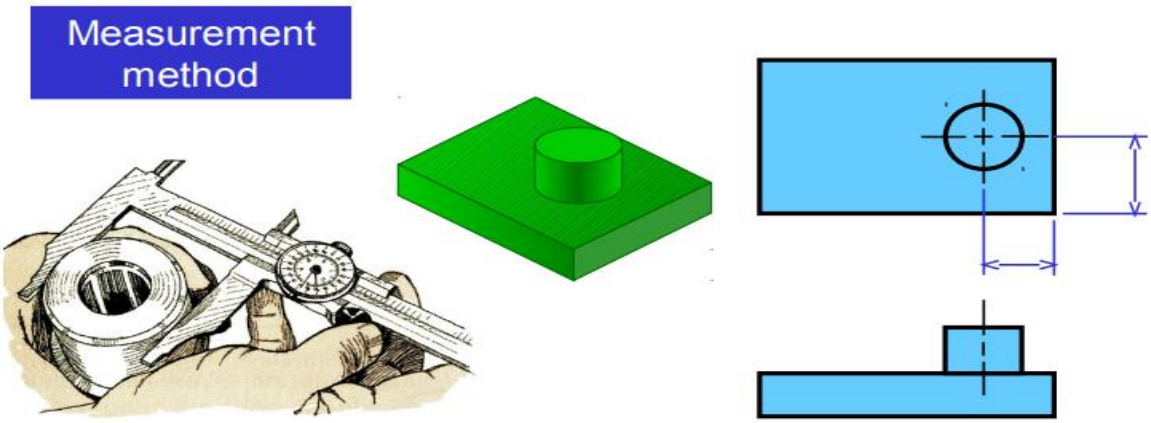
CURVE

- The curve constructed from two or more arcs, requires the dimensions of radii and center's location.

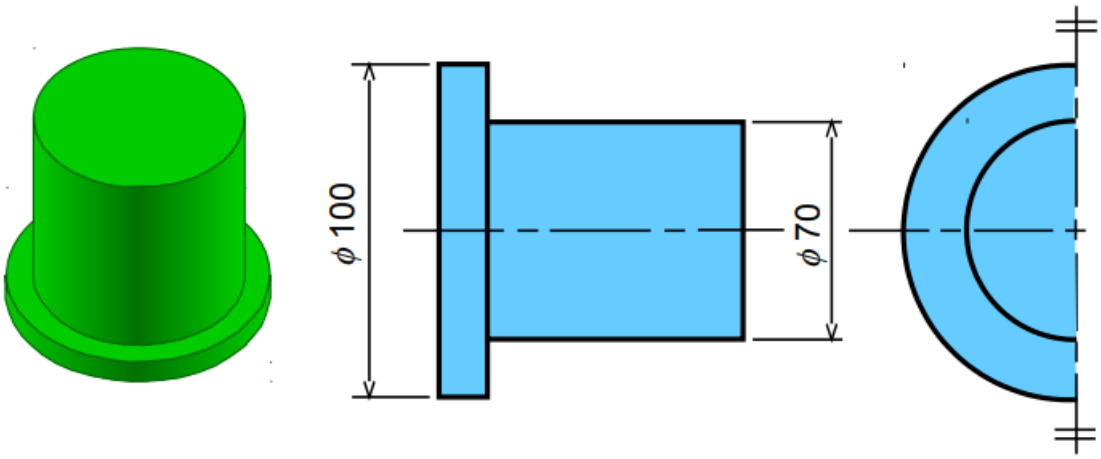


CYLINDER

- Size dimensions are diameter and length.
- Location dimension must be located from its center lines and should be given in circular view.

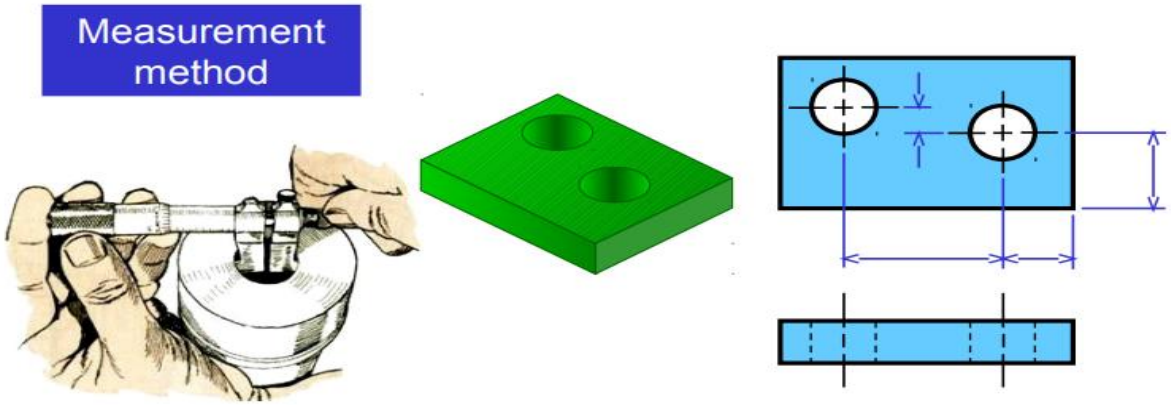


- Diameter should be given in a longitudinal view with the symbol "φ " placed before the figures.

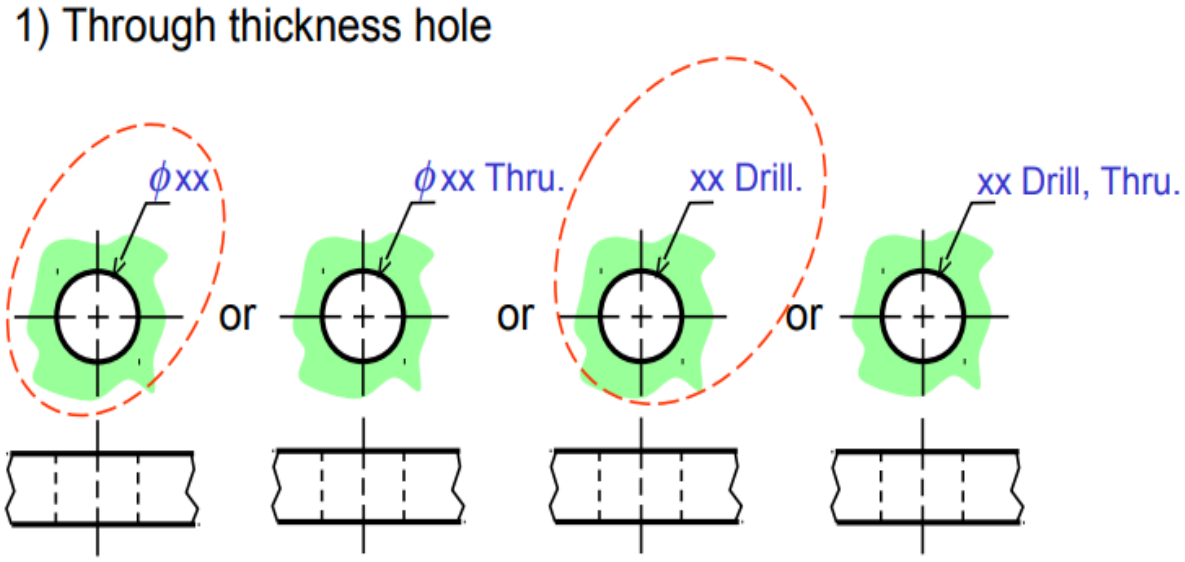


HOLES

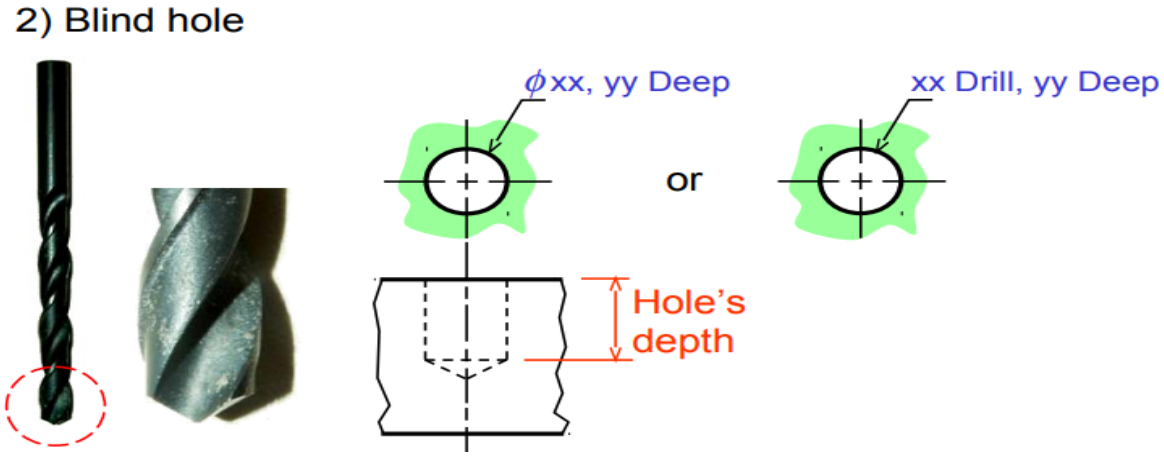
- Size dimensions are diameter and depth.
- Location dimension must be located from its center lines and should be given in circular view.



- Use leader line and local note to specify diameter and hole's depth in the circular view.

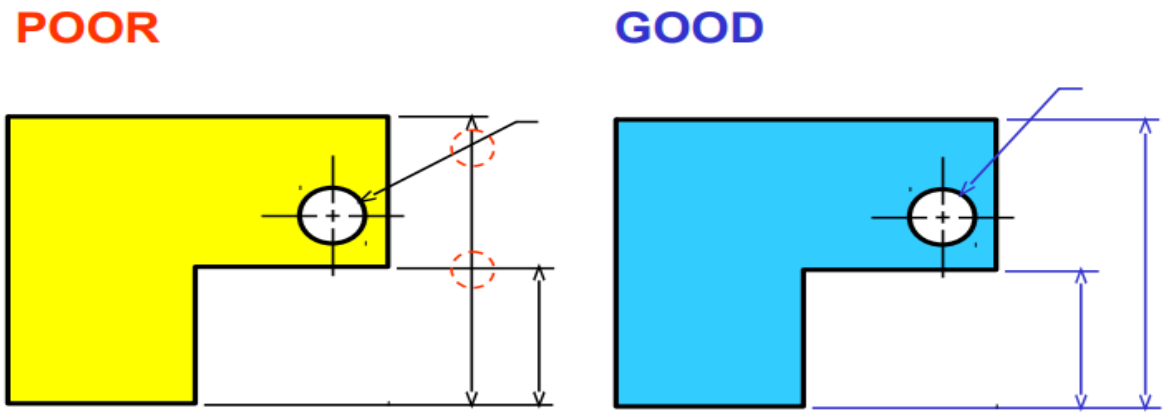


- Use leader line and local note to specify diameter and hole's depth in the circular view.

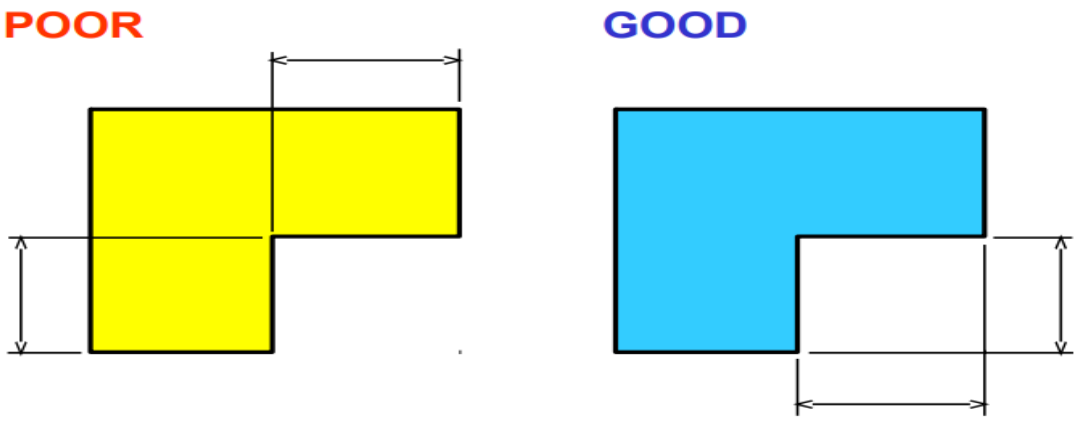


Placement of Dimensions

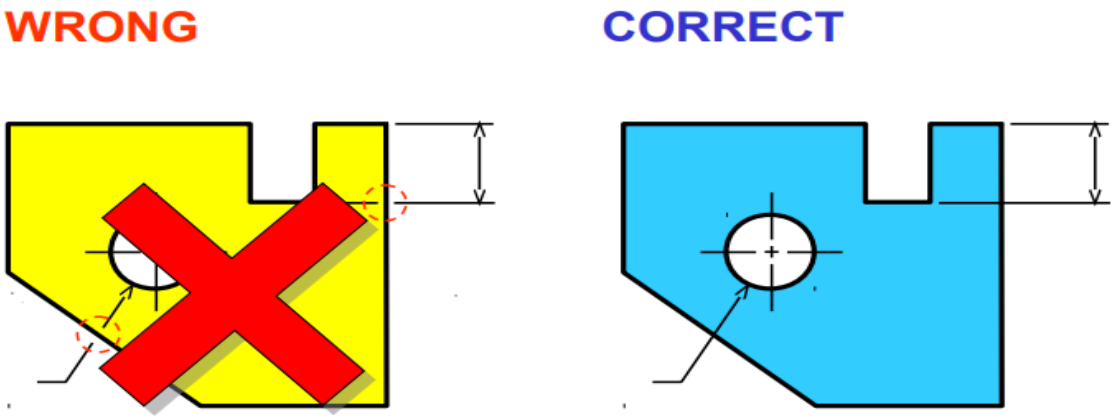
- Provide a minimum of 10 mm from the object outline to the first dimension line
- Provide a minimum of 6 mm between dimension lines
- Place shorter dimensions inside longer dimensions
- Avoid crossing dimension lines with extension lines or other dimension lines.



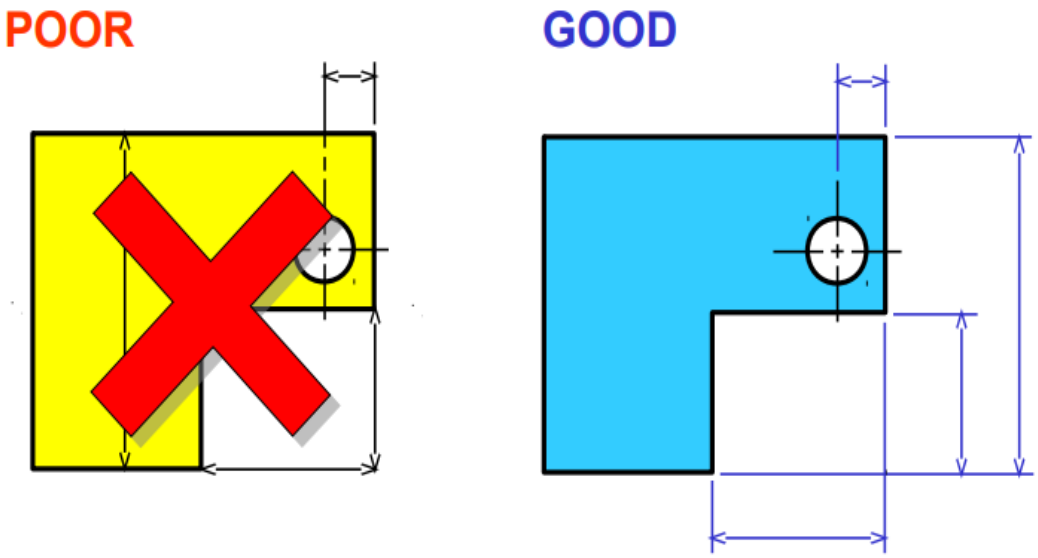
- Extension lines should be drawn from the nearest points to be dimensioned.



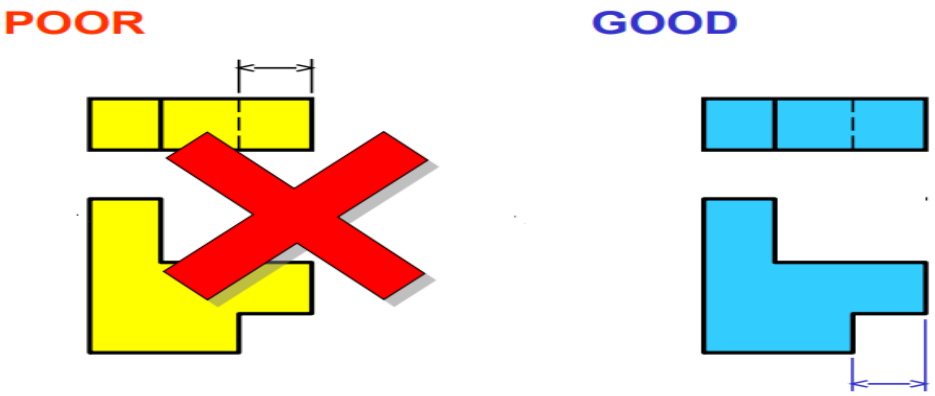
- Extension lines of internal feature can cross visible lines without leaving a gap at the intersection point.



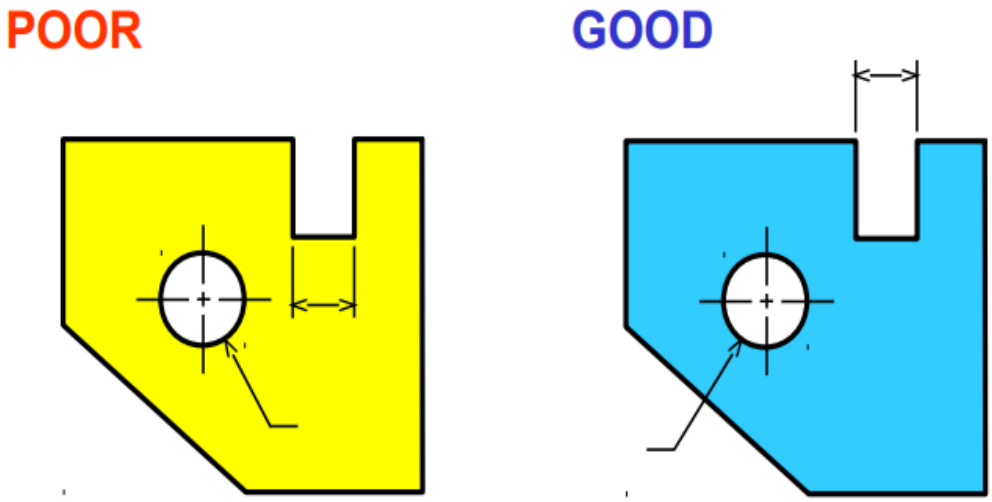
- Do not use object line, center line, and dimension line as an extension lines.



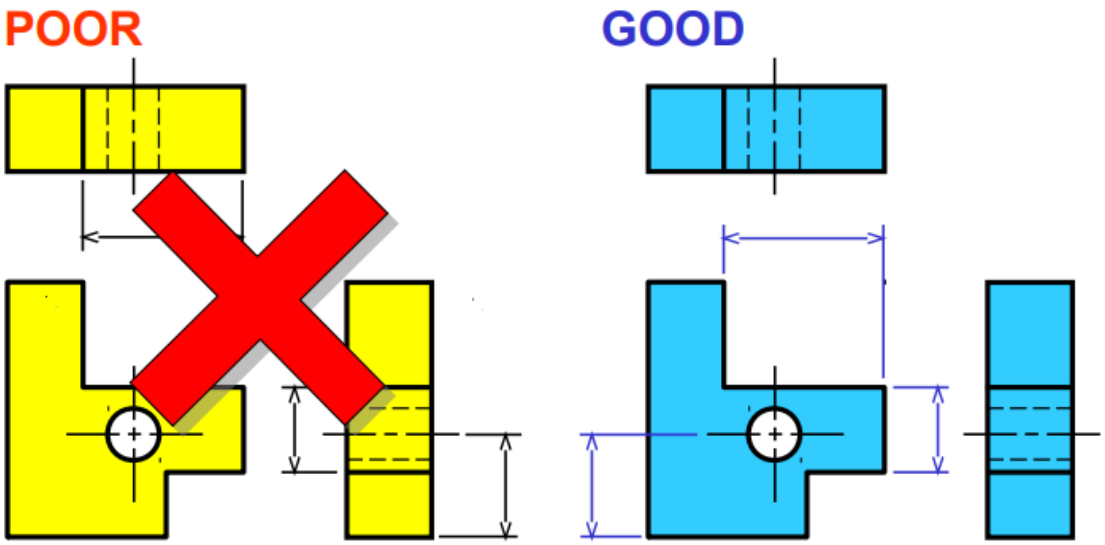
- Avoid dimensioning hidden lines



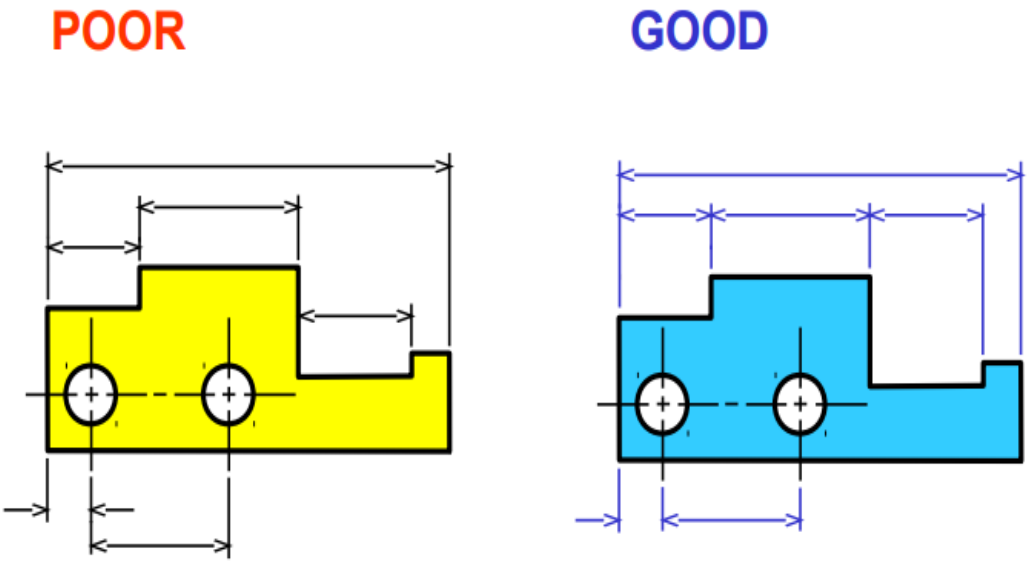
- Place dimensions outside the view, unless placing them inside improve the clarity.



- Apply the dimension to the view that clearly show the shape or features of an object.



- Dimension lines should be lined up and grouped together as much as possible.



- Do not repeat a dimension.
- Dimension the size and location of size features in the same view
- Dimensions are preferably placed outside the outlines of the views.

Scale

- A scale is defined as the ratio of the linear dimensions of the object as represented in a drawing to the actual dimensions of the same.
- Drawings drawn with the same size as the objects are called full sized drawing.

- It is not convenient, always, to draw drawings of the object to its actual size. e.g. Buildings, Heavy machines, Bridges, Watches, Electronic devices etc. Hence scales are used to prepare drawing at
- Full size
- Reduced size
- Enlarged size

BIS Recommended Scales

Reducing scales 1:Y (Y>1)	1:2 1:20 1:200 1:2000	1:5 1:50 1:500 1:5000	1:10 1:100 1:1000 1:10000
Enlarging scales X:1 (X>1)	50:1 5:1	20:1 2:1	10:1
Full size scales			1:1

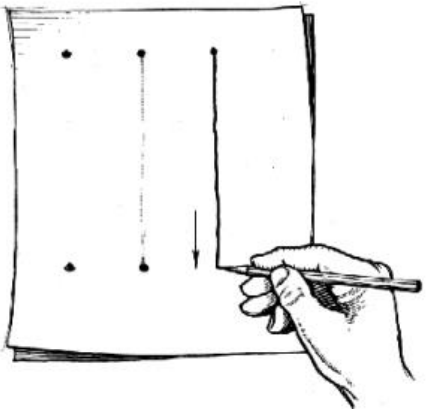
Free hand sketching of straight lines, circle, square, Polygons

Straight Line

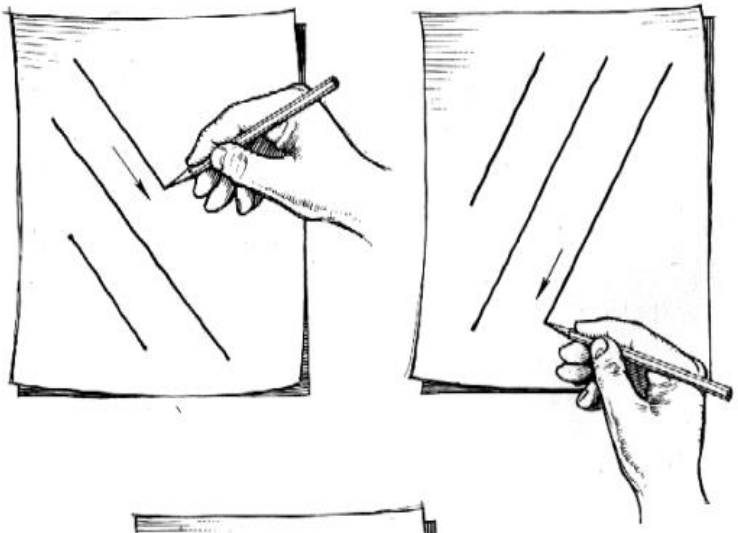
1. Hold the pencil naturally.
2. Spot the beginning and end points.
3. Swing the pencil back and forth between the points, barely touching the paper until the direction is clearly established.
4. Draw the line firmly with a free and easy wrist-and-arm motion.

Horizontal line

Vertical line



Nearly vertical inclined line

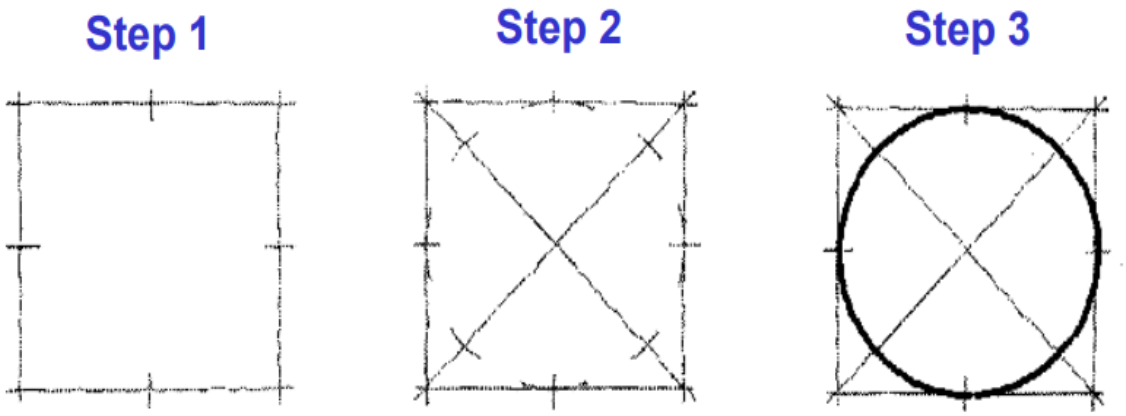


Nearly horizontal inclined line

Small Circle

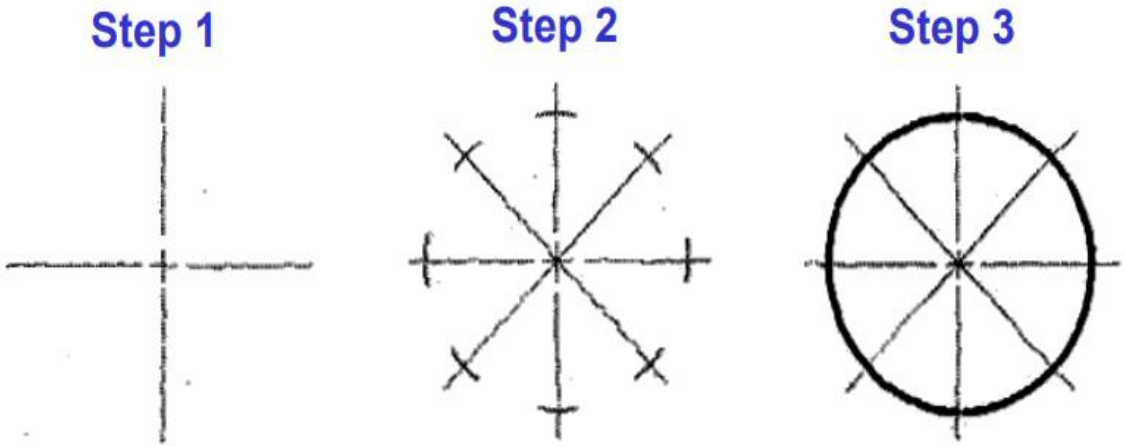
Method 1 : Starting with a square

1. Lightly sketching the square and marking the mid-points.
2. Draw light diagonals and mark the estimated radius.
3. Draw the circle through the eight points.



Method 2 : Starting with centre line

1. Lightly draw a centre line.
2. Add light radial lines and mark the estimated radius.
3. Sketch the full circle.

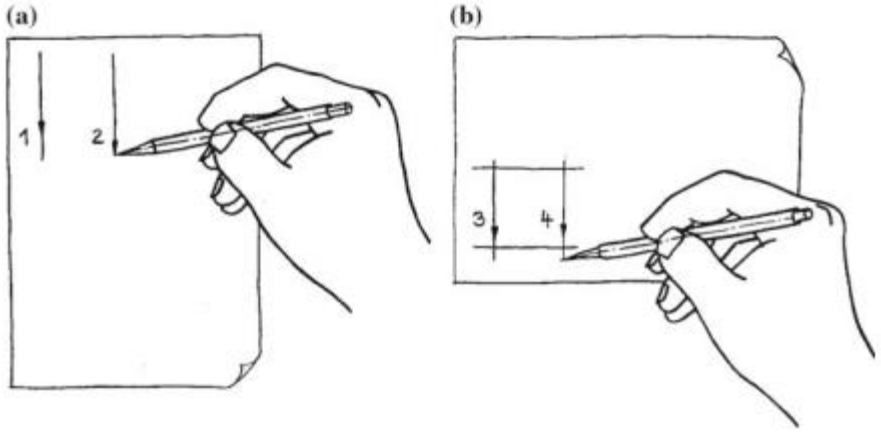


Free hand sketching Rectangle, Square, Polygons

- A rectangle (or a square) is a common shape in technical drawing.
- For sketching purposes, different techniques and rectangle sizes are used.
- They can be: large (exceeding 50 mm), medium (20–50 mm) or small (up to 20 mm).
- With large rectangles, a technique similar to drawing long straight lines is used, combined with paper rotation.
- Drawing large rectangles is demanding (body control, paper rotation).
- Medium-sized rectangles (between 20 and 50 mm) are a very common feature of technical drawing They are not as difficult to sketch (body control, paper rotation) as large rectangles. The rotation of the paper can be limited. In the case of changing the

sketching procedures or the drawing direction, the drawing technique should also be changed occasionally.

- Small rectangles (under 20 mm) are drawn without rotating the paper and the hand. Only the thumb and index finger move. During the drawing, the hand should rest still on the paper. The described thumb and index finger motion allows the drawing of lines of up to 20 mm in length (exceptionally up to 35 mm).
- Everything said so far about drawing rectangles also applies to squares, as their angles are the same and the procedure is identical.
- Geometric shapes without right angles, such as a triangle, a pentagon, a hexagon or any other multi-angle shape, are freehand sketched.



Order of drawing a medium-sized rectangle—with hand position Drawing medium size rectangles or square: parallel line no. 1 and 2 (**a**), perpendicular line no. 3 and 4 (**b**)

Drawing small rectangles and other shapes with a fixed fist (only the thumb and index finger move)

Drawing small rectangles or square: thumb and defined the line direction into the hand (**a**), direction into the hand (**b**)