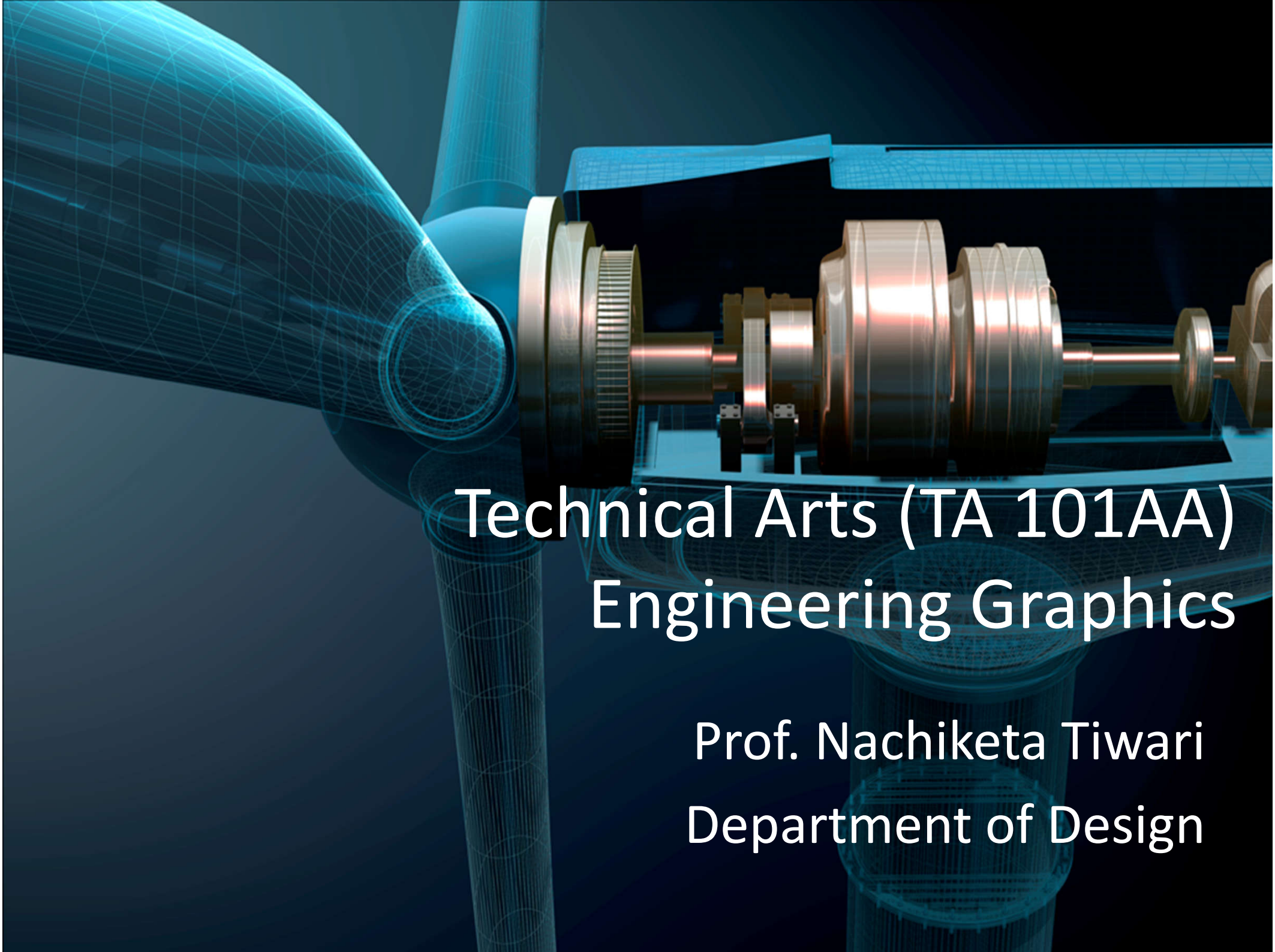
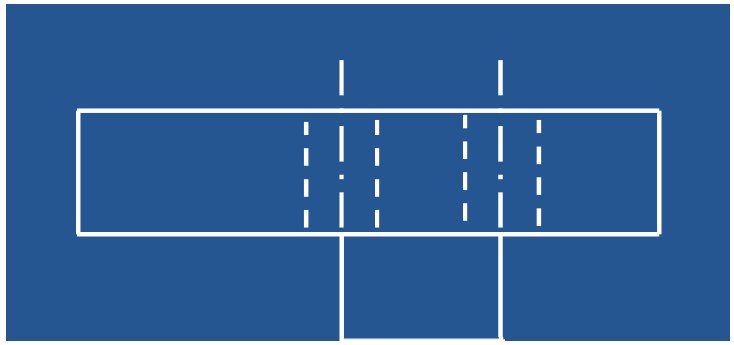


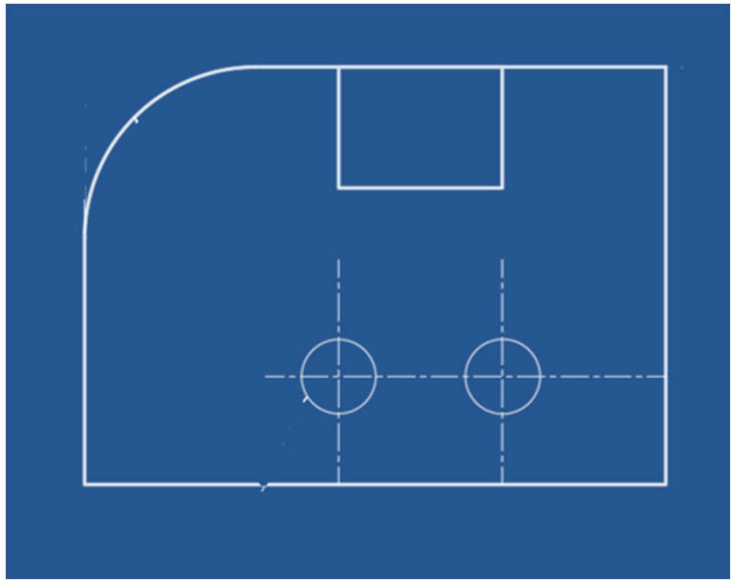
Technical Arts (TA 101AA)
Engineering Graphics

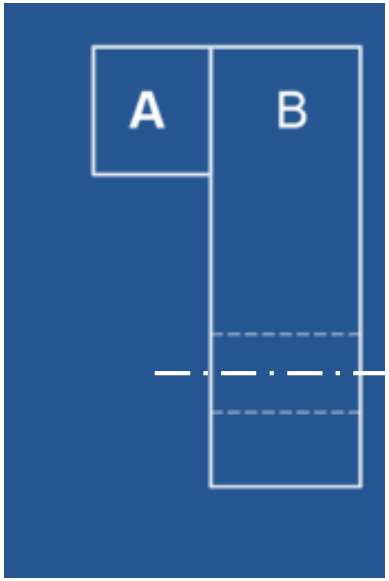
Prof. Nachiketa Tiwari
Department of Design

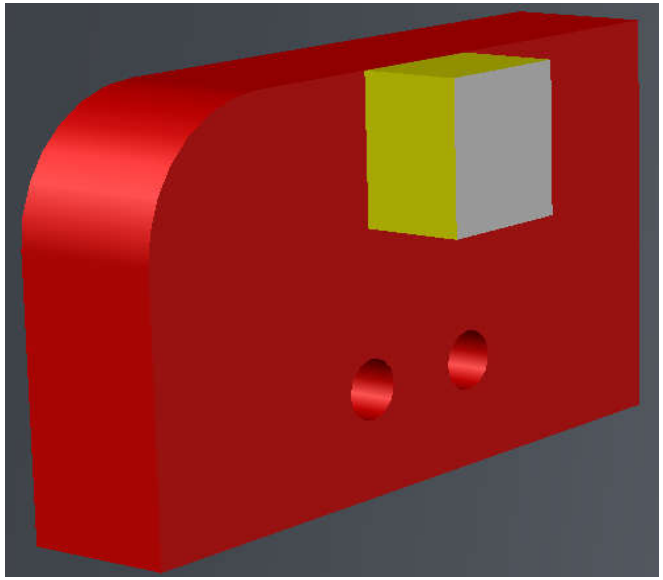
Dimensioning

Is given information sufficient to manufacture this object?

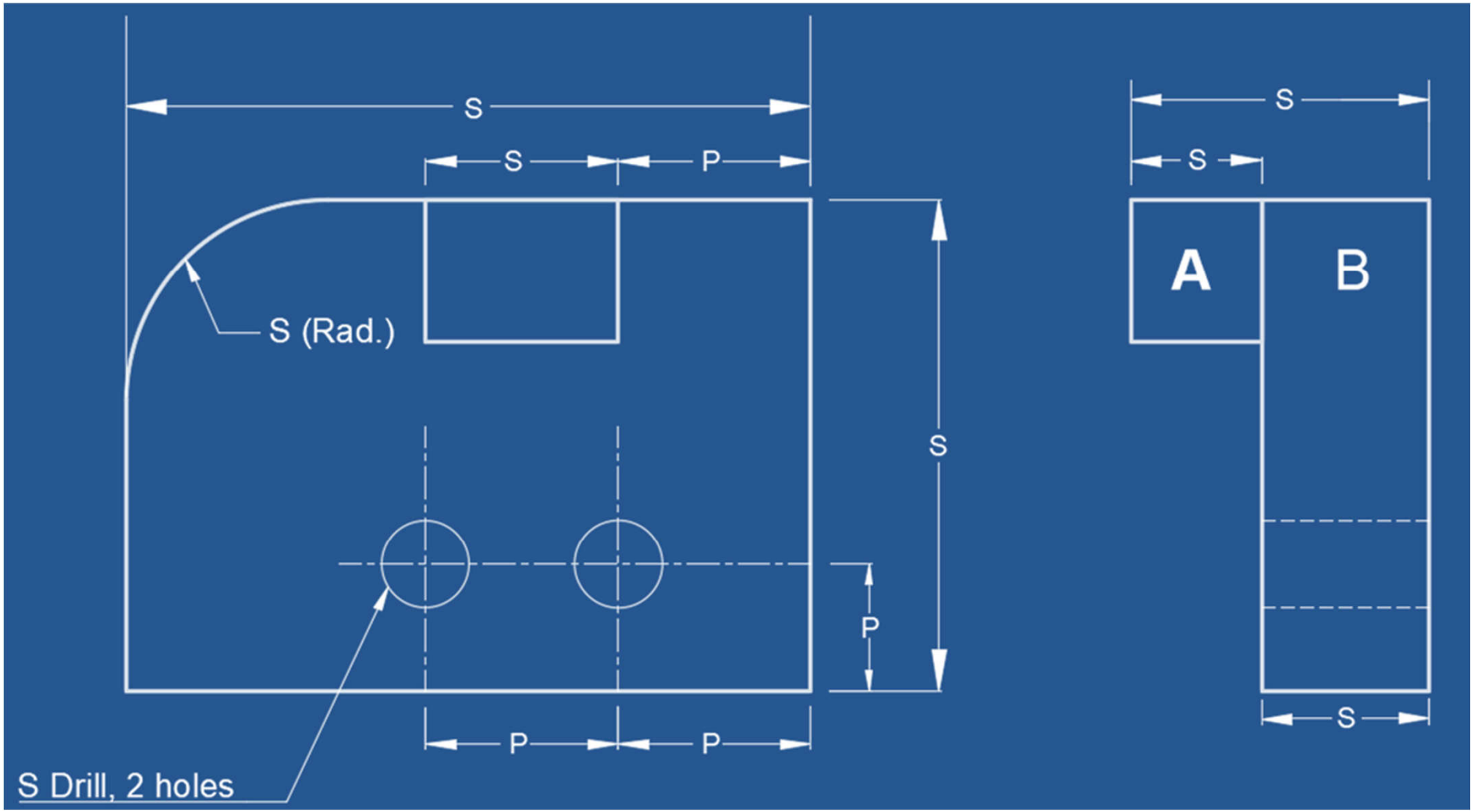








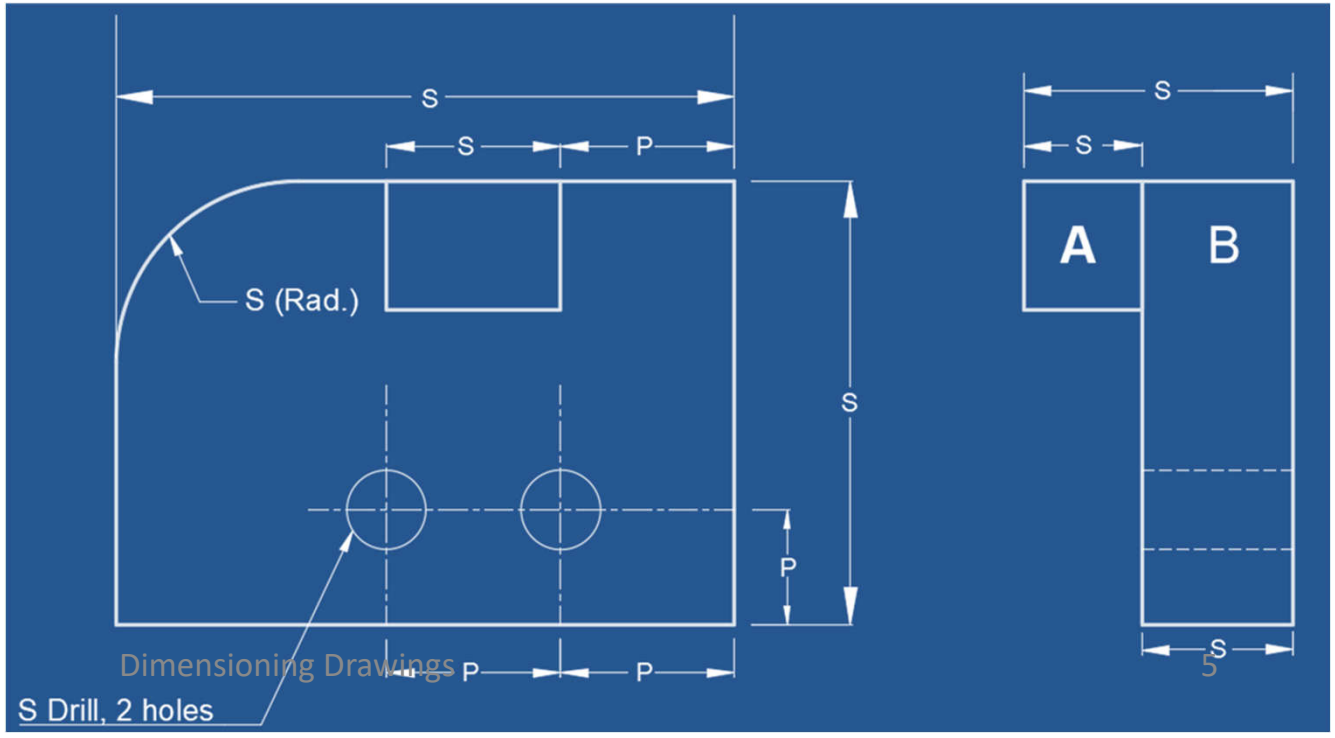
Give dimensions to the following



Write three rules that you think should be followed in dimensioning to make it standard, so all can understand.

Information Needed on Drawings

- Shape
- Position (P) of features
- Size (S) of features



The Underlying Purpose

- Defining our requirements *exactly.*
- Render drawings easier to understand by all stakeholders.
- Make the drawing simpler, cleaner and more legible
- Simpler to draw, redraw and reproduce

Principles of Good Dimensioning

- Start by dimensioning outside of the object.
- Dimensions should be selected to suit:
  Functionality Manufacturability Measurability
- Dimensions should be selected to suit:
  Form Fit Function
- Placed in most descriptive view of the feature.
- Each feature dimensioned *only* once
  Redundancy: Confusion & multiple tolerance calculations

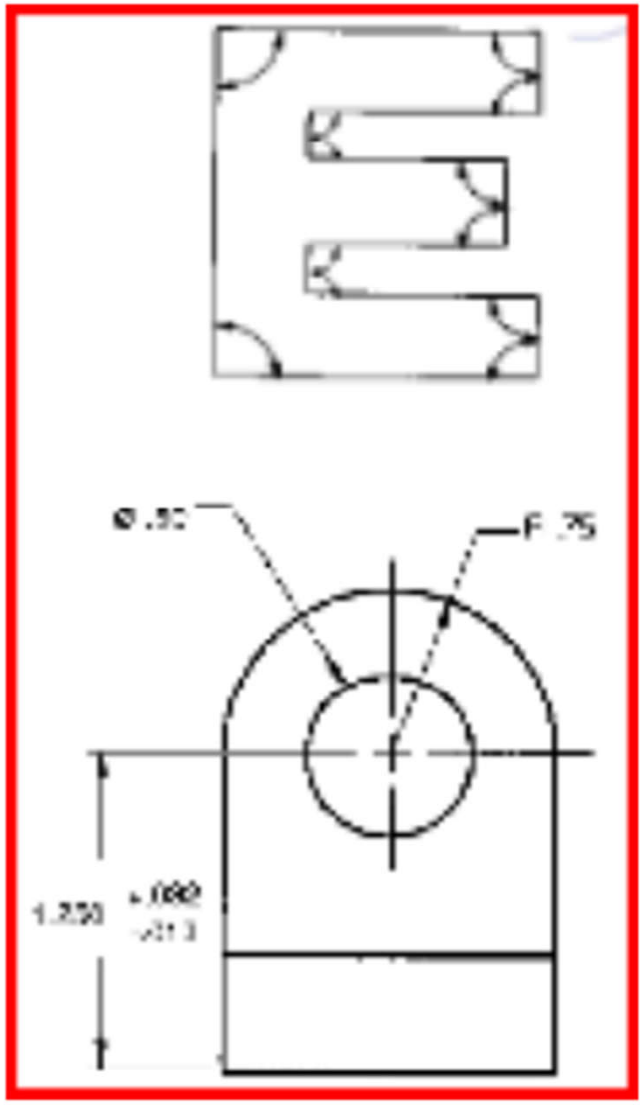
Principles of Good Dimensioning

- Alignment & grouping for clarity & uniformity.
- Dimensions taken from visible outlines
- Dimensions should be given from a baseline, a center line of a hole or a finished surface.
- Avoid crossed dimension lines.
  - When they cross, they should be unbroken.
  - Altered & not to scale dim underline

Over-riding principle of dimensioning is clarity.

Two Important Assumptions

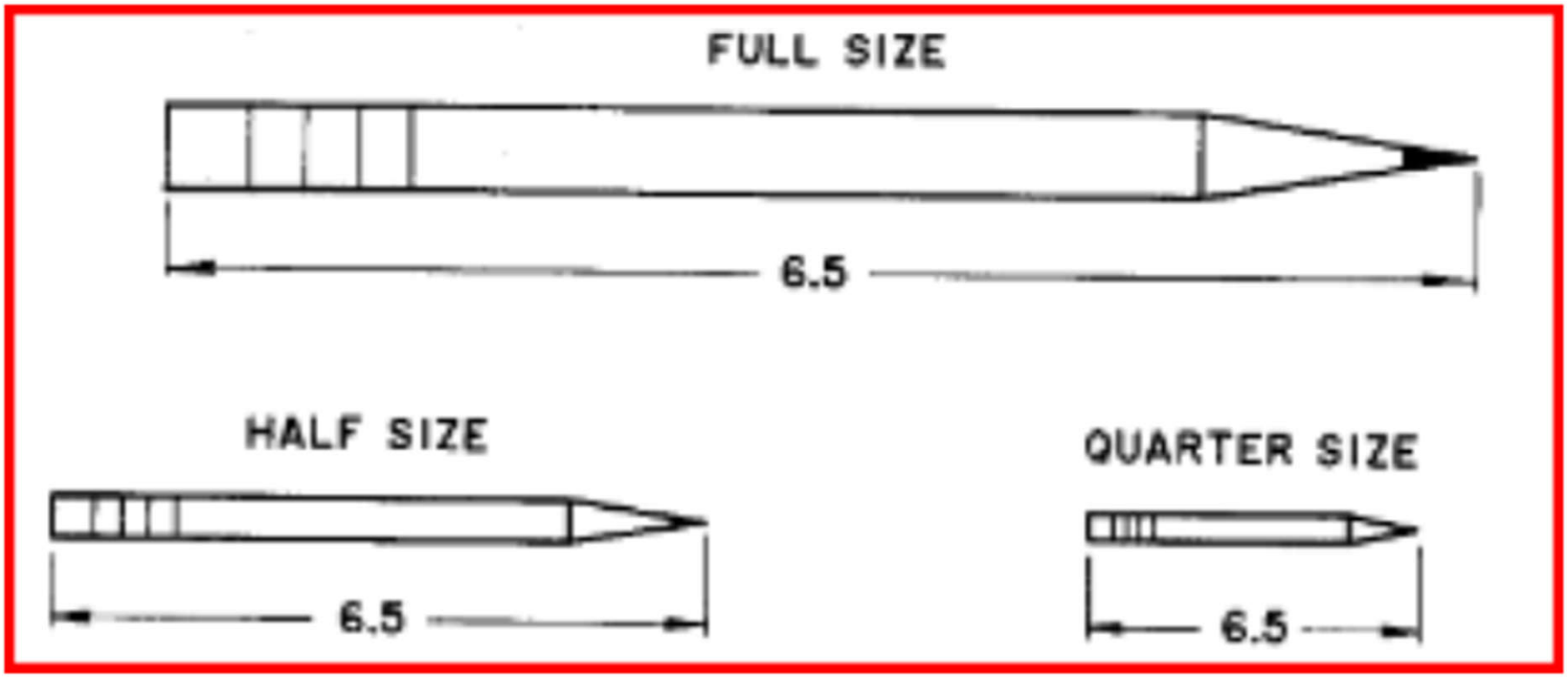
- Perpendicularity
- Symmetry



Dimensioning v/s Scaling

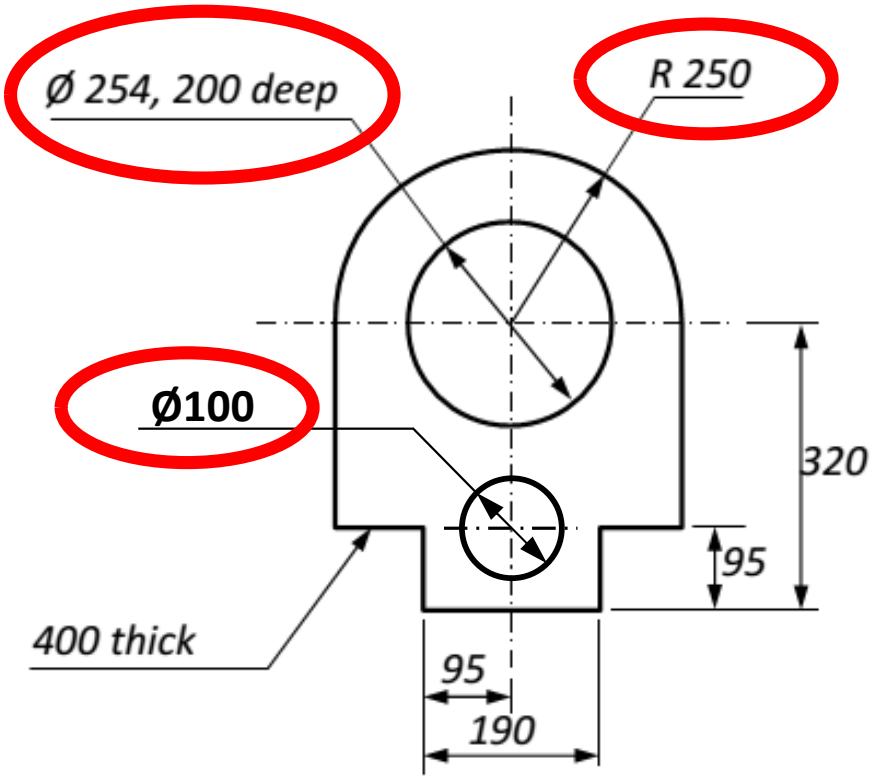
Drawings can be to different scales.

Dimensions are always to full scale.



Dimensioning Basics

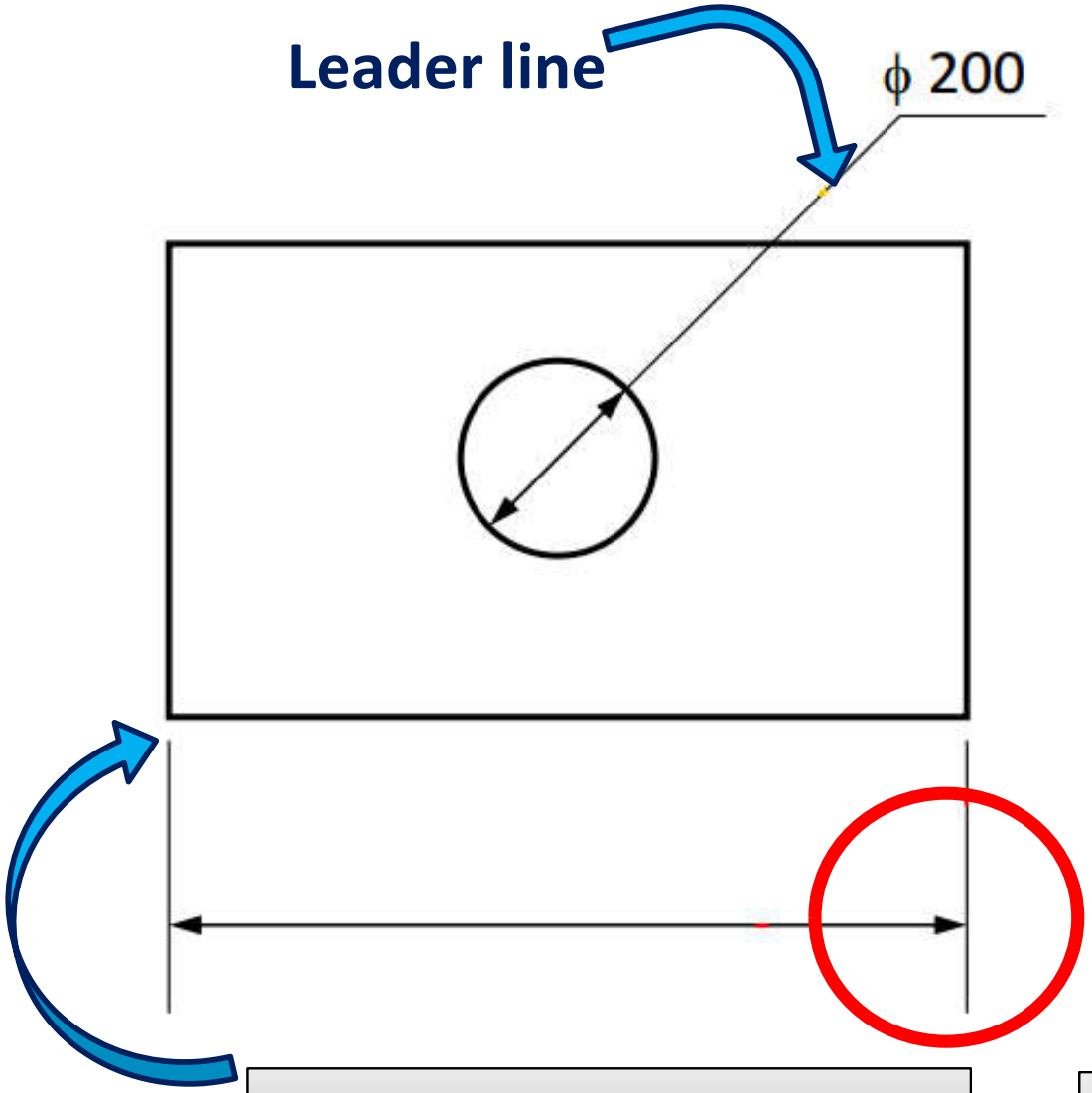
- Four basic aspects of dimensioning
  - Lines
  - Symbols
  - Text
  - Notes

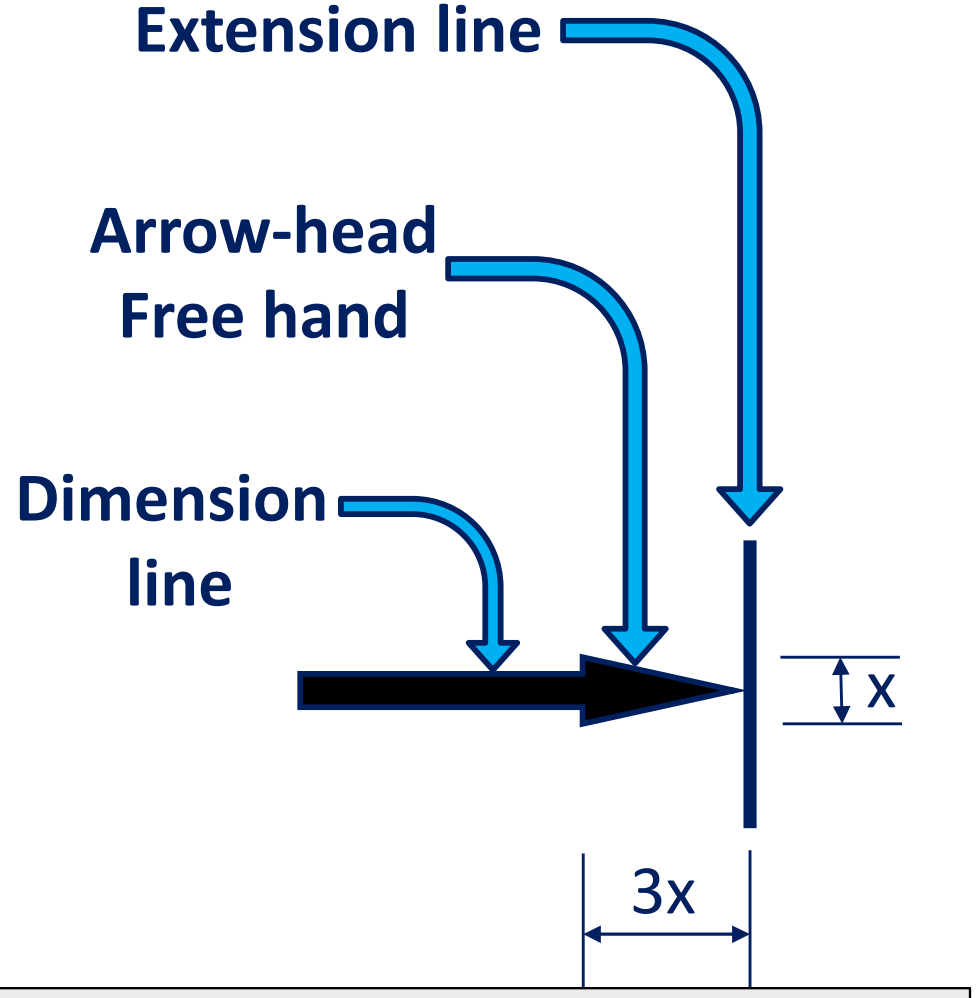


Text should be placed at the midway of the dimension line

All dimensions in mm
*** NO NEED TO WRITE **

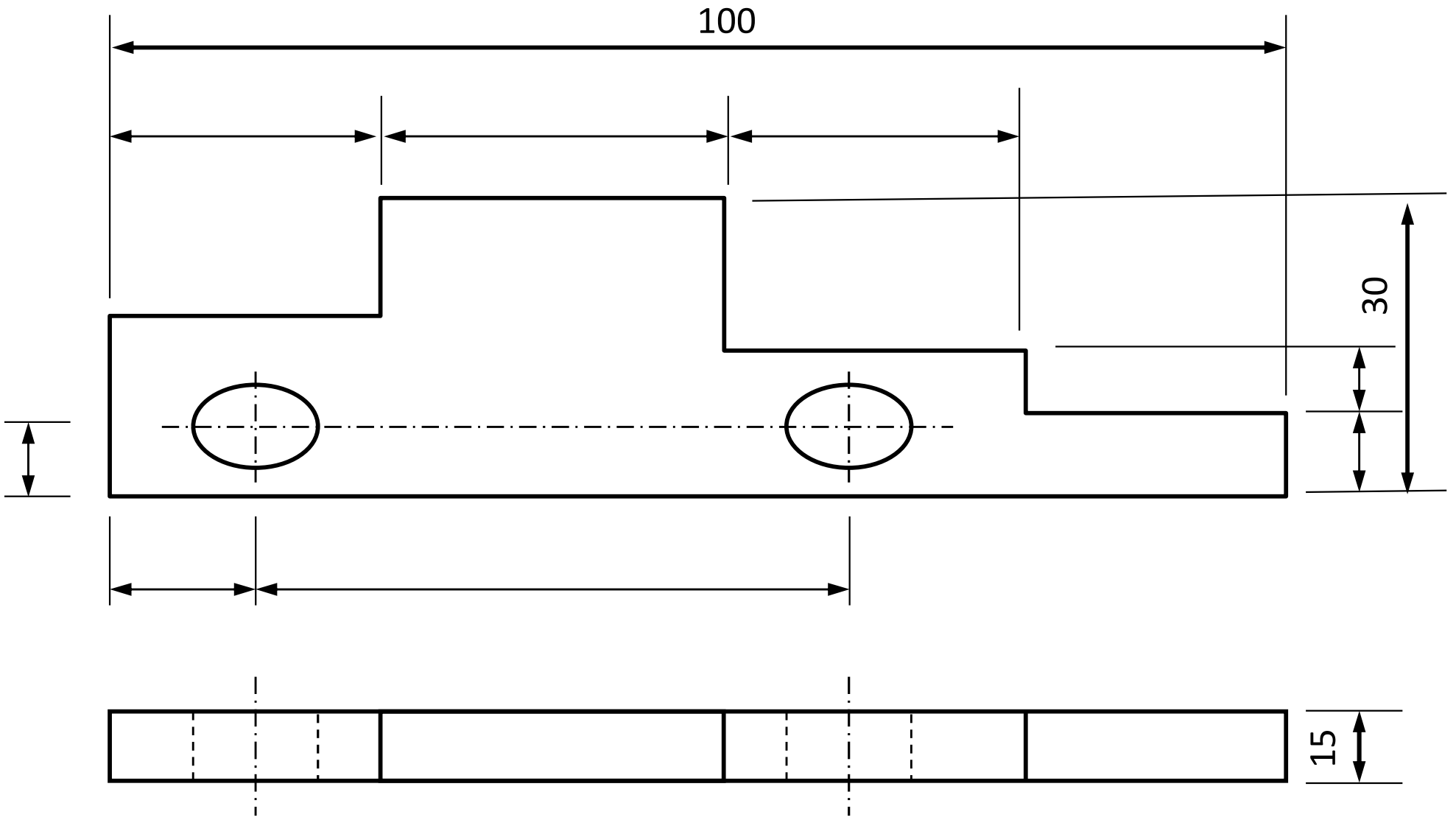
Dimensioning Basics



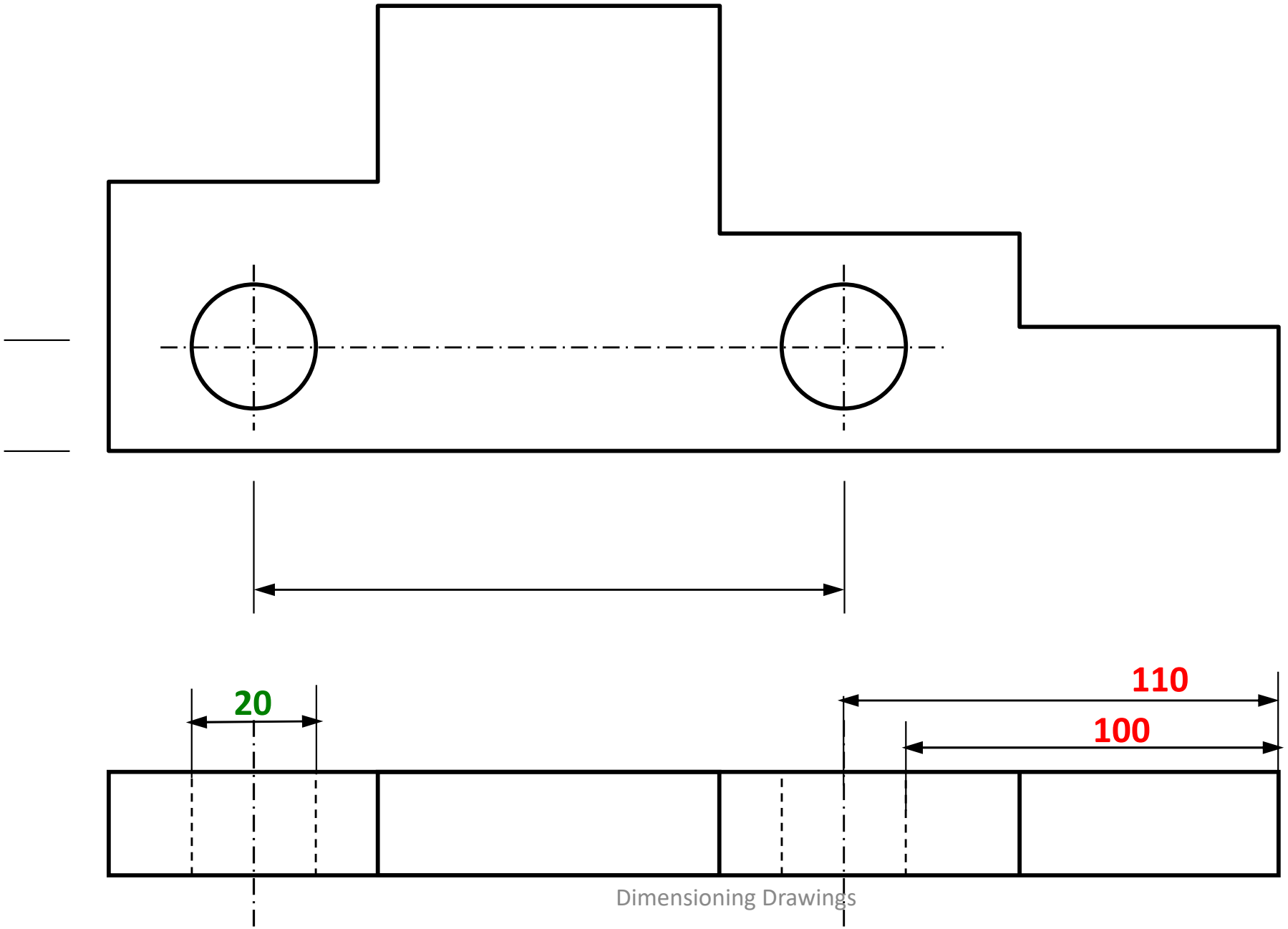


X = 3 mm for usual drawings
= 4-5 mm for larger drawings

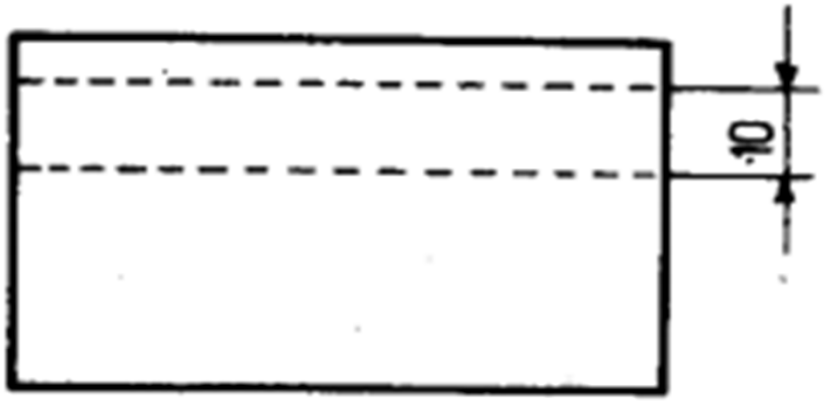
Start with Outside Dimensions



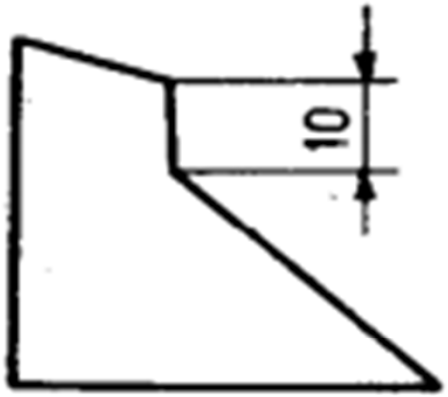
Form, Fit, Functionality



Refer Visible & Accessible Features



INCORRECT
DO NOT DIMENSION
IN THIS VIEW.



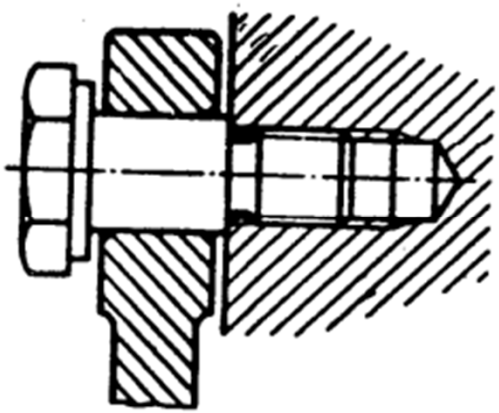
CORRECT
DIMENSION
IN THIS VIEW.

Types of Dimensions

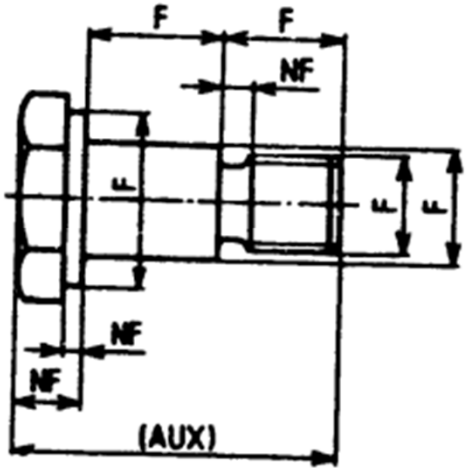
F = functional dimension (critical)

NF = non functional dimension (not critical)

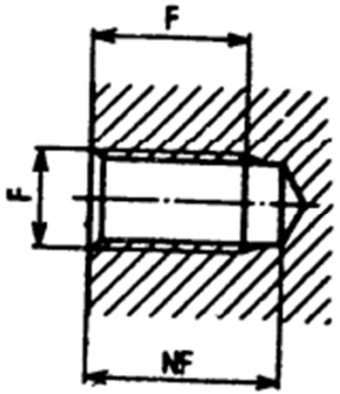
Aux = auxiliary dimension (for information only)



a) Design requirement



b) Shoulder screw



c) Threaded hole

Orientation

- Unidirectional – Always horizontal

- Aligned – Values parallel to dimension line
  - And read from right side.
  - Avoid specifying dim between 90˚ & 135˚.

Arrow heads: open arrow heads forming an angle of 15 to 45 degrees.

Offset of projection lines: 0.5 to 1mm

Extension of projection lines : 2 mm

Dimensioning Schemes

Parallel dimensioning:

Chain dimensioning:

Very Small dimensions:

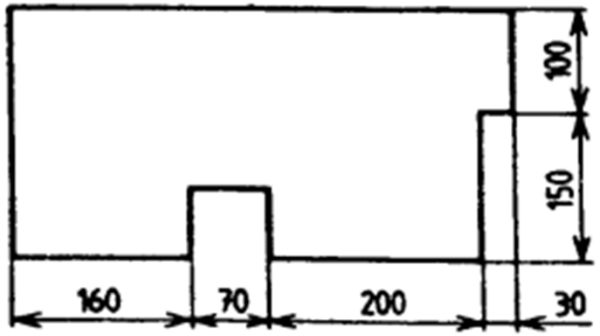


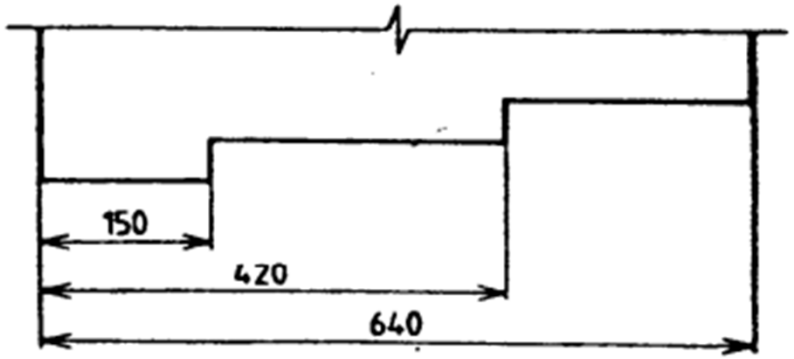
FIG.11.32

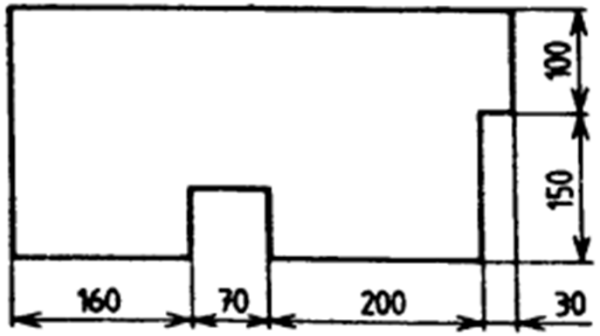
11.4.2 *Dimensioning From a Common Feature*

11.4.2.1 This method of dimensioning is used where a number of dimensions of the same direction relate to a common origin.

11.4.2.2 Dimensioning from a common feature may be executed as parallel dimensioning or as superimposed running dimensioning.

11.4.2.3 Parallel dimensioning is the placement of a number of single dimension lines parallel one to another and spaced out so that the dimensional value can easily be added in (*see* Fig. 11.33 and 11.41).





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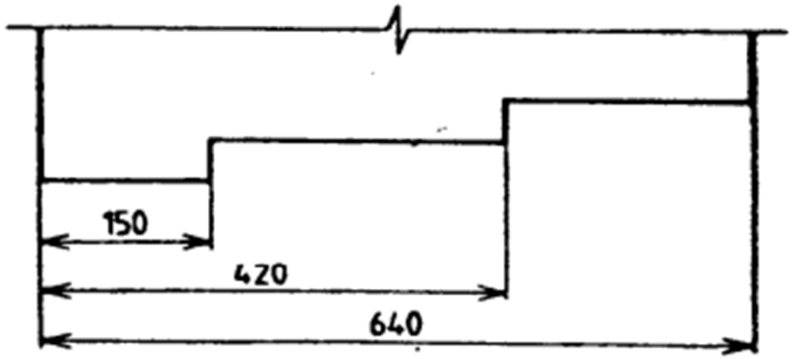
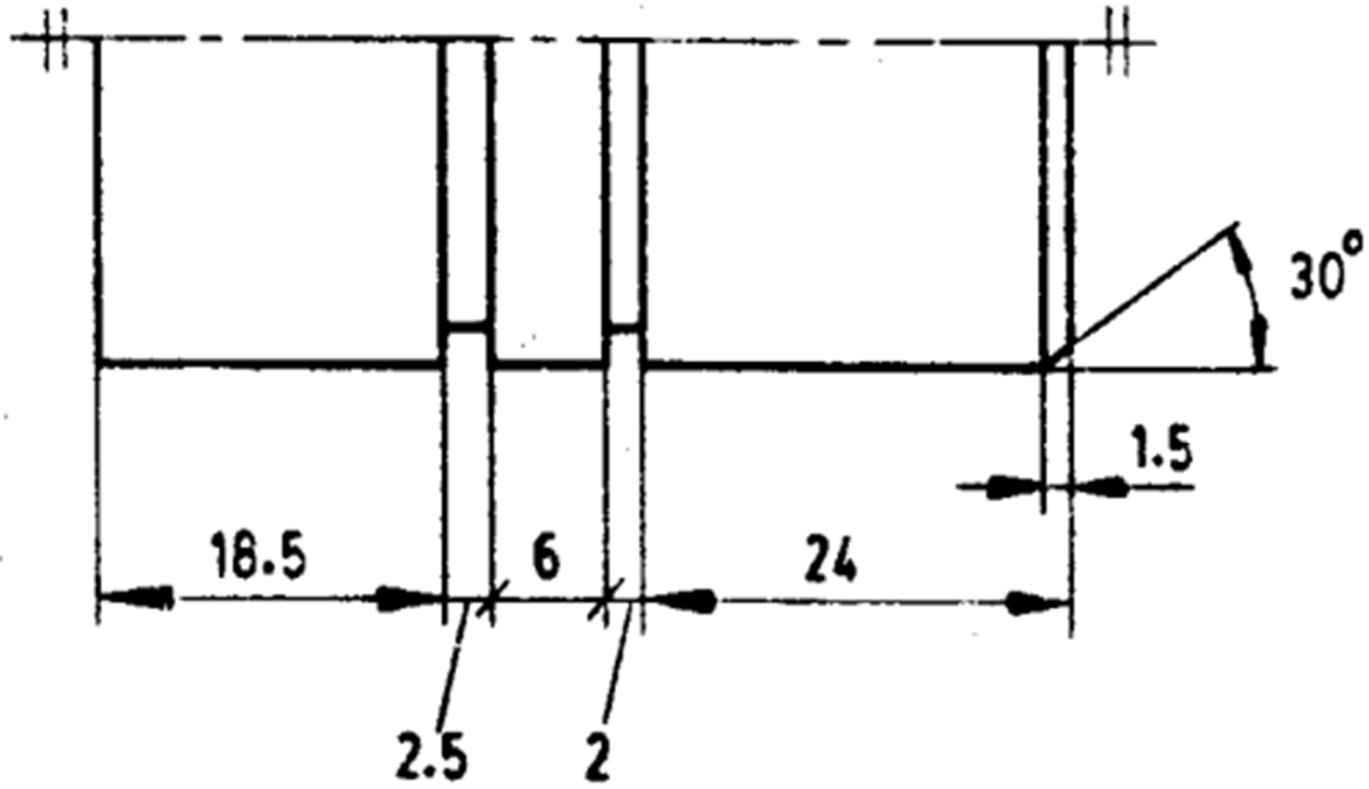


- Small dimensions in two ways
- Angles



- Dimensions with respect to common feature

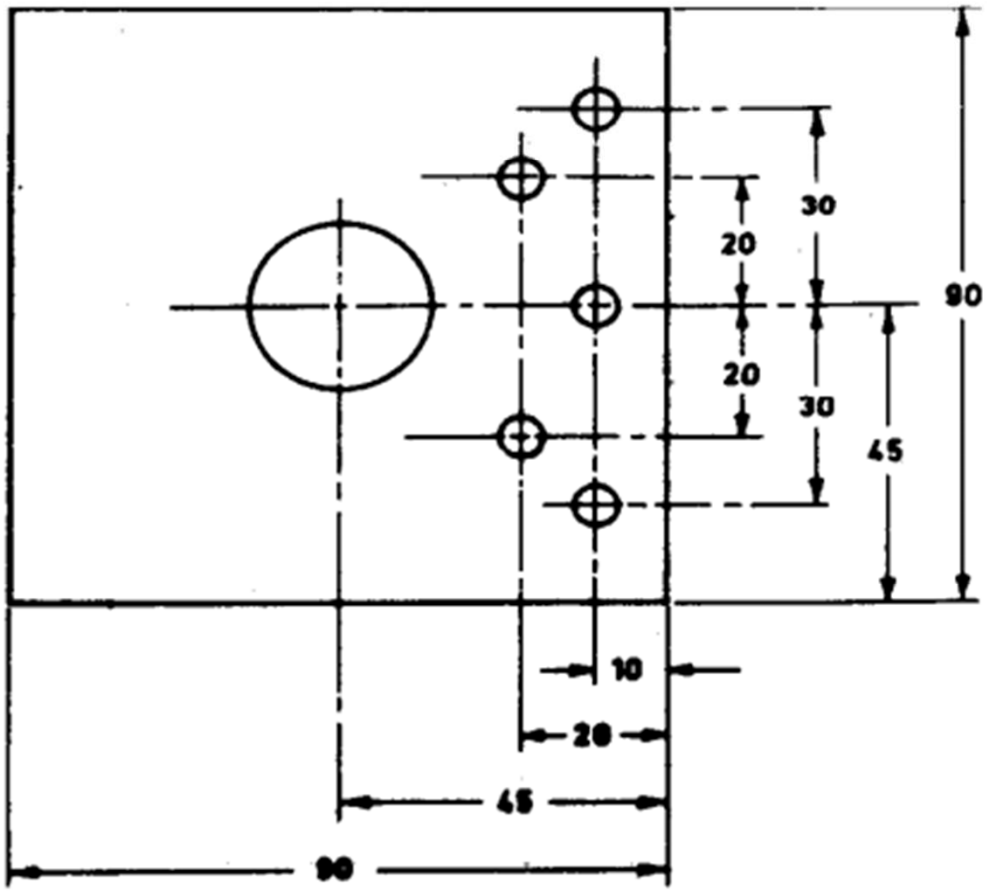


FIG. 2.40 Unidirectional system of dimensioning

- Place them in the view where it makes most sense.
- Do not repeat the same dimension.
- Do not use hidden lines to reference dims.
- Try your best to place them outside the view.

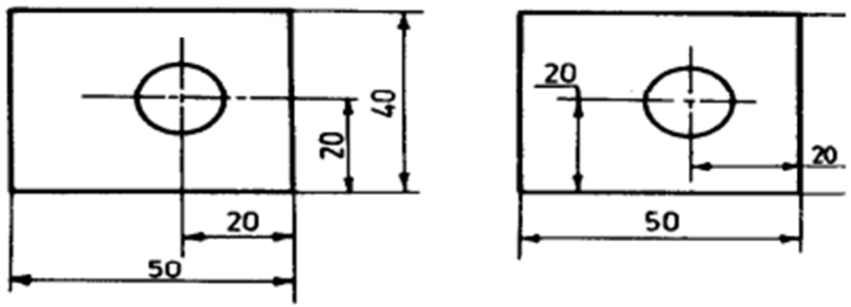


FIG. 2.26 Dimensions should be placed outside the view

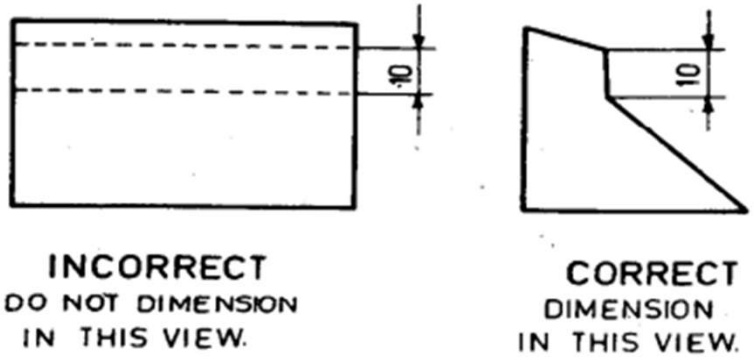
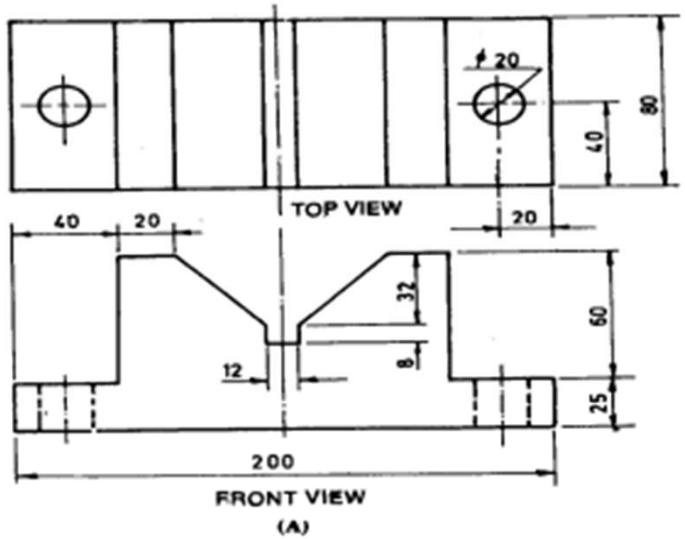
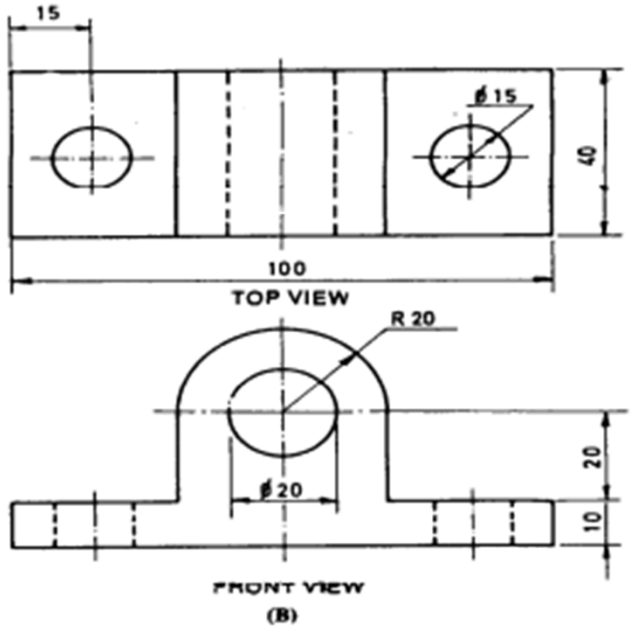


FIG. 2.27 Dimensions should not be taken from hidden line

As for as possible, dimensions should be placed outside the views.





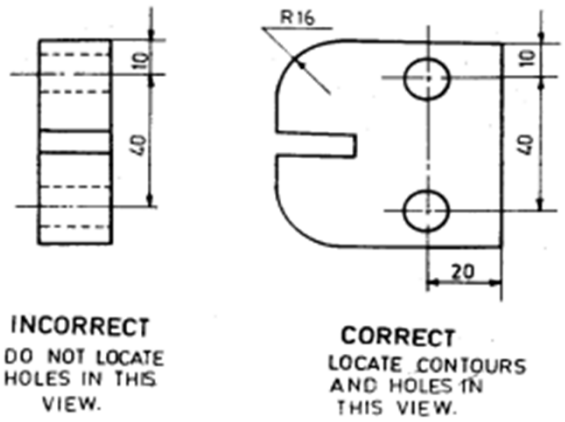


FIG. 2.28 Location of the position of holes

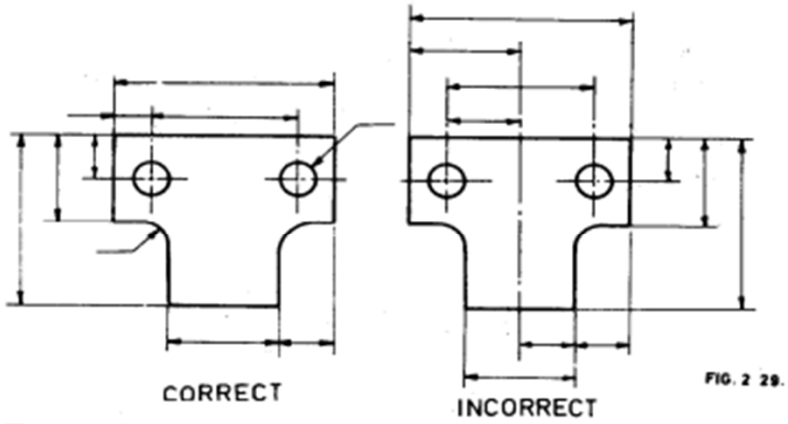


FIG. 2 29.

FIG. 2.29 Dimensioning to the centre line of an object should be avoided

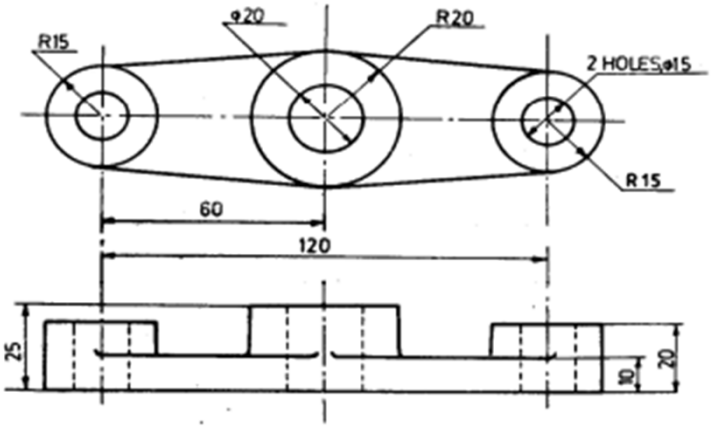


FIG. 2.30 Dimensioning to the centre line of a hole is permitted

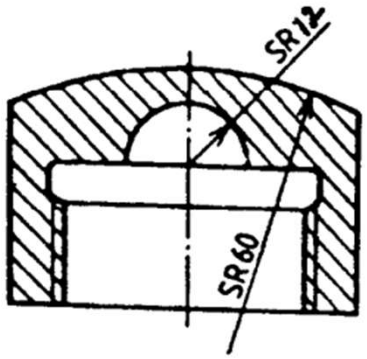
Radius: R

Diameter: Ø or D

Square : SQ or □

spherical dia: SØ

Spherical radius: SR



ϕ : Diameter
R : Radius
□ : Square

Sϕ : Spherical diameter
SR : Spherical radius

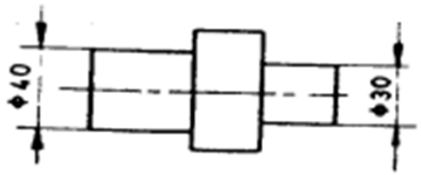


FIG.11.27

FIG.11.28

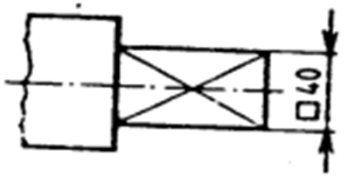


FIG.11.29

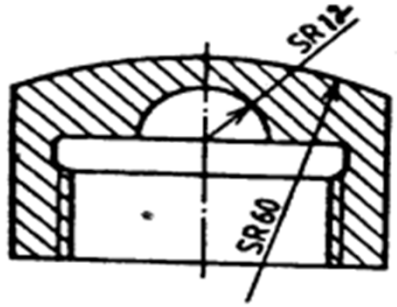


FIG.11.30

Showing radius

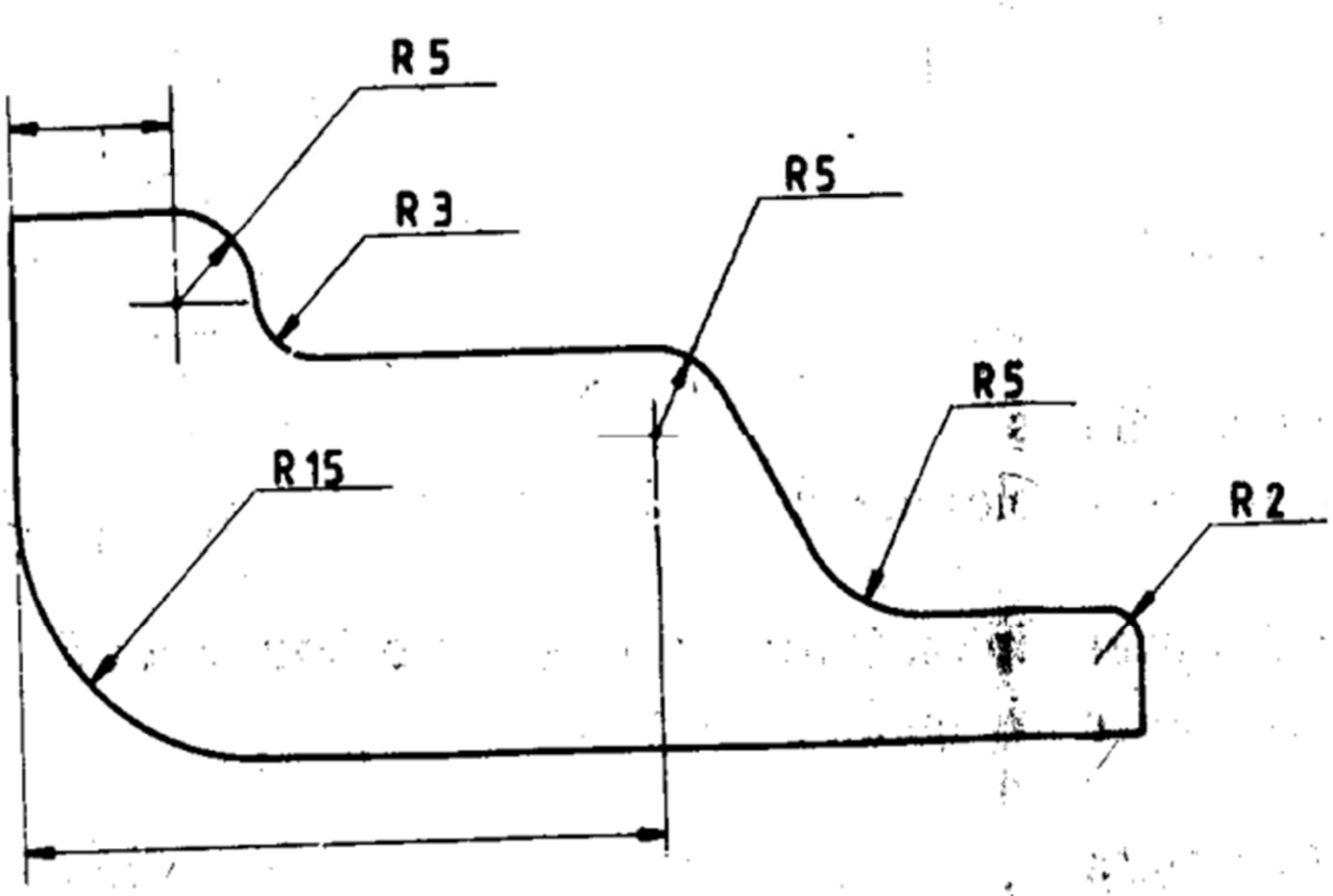


FIG. 2.48 Dimensioning of radii of small arcs

Dimensioning holes

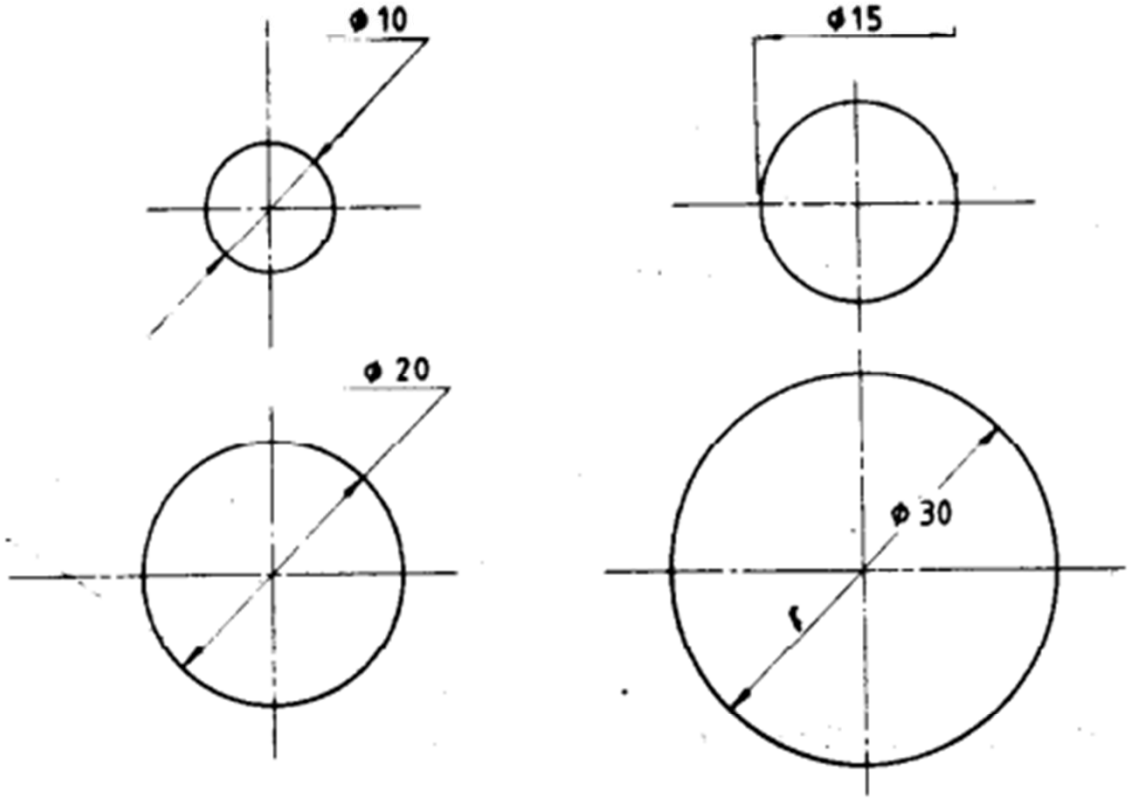


FIG. 2.46 Dimensioning of circles

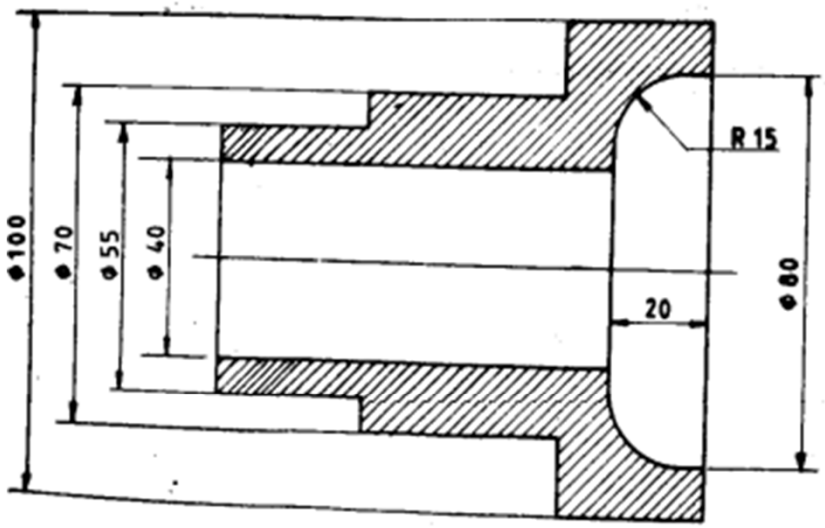


FIG. 2.44 Dimensioning of diameters

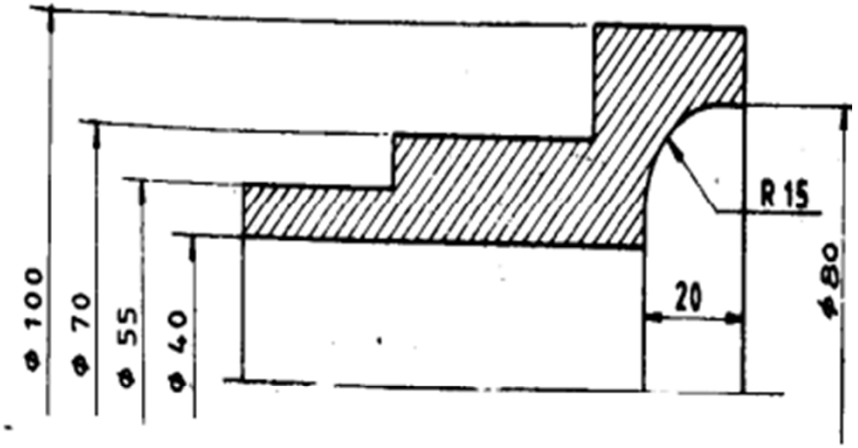


FIG. 2.45 Dimensioning of diameters in half view

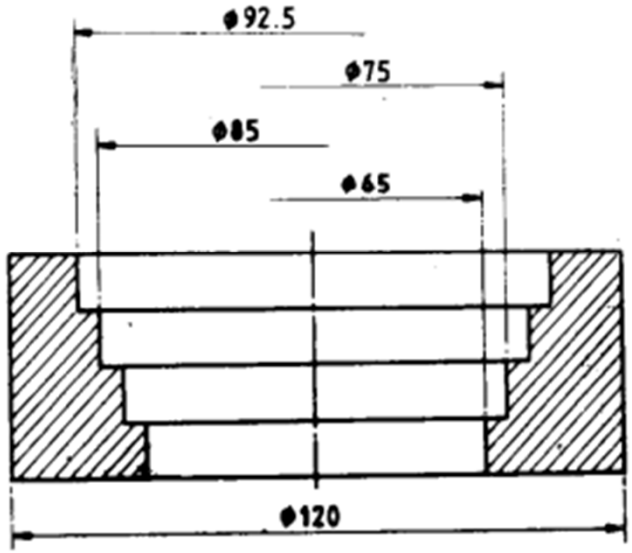
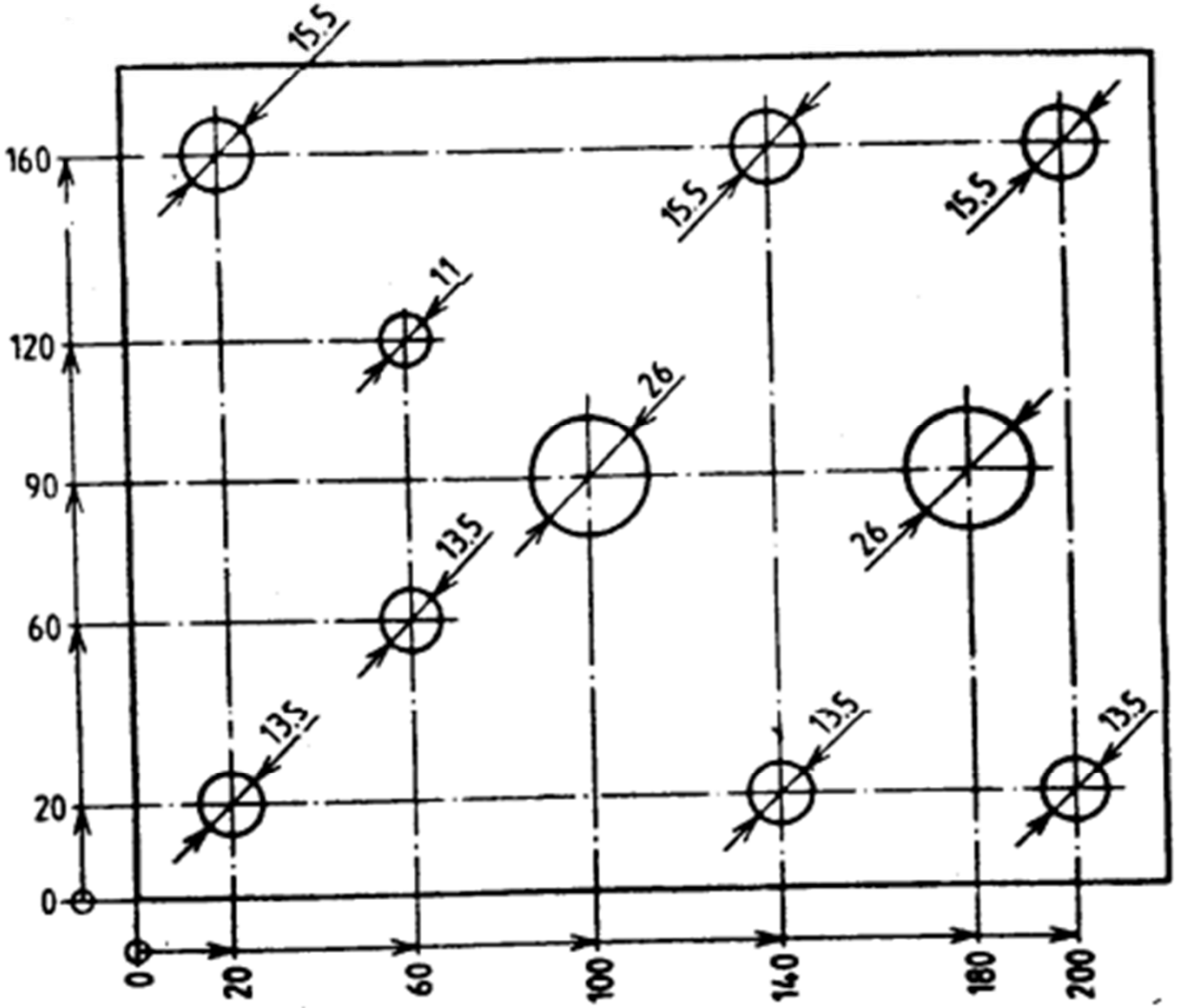
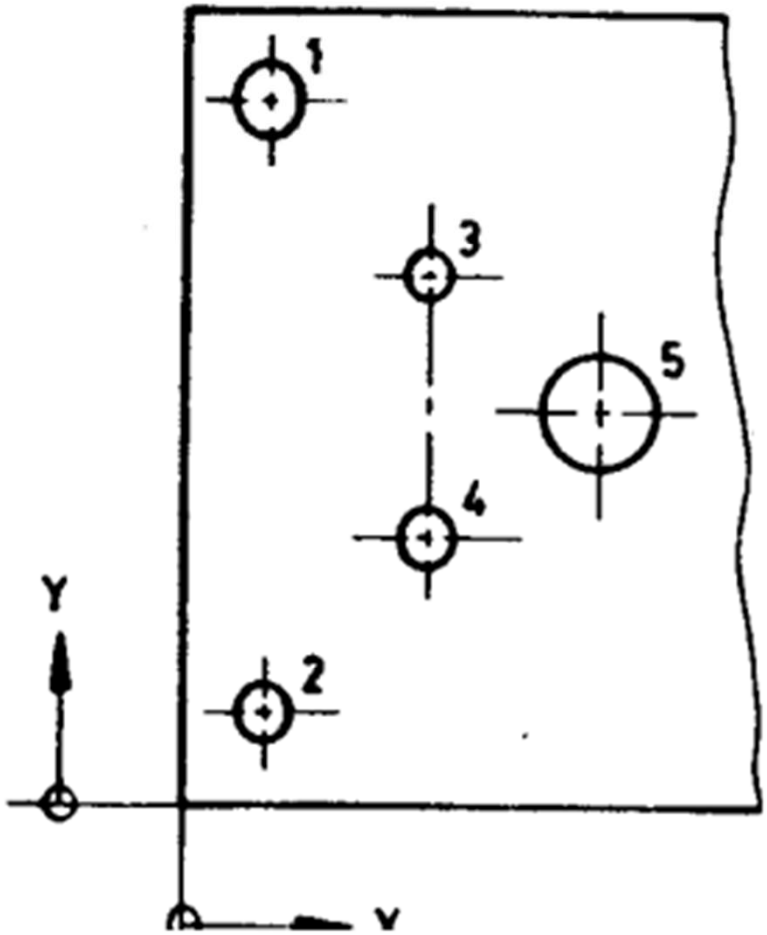


FIG. 2.47 Another method of dimensioning diameters

Position of holes

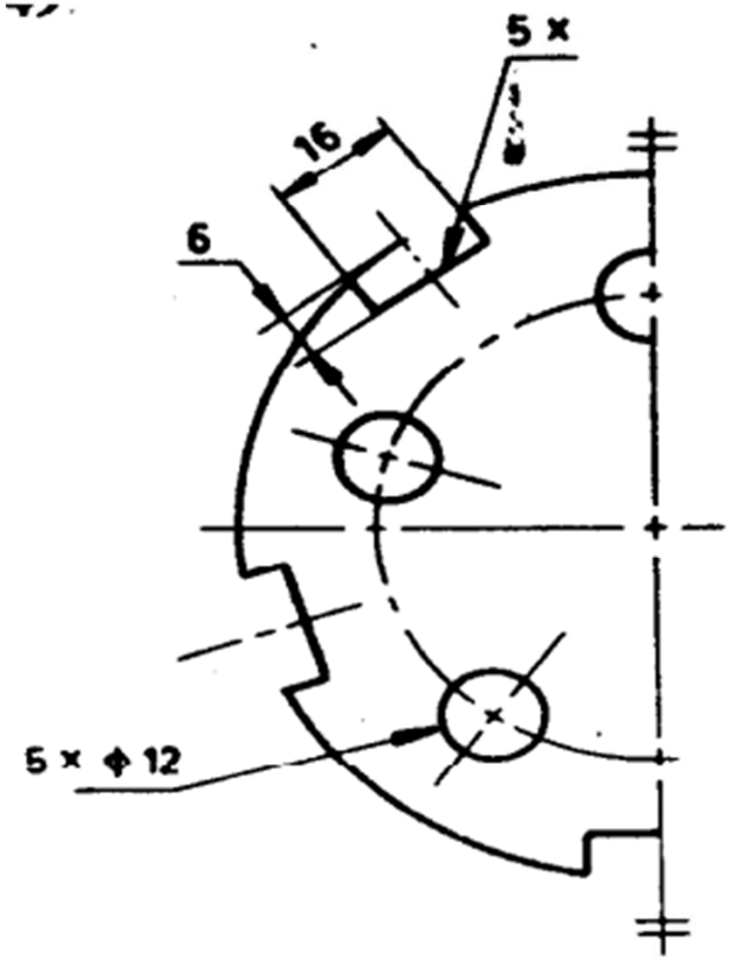


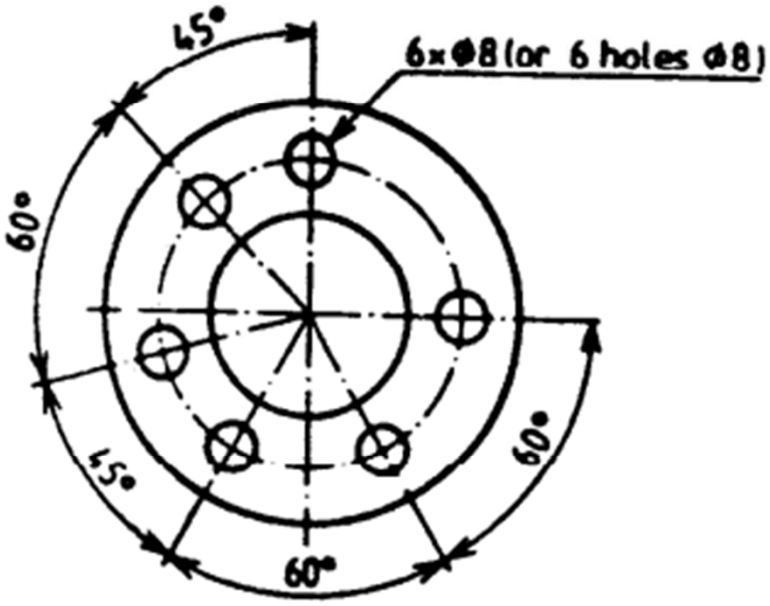
Tabular Dimensioning



	X	Y	♦
1	20	160	15.5
2	20	20	13.5
3	60	120	11
4	60	60	13.5
5	100	90	26
6			
7			
8			

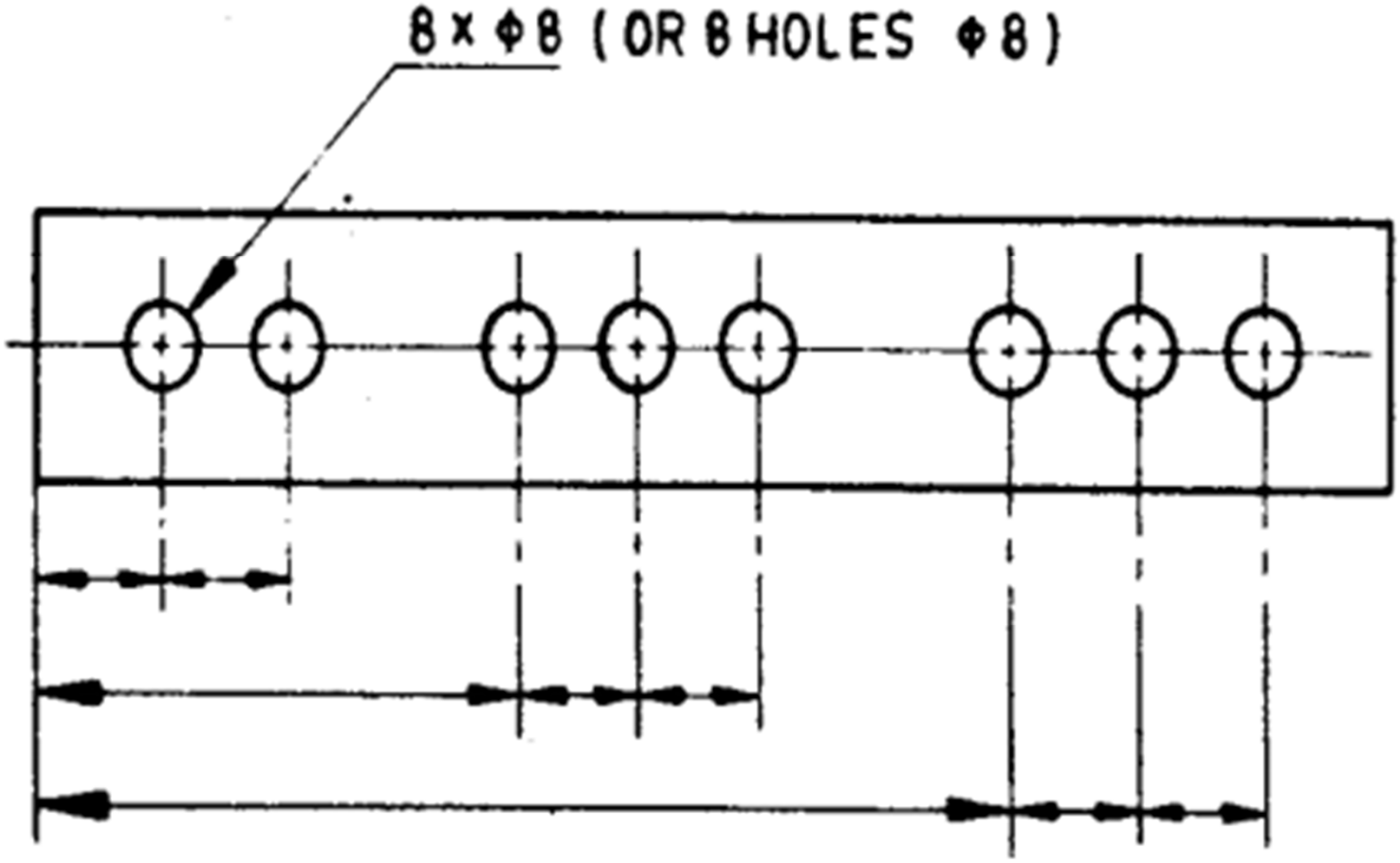
Repeated features



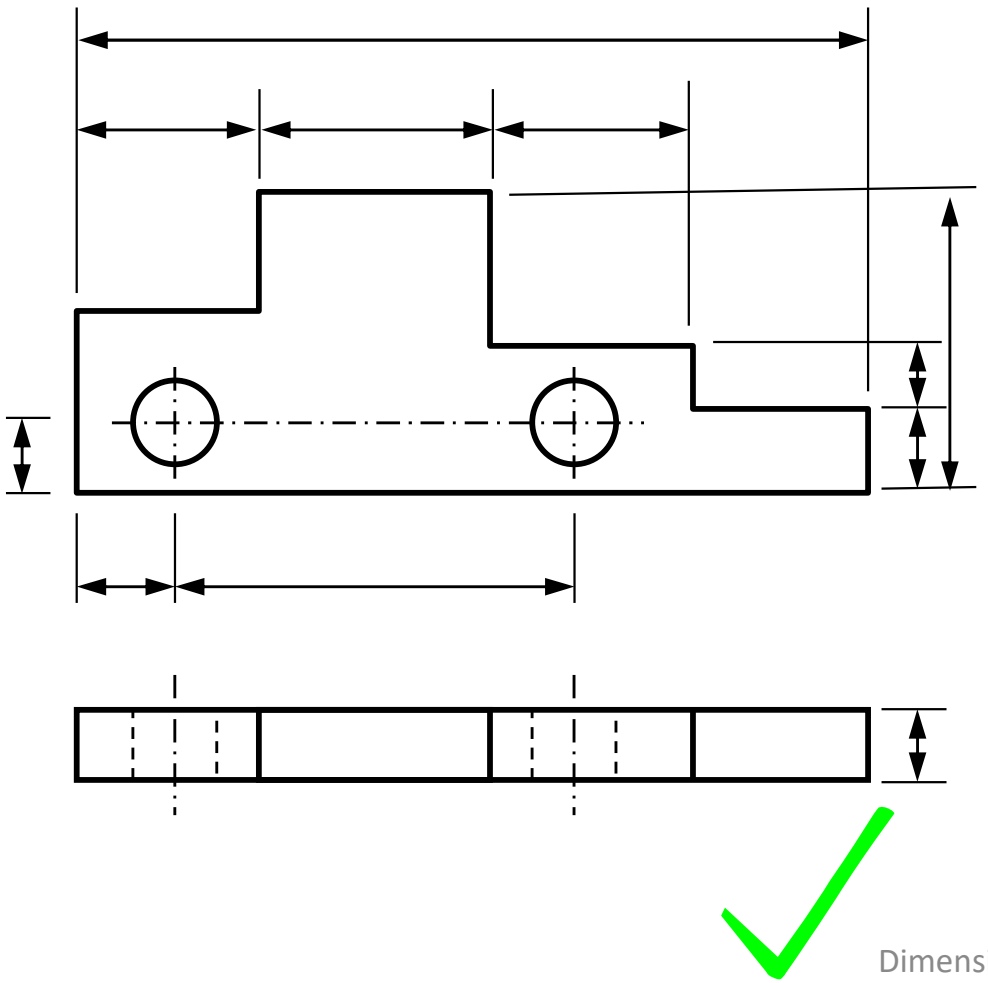


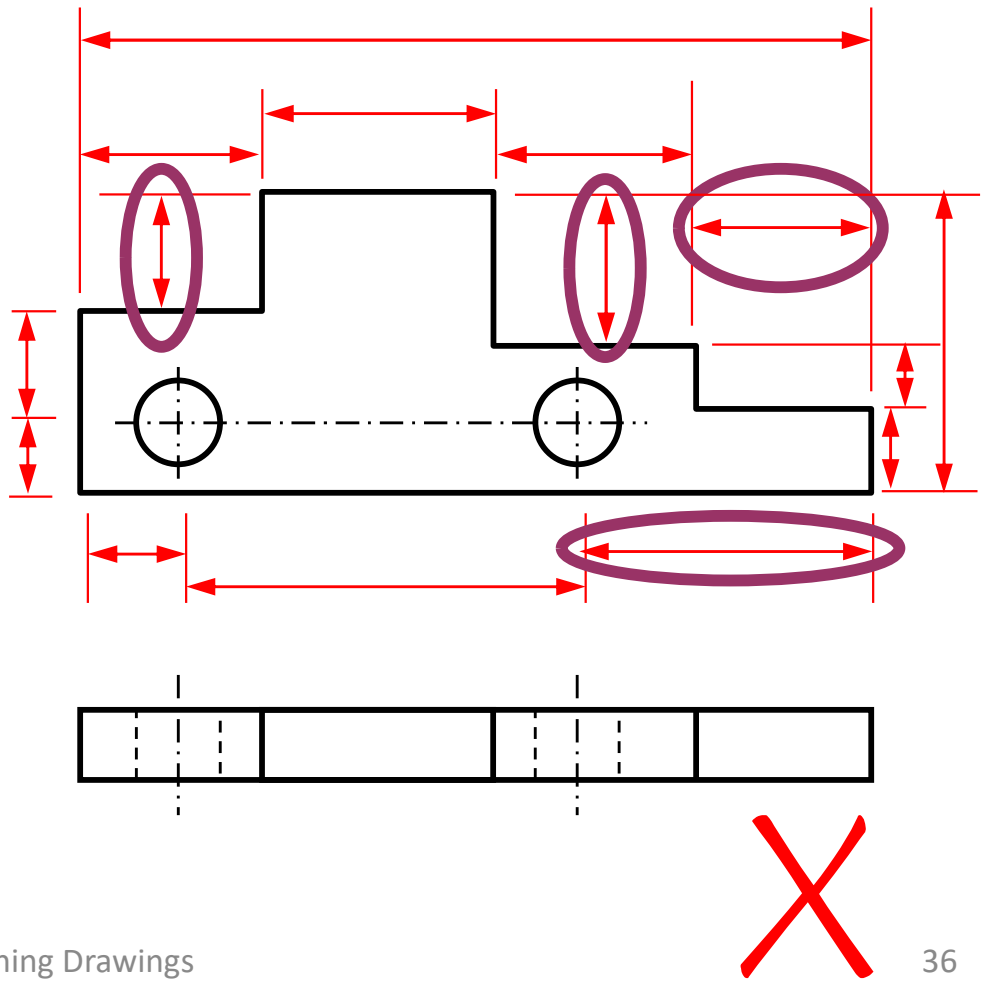
6 X ϕ10 PCD 100

6 X ϕ10

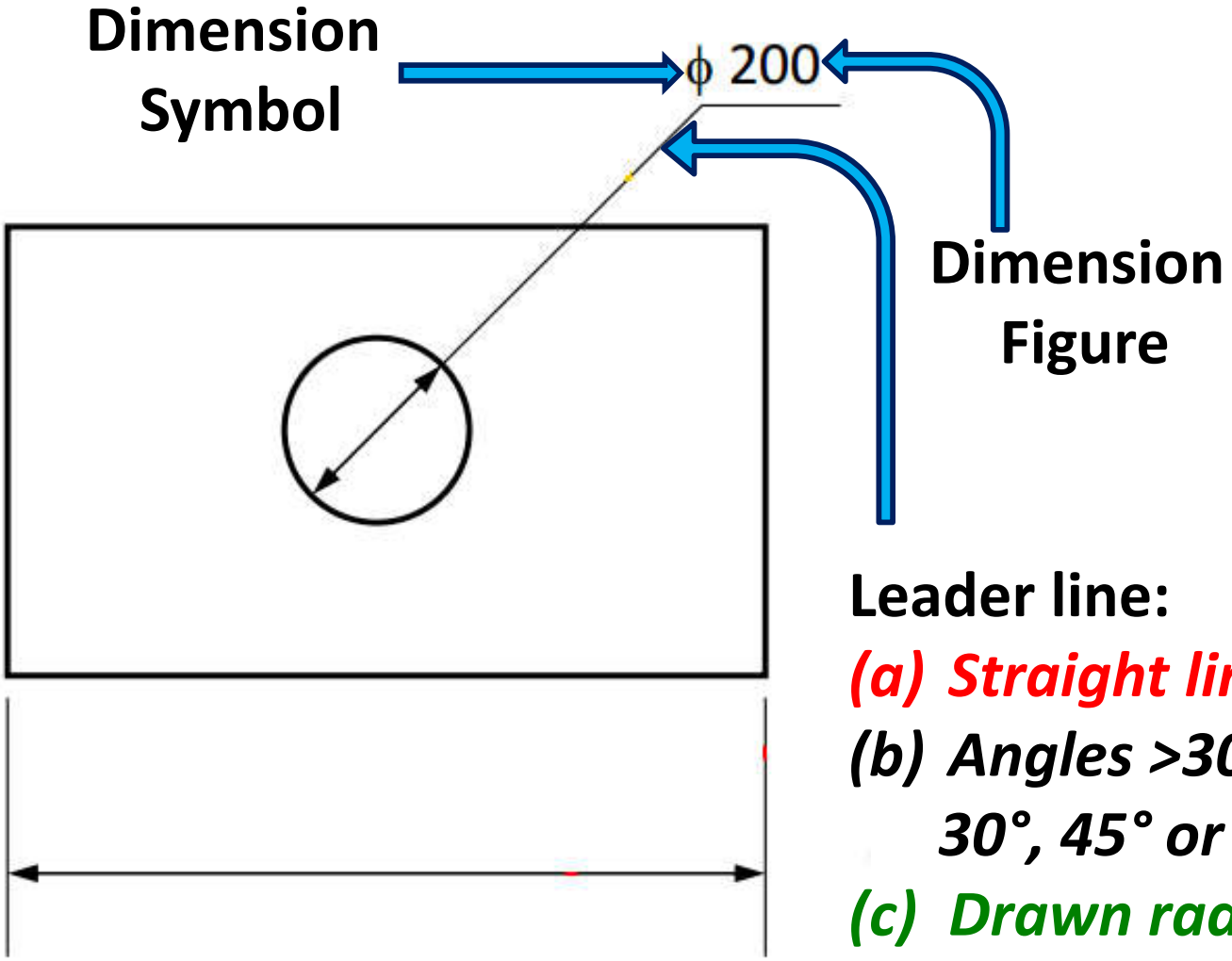

8 x Φ8 (OR 8 HOLES Φ8)

Over-dimensioning





Dimensioning Basic



Leader line:

(a) Straight lines

(b) Angles >30°; ≠ 0° or 90°

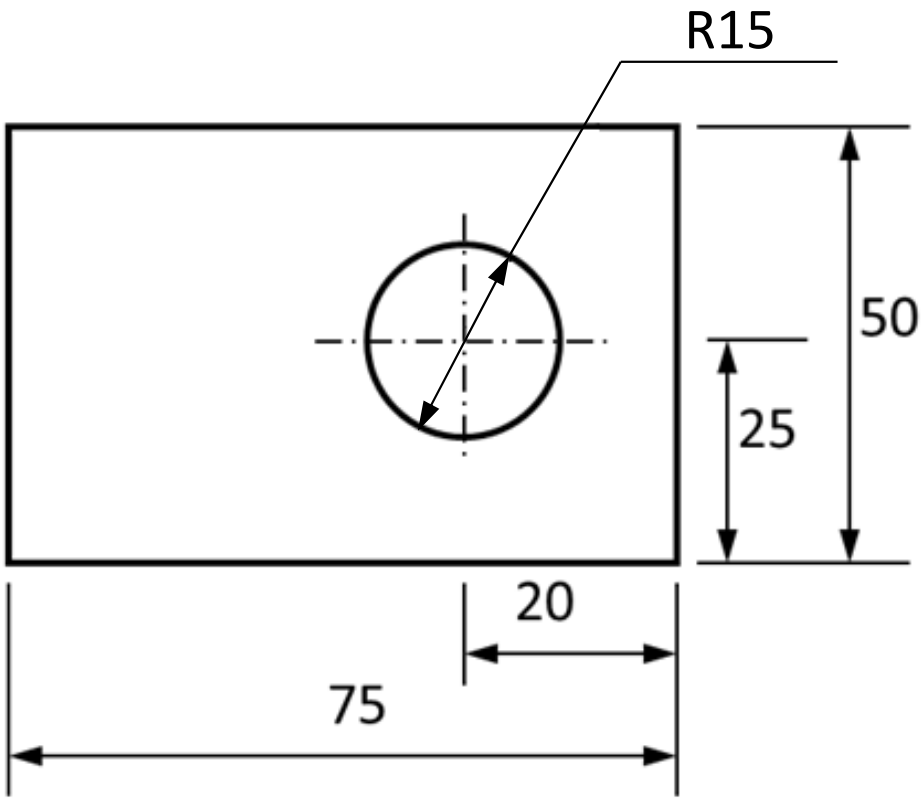
30°, 45° or 60° are preferred

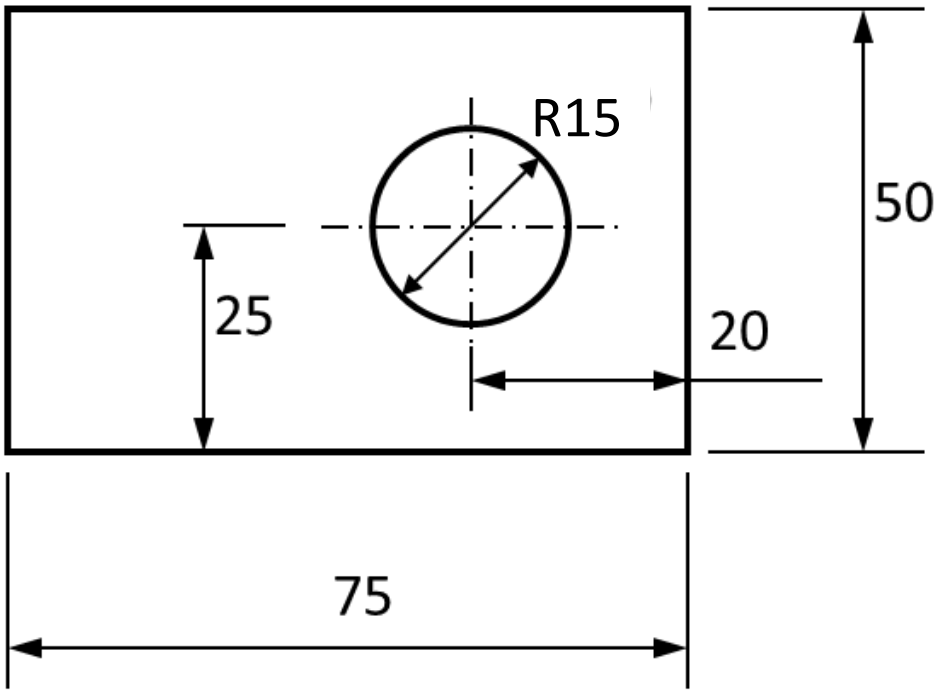
(c) Drawn radial

(must pass through the centre)

Dimensioning Basic

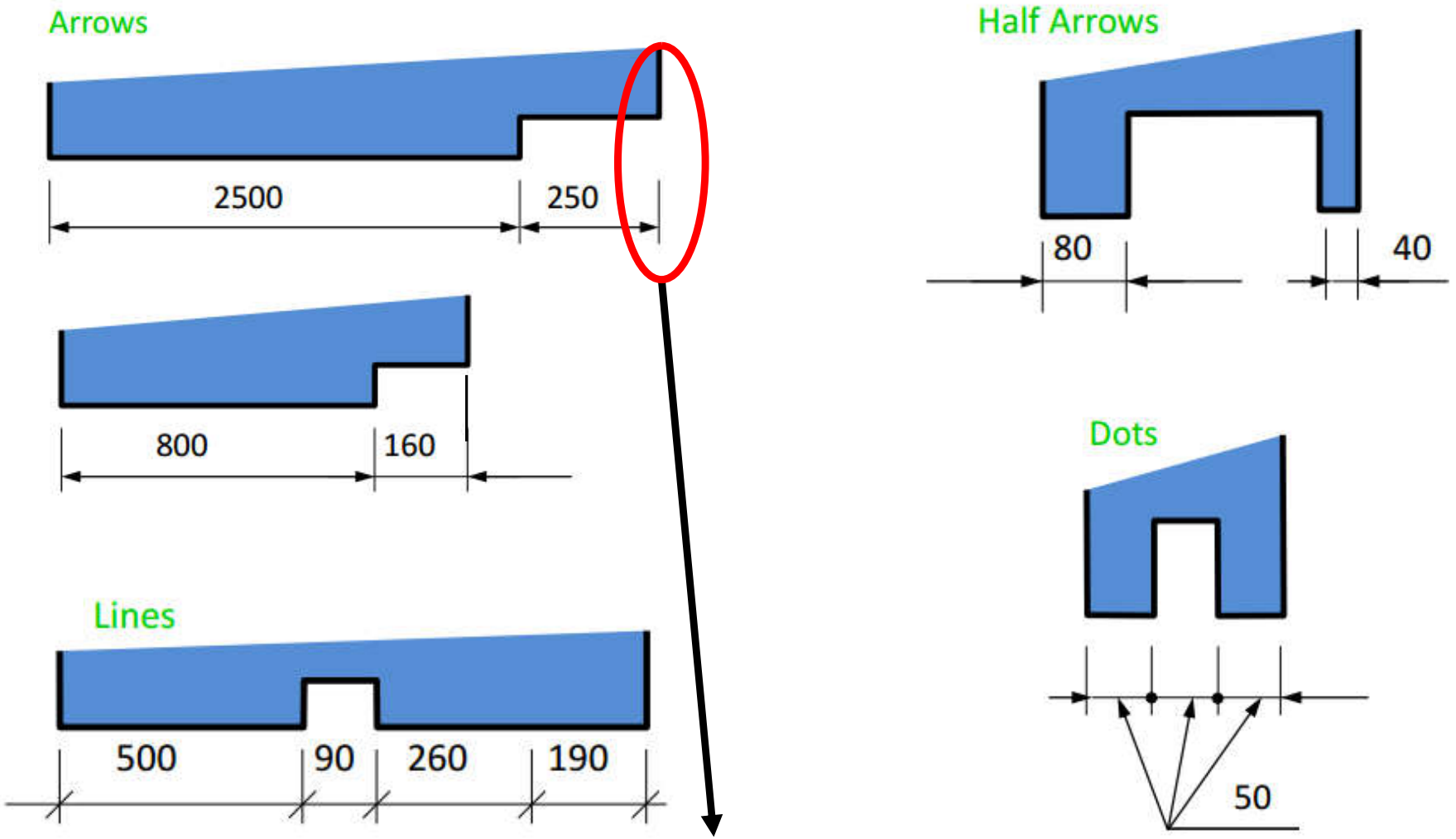
- **Place Dimensions outside the view, as far as possible**





Dimensioning a Length

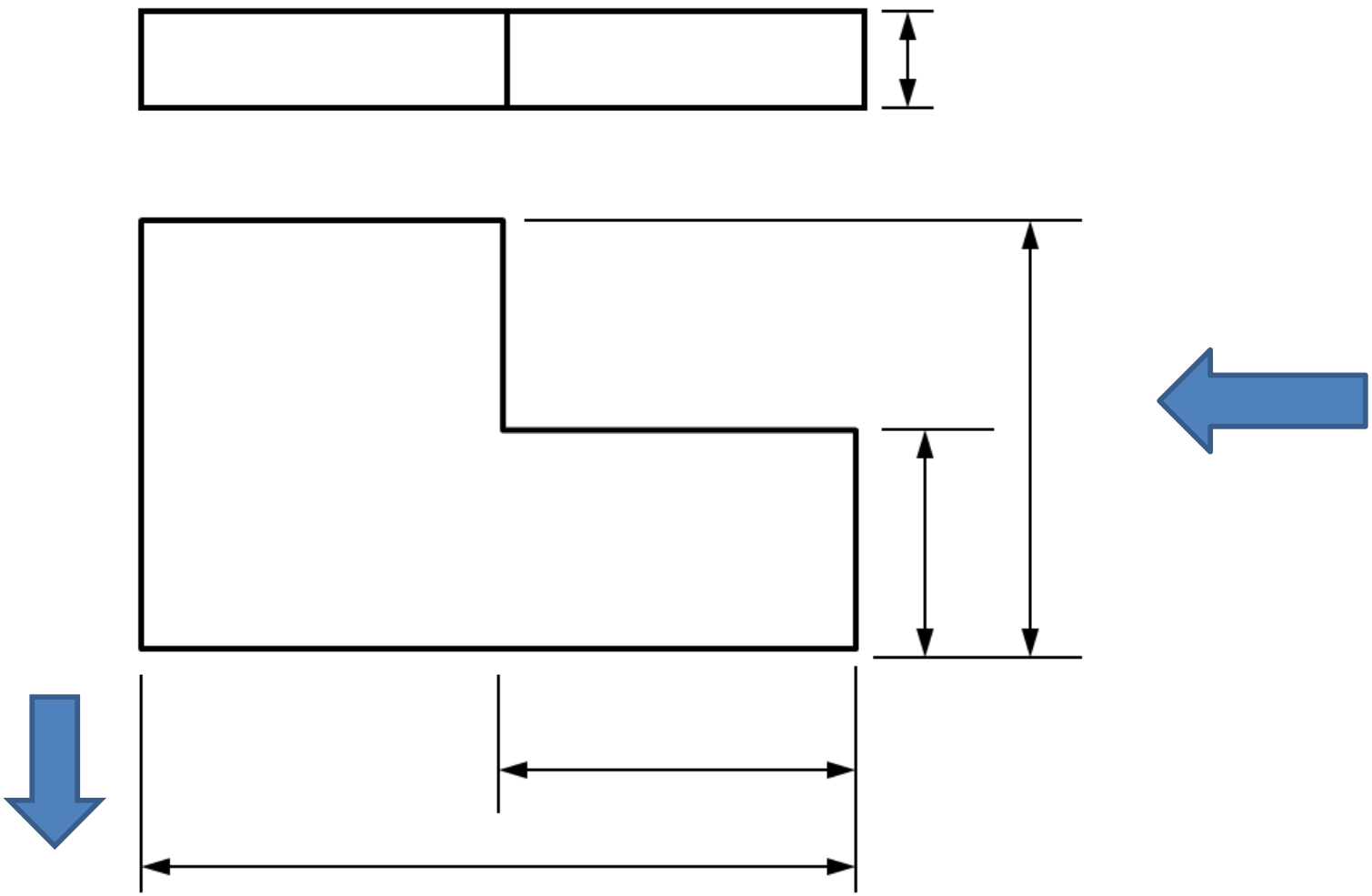
- **Depending on available space**



- **Extension line must be close to object line!**

Placing of Dimensioning

- Only two sides of the views



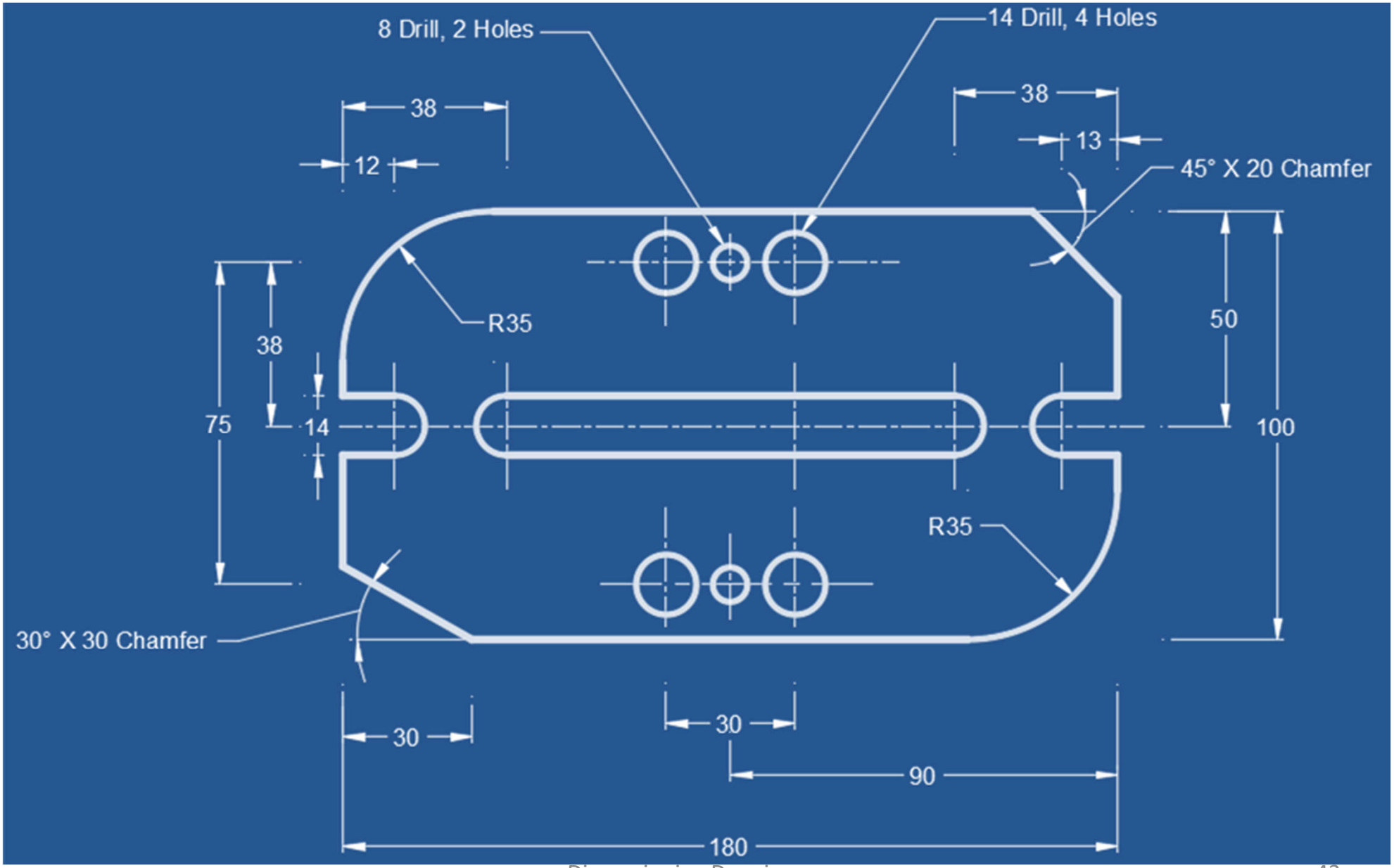
- Smaller dimensions should be inside and bigger outside

DIMENSIONING (IN MORE DETAILS)

Position Dimensions

- Position dimension fix the relationship of the components/parts of the object
- Determine the contact surfaces, finished surfaces and the center lines of the elementary geometric forms
- Position Dimension may be from
    - Center to Center
    - Surface to Center
    - Surface to Surface

Dimensions of Size and Position

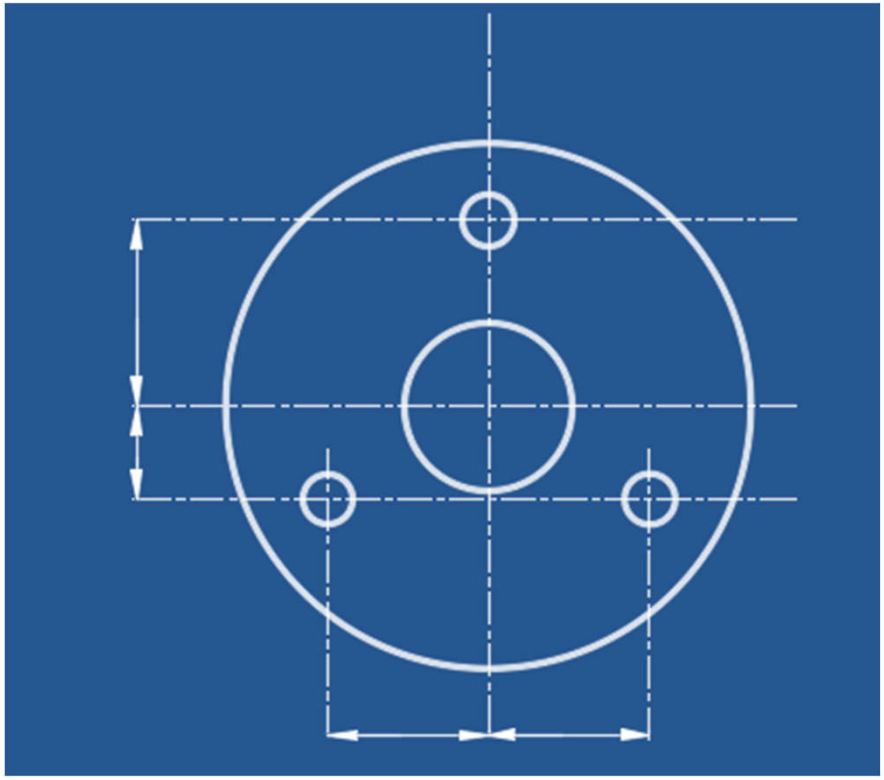


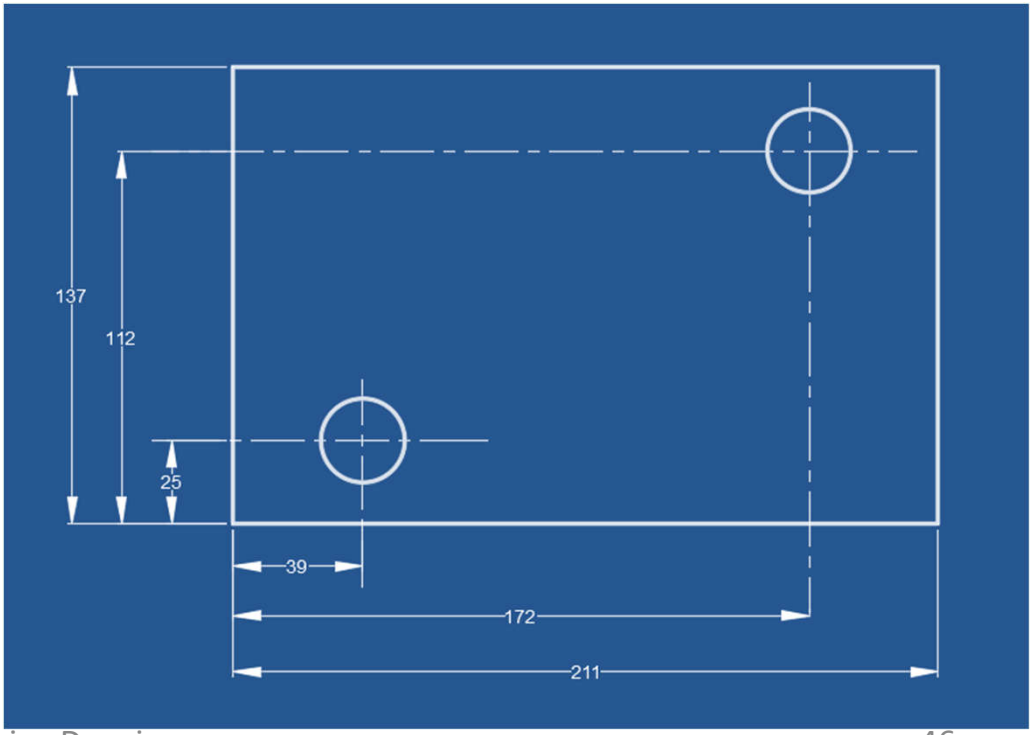
Dimensional Clarity using a Datum

- A datum is a feature of a part that acts as a master reference used to locate other features of the part.
- A datum can be a point, a line or a plane
- Any datum should be a readily available, clearly identifiable and readily recognizable such as finished surface on a bench vise
- Datum must be accessible during manufacturing
- A datum surface must be more accurate than the allowable variation on any dimension of position which is referred to the datum

Dimensional Clarity using a Datum

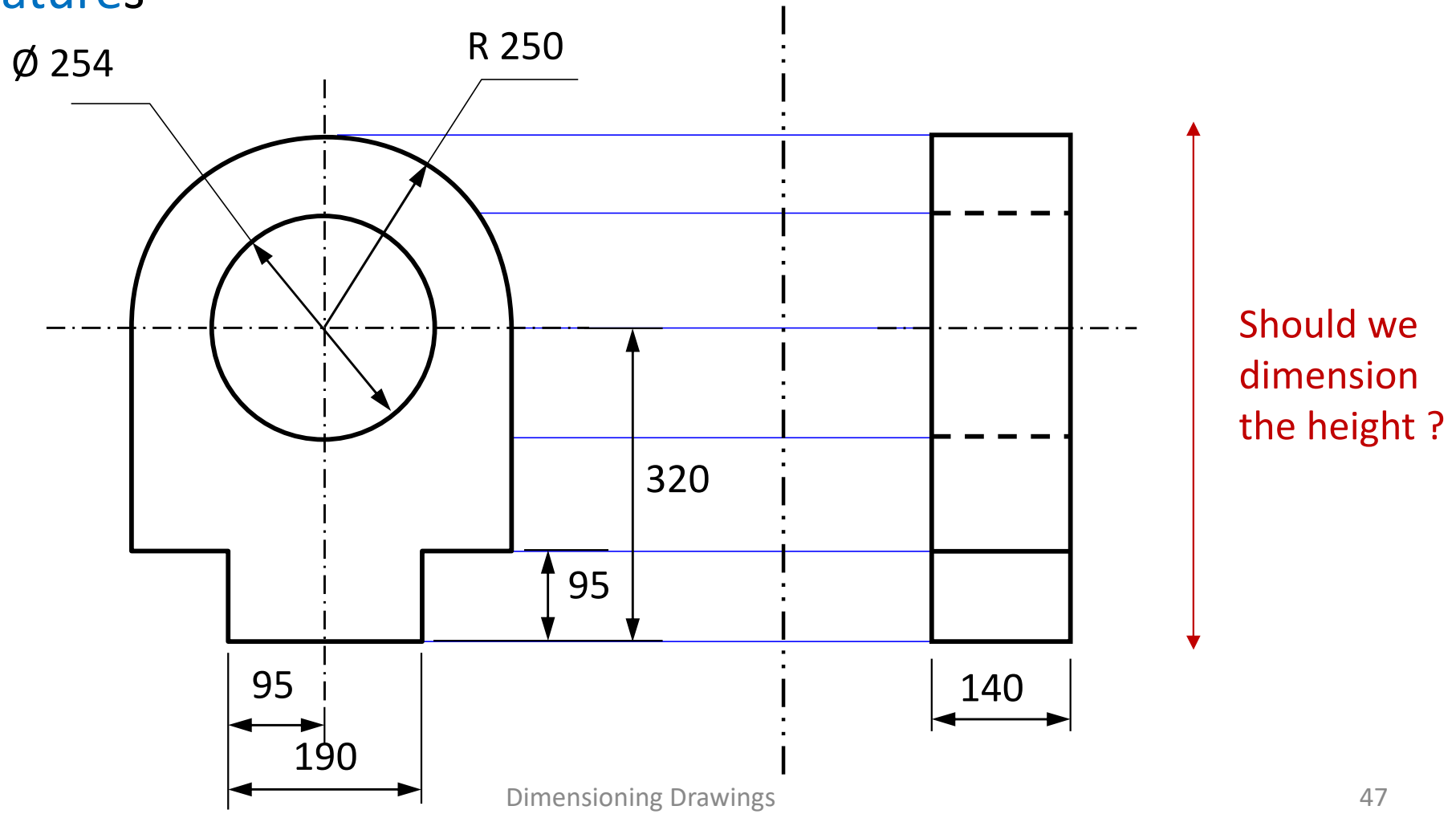
Dimensional Clarity using a Datum





Which view to dimension?

- Show dimensions in the view that shows the most relevant features

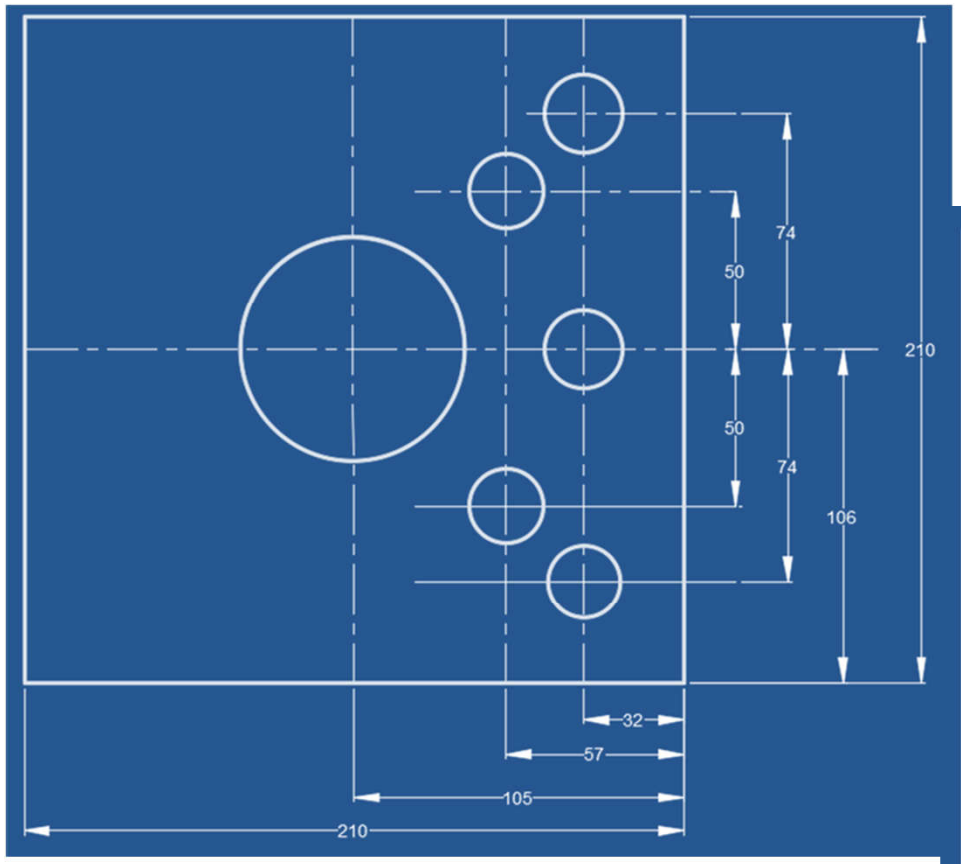


Reading Direction

- Aligned System:
  - Figures are oriented to be read from a position perpendicular to the dimension line

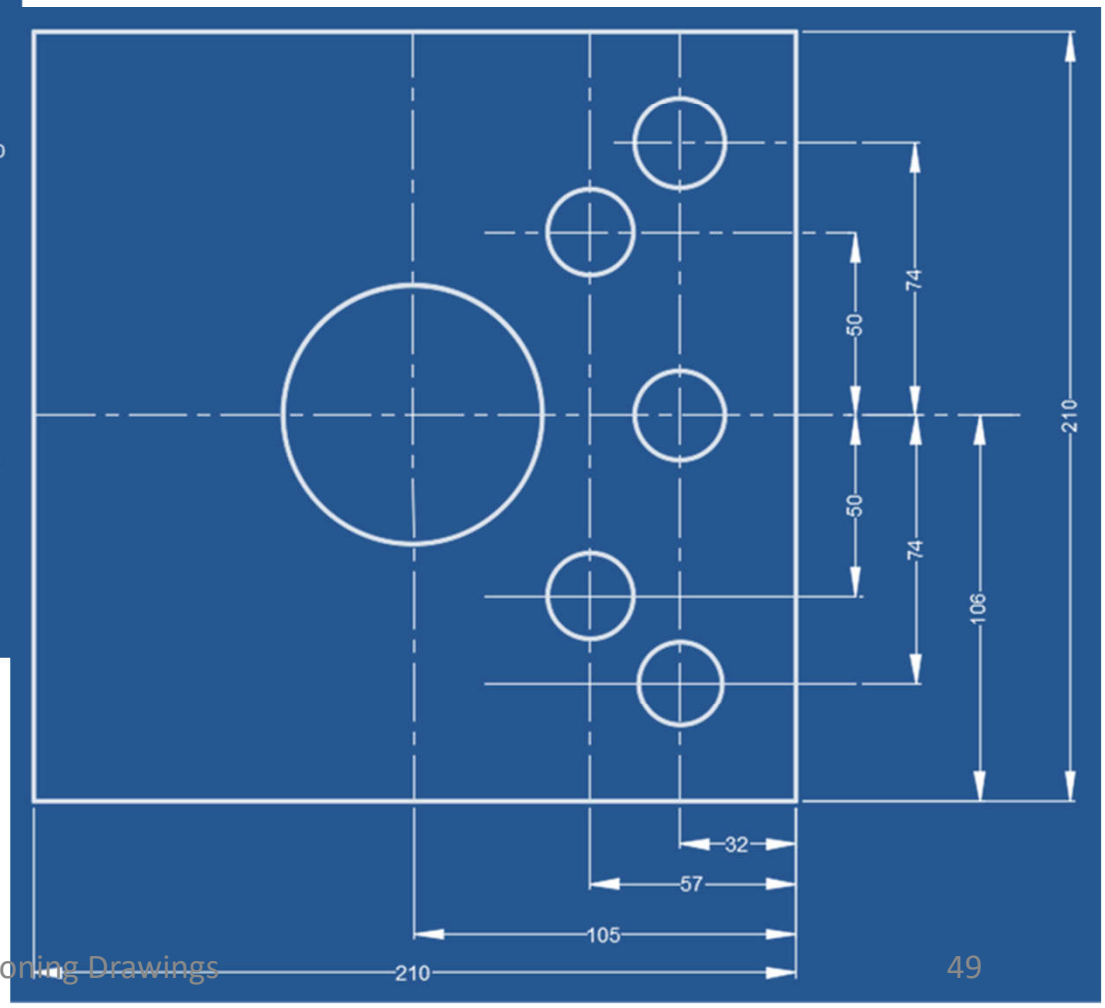
- Unidirectional System:
  - All figures are oriented to read from the bottom of the drawing

Reading Direction

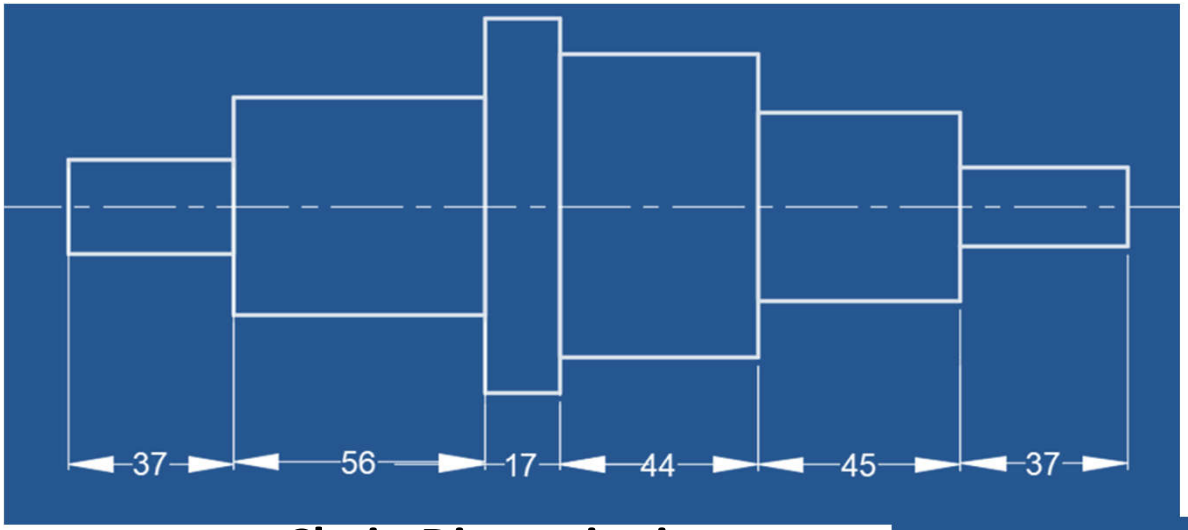


Unidirectional system

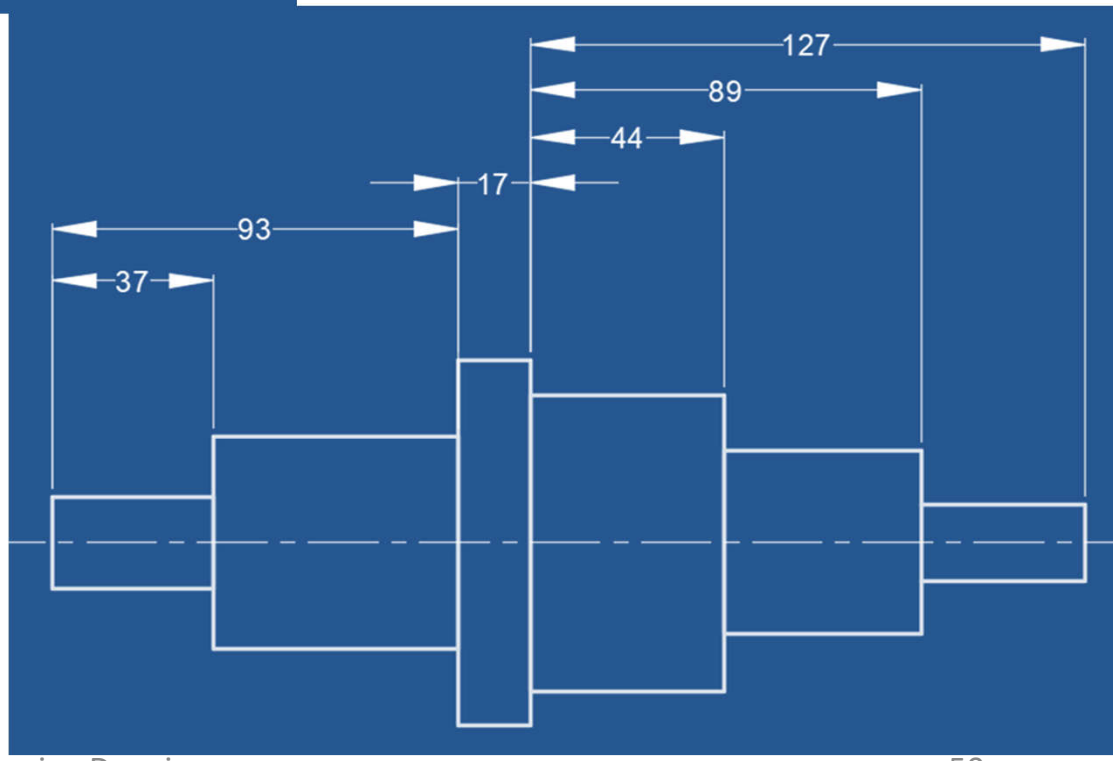
Aligned system



Chain versus Parallel Dimensioning



Chain Dimensioning



Parallel Dimensioning

Contour Principle

- A feature is best dimensioned in the view where the shape of the feature appears with most characteristics shape- advantage in clarity and ease in reading