



Politechnika Wroclawska

Fundamentals of engineering drawing, p.6

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DIMENSIONING

Dimensioning is giving the dimensions of objects on technical drawings using lines, numbers and dimensional signs.



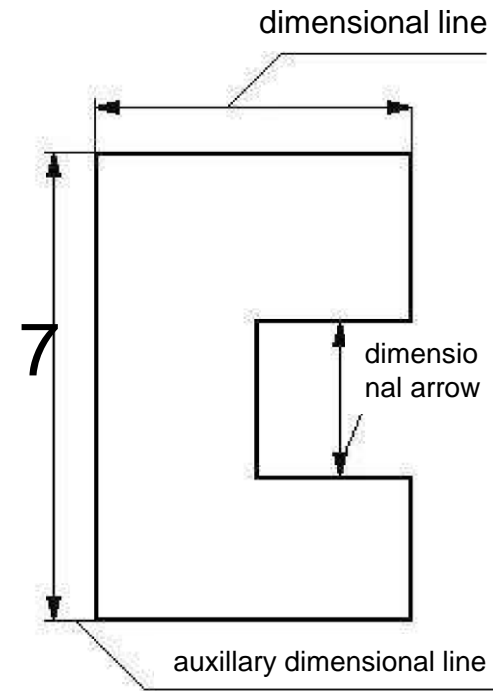
BASIC RULES OF DIMENSIONING

General principles of dimensioning in a technical machine drawing apply to:

- dimension lines and auxiliary dimension lines,
- dimensional arrows,
- dimensional numbers,
- dimensional marks.

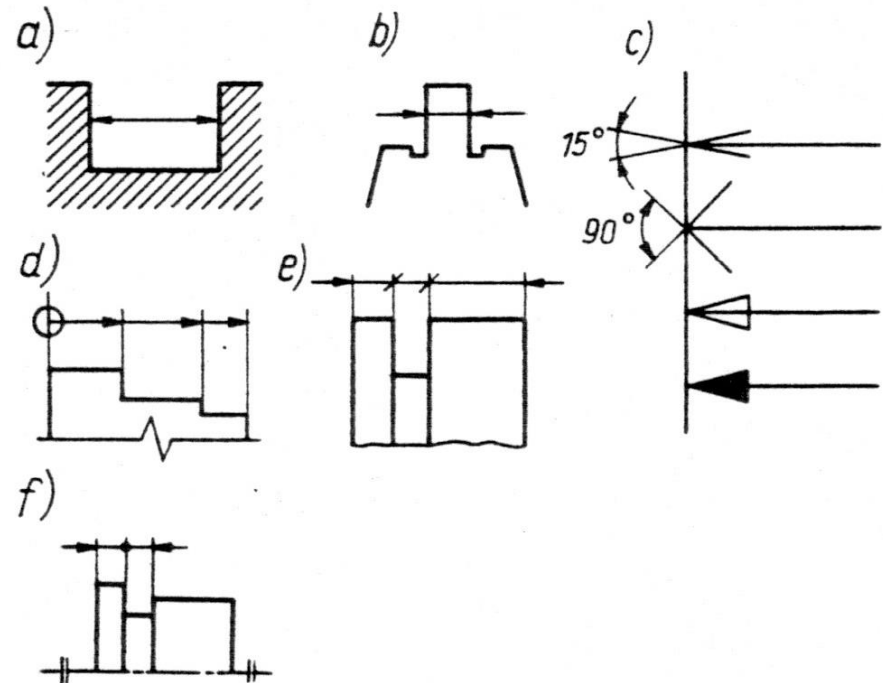
DIMENSIONAL LINES

- Dimension lines are drawn with a solid thin line parallel to the dimensioned section at a distance of at least 10 mm from the contour lines, and subsequent dimension lines are drawn at a distance of not less than 7 mm from the previous ones.
- They are finished with tips touching the edge of the object, auxiliary dimension lines or the axis of symmetry.



DIMENSIONAL LINES

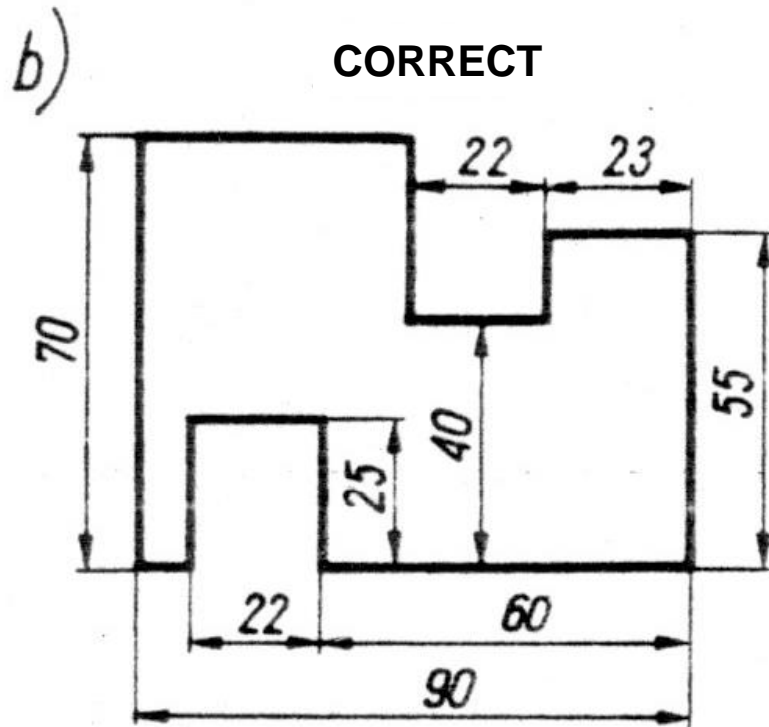
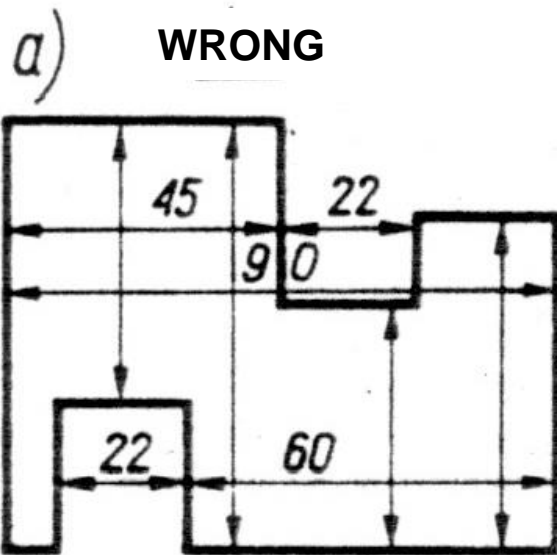
- Instead of arrows (heads), it is allowed to use short lines ~3.5 mm long and inclined at $\angle 45^\circ$ to dimension lines or possibly dots with a diameter of approx. 1 mm.
- **DIMENSIONAL LINES CANNOT INTERSECT!**



Rys. 6.1. Linie wymiarowe: a) ze strzałkami wewnątrz, b) ze strzałkami na zewnątrz, c) kształt grota, d) początek linii wymiarowej, e) ukośne kreski zastępujące groty, f) kropka zastępująca dwa groty



DIMENSIONAL LINES





AUXILLARY DIMENSIONAL LINES

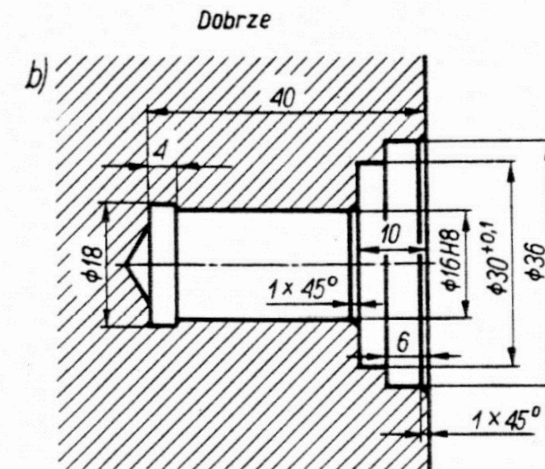
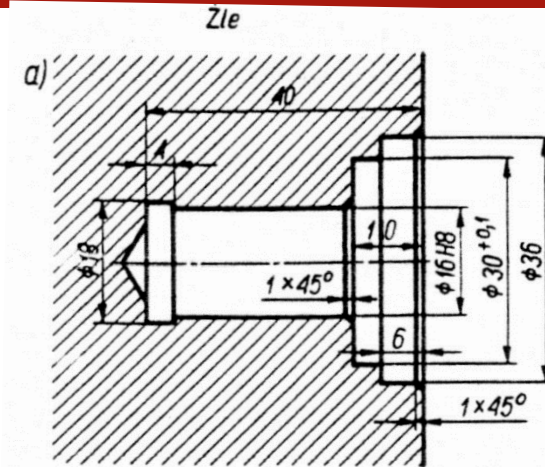
- Auxiliary dimension lines are continuous thin lines, which are extensions of the drawing line. They are drawn perpendicularly to the measured segment. Auxiliary dimension lines extend 1-2 mm above the arrowhead.

AUXILIARY DIMENSIONAL LINES MAY INTERSECT!

They can be interrupted when they intersect the string.

AUXILLARY DIMENSIONAL LINES

- If an auxiliary line passes through the hatch, its direction must not match the direction of the hatch.





DIMENSION NUMBERS

- Dimensions are given in mm (without writing it), when we put other units, we write, e.g. inches, cm.
- Angular dimensions are given in degrees, minutes and possibly in seconds (in fractional form only of a second).
- For dimensional numbers specifying nominal dimensions, letter height at least 3.5 mm, in all drawings on one sheet the same.

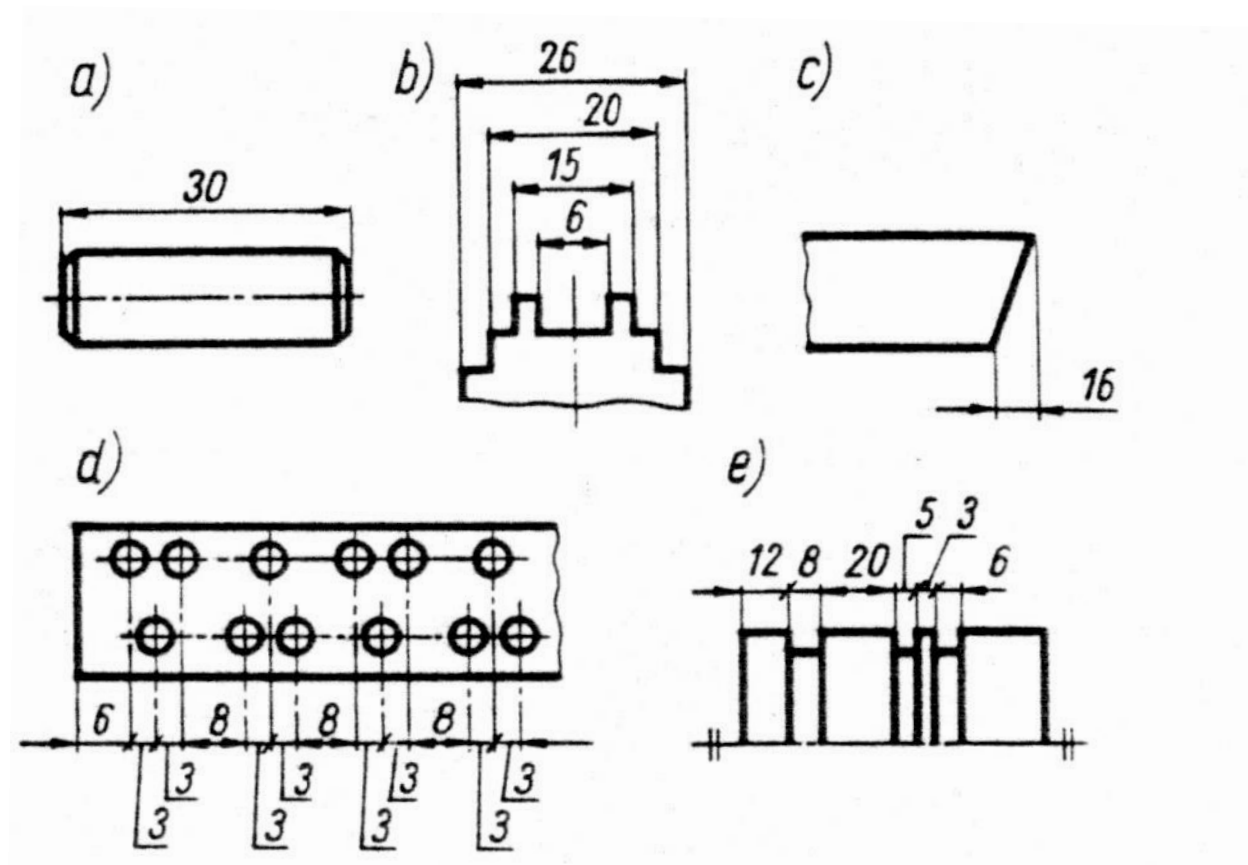


DIMENSION NUMBERS

- Dimensional numbers are written above the dimension lines at a distance of $\sim 0.5 - 1.5$ mm from them, more or less in the middle.
- Avoid placing dimensional numbers on part outline lines, axes, and hatch lines.
- Avoid writing dimension numbers exactly one above the other.
- When the dimension line is short, you can write a number above its extension, basically to the right.



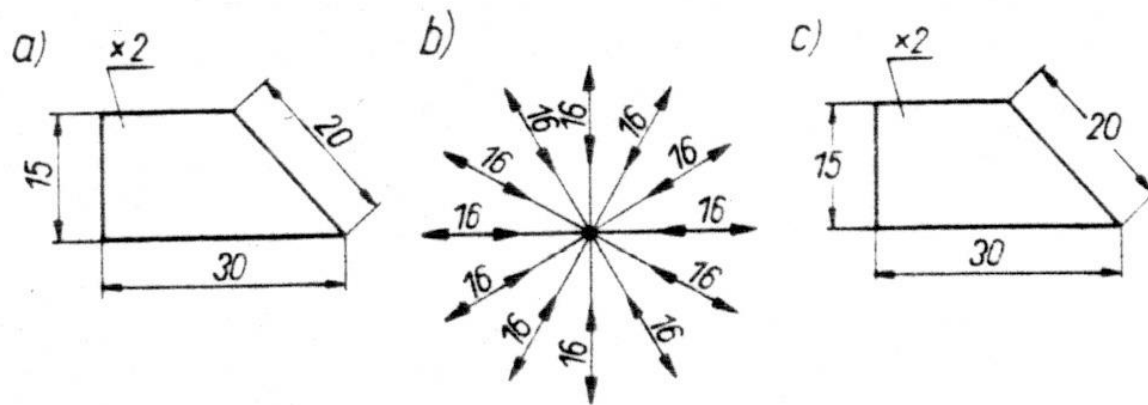
DIMENSION NUMBERS



LOCATION OF DIMENSIONS ON DRAWINGS

When arranging dimensions in drawings:

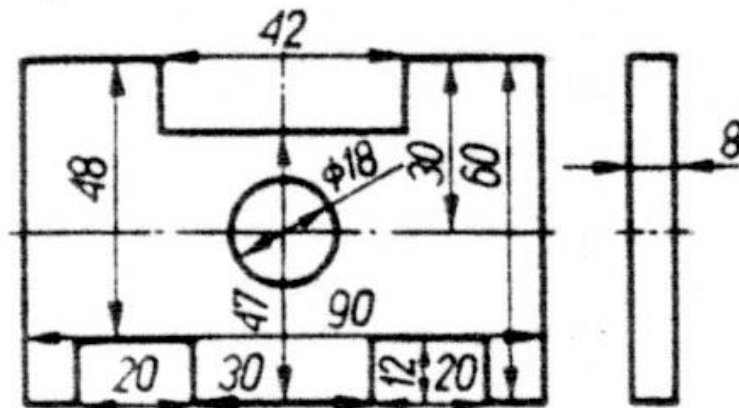
- dimensional numbers should be given in such a way that they can be read looking from the bottom of the drawing or from the right side.
- dimensional numbers should be entered in such a way that they can be read from the bottom.



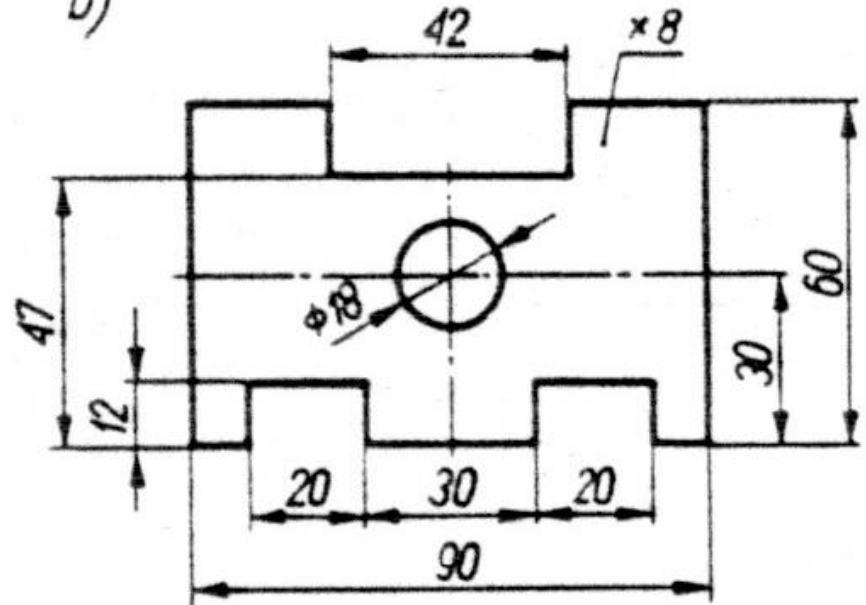


LOCATION OF DIMENSIONS ON DRAWINGS

a) **WRONG**



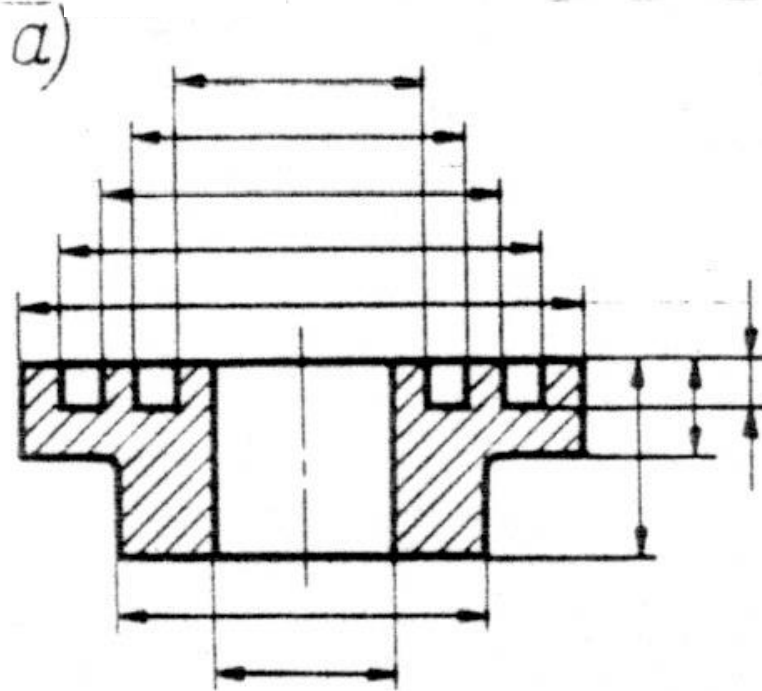
b) **CORRECT**



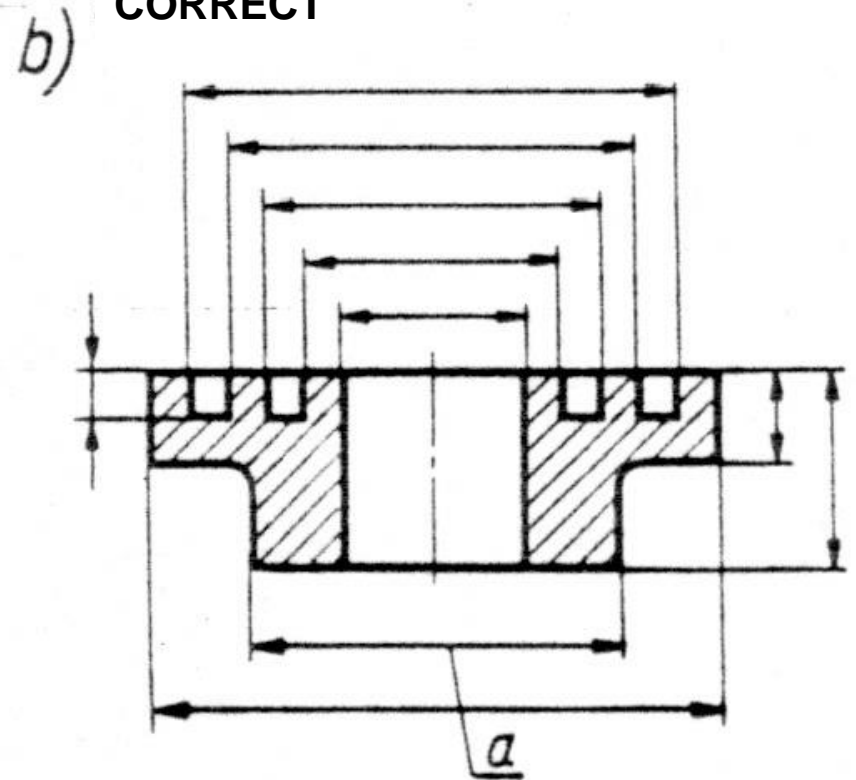


LOCATION OF DIMENSIONS ON DRAWINGS

WRONG



CORRECT





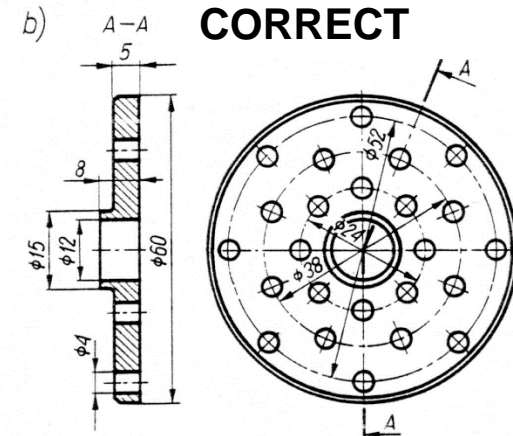
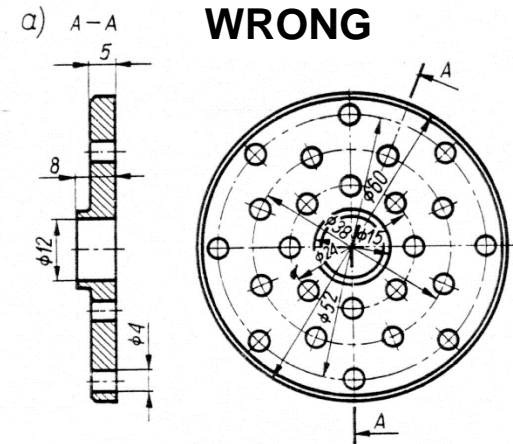
LOCATION OF DIMENSIONS ON DRAWINGS

- Intersection of dimension extension lines with dimension lines of other dimensions and with drawing lines should be avoided.
- It is not allowed to use extension lines and their extensions as well as drawing lines as dimension lines, or dimension lines as extensions for other dimensions.



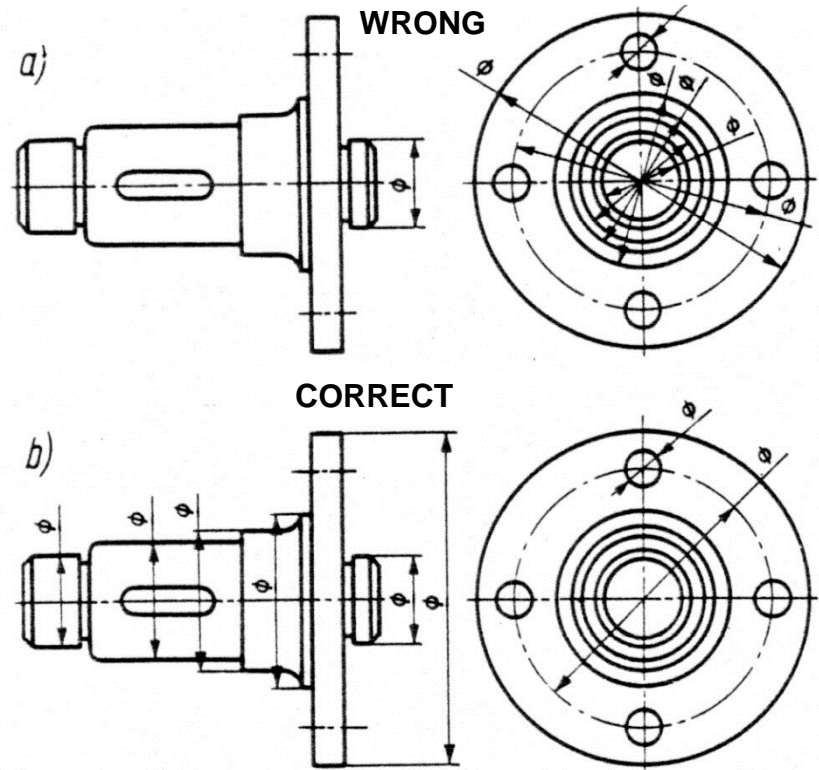
LOCATION OF DIMENSIONS ON DRAWINGS

Basically dimensions should be written on:
sections, not views



LOCATION OF DIMENSIONS ON DRAWINGS

- and for rotating objects, projections on a plane parallel to their axis, not perpendicular to it.



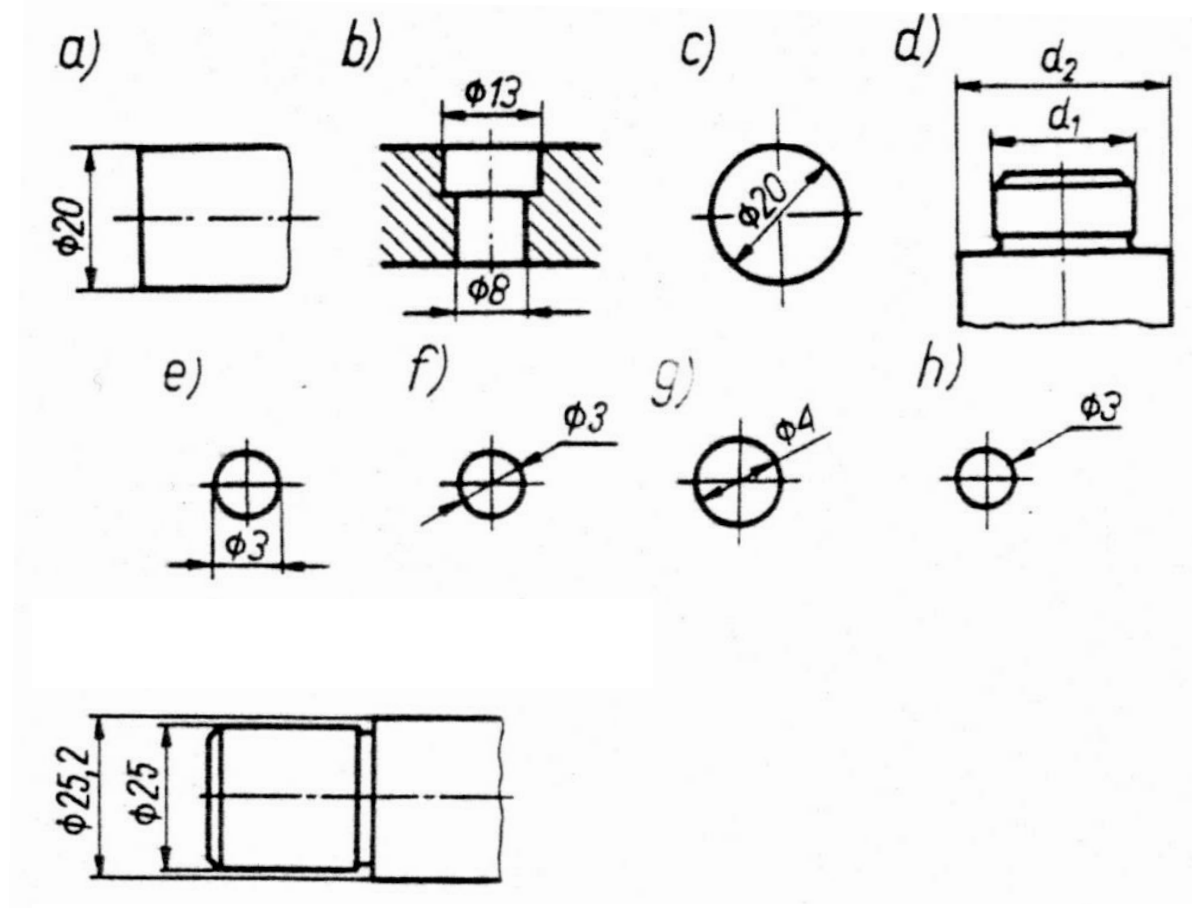


DIAMETER AND RADIUS DIMENSIONS

- When dimensioning diameters, regardless of the projection, we write the sign Φ or D (d) before the dimension.
- When dimensioning arc radii, the dimension line is drawn from the center of the arc and ends with an arrow from the arc side, and the dimension number is preceded by the letter R (r).

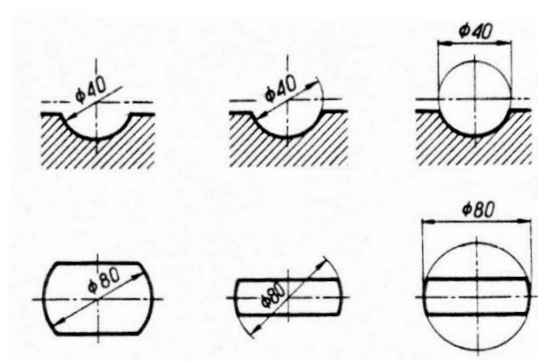
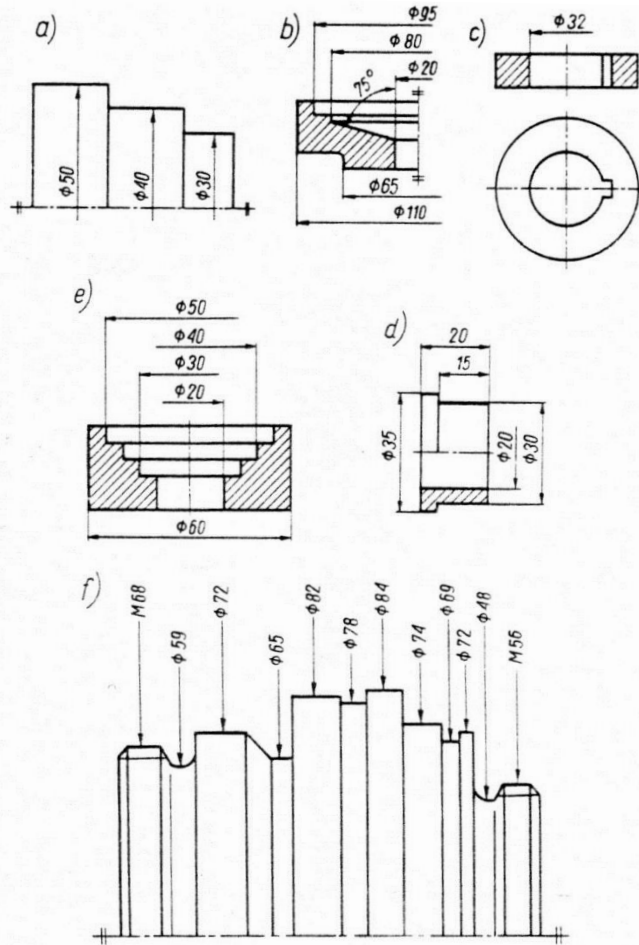


DIAMETER AND RADIUS DIMENSIONS





DIAMETER AND RADIUS DIMENSIONS

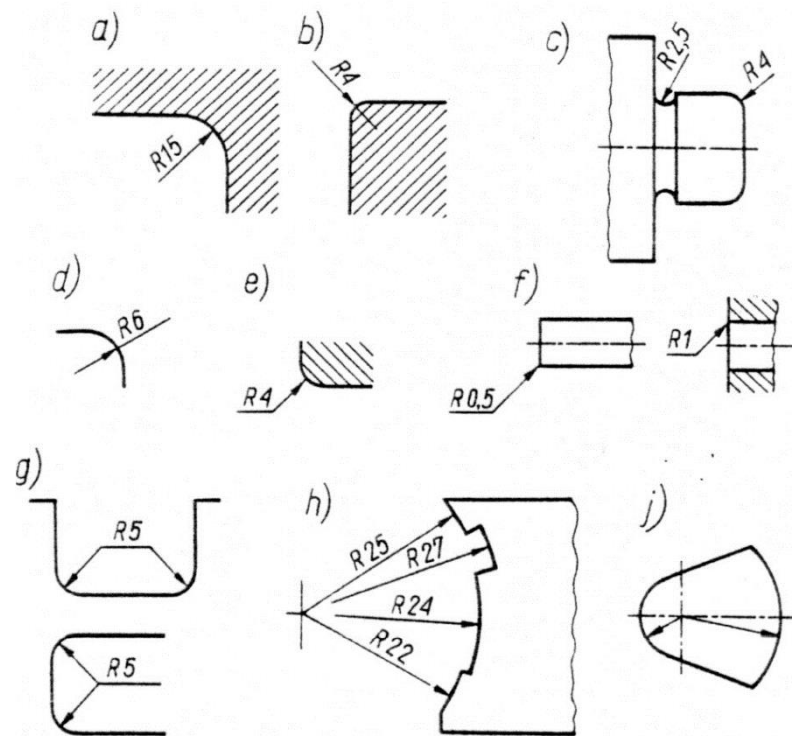
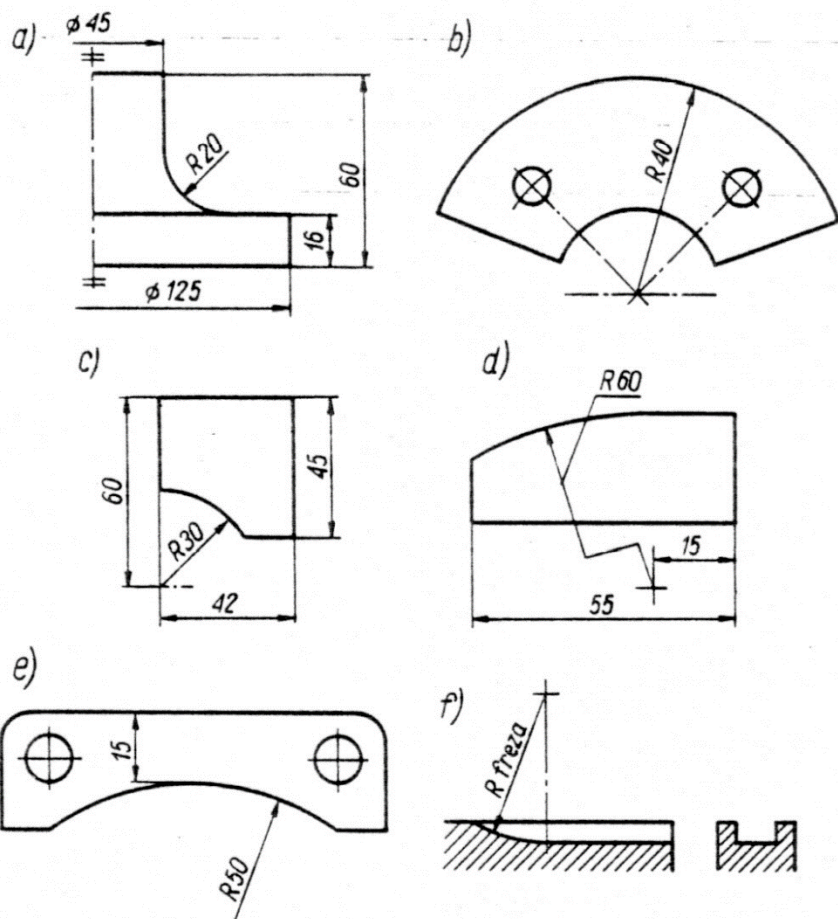


Dimensioning the diameters of fragments of rotating surfaces

Dimensioning diameters using dimension lines with one arrow



DIAMETER AND RADIUS DIMENSIONS



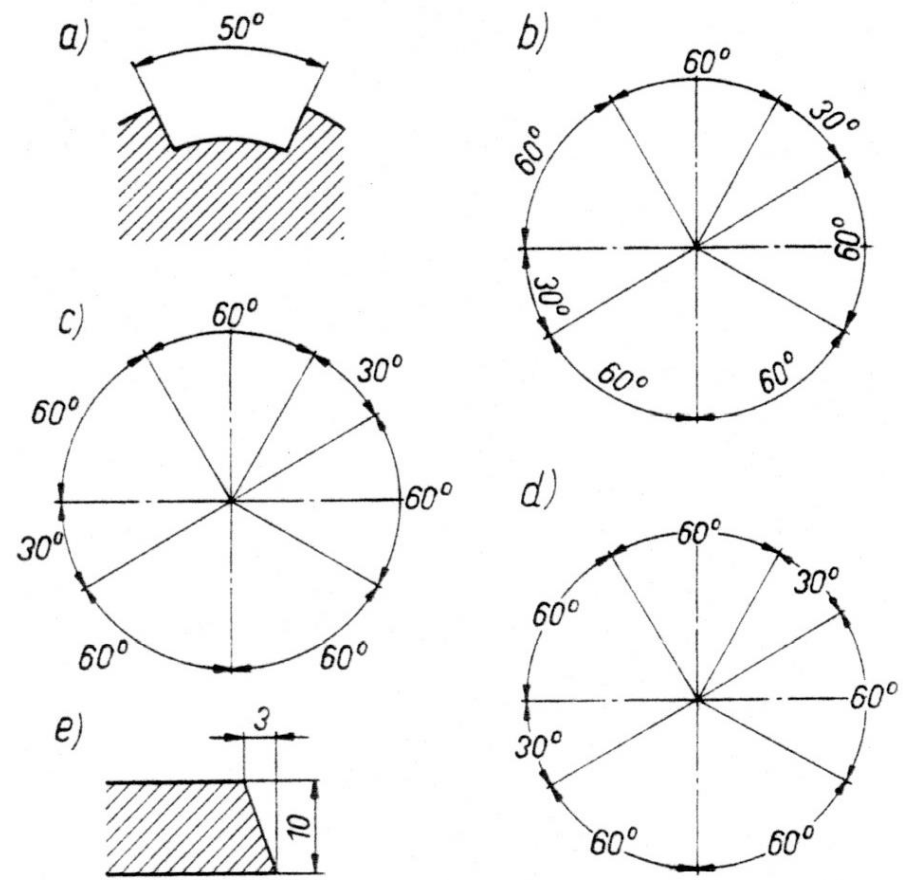
Dimensioning of small radii and radii with a common center

Dimensioning of radii



DIMENSIONING OF ANGLES

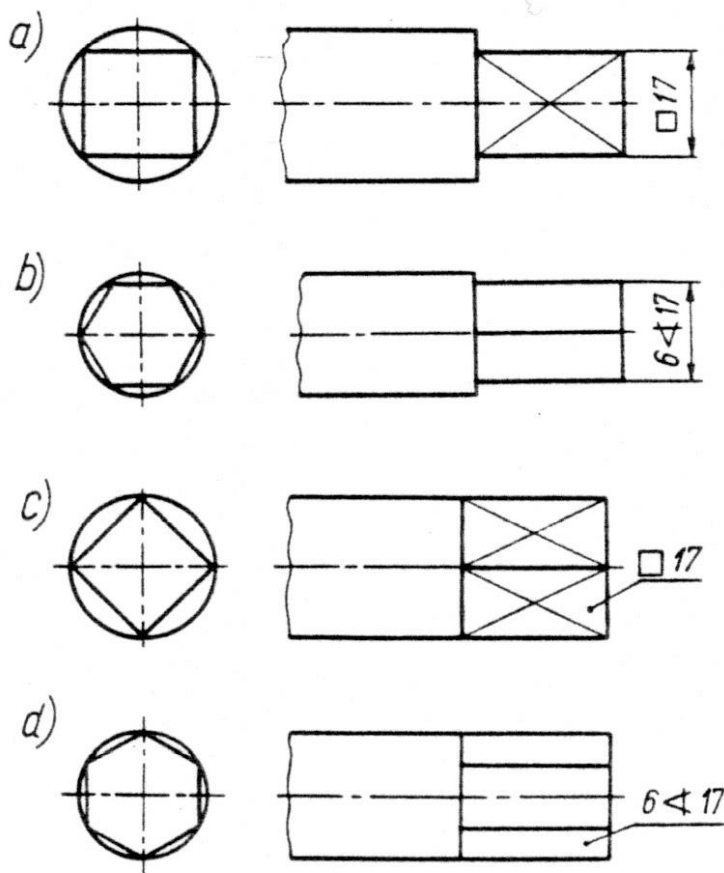
The dimension line is an arc circled with angle vertex, auxiliary lines dimensions are arm extensions angle, number of ditch is written \perp to the bisector of \angle



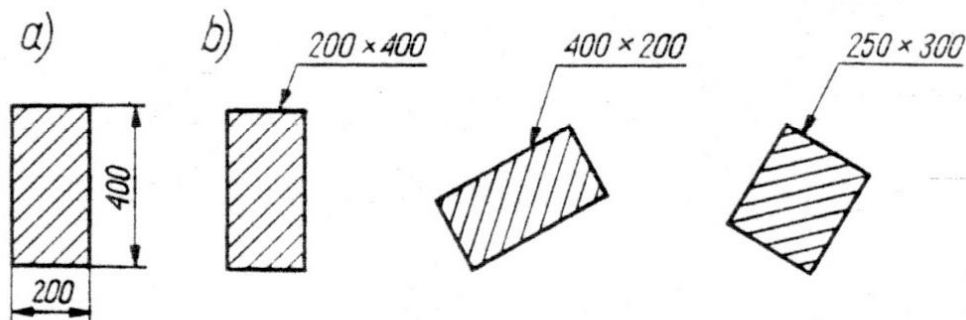
Dimensioning of angles: a) in degrees, b) and c) according to method 1, c) and d) according to method 2, e) using dimension lines



DIMENSION OF SQUARE, HEXAGON AND RECTANGULAR SECTIONS



Dimensioning of square and hexagonal sections



Dimensioning of rectangular sections



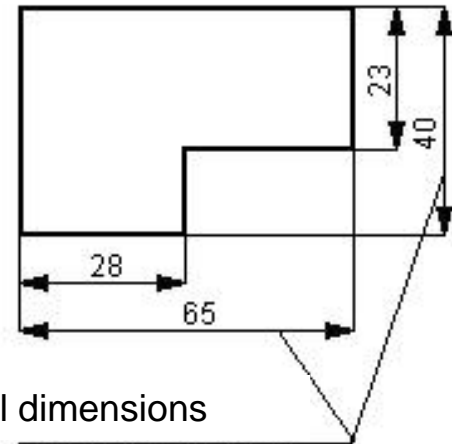
GENERAL DIMENSIONING PRINCIPLES

Rule of Necessary Dimensions!

We always provide overall (external) dimensions.

Smaller dimensions are drawn closer to the projection of the object.

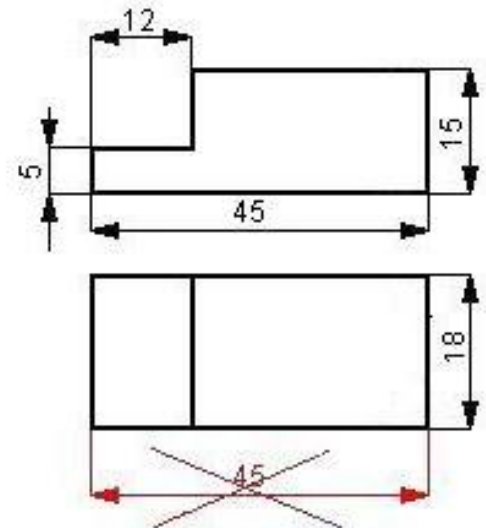
Each dimension in the drawing should be measurable on the workpiece during machining operations.



GENERAL DIMENSIONING PRINCIPLES

The principle of non-repeating of dimensions!

In the drawings, we put as many and such dimensions as are necessary to unambiguously present the object, and each necessary dimension should be given only once.



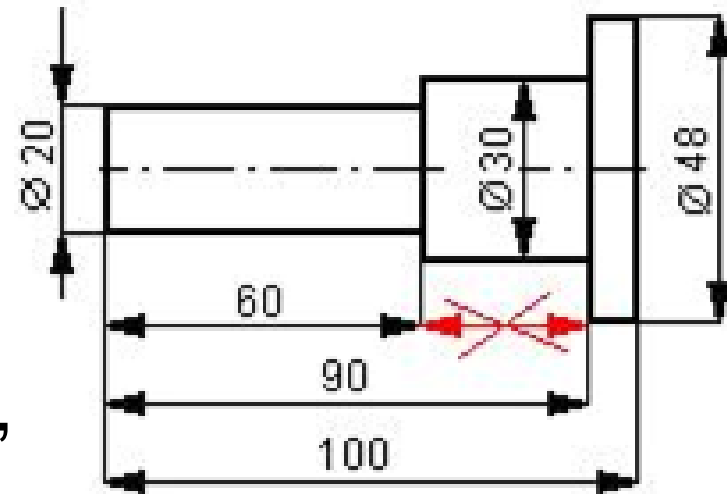
Repeated dimension



GENERAL DIMENSIONING PRINCIPLES

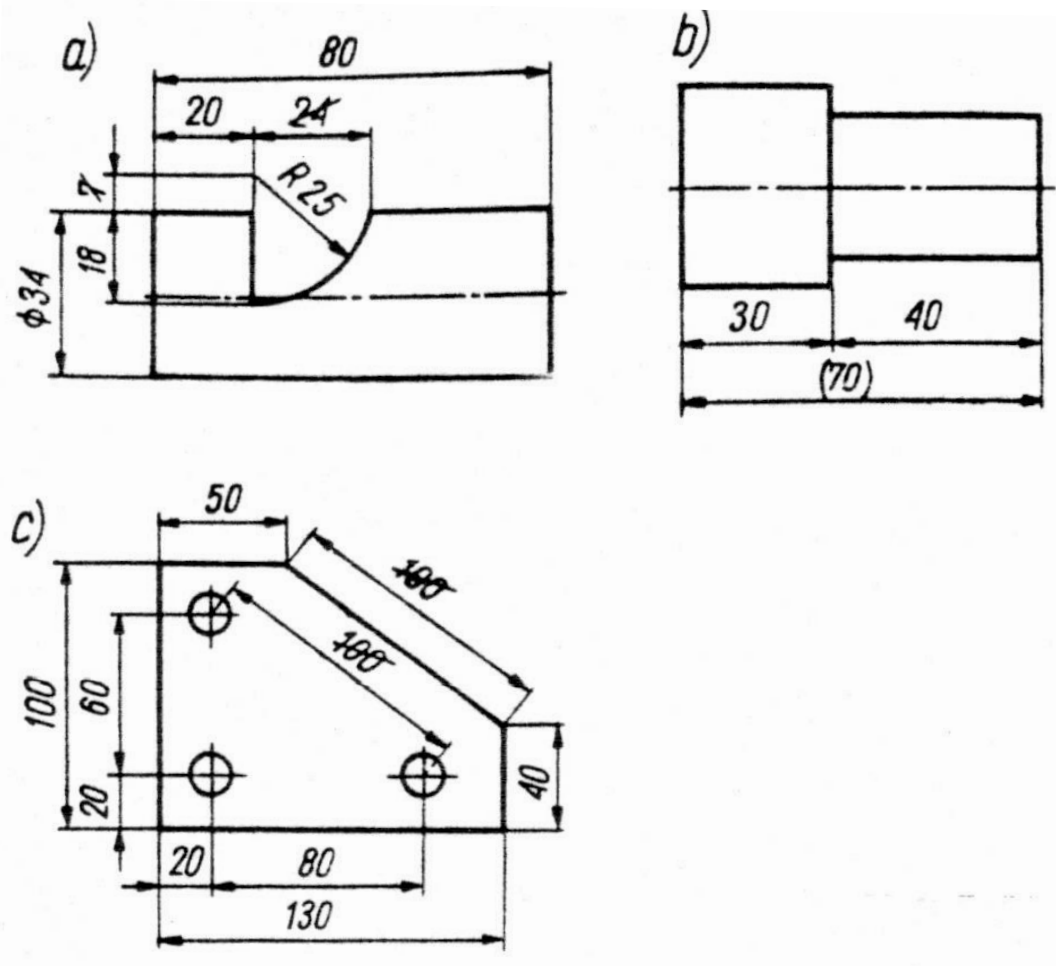
The principle of not closing dimensional chains!
Obvious dimensions should not be given.

If presented in the drawing a series of dimensions located one by one and their dimensions total, i.e. chain of simple dimensions, that is least important dimension string should be omitted, not to repeat dimensions.





GENERAL DIMENSIONING PRINCIPLES

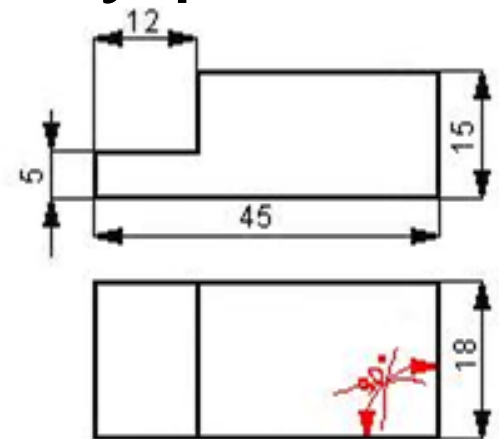


Dimensions chains: a), b) simple, c) complex

GENERAL DIMENSIONING PRINCIPLES

The principle of omitting obvious dimensions!

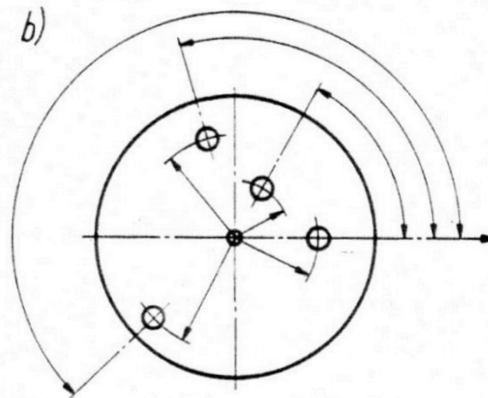
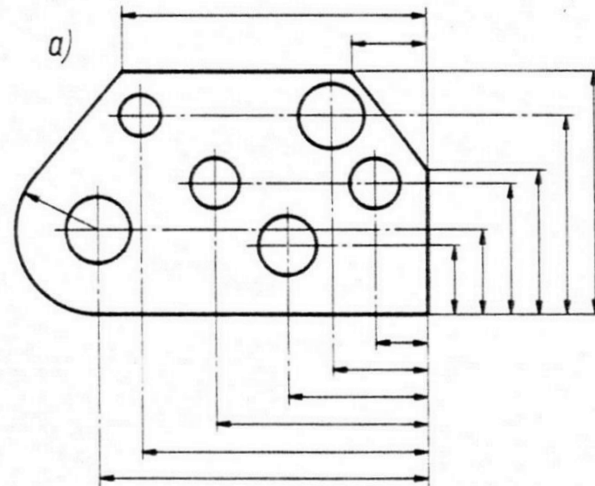
Omitting obvious dimensions applies primarily to all angular dimensions of 0° or 90° , i.e. relating to mutually parallel or perpendicular lines.





PARALLEL DIMENSIONING

It's about giving all dimensions parallel to one base (surface or line)



Dimensioning in the parallel system: a) in rectangular coordinates, b) in polar coordinates

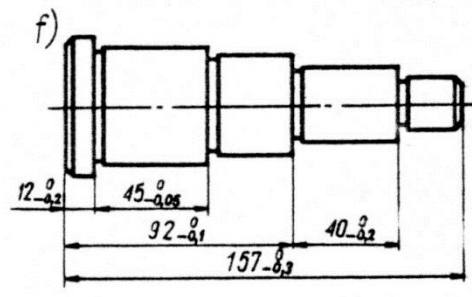
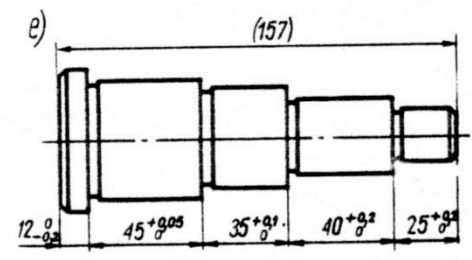
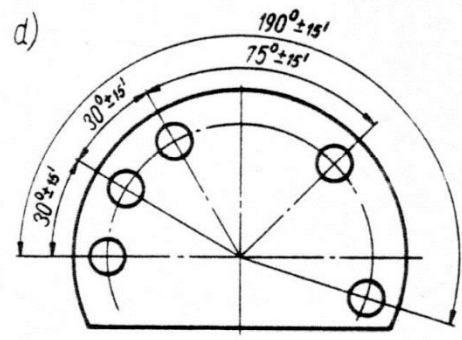
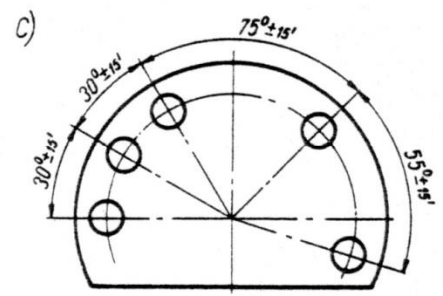
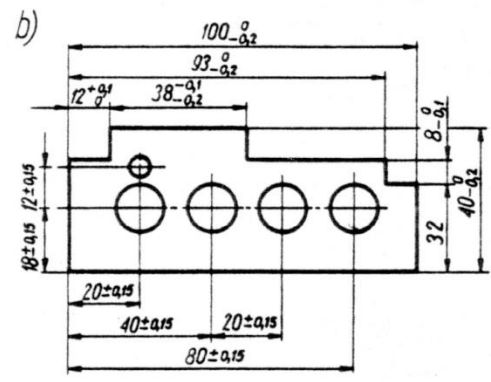
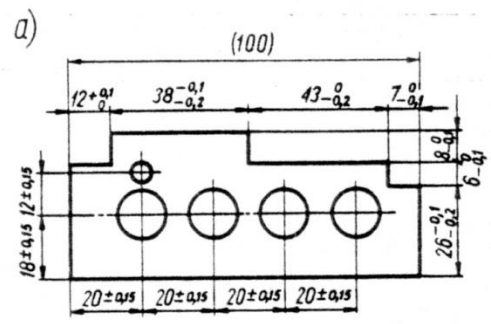


SERIAL AND MIXED SIZING

- Serial dimensioning consists in entering parallel dimensions one after the other.
- Mixed design is a combination of both methods.
- Mixed dimensioning is the most commonly used.



SERIAL AND MIXED SIZING



Dimensioning: a), c), e) in the serial system, b), d), f) mixed