Tishk International University
Mechatronics Engineering Department
Engineering Drawing lecture 2 theoretical: 21 /12 /2020

Geometrical Construction

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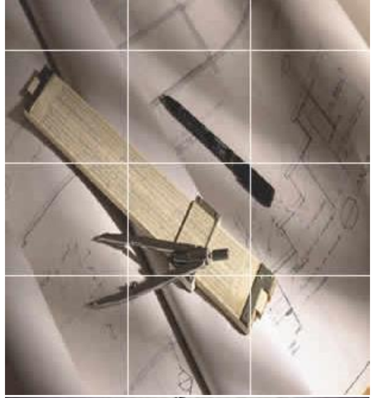
outline

- Principles of Dimensioning
- Arrangement of Dimensions
- Geometrical Construction



Preparation of Tools






Principles of Dimensioning

Some of the basic principles of dimensioning are given below.

I. All dimensional information necessary to describe a component clearly and completely shall be written directly on a drawing.

2. Each feature shall be dimensioned once only on a drawing, i.e., dimension marked in one view need not be repeated in another view.

3. Dimension should be placed on the view where the shape is best seen (Fig.1)

4. As far as possible, dimensions should be expressed in one unit only preferably in millimeters, without showing the unit symbol (mm).

5. As far as possible dimensions should be placed outside the view (Fig.2).

6. Dimensions should be taken from visible outlines rather than from hidden lines (Fig3).

7. No gap should be left between the feature and the start of the extension line (Fig.4).

8. Crossing of centre lines should be done by a long dash and not a short dash (Fig 5).

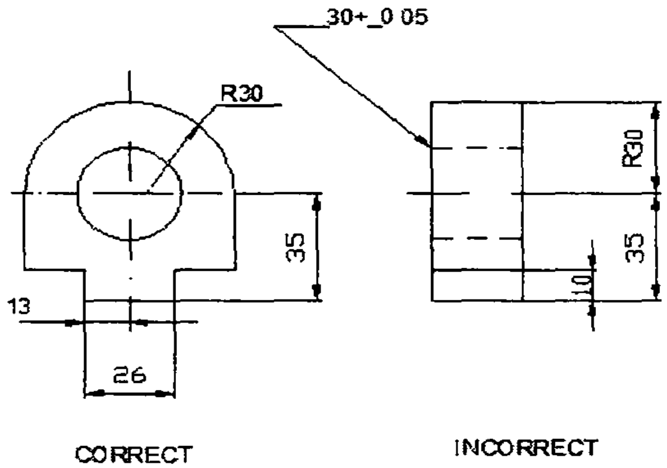


Figure 1 Placing the dimension where the shape is best known.

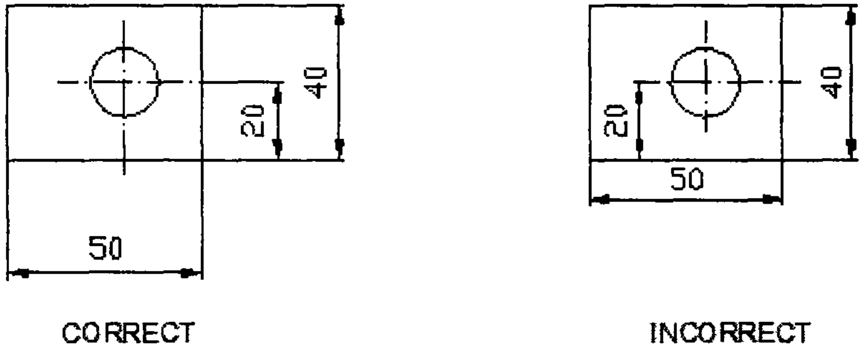


Figure 2 Placing the dimension outside view.

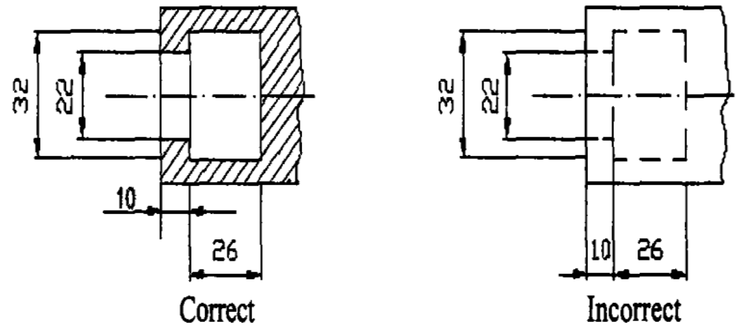


Figure 3 Marking the dimension from the visible outlines.

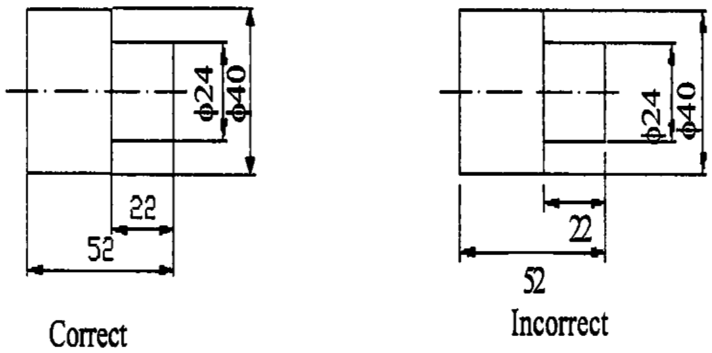


Figure 4 Marking of Extension Line.

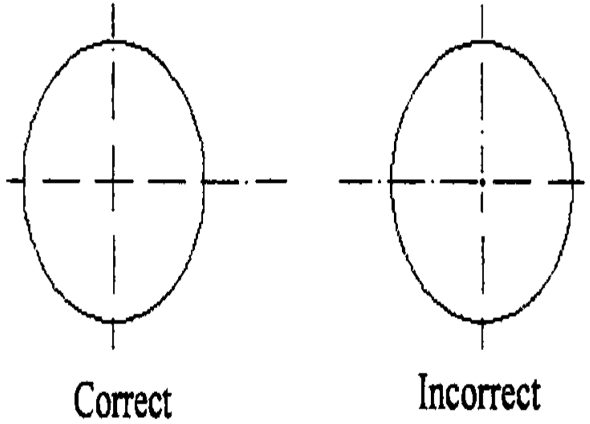


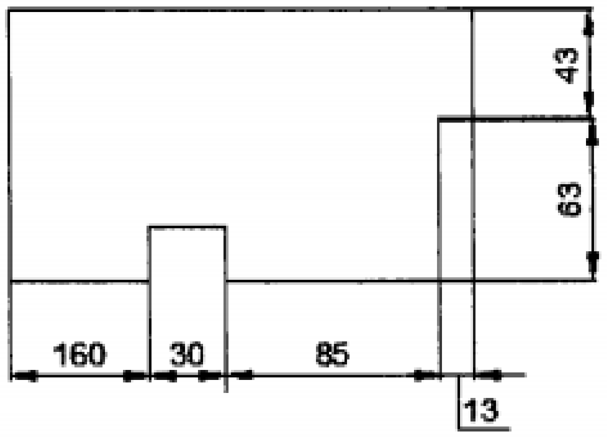
Figure 5 crossing of centre line

Arrangement of Dimensions

The arrangement of dimensions on a drawing must indicate clearly the purpose of the design of the object. They are arranged in three ways.

1. Chain dimensioning
2. 2. Parallel dimensioning
3. 3. Combined dimensioning.

Chain dimensioning Chain of single dimensioning should be used only where the possible accumulation of tolerances does not endanger the fundamental requirement of the component (Fig.2.33) .



Parallel dimensioning In parallel dimensioning, a number of dimension lines parallel to one another and spaced out, are used. This method is used where a number of dimensions have a common datum feature (Fig.2.34).

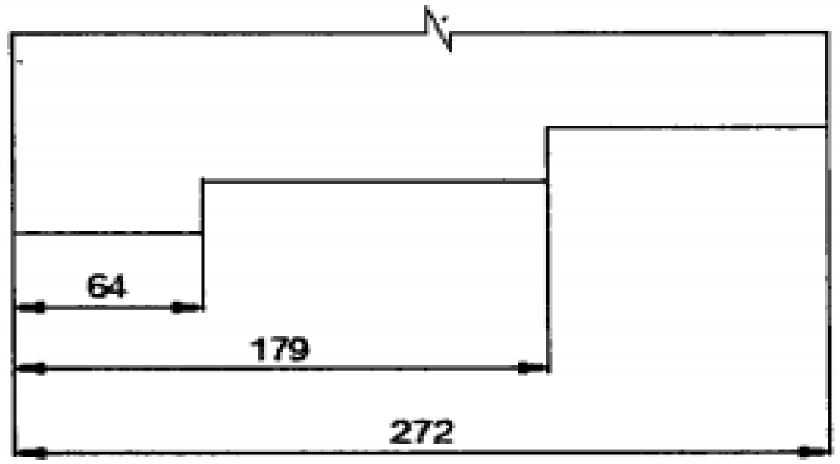


Figure Parallel dimensioning

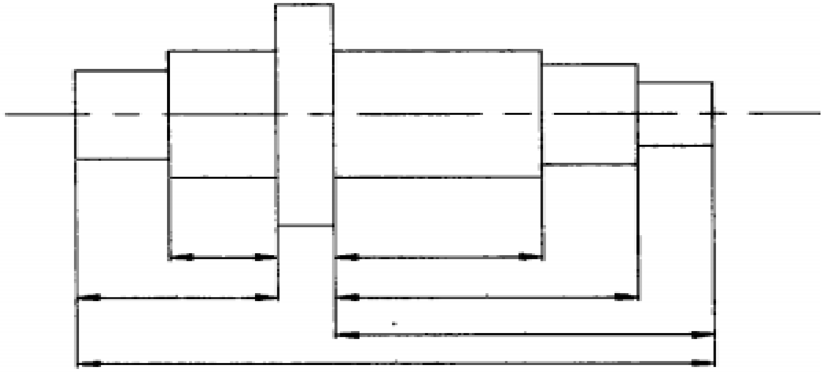
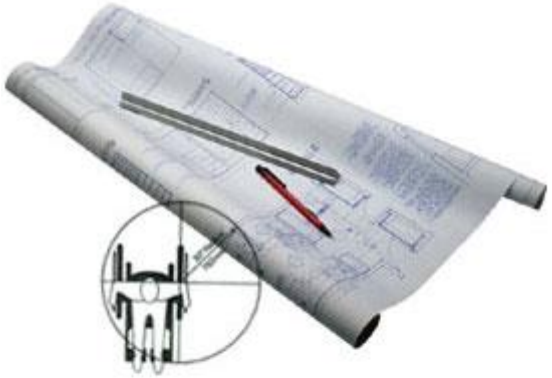


Figure Combined dimensioning



Applied Geometry





Parallel lines

- Parallel line are lines in a plane that are always the same distance apart. Parallel lines never intersect.

Figure Example of parallel line

To Draw a Line parallel to a given line

AB is the given line and c the given distance.

1. From any two points well apart on AB draw two arcs of radius equal to c.
2. Draw a line tangential to the two arcs, to give the required line.

Bisect

- **Bisect" means to** divide into two equal parts. You **can bisect** lines, angles, and more.

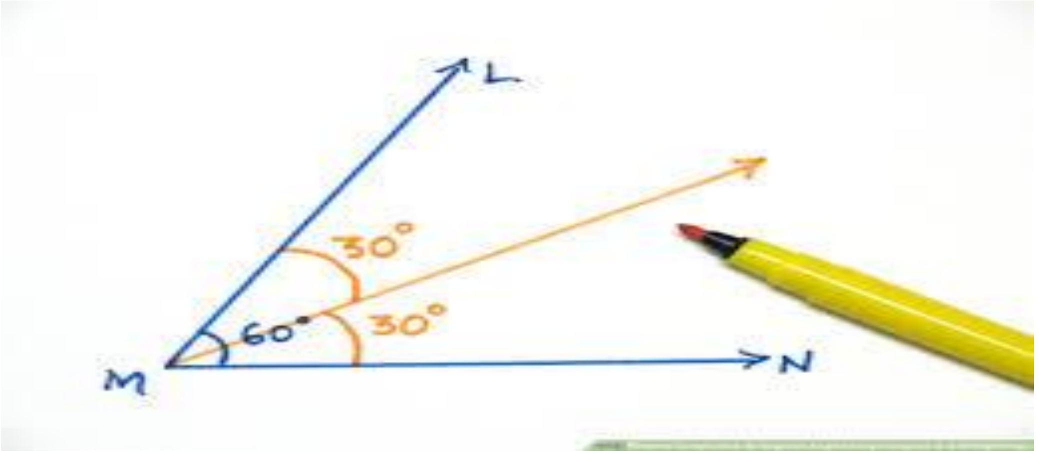
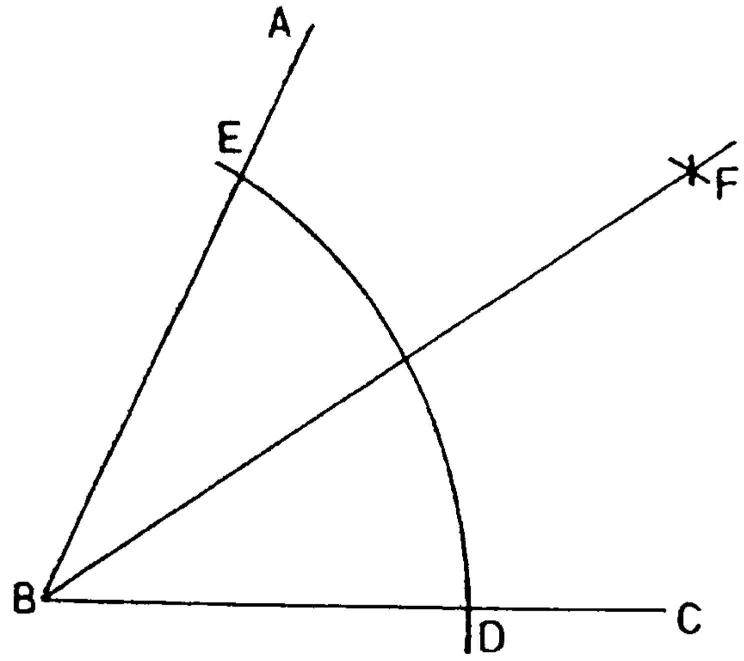


Figure Bisect Angle

TO BISECT A GIVEN ANGLE

ABC is the given angle

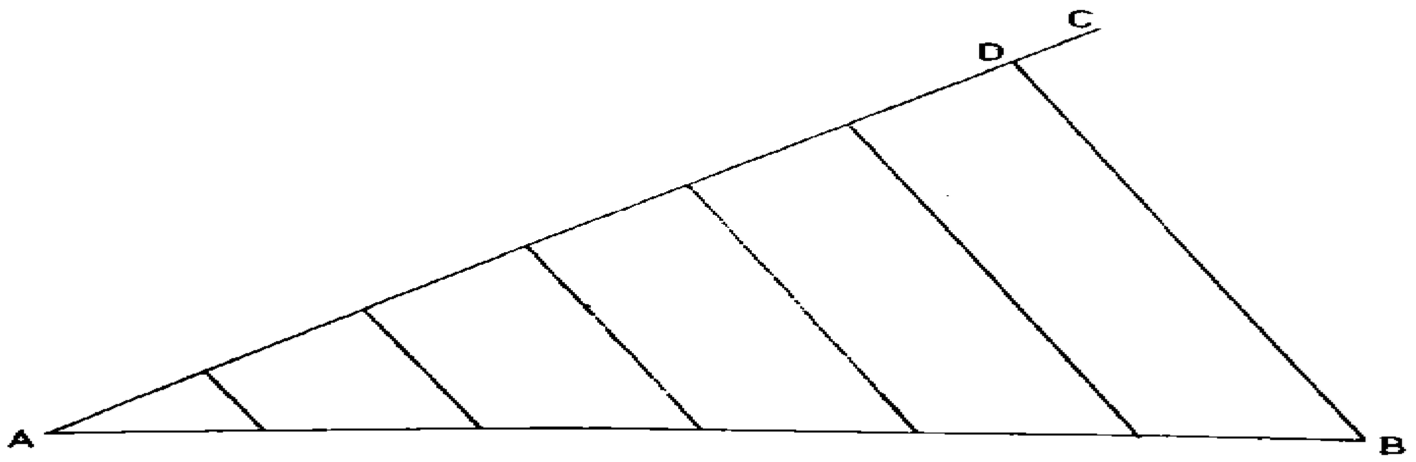
1. From B describe an arc to cut AB and BC at E and D respectively.
2. With centers E and D draw equal arcs to intersect at F.
3. Join BF, the required bisector of the angle.



To divide a line into any number of equal parts

AB is the given line.

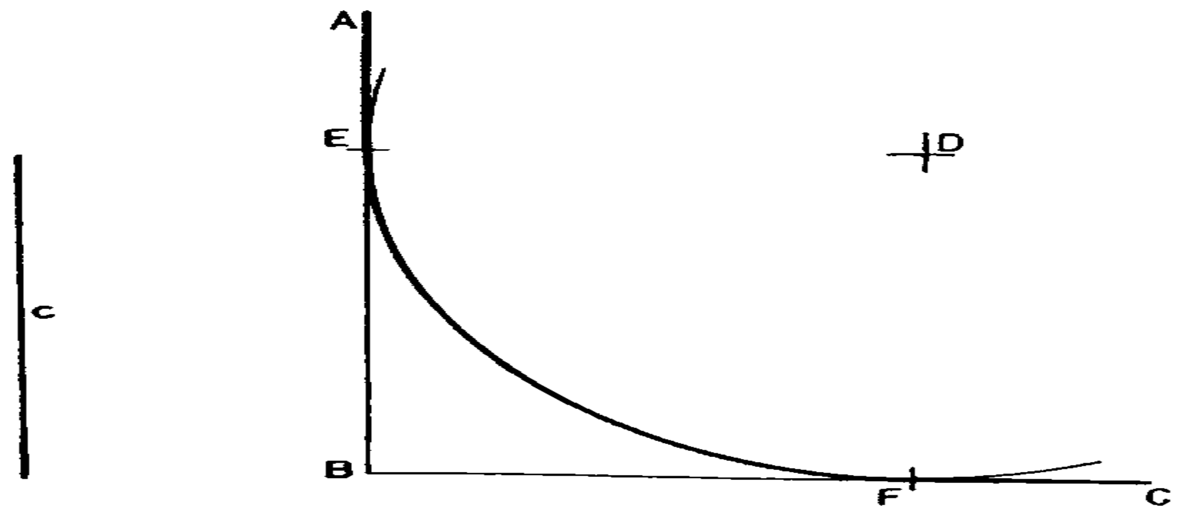
1. Draw AC at an angle of approximately 30° with AB.
2. Mark along AC six lengths which are approximately equal to one-sixth of AB.
3. Join the sixth mark, D on AC, to B.
4. Using sliding set squares draw lines parallel to DB from the points of division on AC to intersect AB and give the required points of division.



To Draw an arc tangential to two straight line.

AB and BC are the given lines and c the radius of the required arc.

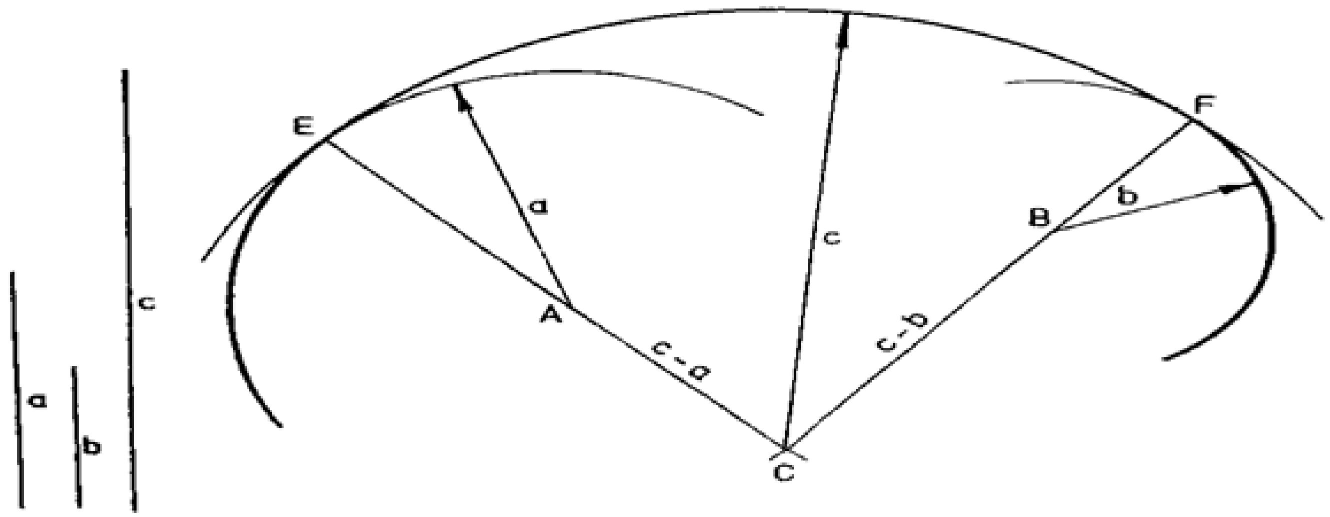
1. From B mark off BE and BF equal to c.
2. From E and F draw arcs of radius c to intersect at D.
3. From D as centre and radius c describe an arc which will be tangential to both AB and BC.



To draw an arc tangential to two arcs internally

A and B are the centres of two given arcs of radius a and b respectively, and c is the required tangential arc radius.

1. From A and B describe arcs equal to c − a and c − b respectively to intersect at C.
2. With centre C and radius c describe an arc which will be tangential to the given arcs.
3. Produce CA and CB to intersect the curve at E and F respectively. These are the points of tangency of the arcs.

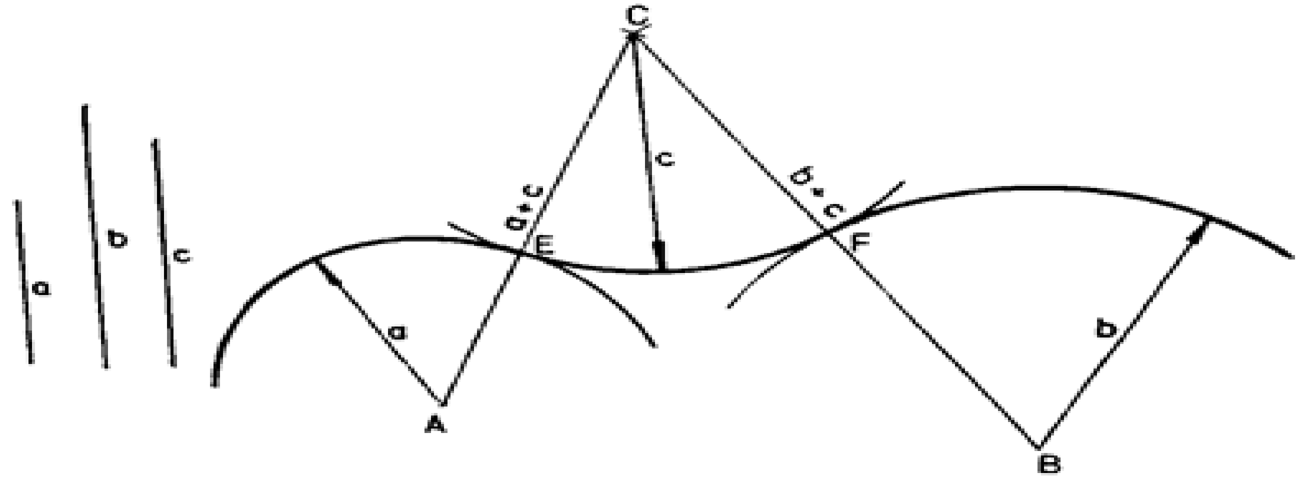


To Draw an arc tangential to two arcs- Externally

A and B are the centres of the given arcs of radius a and b respectively; c is the external arc radius.

1. From centres A and B describe two arcs equal to a + c and b + c respectively to intersect at C.
2. With centre C and radius c describe an arc which will be tangential to the given arcs.

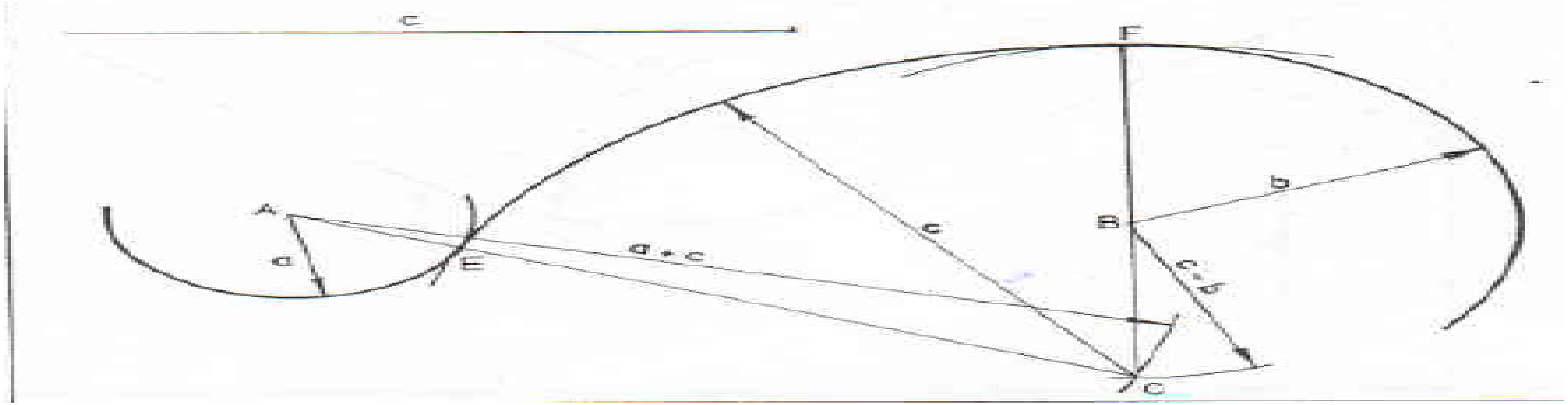
E and F are the points of tangency of the three arcs.



To draw an Arc tangential to two Arc externally and internally.

A and B are centres of two arcs of radius a and b respectively, c is the radius of the required arc.

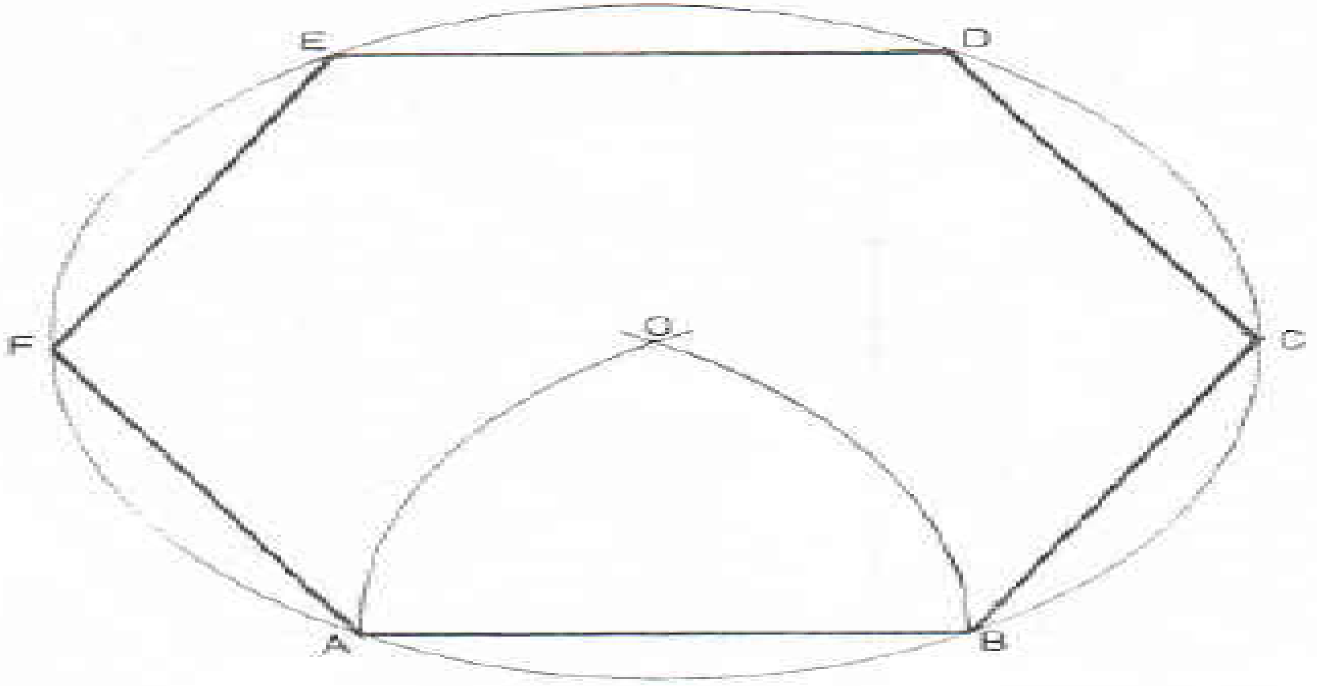
1. With A and B as centres describe arcs a + c and c − b respectively to intersect at C.
2. With centre C and radius c describe the required arc.
3. Join AC to intersect the curve at E and produce CB to intersect the curve at F. Then E and F are the points of tangency of the three arcs.



To construct a regular Hexagon on a given line

AB is the given line.

1. From A and B and radius AB draw two equal arcs to intersect at O.
2. With radius OA or OB and centre O draw a circle.
3. From A or B using the same radius step off arcs around the circle at C, D, E and F.
4. Join these points to complete the hexagon.



Example