CONICS

1. A fixed point is 75 mm from a fixed straight line. Draw the locus of a point P moving such a way that its distance from the fixed straight line is
   a) Twice its distance from the fixed point.
   b) Equal to its distance from the fixed point. Name the curves
2. The vertex of a hyperbola is 65 mm from its focus. Draw the curve if the eccentricity is 3/2. Draw a normal and tangent at a point on the curve, 75 mm from the directrix.
3. The vertex of an ellipse is 65 mm from its focus. Draw the curve if the eccentricity is 2/3. Draw a normal and tangent at a point on the curve, 75 mm from the directrix.
4. Two fixed points A and B are 100 m apart. Trace the complete path of a point P moving (in the same plane as that of A and B) in such a way that, the sum of its distances from A and B is always the same and equal to 125 mm. Name the curve. Draw another curve parallel to and 25 mm away from this curve.
5. Construct a hyperbola when the distance between the focus and the directrix is 40 mm and the eccentricity is 4/3. Draw a tangent and normal at any point on the hyperbola.
6. Two straight lines OA and OB make an angle of 75° between them. P is a point 40 mm from OA and 50 mm from OB. Draw a hyperbola through P, with OA and OB as asymptotes, marking at least ten points.
7. A fixed point F is 7.5 cm from a fixed straight line. Draw the locus of a point P moving in such a way that its distance from the fixed straight line is 2/3 times its distance from F. Plot at least 9 points. Name the curve. Also draw a normal and a tangent to the curve at a point on it 6 cm from F.
8. Construct a parabola when the distance between focus and the directrix is 40 mm. Draw tangent and normal at any point P on the curve.
9. Two points A and B are 100 mm apart. A point C is 75 mm from A and 60 mm from B. Draw an ellipse passing through A,B and C.
10. A point P is 30 mm and 50 mm respectively from two straight lines which are at right angles to each other. Draw a rectangular hyperbola from P within 10 mm distance from each line.
11. The foci of an ellipse are 85 mm apart and the minor axis is 60 mm long. Determine the length of the major axis and draw the ellipse by oblong method.
12. A stone is discharged from the ground level at an inclination of 45° to the ground which is horizontal. The shot returns to the ground at a point 250 m from the point of discharge. Trace the path of shot. Find the direction of shot after it has travelled a horizontal distance of 200 m (scale 1:2000).
CYCLOIDS AND INVOLUTES

1. A circle of 45 mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference for 1.5 revolution of the circle. Name the curve. Draw a tangent and normal at any point on the curve.

2. A circle of 50 mm diameter rolls along the circumference of another circle of 175 mm diameter and outside it. Trace the locus of a point on the circumference of the rolling circle for one complete revolution. Name the curve. Draw a tangent and a normal to the curve at a point 125 mm from the centre of the directing circle.

3. A circle of 30 mm diameter rolls along a line for one revolution clockwise. Draw the locus of a point on the circle, which is in contact with the line. Also draw a tangent and normal to the curve, at a point 20 mm from the directing line.

4. A circle of 35 mm diameter rolls on a horizontal line. Draw the curve traced out by a point R on the circumference for one half revolution of the circle. For the remaining half revolution, the circle rolls on a vertical line. The point R vertically above the centre of the circle in the starting position.

5. A coin of 40 mm diameter rolls over horizontal table without slipping. A point on circumference of the coin is in contact with the table surface in the beginning and after one complete revolution. Draw and name the curve. Draw a tangent and normal at any point on the curve.

6. A circle of 30 mm diameter rolls along a line for one revolution clockwise. Draw a locus of a point on the circle, which is in contact with the line. Also draw a normal and a tangent to the curve, at a point 20 mm from the directing line.

7. Construct a hypocycloid, rolling circle 50 mm diameter and directing circle 175 mm diameter. Draw a tangent to it at a point 50 mm from the centre of the directing circle.

8. A circle of 50 mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference, for one complete revolution of the circle. Name the curve. Draw a tangent to the curve at a point on it 40 mm from the line.

9. Draw a hypocycloid of a circle of 30 mm diameter which rolls inside another circle of 160 mm diameter, for one revolution counter-clockwise. Draw a tangent and a normal to it at a point 60 mm from the centre of the directing circle.
10. A circle of 40 mm diameter rolls on a straight line without slipping. In the initial position, the diameter PQ of the circle is parallel to the line on which it rolls. Draw the locus of the points P and Q for one complete revolution of the circle.

11. Draw an involute of a circle of 50 mm diameter. Also draw a normal and a tangent to the curve at any point.

12. A wire unwinds itself from a drum 5 cm in radius. Draw the locus of the free end of the wire for unwinding through an angle 360°. Also draw a tangent and a normal to the curve.

13. An elastic string of 120 mm long, is wound around the circumference of a circular disc of diameter 50 mm. Draw the curve traced out by one end of the string, when it is unwound completely keeping the string always tight.