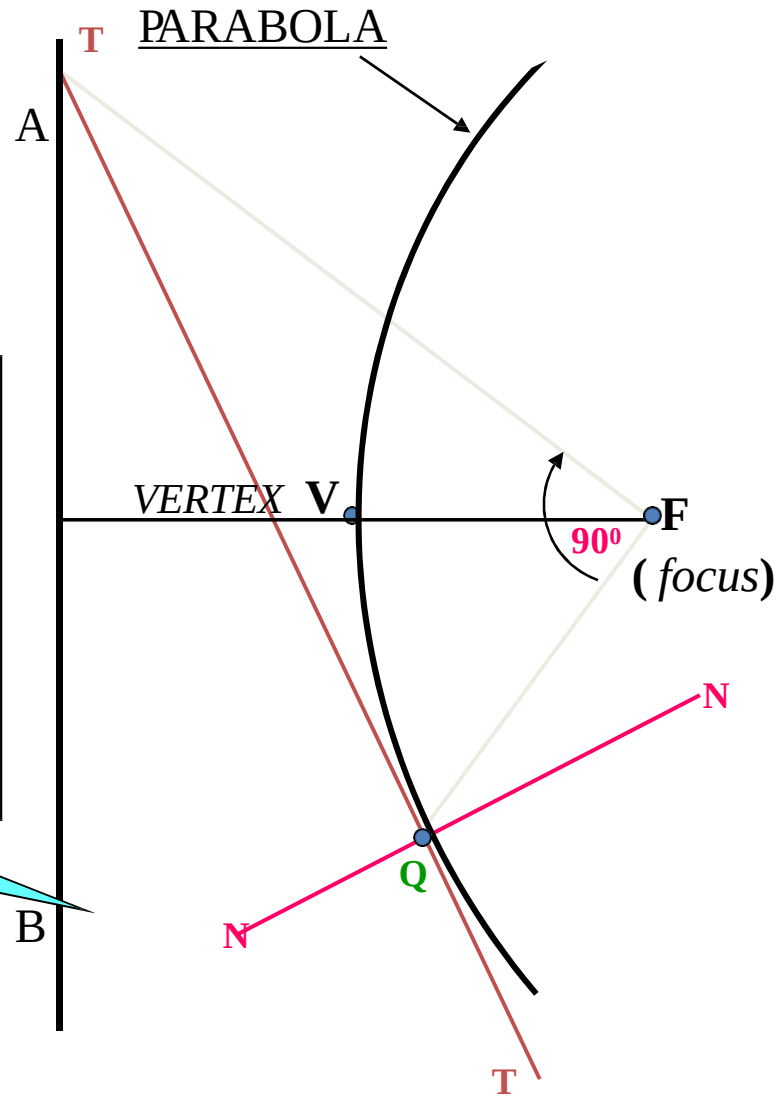
PARABOLA
TANGENT & NORMAL

Problem 15:

TO DRAW TANGENT & NORMAL TO THE CURVE FROM A GIVEN POINT (Q)

1. JOIN POINT **Q** TO **F.**
2. CONSTRUCT **90⁰** ANGLE WITH THIS LINE AT POINT **F**
3. EXTEND THE LINE TO MEET DIRECTRIX AT **T**
4. JOIN THIS POINT TO Q AND EXTEND. THIS IS TANGENT TO THE CURVE FROM Q
5. TO THIS TANGENT DRAW PERPENDICULAR LINE FROM Q. IT IS NORMAL TO CURVE.

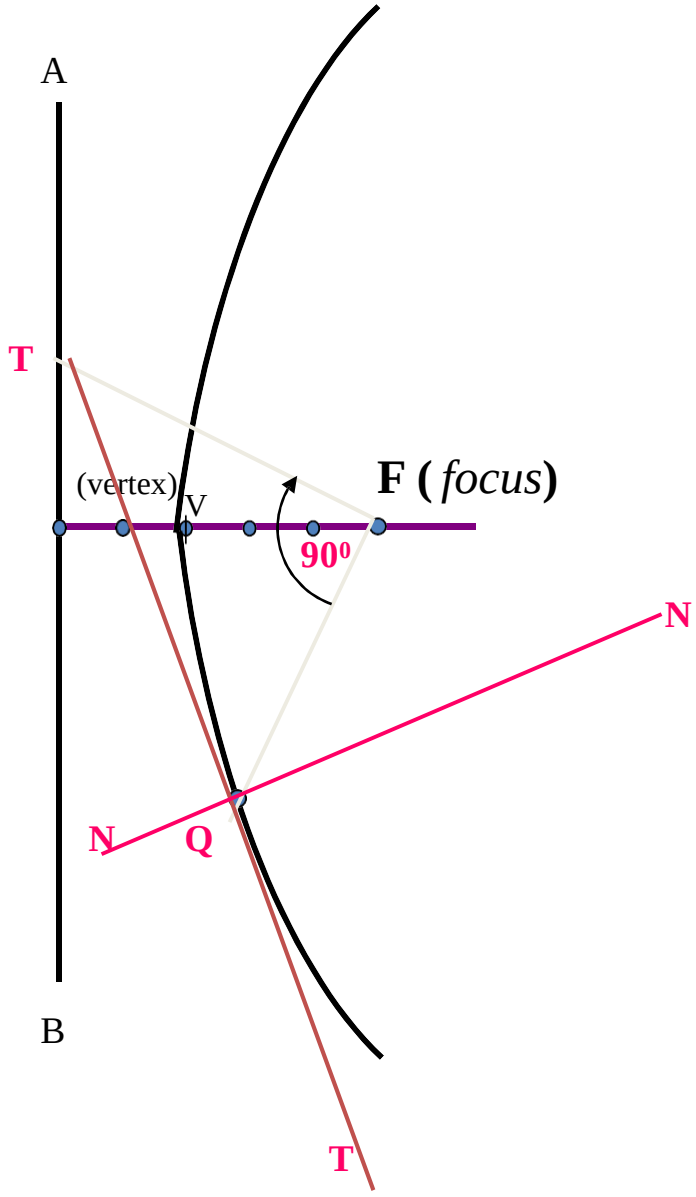


HYPERBOLA
TANGENT & NORMAL

Problem 16

TO DRAW TANGENT & NORMAL TO THE CURVE FROM A GIVEN POINT (Q)

1. JOIN POINT **Q** TO **F.**
2. CONSTRUCT 90^0 ANGLE WITH THIS LINE AT POINT **F**
3. EXTEND THE LINE TO MEET DIRECTRIX AT **T**
4. JOIN THIS POINT TO **Q** AND EXTEND. THIS IS TANGENT TO CURVE FROM **Q**
5. TO THIS TANGENT DRAW PERPENDICULAR LINE FROM **Q**. IT IS NORMAL TO CURVE.

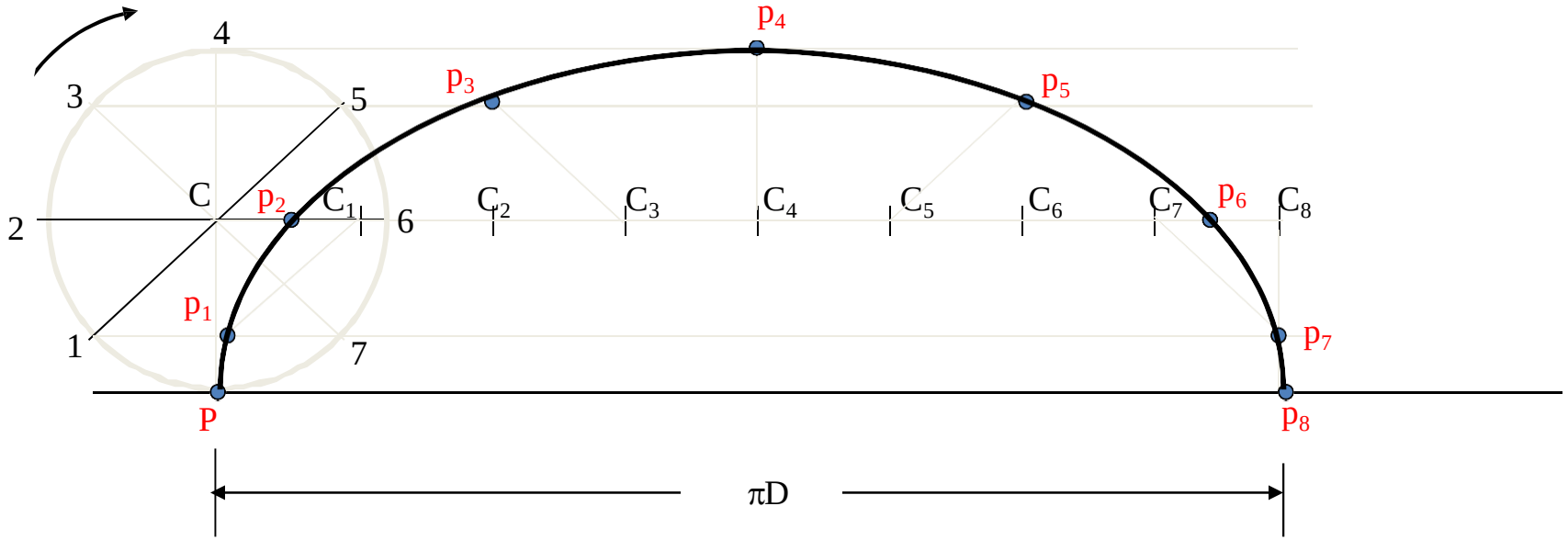


CYCLOID

A **cycloid** is the curve traced by a point on the rim of a circular wheel as the wheel rolls along a straight line without slipping.

PROBLEM 22: DRAW LOCUS OF A POINT ON THE PERIPHERY OF A CIRCLE WHICH ROLLS ON STRAIGHT LINE PATH. Take Circle diameter as 50 mm

CYCLOID



Steps

1) From center C draw a horizontal line equal to πD distance.
2) Divide πD distance into 8 number of equal parts and name them C1, C2, C3 etc.
3) Divide the circle also into 8 number of equal parts and in clock wise direction, after P name 1, 2, 3 up to 8.
4) From all these points on circle draw horizontal lines. (parallel to locus of C)
5) With a fixed distance C-P in compass, C1 as center, mark a point on horizontal line from 1. Name it P1.
6) Repeat this procedure from C2, C3, C4 upto C8 as centers. Mark points P2, P3, P4, P5 up to P8 on the horizontal lines drawn from 2, 3, 4, 5, 6, 7 respectively.
7) Join all these points by curve. **It is Cycloid**.

Reference Youtube Videos

- ELLIPSE DRAWING

https://www.youtube.com/watch?v=qkPZgVbtiHE

- PARABOLA DRAWING
- https://www.youtube.com/watch?v=ZlekZGPfbo8
- Hyperbola Drawing:
- https://www.youtube.com/watch?v=dcaGNfplUbU

Reference Youtube Videos

- Cycloid drawing

https://www.youtube.com/watch?v=UiNKuPztBfg

- Involute Drawing

https://www.youtube.com/watch?v=WmhOVyQVveQ

OTHER METHODS FOR CONSTRUCTING ELLIPSE

ELLIPSE

BY CONCENTRIC CIRCLE METHOD

Problem 1 :-

Draw ellipse by **concentric circle method**.

Take major axis 100 mm and minor axis 70 mm long.

Steps:

1.Draw both axes as perpendicular bisectors of each other & name their ends as shown.

2.Taking their intersecting point as a center, draw two concentric circles considering both as respective diameters.

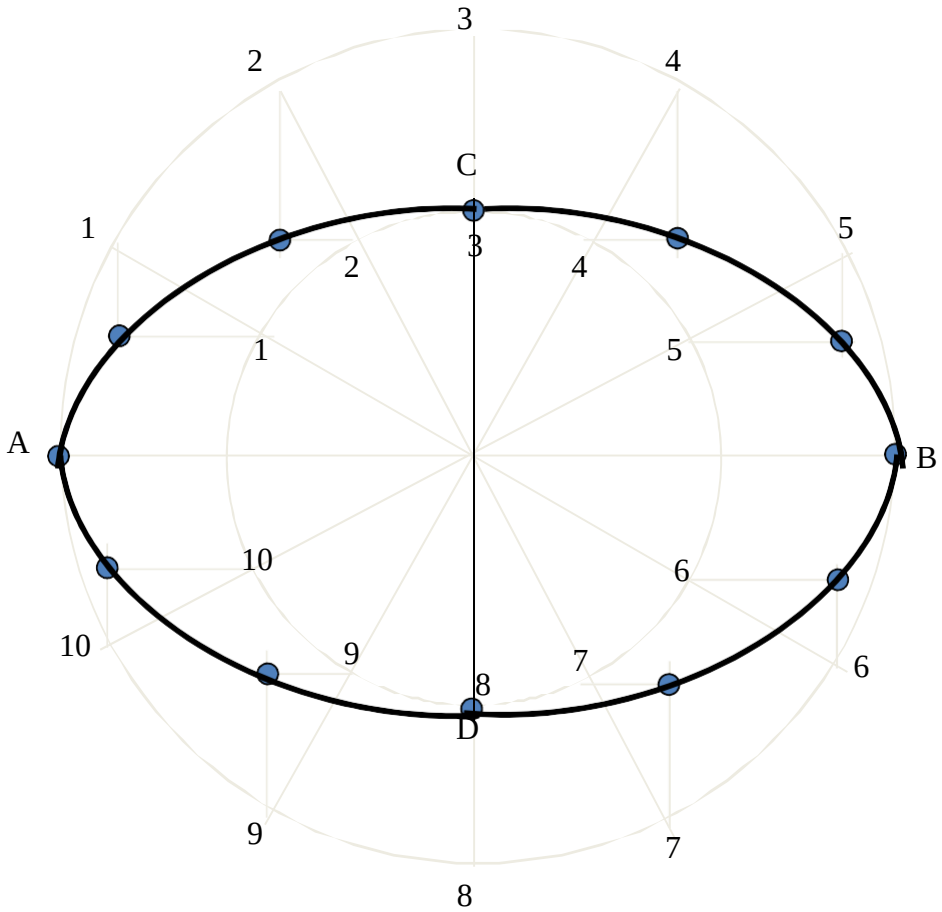
3.Divide both circles in 12 equal parts & name as shown.

4.From all points of outer circle draw vertical lines downwards and upwards respectively.

5.From all points of inner circle draw horizontal lines to intersect those vertical lines.

6.Mark all intersecting points properly as those are the points on ellipse.

7.Join all these points along with the ends of both axes in smooth possible curve. It is required ellipse.



ELLIPSE

BY RECTANGLE METHOD

Problem 2

Draw ellipse by **Rectangle** *method.*
Take major axis 100 mm and minor axis 70 mm long.

Steps:

1 Draw a rectangle taking major and minor axes as sides.

2. In this rectangle draw both axes as perpendicular bisectors of each other..

3.For construction, select upper left part of rectangle. Divide vertical small side and horizontal long side into same number of equal parts.(here divided in four parts)

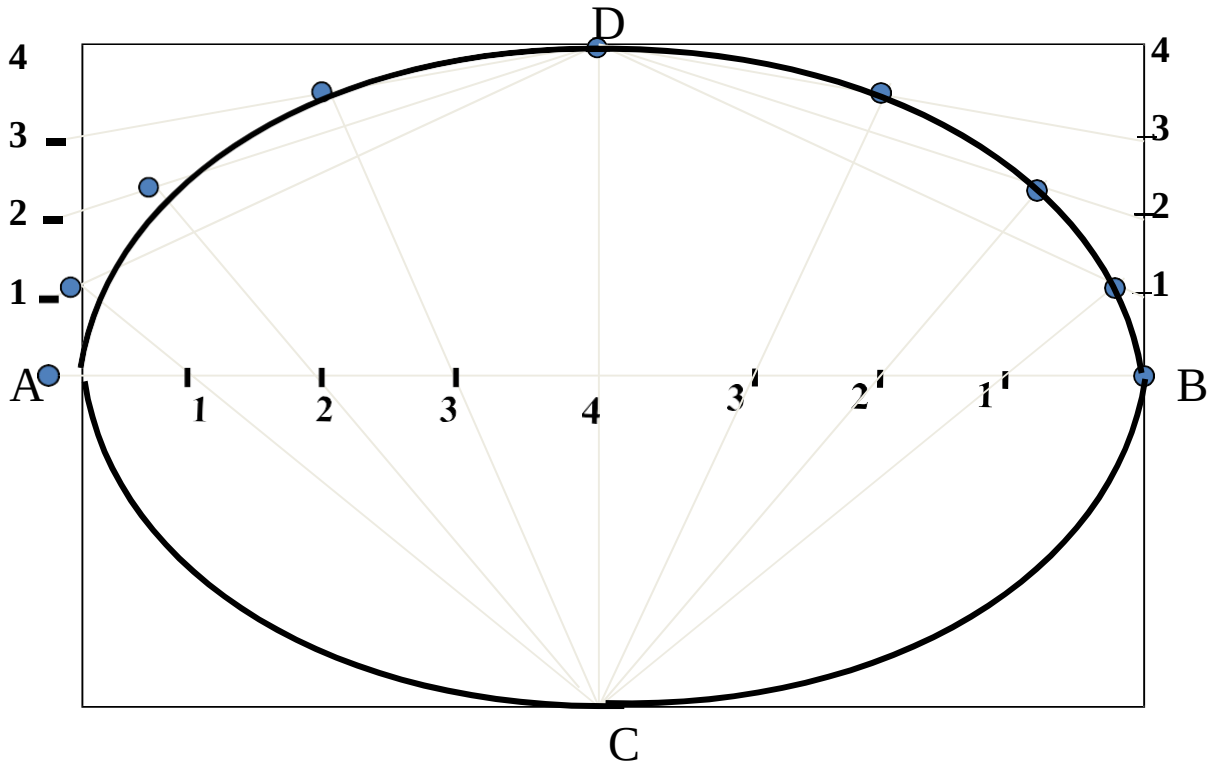
4. Name those as shown..

5.Now join all vertical points 1,2,3,4, to the upper end of minor axis. And all horizontal points i.e.1,2,3,4 to the lower end of minor axis.

6.Then extend C-1 line upto D-1 and mark that point. Similarly extend C-2, C-3, C-4 lines up to D-2, D-3, & D-4 lines.

7.Mark all these points properly and join all along with ends A and D in smooth possible curve. Do similar construction in right side part.along with lower half of the rectangle.Join all points in smooth curve.

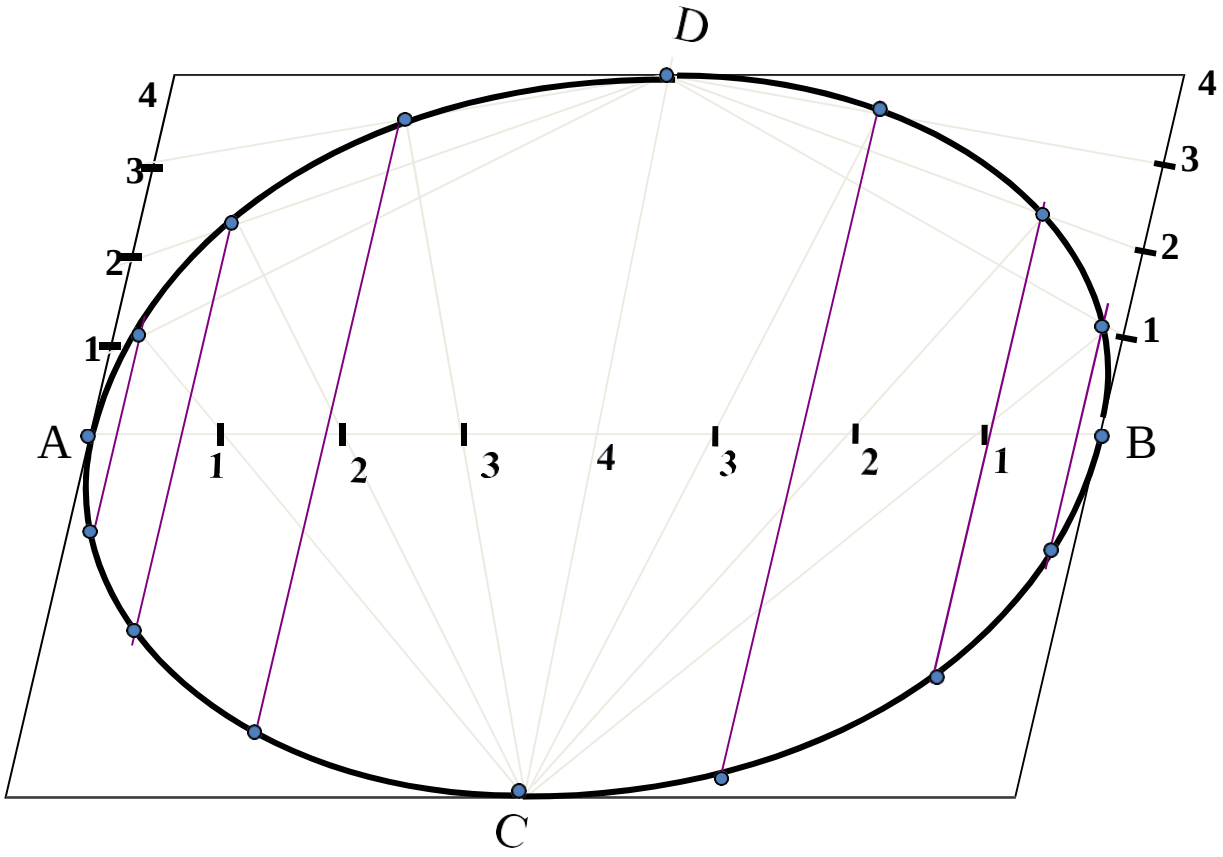
It is required ellipse.



Problem 3:- *Draw ellipse by* **Oblong method.**
Draw a parallelogram of 100 mm and 70 mm long sides with included angle of 75^0. Inscribe Ellipse in it.

ELLIPSE

BY OBLONG METHOD



PROBLEM 4.
MAJOR AXIS AB & MINOR AXIS CD ARE 100 AMD 70MM LONG RESPECTIVELY .DRAW ELLIPSE BY ARCS OF CIRLES METHOD.

ELLIPSE

BY ARCS OF CIRCLE METHOD

STEPS:

1. **Draw both axes as usual.Name the ends & intersecting point**
2. **Taking AO distance I.e.half major axis, from C, mark F_1 & F_2 On AB . (focus 1 and 2.)**
3. **On line F_1- O taking any distance, mark points 1,2,3, & 4**
4. **Taking F_1 center, with distance A-1 draw an arc above AB and taking F_2 center, with B-1 distance cut this arc.**
   Name the point p_1
5. **Repeat this step with same centers but taking now A-2 & B-2 distances for drawing arcs. Name the point p_2**
6. **Similarly get all other Ppoints.**
   With same steps positions of P can be located below AB.
7. **Join all points by smooth curve to get an ellipse/**

As per the definition Ellipse is locus of point P moving in a plane such that the SUM of it's distances from two fixed points (F_1 & F_2) remains constant and equals to the length of major axis AB.(Note A .1+ B .1=A . 2 + B. 2 = AB)