**Q)** **A** circle of 50 mm rolls on a horizontal straight line for half revolution. For another half revolution it rolls on a vertical line. Trace the path of a point P on the circumference of the circle. Take the generating point as top most point of circle.

**Ans)** The **Curve** is a **cycloid** as the **circle** rolls along a **straight line** without slipping. The **length** for one revolution will be equal to $\prod*D$ (i.e. 3.14* Diameter of circle).

 **L = PA= 3.14 * 50 = 157mm**.
**Since there are 2 half revolutions, the length for each ½ revolution will be = ($\prod*D$)/2.**

**1)** Draw a circle of 25 mm radius with centre C and mark P as the top most point. Divide the circle into 12 parts and label them as 1, 2, 3…12 after P.
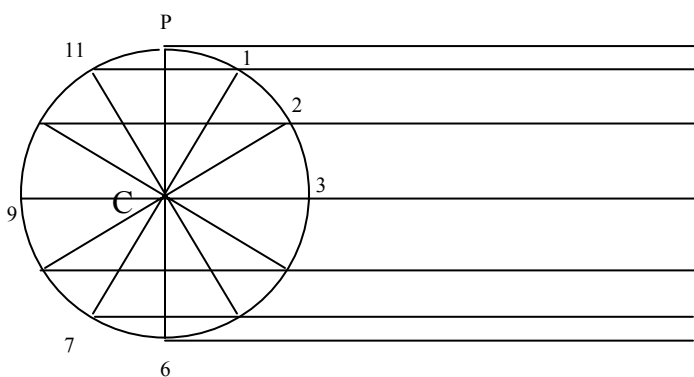


**2)** At 6, draw a tangent 6A (straight line) length for **half** revolution will be equal to ($\prod*D$)/2 (i.e. PA=157/2=78.5 mm). Divide 6A into 6 equal parts and mark 1', 2',..6'.
On 1', 2',..6' draw lines $\perp$ to 6A to cut center line CB at $C_1$, $C_{2..}$, $C_6$.
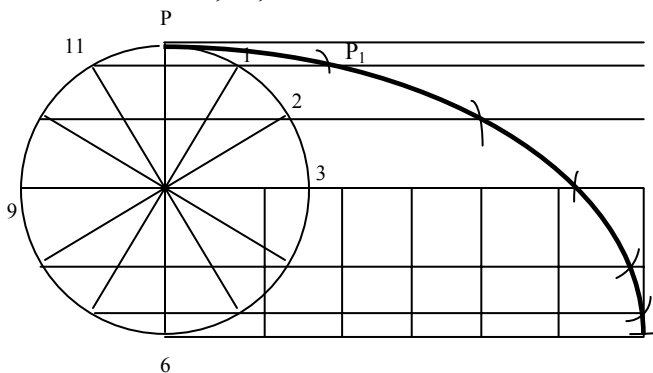


**3)** With $C_1$ as centre and CP (=25) as radius, cut arc on 1-11 line of circle to the right side to get first point $P_1$. Similarly, repeat with CP radius and $C_2$, $C_3$,..$C_6$ to get **half cycloid**. The steps are similar like earlier cycloids, but P is at top and next points after P are labeled as 1,2,3…12.
**The above figure is the completed cycloid for first ½ revolution**.

**Since there are 2 half revolutions, the length for each ½ revolution will be = ($\prod$*D)/2.**

**4)**    For the $2^{nd}$ half revolution, the length of line will be = ($\prod$*D)/2 = 78.5 mm.
Draw the same circle at $C_6$ with radius = CP (25), with $C_6$ as centre.
The line should be tangential to circle when it rolls and hence draw line of 78.5 from Q.
Mark 7, 8, 9..12 from A on $2^{nd}$ circle.
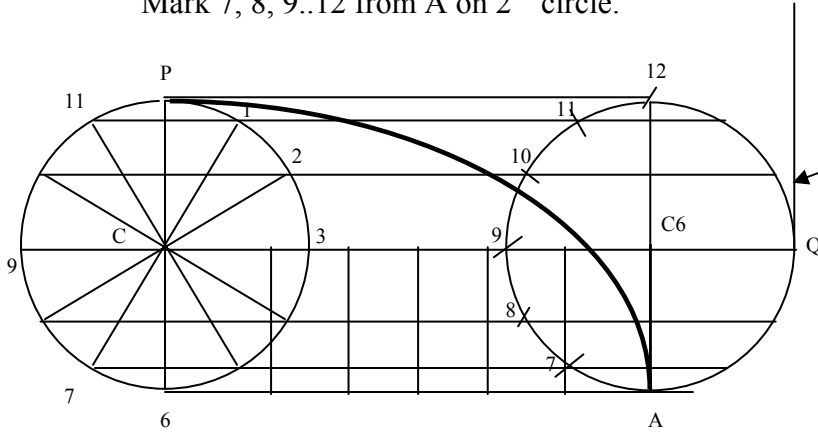


Vertical Line Tangentially at Q
of 78.5, divide into 6 parts, to
get 7', 8',..12'…Draw $\perp$ to
centre line to get $C_7$, $C_8$,..$C_{12}$.

**5)**    For $2^{nd}$ half cycloid, start with $C_7$ as **centre**, CP radius, cut arc on **7-11** line of $2^{nd}$ circle.
Similarly for C8, C9, etc, get the other points of cycloid.
*Note*: For **7,8,9** arcs to be cut on **left side of centers** and for **10, 11 and 12 arcs** to be cut on the
**right side** of centers. **Last arc** will **cut 6-12** line on **extended lines beyond $C_{12}$**