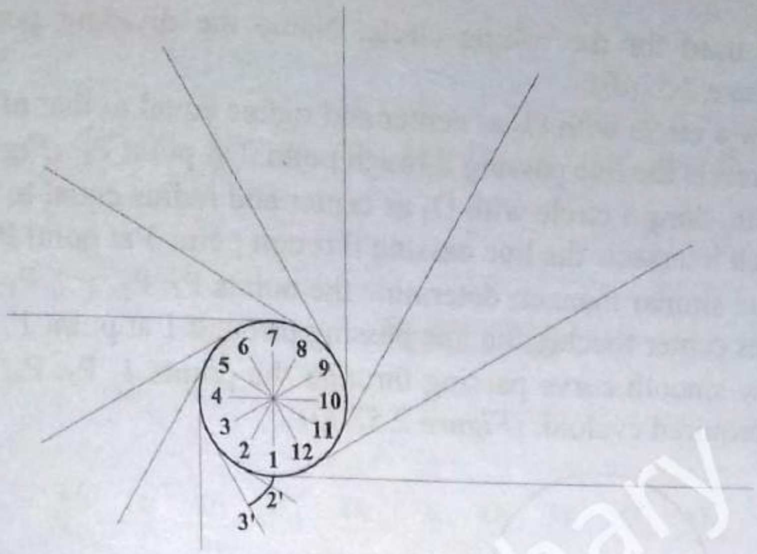

Figure 2.56(b)

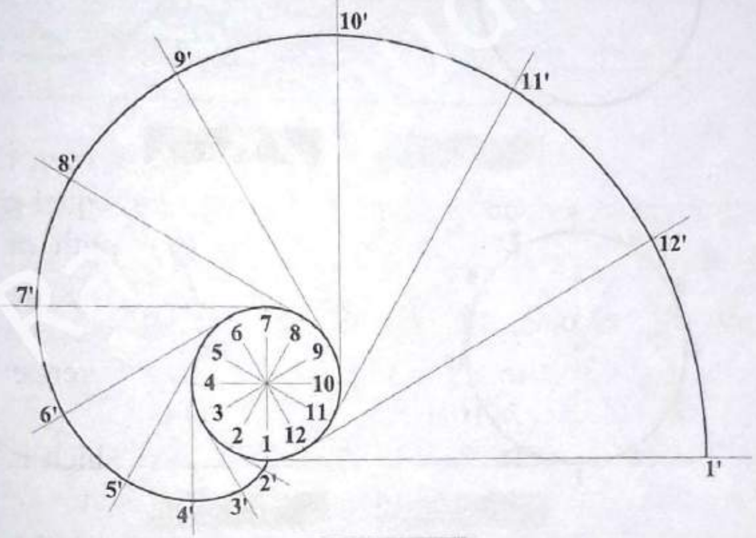

Figure 2.56(c)

2.5.2 Construction of Cycloids

The plane curves generated by a fixed point on a rolling circle when it rolls on different surfaces are called cycloids. When the circle rolls on a straight line, it is called a cycloid. If the circle rolls on the outside of another circle the locus is called an epicycloid and if the circle rolls on the inside of another circle the locus is called a hypocycloid.

The cycloid curve is usually used in the design of tooth profiles of small gears used in instruments whereas epicycloid and hypocycloid curves are used in mechanisms for cutting gear teeth and metal cutting machine tools.

(a) Construction of a Cycloid

- Draw the given rolling circle with O_1 as its center and a tangent line at the bottom of the circle as the rolling path. *(Figure 2.57(a))*
- Divide the circle into any number of equal parts, say 12. *(Figure 2.57(b))*
- Draw lines passing through each point on the circumference of the circle and parallel to the rolling path. *(Figure 2.57(c))*
- Mark point O_1' on the line passing through O_1 such that O_1O_1' is equal to the circumference of the rolling circle. Divide O_1O_1' into the same number of parts as

that used for the rolling circle. Name the dividing points as O_2, O_3, ... O_{12}. *(Figure 2.57(d))*

- Draw a circle with O_2 as center and radius equal to that of the rolling circle which intersects the line passing through point 2 at point P_2. *(Figure 2.57(e))*
- Again, draw a circle with O_3 as center and radius equal to that of the rolling circle which intersects the line passing through point 3 at point P_3. *(Figure 2.57(f))*
- In the similar manner, determine the points P_4, P_5, ..., P_{12}. The circle drawn with O_1' as center touches the line passing through 1 at point 1'. *(Figure 2.57(g))*
- Draw smooth curve passing through the points 1, P_2, P_3, ..., P_{12} and 1' to get the required cycloid. *(Figure 2.57(h))*

Figure 2.57(a)

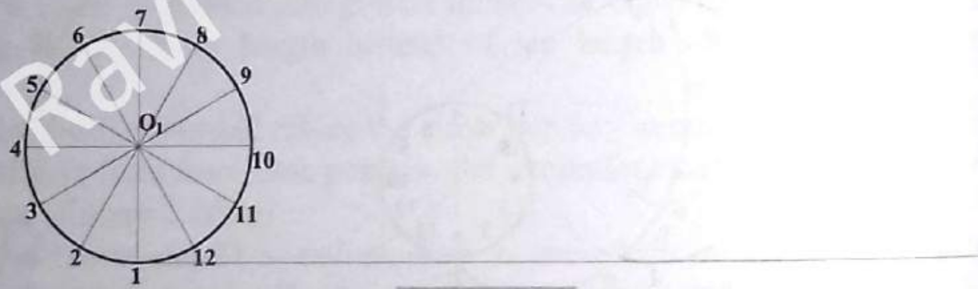

Figure 2.57(b)

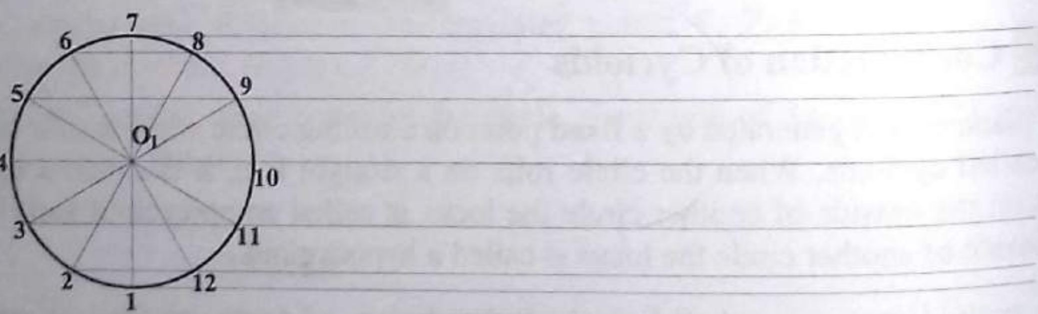

Figure 2.57(c)

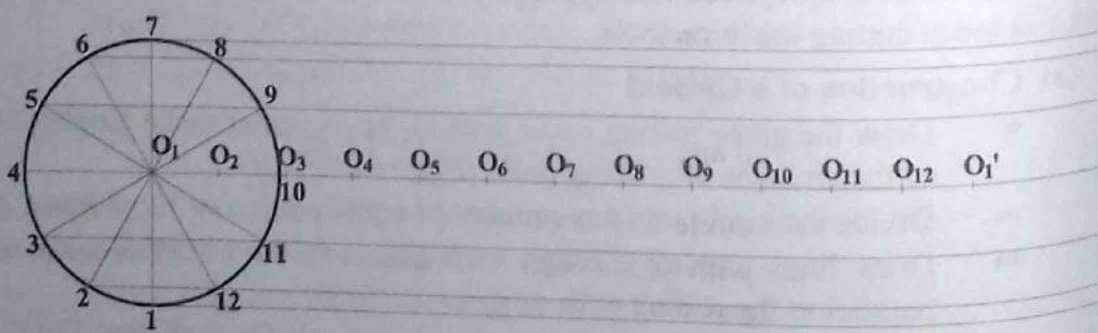

Figure 2.57(d)

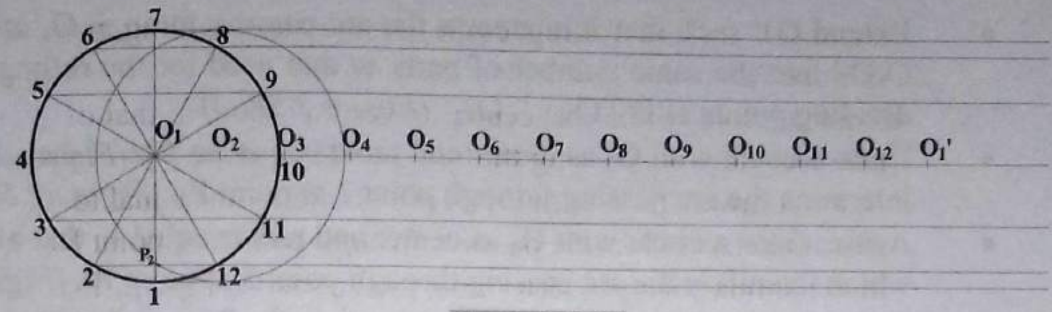

Figure 2.57(e)

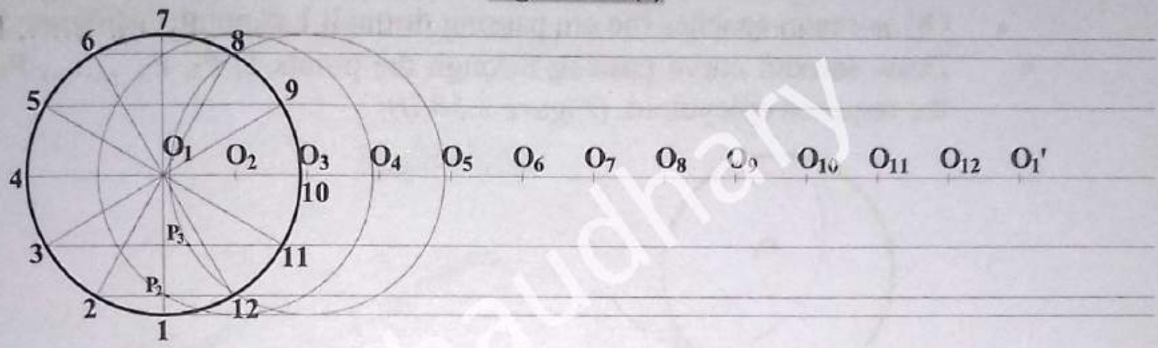

Figure 2.57(f)

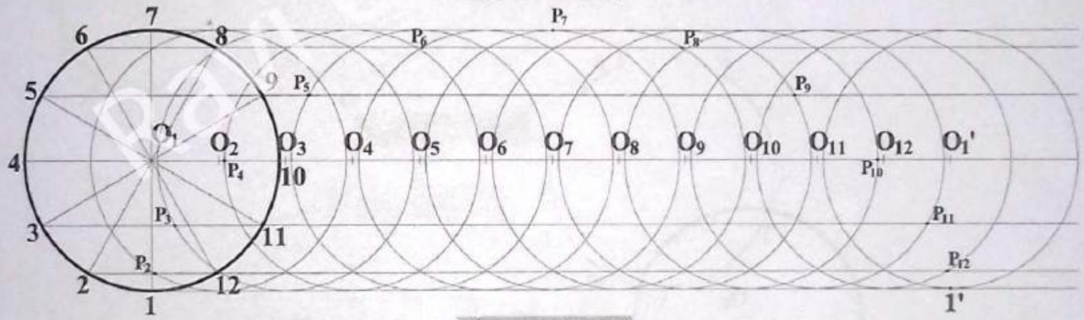

Figure 2.57(g)

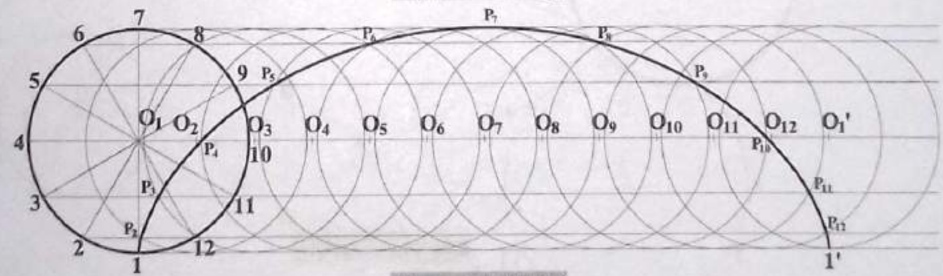

Figure 2.57(h)

(b) Construction of an Epicycloid

- Draw the given rolling circle with O_1 as its center and a guiding circle with O as its center and radius R tangent at point 1. *(Figure 2.58(a))*
- Mark arc length 11' equal to the circumference of the rolling circle (πD) such that the included angle between the point 1 and 1' is $\theta = \left(\frac{180D}{R}\right)^0$. *(Figure 2.58(b))*
- Divide the circle into any number of equal parts, say 12. *(Figure 2.58(c))*
- Draw arcs with O as center and passing through each point on the circumference of the circle as well as through point O_1. *(Figure 2.58(d))*