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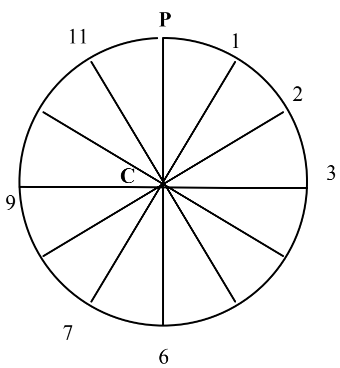
Q) **Show** by means of drawing **that** the ***hypo cycloid is a straight line*** when the **diameter** of the **Rolling circle (**Generating circle**) is *half*** of the **diameter** of the **Directing circle (Base circle).** Take the diameter of the rolling circle as 50 mm**.**

Ans) The **Curve** is a **hypo cycloid** as the **circle** rolls on inside of another circle. The **angle** for one revolution will be equal to (360 * **d/D**).

Logic: Since a hypocycloid is to be drawn, we need to find the angle θ for one revolution.

Since **D=2d** we have **d/D** = **1/2** and hence the angle θ is 360*d/D=360*(1/2)=180^0
Hence we have to draw a hypocycloid with the angle of 180^0 by the general procedure.

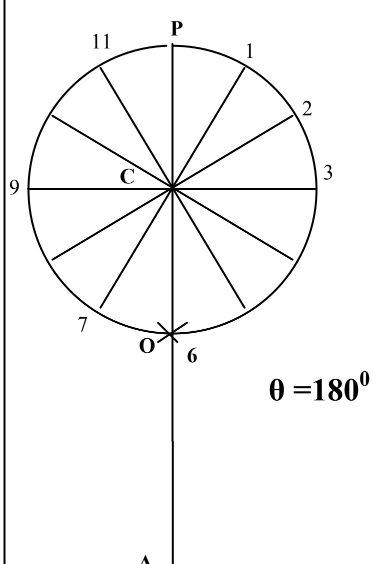
1) Draw a circle of 25 mm radius with centre C and **mark P as the top most point**. Divide the circle into 12 parts and label them as 1, 2, 3…12 after P.



2) **From P, mark O, centre of big circle (base circle) at PO=R=50 mm. Here, O will be on point 6 of the circle. Hence O will be the bottommost point while P is the top most point of the circle.**

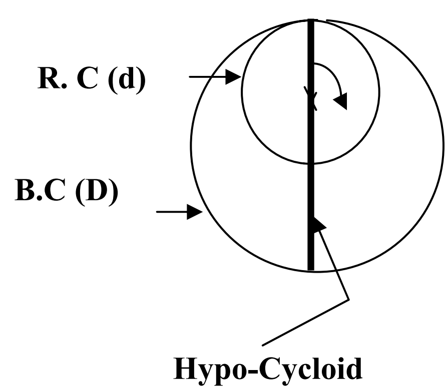
3) Mark ∟POA = θ= 180^0 and draw straight line OA at 180^0 to OP.

d=D/2; d=50 ⟶ D=100;



PO=50 (R);(R=D/2)
P6=50 (**d**);(d=D/2)

θ =180^0



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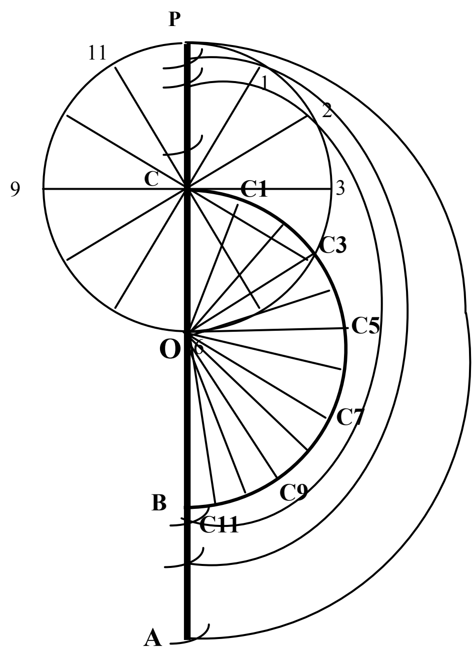
The above figure is the profile of the Hypo Cycloid (a straight line) that is generated when the rolling circle of diameter d rolls on a base circle of Diameter D (D=d/2) and inside it.

4) With O as centre and OP radius, draw base circle up to A. PA is part of the base Circle.

5) With O as centre and OC radius, draw an arc through centre to get **Centre Arc CB**. On CB, the centers $C_1 \ldots C_{12}$ will lie.

6) To get the centers, divide ∟POA into 12 equal parts (here $180^0/12 = 15^0$) and join O to each of these 15^0 lines on **CB** to get C1, C2,…C12.



7) Now, similar to cycloids, with **C1 centre** and **radius CP (=25)**, cut arc on **1-11 arc** of **rolling circle** to get P1. Repeat with C2, C3, etc on 2-10, 3-9, etc to get the hypocycloid.

<u>**Note**</u>: While dividing the θ into 12 parts, mark centers C1, C2,..C12 on centre arc **CB** passing through **C** only and **not** on the **arc passing through 3-9**.
Arc passing through 3-9 will be **separate** and is used for getting P3 and P9 while cutting arcs.