

Geometry > The Cycloid

Learning outcome:





- I can trace and name the locus of a point on a circle as it rolls without slipping on plane surfaces.

By the end of the lesson I will be able to:

- Draw one revolution of a cycloid
- Draw a part revolution of a cycloid (or a combination of)
- Design my own shapes using the cycloids

Before studying this lesson I need to make sure that I know how to:

- Draw a center line
- Draw a neat freehand curve
- Divide the circle into 12 equal parts
- Divide a line into 12 equal parts
- Calculate the circumference of a circle ($2\pi r$)

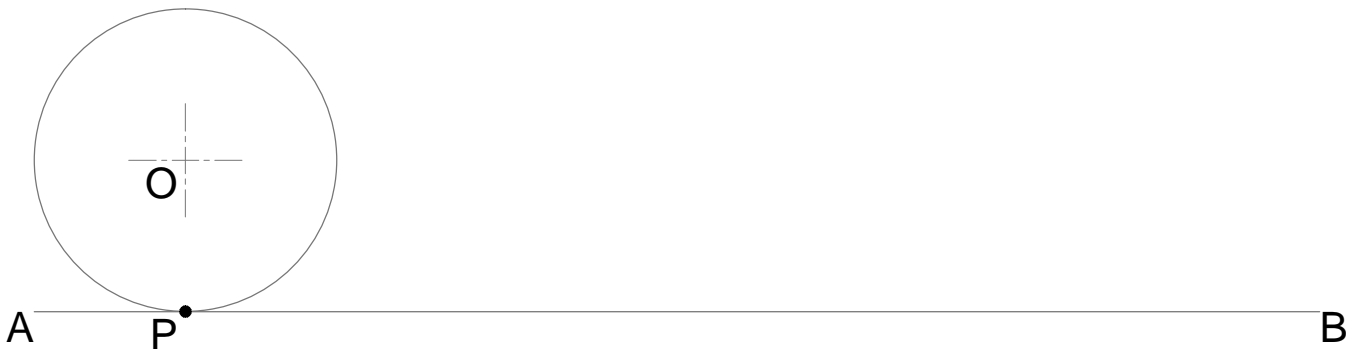
Self Assessment (to be done after the lesson)				
	Well Achieved 	Achieved 	Almost There 	Need more Effort 
I can divide the circle and draw the constructions well				
My drawings are accurate and correct				
My drawings are neat and well presented				
I have understood this lesson well and I can come up with new designs				

The Cycloid

A **cycloid** is the **locus** of a point on the **circumference** of a circle that is rolling on a **straight** line. To see an example of this you can visit: <https://www.youtube.com/watch?v=aXYMBarYPg8> . Note that the line forming the cycloid is the **green** one as it is the one that lies on the **circumference**.

Worked Example

Construct **one revolution** of the cycloid formed by the given circle centre 'O' as it rolls on the base line 'AB'. Start the cycloid from point 'P' which initially lies at the bottom of the circle.



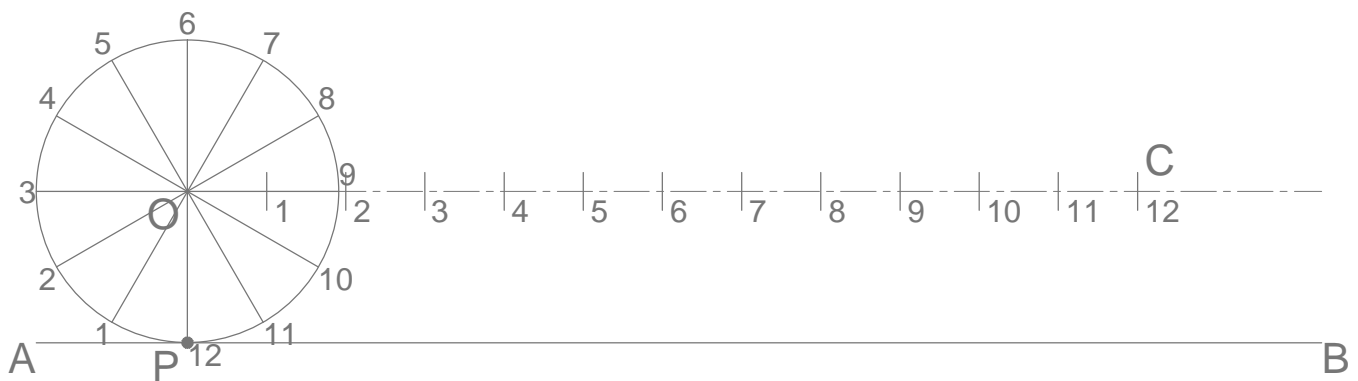
Step 1: Draw the **generating circle**, the **base line** and the **centre lines**. Mark off point 'P'. Notice the **centre line** has been extended **parallel** to the **base line**. Draw everything **faint**.



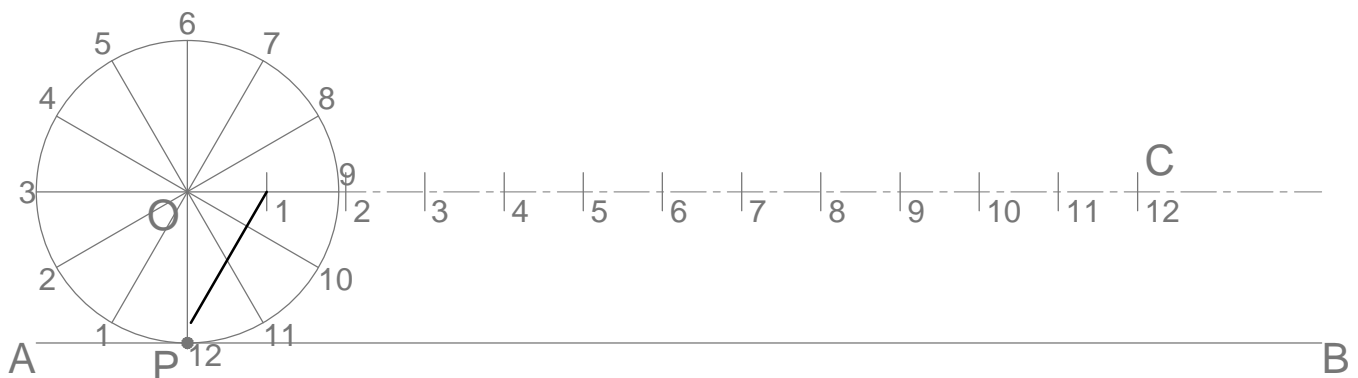
Step 2: Divide the circle into 12 parts at 30° intervals. Add numbers.



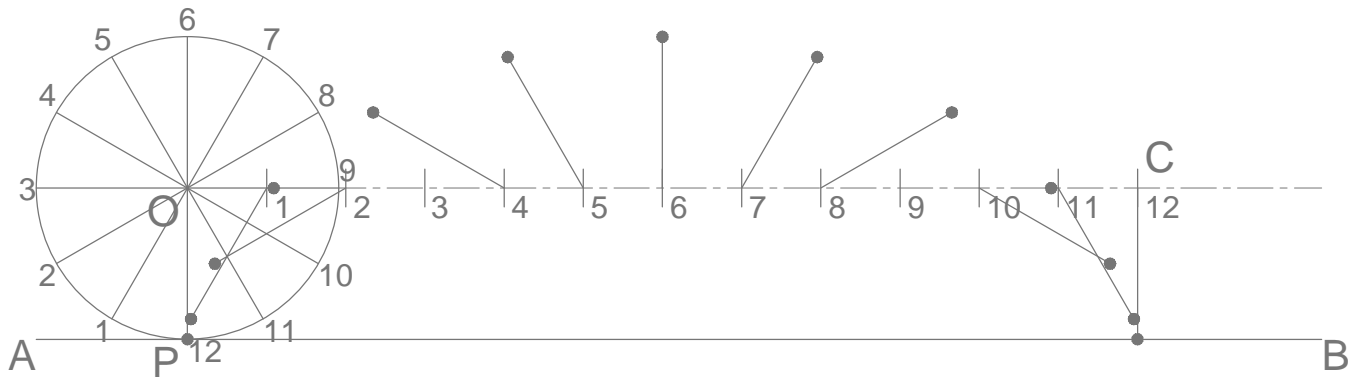
Step 3: When the circle makes **one whole revolution** it will **travel a distance equal to its circumference**. Mark this distance off on the **centre line** as shown so that the distance 'OC' is equal to the circumference. Divide 'OC' into 12 equal parts. Add numbers.



NOTE: If you imagine the circle as it makes **1/12th of a revolution**, its **centre will move from 'O' to point '1' on the centre line**. Also, after 1/12th of a revolution, the **radius 'OP' will rotate 30°**; so when the circle's centre is at '1', radius 'OP' is oriented parallel to 'O1' as shown.



Step 4: Mark off the radii on the centre line representing every 1/12th step of the revolution. Make sure to draw them **parallel to the corresponding number on the circle**.



Step 5: The cycloid required goes through the 12 points at the end of each radius. Draw freehand a line going through the 12 points marked off. This is one revolution of your cycloid!

