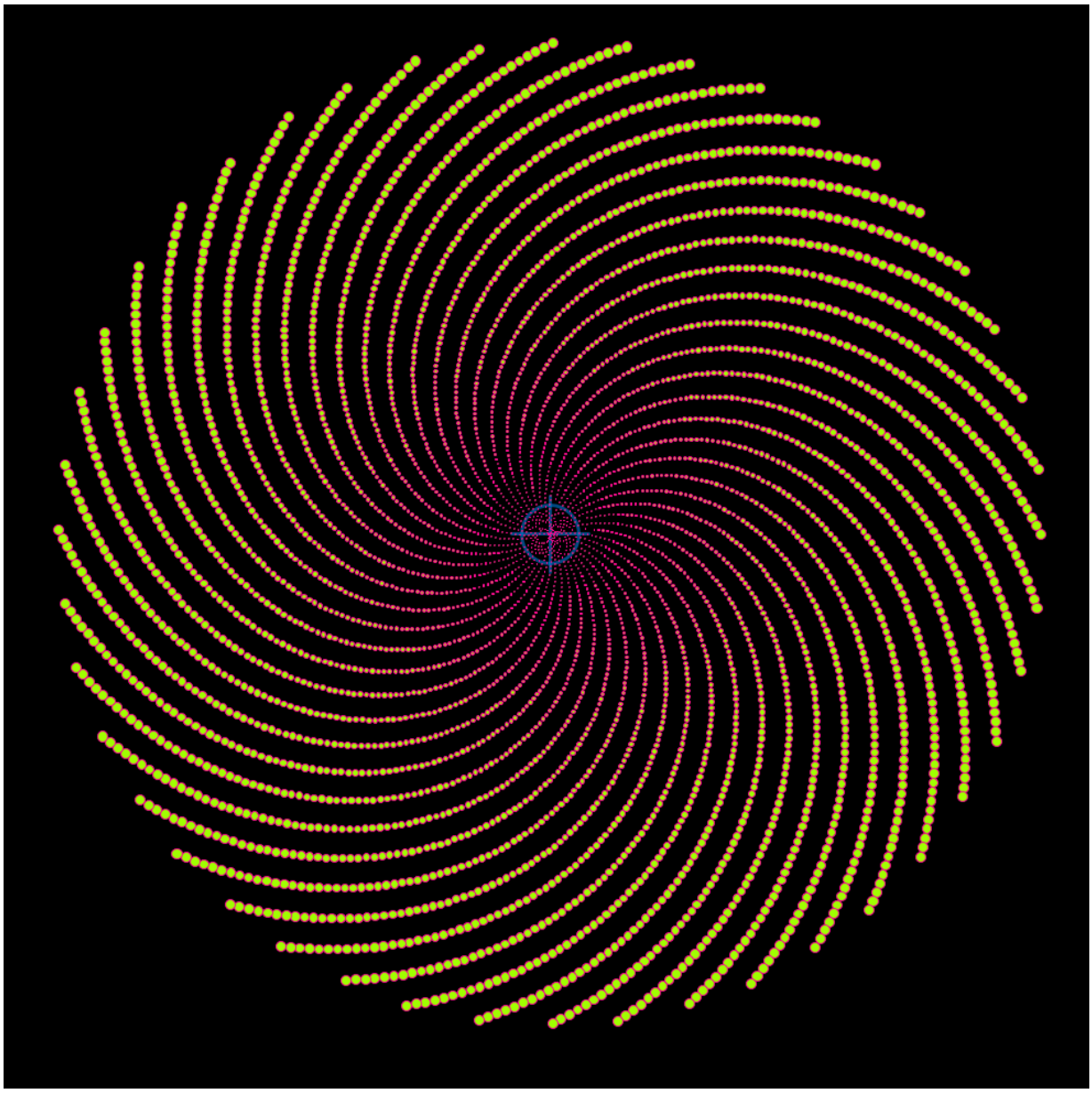
Further Pure A-Level Mathematics
Compulsory Course Component
Core 2

POLAR COORDINATES



Artwork made using Polar Coordinates

P O L A R C O O R D I N A T E S

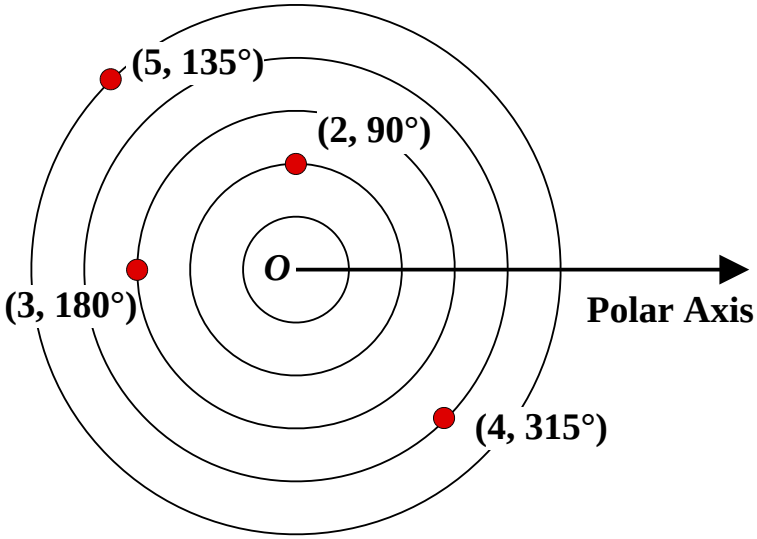
Lesson 1

Further A-Level Pure Mathematics, Core 2

Polar Coordinates

1.1 The Polar Coordinate System

The polar coordinates of a point describe its position in terms of a distance, r, from the origin, O, (called the "pole") and an angle, θ, measured anticlockwise from the polar axis. Usually the polar axis is in the same direction as the positive x-axis when using Cartesian coordinates.



The diagram shows four point along with their polar coordinates.
Here, degrees have been used but often radians are preferred.

1.2 Plotting a Polar Curve

On a Cartesian graph the points are of the form (x, y) and equations are formed with x and y in them, these then being graphed. On a Polar graph the points are of the form (r, θ). Mirroring what is done with the Cartesian system, polar equations can be formed with r and θ in them. And these can be graphed, but on polar graph paper, rather than Cartesian.

Here is a polar equation which is to be graphed.

$$r = 12\cos^2\theta - 4\sin\theta$$

To graph this polar equation, complete the table provided and then plot the polar coordinates obtained on the polar graph paper.

Work to 1 decimal place.

θ (in degrees)	0	15	30	45	60	75	90
$r = 12\cos^2\theta - 8\sin\theta$							

θ (in degrees)	105	120	135	150	165	180
$r = 12\cos^2\theta - 8\sin\theta$						

θ (in degrees)	195	210	225	240	255	270
$r = 12\cos^2\theta - 8\sin\theta$						

θ (in degrees)	285	300	315	330	345	360
$r = 12\cos^2\theta - 8\sin\theta$