

9 Polar coordinates – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
Polar coordinates	极坐标	_____

Recall

You locate points on a grid with (x, y) coordinates:

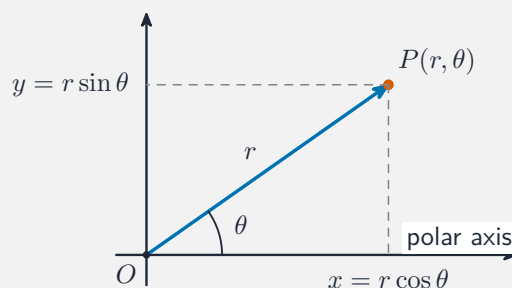
- x is how far across, y is how far up.
- But you could also describe a point by its **distance** and **direction** from the centre.

Each idea has a worked example before the Practice.

New ideas

■ 1 Polar coordinates

Polar coordinates 极坐标 locate a point by its distance r from the origin and its angle θ from the positive x -axis – written (r, θ) .



■ 2 Converting to x and y

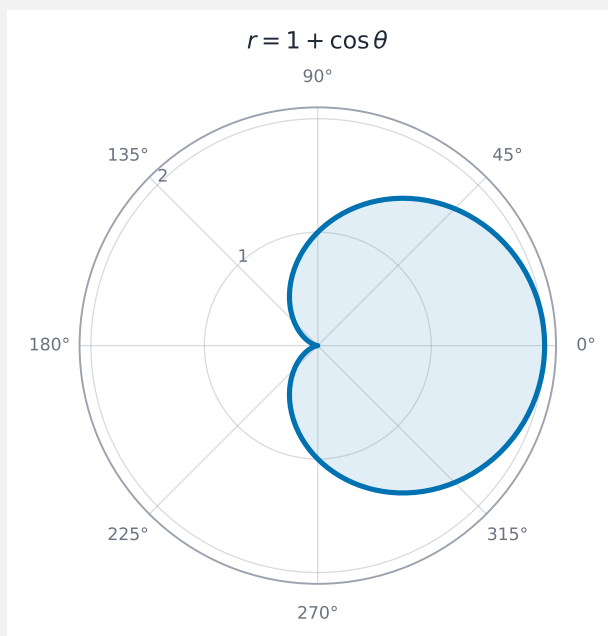
To convert polar to the usual coordinates:

$$x = r \cos \theta, \quad y = r \sin \theta.$$

Worked example. The polar point $(2, 0^\circ)$ is $x = 2 \cos 0^\circ = 2$, $y = 2 \sin 0^\circ = 0$ –the point $(2, 0)$.

■ 3 Polar curves

Letting r depend on θ traces a **polar curve** –often beautiful shapes like circles, spirals, and flower petals.



■ 4 Why use polar

Polar coordinates make round and rotating shapes much simpler to describe than x – y coordinates do.

Watch out: in polar coordinates the first number is the **distance** r and the second is the **angle** θ –not an x and a y . Reading $(2, 90^\circ)$ as "across 2, up 90° " is wrong; it means "distance 2, angle 90° ".

Practice

Try these in order. The methods are all above.

2.1 State how polar coordinates locate a point.

[2]

2.2 Write the formulas that convert polar (r, θ) to x and y .

[2]

2.3 Convert the polar point $(3, 0^\circ)$ to x - y coordinates. [2]

2.4 Convert the polar point $(4, 90^\circ)$ to x - y coordinates ($\cos 90^\circ = 0$, $\sin 90^\circ = 1$). [3]

2.5 State one advantage of polar coordinates. [1]
