

Cyclic Quadrilaterals

Purpose:

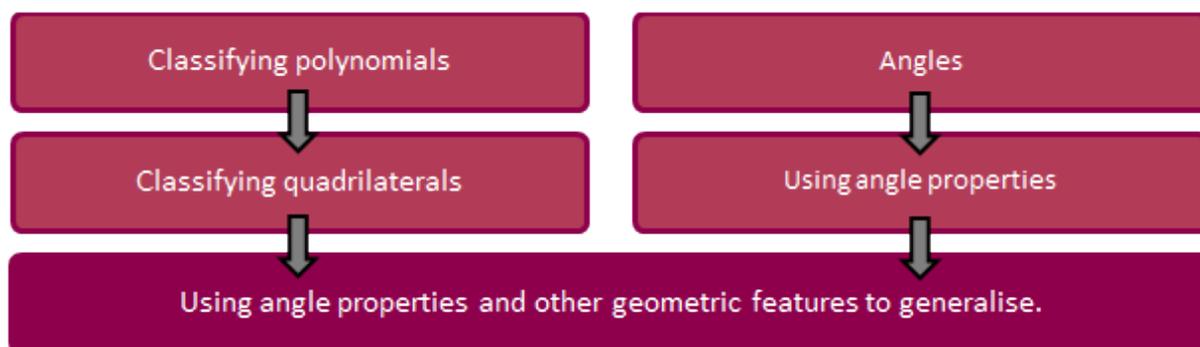
The purpose of this activity is to engage students in considering geometric properties when categorising shapes.

Achievement Objectives:

GM4-5: Identify classes of two- and three-dimensional shapes by their geometric properties.

Description of mathematics:

This activity ideally follows exploration and learning in the following areas.



Classifying polynomials

How many sides does a pentagon have?

Classifying quadrilaterals

What is the name given to a four sided shape with one pair of parallel lines and all four sides are of different length?

Angles

Which angles on this kite (shown) are equal in size?



Using angle properties

If three of the interior angles of a quadrilateral are 45° , 110° and 95° , what must the fourth interior angle be?

Using angle properties and other geometric features to generalise.

What are the differences between a rhombus and a rectangle?

To solve this problem, the students may sketch, construct or explore with number. The approach should be chosen in sympathy with their skills and preferred method of solution. Choices of blank or gridded paper, along with maths construction tools should be made available.

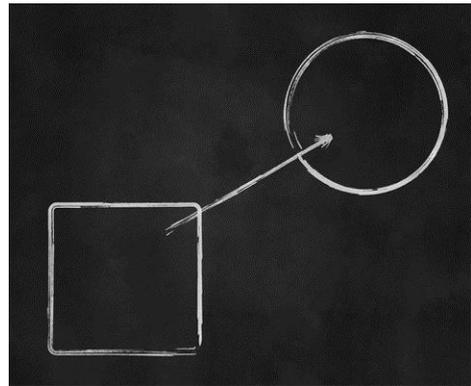
Activity:

A cyclic quadrilateral is a four sided shape which has the following properties:

- All four vertices lie on the circumference of a single circle.
- Opposite interior angles sum to 180° .

Which of the following **cannot** be a cyclic quadrilateral?

- a square
- a rectangle that is not a square
- a rhombus that is not a square
- a kite that is not a rhombus
- a parallelogram that is not a rhombus
- a trapezium, that is not a parallelogram
- an arrowhead.

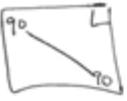
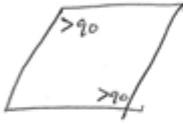
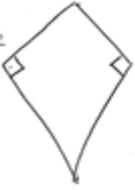
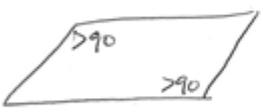
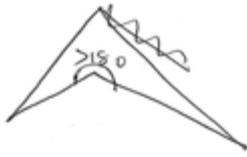


The procedural approach

The student is able to use geometric reasoning and/or exploration, with guidance, to solve a problem.

Prompts from the teacher could be:

1. Can you draw each of the quadrilaterals on the list.
2. Do any of these quadrilaterals clearly look unable to be cyclic?
3. Use the angle property of cyclic quadrilaterals given, to test each of the quadrilaterals that you have drawn. Note that you are looking for ones that can **never** be cyclic, so they have a pair of opposite interior angles that can **never** add to 180° .

	yes	$90 + 90 = 180$
	yes	$90 + 90 = 180$
	no	$>90 + >90 = >180$
maybe 	yes	$90 + 90 = 180$
	no	$>90 + >90 = >180$
	maybe	$>90 + <90 = 180$
	no	$>180 + \text{something} = >180$

answer : rhombus, parallelogram, arrowhead

