

Polygons - Ideas & Tips to Maximise the Game

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Abstract

This document provides teachers with ideas, information & support with the topic *Polygons* for the Guess It Maths game. It contains some definitions and key facts/rules that students should know & be comfortable with by the end of Year 8 or KS3.

Overleaf, you will find *Ideas & Support to Scaffold* which I hope is fairly self explanatory, but you can use these questions or sentences to guide students to useful questions and to identify gaps in knowledge. The other section is *Questions & Ideas to Stretch*, these will be useful to push students to the highest levels of thinking and to make them fully comfortable with all the material.

Key Definitions & Information

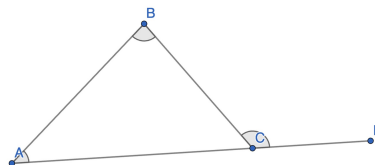
Polygon Definitions

- A *Parallelogram* - a quadrilateral with two pairs of parallel sides.
- A *Rectangle* - a parallelogram with 4 right angles.
- A *Rhombus* - a parallelogram with 4 equal sides.
- A *Square* - a parallelogram with 4 right angles & 4 equal sides.
- A *Trapezium* - a quadrilateral with 1 pair of parallel sides.

Nomenclature

- | | |
|----------------------|--------------------|
| • Triangle (3), | • Octagon (8), |
| • Quadrilateral (4), | • Nonagon (9), |
| • Pentagon (5), | • Decagon (10), |
| • Hexagon (6), | • Hendecagon (11), |
| • Heptagon (7), | • Dodecagon (12). |

Angle Rules



The above is a diagram which can be used to demonstrate the angle rule: $\angle A + \angle B = \angle C$.

The other important rule, of course, is that interior angles of a triangle sum to 180° .

Angle Definitions

- *Acute* - an angle smaller than a right angle.
- *Obtuse* - an angle larger than a right angle but less than 180° .
- *Reflex* - an angle larger than 180° and less than 360° .

Script Thoughts

This game can be made considerably easier if students are provided with a keyword printout, to jog their memory and aid their questioning ability. You may also want to provide some sketches on a whiteboard so that students have visuals that you have gone through with them. In addition, you can make this game harder by adding restrictions to the student's questions. Such as; *I want you to craft a question that doesn't use the name of any polygon* or *Craft a question that eliminates at least 4 cards*.

Ideas & Support to Scaffold

Guess It Maths is meant to support and deepen the understanding of polygons and hence here are some basic questions that students should be fluent with:

- Does the polygon have more than 5 sides?
- Are there pairs of parallel sides?
- Does the shape have any equal sides?
- Can you easily split it into a quadrilateral & another shape?
- Is the sum of interior angles less than 360° ? More than 720° ?
- Is it a regular shape?
- Is it a type of quadrilateral?
- Are the diagonals perpendicular to one another?

Questions & Ideas to Stretch

Here are some higher level thinking questions to stretch students, which you can try to hint at:

- Do the diagonals bisect each other?
- Can you triangulate the polygon? ie. can it be split into triangles? Or is it a composite shape?
- Does the area involve an irrational number or the perpendicular height?
- Is the area greater than 15 units²?
- Is the number of sides a prime number?
- Is the area a square number?
- Are there more or fewer vertices than 6?
- Does the polygon's name end in -gon?

Aims of this Topic

This topic was developed with the Discovering Mathematics 2C course in mind. That being said, it can of course be used with groups of all ages and abilities. This document provides all the tips & tricks to help you target this game to a wide range of classes. It is perfect for students in KS3 or as a quick and stress-free recap activity for students in KS4.

To further develop it, I recommend connecting it with the Polyhedra topic, to get students to develop their intuition of 3 dimensional shapes & to build links between 2 dim and 3 dim. Students may also then find the Proofs topic useful if this is used as a starter for Circle Theorems.

Extension Information: Area & Perimeter

Perimeter

- *Square with sides a*: $P=4a$
- *Rectangle with sides a, b, a, b*: $P=2(a+b)$
- *Trapezium with sides a, b, c, d*: $P=a+b+c+d$
- *Rhombus with sides a*: $P=4a$
- *Parallelogram with sides a, b, a, b*: $P=2(a+b)$
- *Circle with radius r*: $P=2\pi r$

Area

- *Square with sides a*: $A=a^2$
- *Rectangle with sides a, b, a, b*: $A=ab$
- *Trapezium with parallel sides a, b and height h*: $A=\frac{1}{2}(a+b)h$
- *Rhombus with diagonals p & q*: $A=\frac{pq}{2}$
- *Parallelogram with base b & height h*: $A=bh$
- *Circle with radius r*: $A=\pi r^2$