# Angle sum investigation

## Your task

You are going to investigate the angle sum of a number of different polygons. You will need your investigation table, the page of triangles, scissors and a pen. You may also like to use the page of prompts to help you.

### Task 1 – Angle sum of a triangle

You may already know the angle sum of a triangle. How would you prove it to someone? Show it in your investigation table. Need some prompts? You can find them on page 4.

### Task 2 – Angle sum of a quadrilateral

You may already know the angle sum of a quadrilateral. How would you prove it to someone? Show it in your investigation table. Need some prompts? You can find them on page 4.

### Task 3 – Angle sum of a pentagon

Cut out three triangles and place them together. Make sure you only match up equal sides. You may flip the triangles if you need. Do you agree that you have formed a pentagon? How do you know?

We already know that the angle sum of one triangle is 180o. What is the angle sum of your pentagon? How do you know?

You may also like to use the page of prompts to help you answer these questions.

### Task 4 – Angle sum of a hexagon

* Cut out four triangles and place them together. Do you agree that you have formed a hexagon? How do you know?
* We already know that the angle sum of one triangle is 180o. What is the angle sum of your hexagon? How do you know?
* You may also like to use the page of prompts to help you answer these questions.

### Task 5 – Angle sum of any polygon

* Cut out any number of remaining triangles and place them together. Make sure you only match up equal sides. You may flip the triangles if you need. What shape have you formed?
* What is the angle sum of your polygon? How do you know?

## Investigation table

Complete the following table with your investigation findings.

Table 1 – Investigation findings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Shape | Number of sides | Diagram | Number of triangles | Angle sum  |
| Triangle |  |  |  |  |
| Quadrilateral |  |  |  |  |
| Pentagon |  |  |  |  |
| Hexagon |  |  |  |  |
|  |  |  |  |  |

### Task 6 – Generalising the angle sum

* Can you find the pattern in your investigation table and write it as a rule in words?

**Angle sum of a polygon is equal to…**

Can you find an algebraic rule to describe the pattern?

## A page of triangles

Cut out the triangles below to help you with your investigation.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Prompts

Cover up the prompts so that you only use one at a time. If you need a further prompt, uncover the next one.

### Prompts – Angle sum of a triangle

* Cut out a triangle.
* Colour each of the angles in the triangle a different colour or label them inside with a pronumeral.
* Cut out the angles and line them up so that the vertex of each angle meets at the same point.
* You should have formed a set of angles that form a **straight line**.
* We already know that a straight line has 180°
* The angle sum of your triangle **must be 180°.**

### Prompts – Angle sum of a quadrilateral

Cut out two triangles and place them together. Make sure you only match up equal sides. You may flip the triangles if you need. What shape have you formed?

You have formed a quadrilateral.

We already know that the angle sum of one triangle is 180o. What is the angle sum of your quadrilateral? How do you know?

The angle sum of a quadrilateral is **two triangles or 2 x 180ͬ° = 360°**.

### Prompts – Angle sum of a pentagon

The shape is a pentagon because it has 5 sides.

The angle sum of a pentagon is **three triangles or 3 x 180° = 540°**.

### Prompts – Angle sum of a hexagon

The shape is a hexagon because it has 6 sides.

The angle sum of a hexagon is **four triangles or 4 x 180° = 720°.**

### Prompts – Generalising the angle sum

Can you find the pattern in your investigation table and write it as a rule in words?

**Angle sum of a polygon is equal to the number of triangles multiplied by 180°.**

Can you find an algebraic rule to describe the pattern?

**A = (n – 2) x 180°**, where A is the angle sum, n is the number of sides in the polygon,
n – 2 is the number of triangles inside the polygon.

## Outcomes

### 5.2

* selects appropriate notations and conventions to communicate mathematical ideas and solutions MA5.2 1WM
* constructs arguments to prove and justify results MA5.2 3WM
* calculates the angle sum of any polygon and uses minimum conditions to prove triangles are congruent or similar MA5.2 14MG