Calculate Angles

Reasoning and Problem Solving

There are five equal angles around a point.

What is the size of each angle?

Explain how you know.

72° because
360 ÷ 5 = 72

Four angles meet at the same point on a straight line.

One angle is 81°

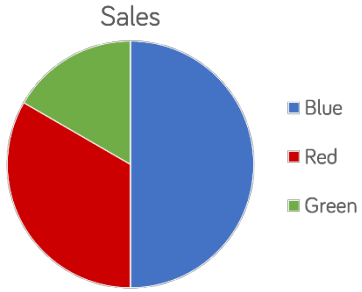
The other three angles are equal.

What size are the other three angles?

Draw a diagram to prove your answer.

180 − 81 = 99°
99 ÷ 3 = 33°

Here is a pie chart showing the colour of cars sold by a car dealer.



The number of blue cars sold is equal to the total number of red and green cars sold.

The number of red cars sold is twice the number of green cars sold.

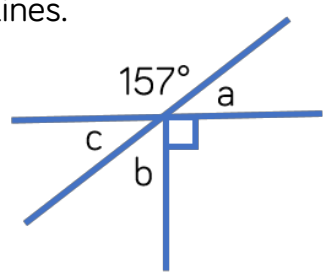
Work out the size of the angle for each section of the pie chart.

Blue : 180°
Red : 120°
Green : 60°

Vertically Opposite Angles

Reasoning and Problem Solving

The diagram below is drawn using three straight lines.



Whitney says that it's not possible to calculate all of the missing angles.

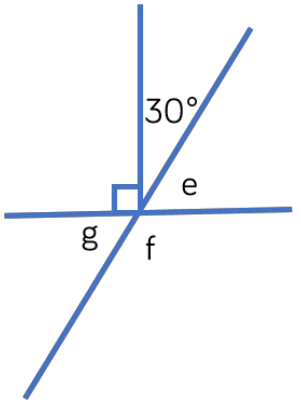
Do you agree? Explain why.

I disagree because:
180 – 157 = 23
so a = 23°
because angles on a straight line add up to 180°

Angles a and c are equal because they are vertically opposite so
c = 23°

Angles around a point add up to 360° so
b = 67°

The diagram below is drawn using three straight lines.



Amir says that angle g is equal to 30° because vertically opposite angles are equal.

Do you agree? Explain your answer.

Find the size of all missing angles.
Is there more than one way to find the size of each angle?

Amir is wrong because g is vertically opposite to e, not to 30° so g would actually be 60°

e = 60°
g = 60°
f = 120°
There are multiple ways to find the size of each angle.

Angles in a Triangle (1)

Reasoning and Problem Solving

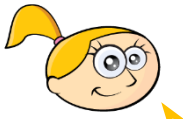
Amir says,

My triangle has two 90° angles.

Can Amir be correct? Can you demonstrate this?

Amir can't be correct because these two angles would add up to 180 degrees, and the third angle can't be 0 degrees.

Eva says,



My triangle is a scalene triangle. One angle is obtuse. One of the angles measures 56° The obtuse angle is three times the smallest angle.

Work out the size of each of the angles in the triangle.

The interior angles of Eva's triangle are 56°, 93° and 31°

True or False?

A triangle can never have 3 acute angles.

False

Children could use multiple examples to show this.

Angles in a Triangle (2)

Reasoning and Problem Solving

I have an isosceles triangle.
One angle measures 42 degrees.

What could the other angles measure?

The angles could be:
42°, 42°, 96°
or
42°, 69°, 69°

Alex

My angles are 70°, 70° and 40°

My angles are 45°, 45° and 90°

Mo

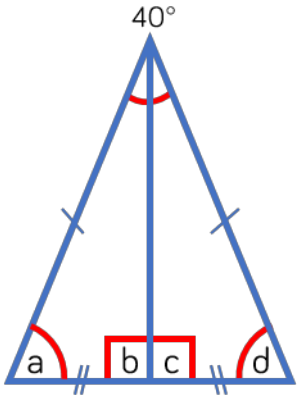
Eva

My angles are 60°, 60° and 60°

What type of triangle is each person describing?
Explain how you know.

Alex is describing an isosceles triangle.
Mo is describing an isosceles right-angled triangle.
Eva is describing an equilateral triangle.

How many sentences can you write to express the relationships between the angles in the triangles?
One has been done for you.



40° + a + d = 180°

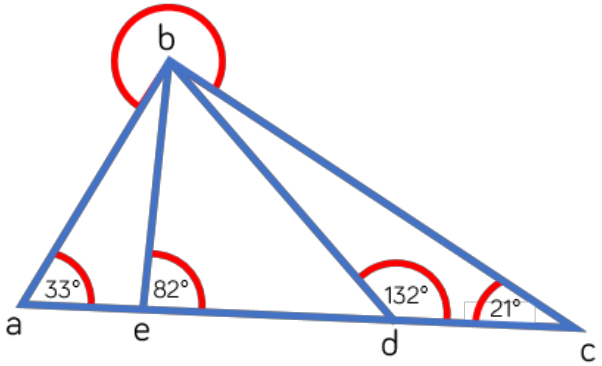
Possible responses:
20° + a + b = 180°
20° + c + d = 180°
b = 90 °
c = 90 °
b = c
a = d
etc.

Children could also work out the value of each angle.

Angles in a Triangle (3)

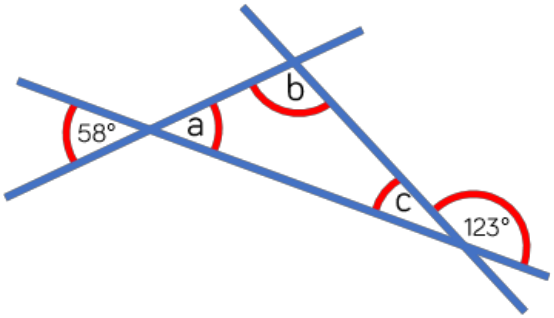
Reasoning and Problem Solving

Calculate the size of the reflex angle b.



234°

Calculate the size of angles a, b and c.



Give reasons for all of your answers.

a is 58 degrees because vertically opposite angles are equal.

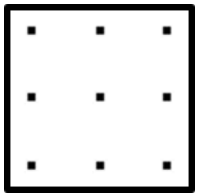
c is 57 degrees because angles on a straight line add up to 180 degrees.

b is 65 degrees because angles in a triangle add up to 180 degrees.

Angles in Quadrilaterals

Reasoning and Problem Solving

How many quadrilaterals can you make on the geoboard?



Identify the names of the different quadrilaterals.

What do you notice about the angles in certain quadrilaterals?

If your geoboard was 4 × 4, would you be able to make any different quadrilaterals?

There are lots of different quadrilaterals children could make.
They should notice that opposite angles in a parallelogram and rhombus are equal.
They should also identify that a kite has a pair of equal angles, and some kites have a right angle.
On a larger grid, they could draw a trapezium without a right angle.

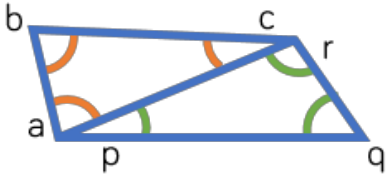
Jack says,

All quadrilaterals have at least one right angle.

Draw two different shapes to prove Jack wrong. Measure and mark on the angles.

Examples:
Trapezium (without a right angle)
Rhombus
Parallelogram

This quadrilateral is split into two triangles.



Use your knowledge of angles in a triangle to find the sum of angles in a quadrilateral.

Split other quadrilaterals into triangles too. What do you notice?

Children should find that angles in all quadrilaterals will always sum to 360 degrees.

Angles in Polygons

Reasoning and Problem Solving

Use the clues to work out what shape each person has.

Dora

My polygon is made up of 5 triangles.

Tommy

The sum of my angles is more than 540° but less than 900°

Alex

The sum of my angles is equivalent to the sum of angles in 3 triangles.

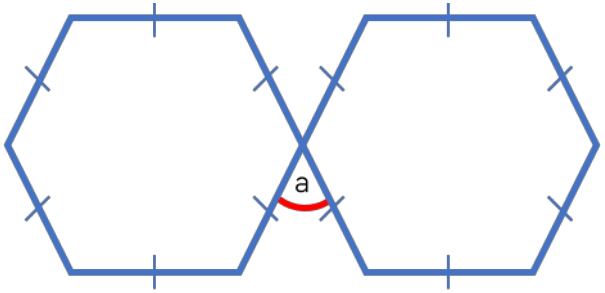
What is the sum of the interior angles of each shape?

Dora:
Heptagon – 900°

Tommy:
Hexagon – 720°

Alex:
Pentagon – 540°

Here are two regular hexagons.



The interior angles of a hexagon sum to 720°
Use this fact to work out angle a in the diagram.

60°