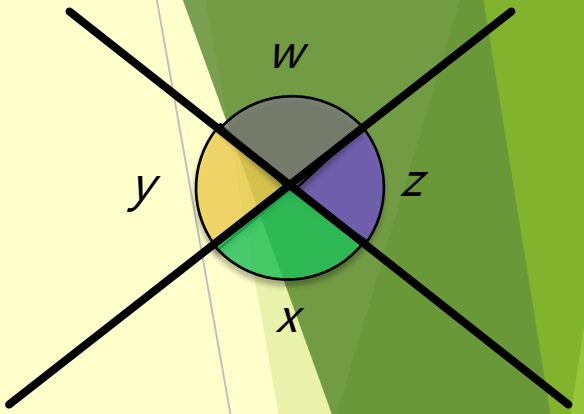
Properties of Shape

Day 1

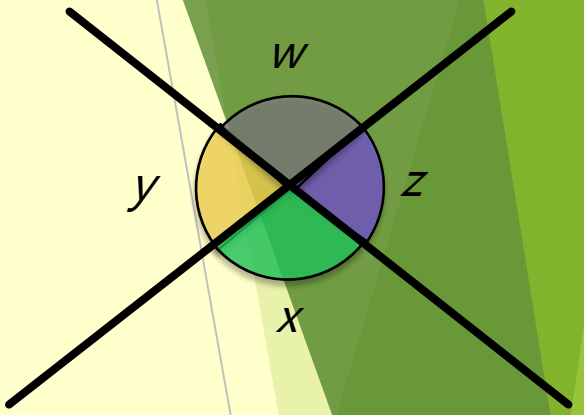
Starter



On a piece of paper draw a large cross.
Mark the angles on as shown.
Measure the angles you have drawn.

What do you notice about angles w and x?
What do you notice about angles y and z?
Are your observations always, sometimes or never true?

Starter - ANSWERS



Angles *w* and *x* share the same value.
Angles *y* and *z* also share the same value (often different from w and x's value).

It is always true that vertically opposite angles share the same value.

Key Vocabulary

Date: Day 1

LO: To calculate missing angles using vertically opposite angles knowledge.

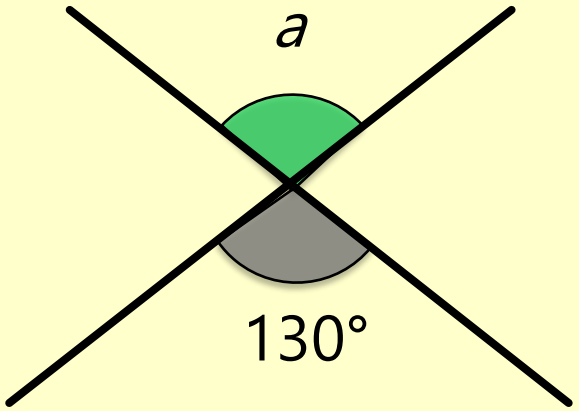
Success Criteria

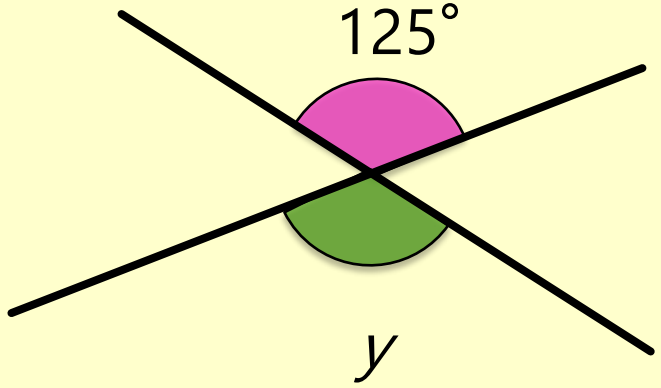
I can use my knowledge of vertically opposite angles to find and calculate missing angle values.

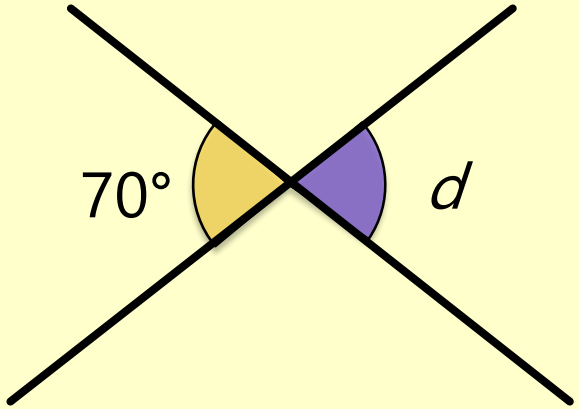
I can explain my reasoning.

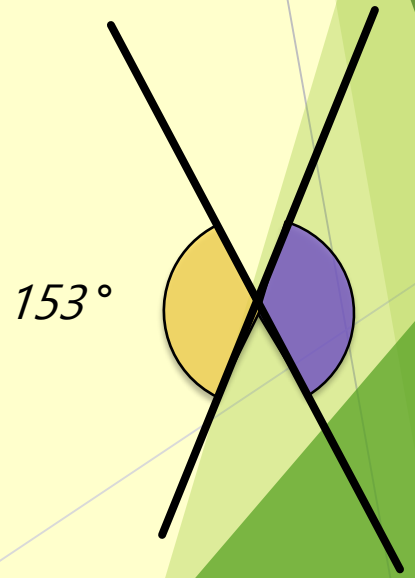
Descriptive Doing

Find the missing angle.



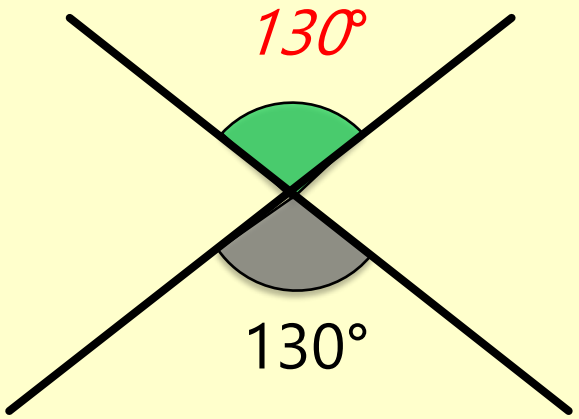


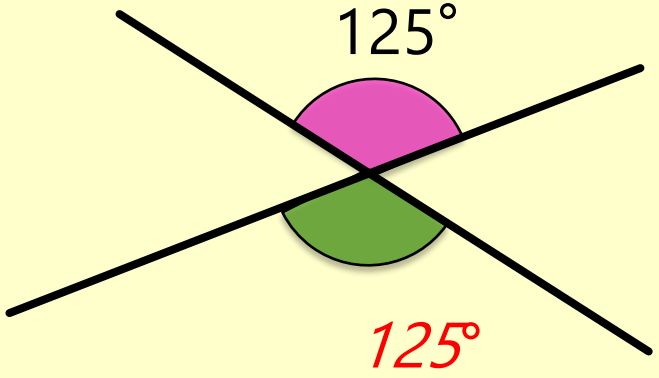


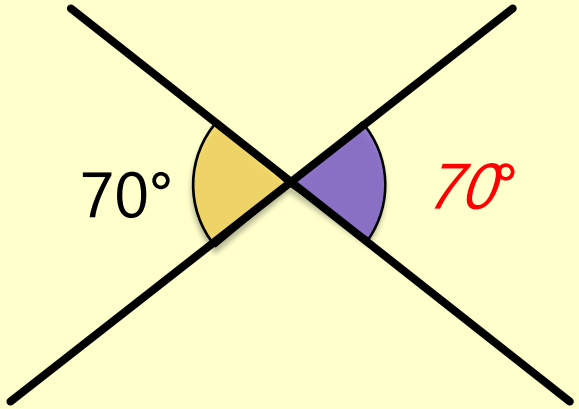


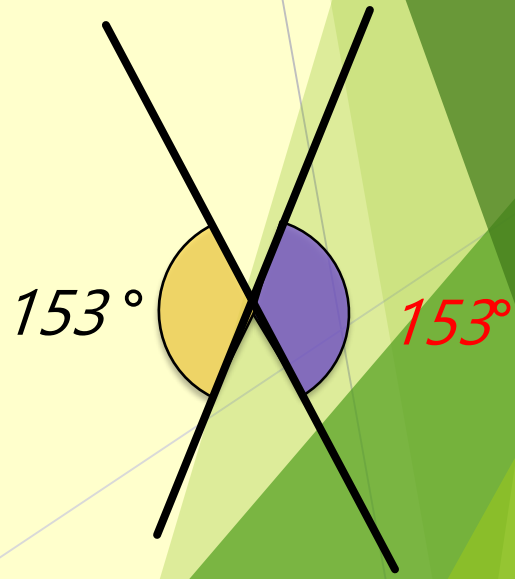
Remember vertically opposite angles are the same.

Descriptive Doing - ANSWERS









Descriptive Teaching

Find the missing angles.

Angle c is 110° because vertically opposite angles are the same.

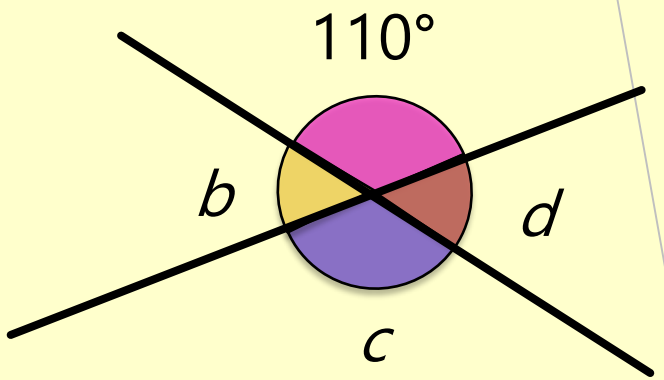
There are 360° in a circle.

110° + 110° = 220°

360° - 220° = 140°

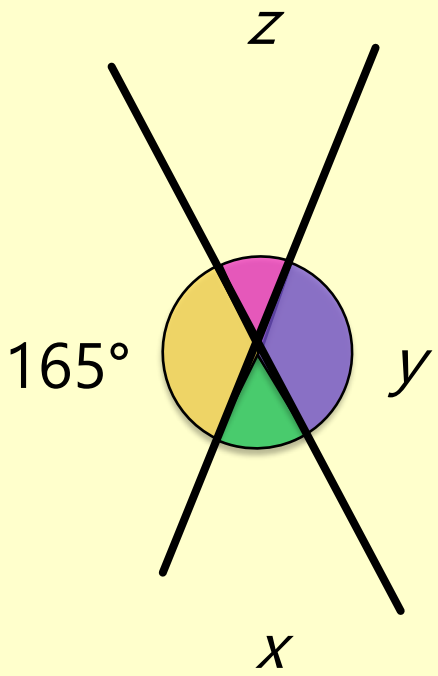
140° ÷ 2 = 70°

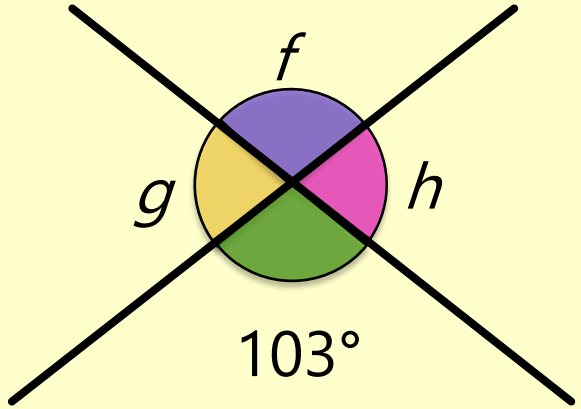
Angle b and d = 70°



Descriptive Doing

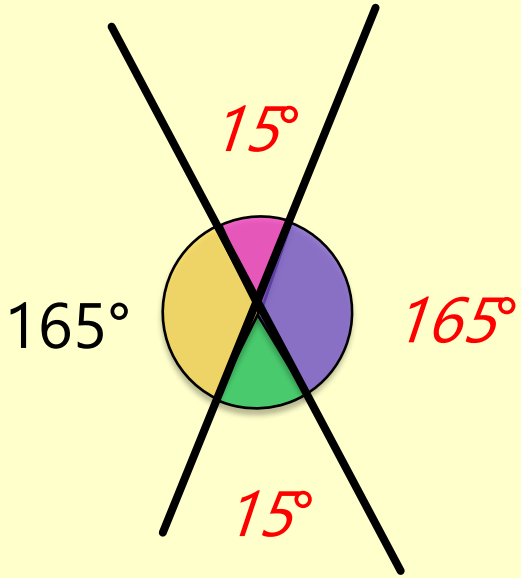
Find the missing angles.

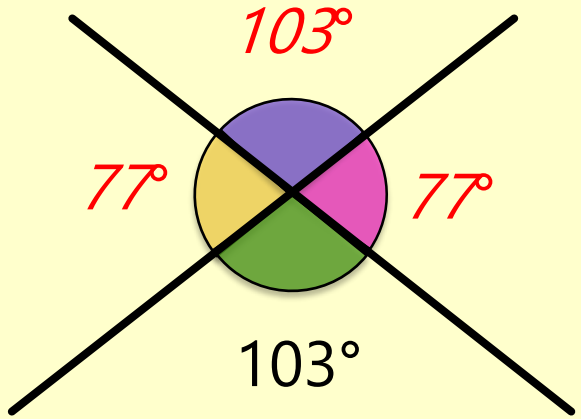




Remember vertically opposite angles are the same.

Descriptive Doing - ANSWERS

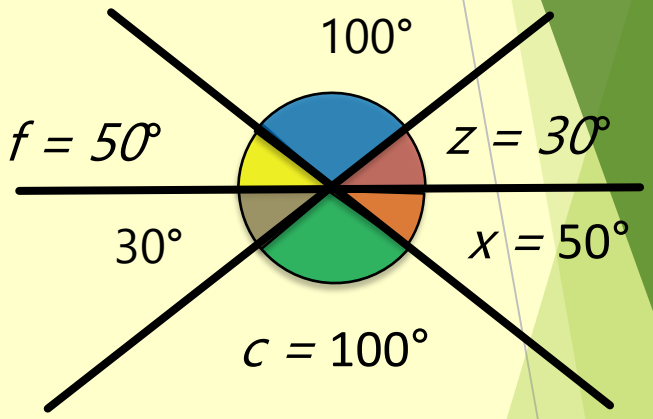




Reflective Teaching

Find the missing angles.

Angle c = 100° because vertically opposite angles are the same.



Angle z = 30° because vertically opposite angles are the same.

100° + 100° + 30° + 30° = 260°

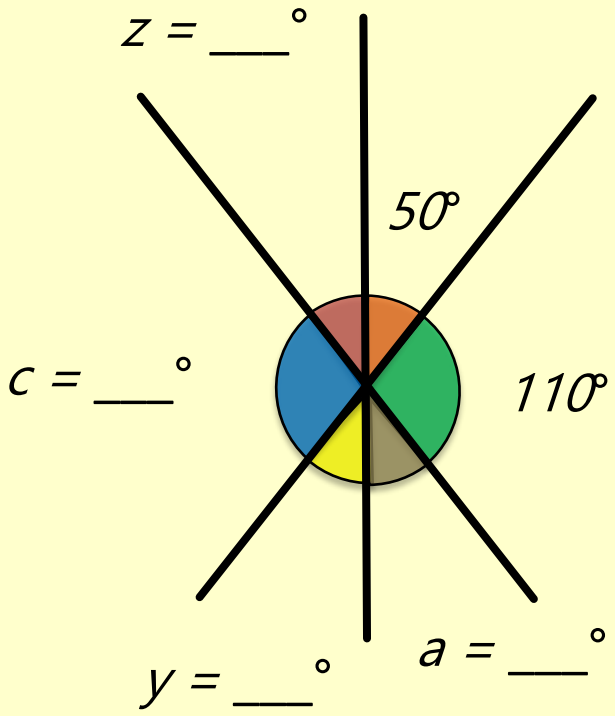
360° - 260° = 100°

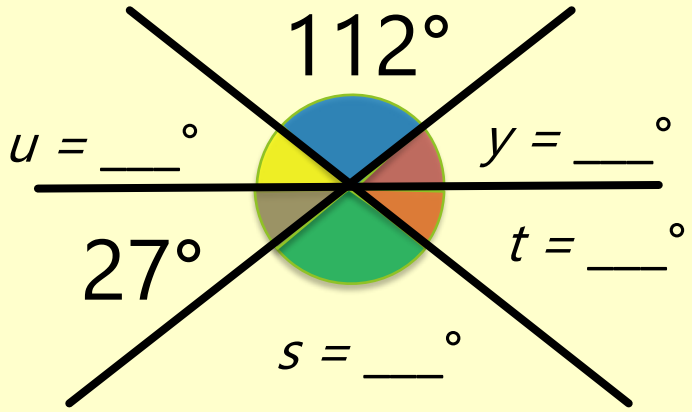
100° ÷ 2 = 50°

Therefore, angles f and x are worth 50°.

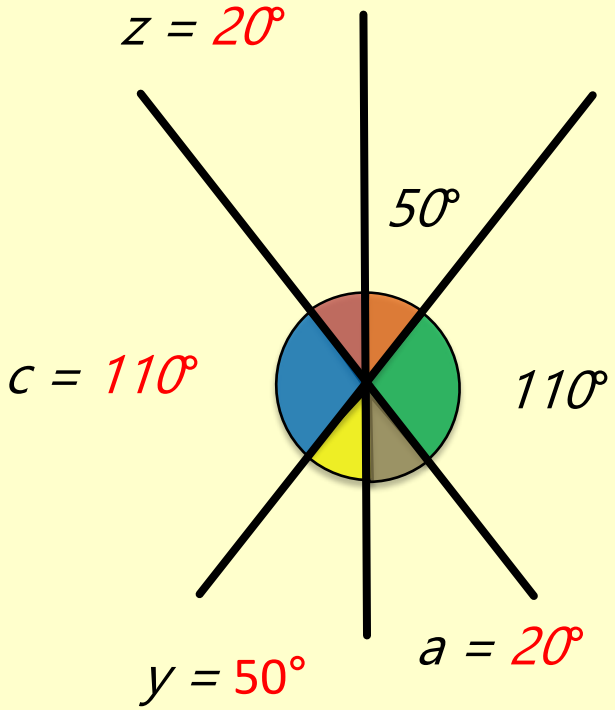
Reflective Doing

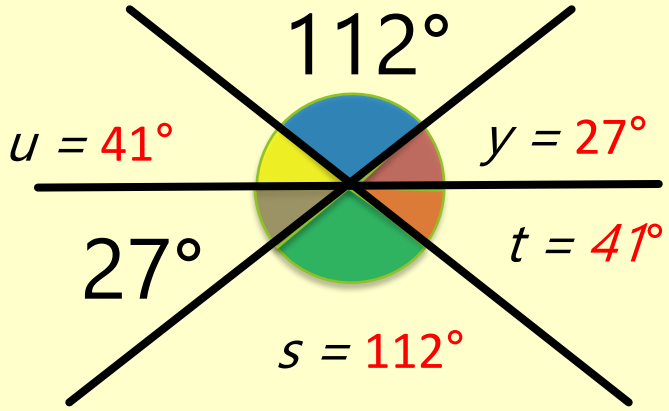
Find the missing angles.





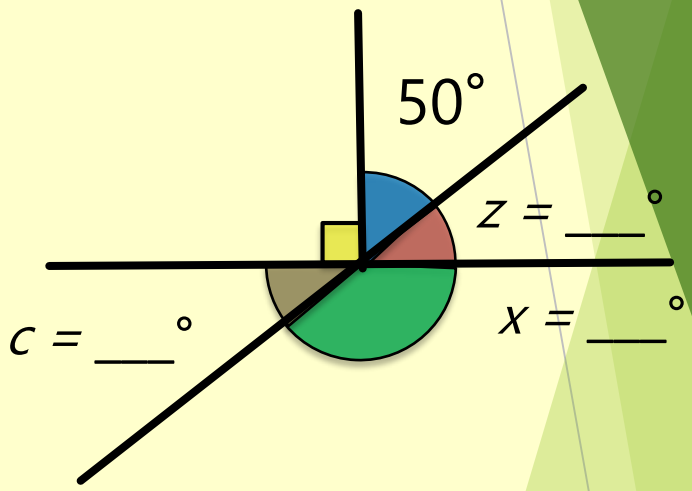
Reflective Doing - ANSWERS





Reflective Teaching

Find the missing angles.



50° + 90° = 140°

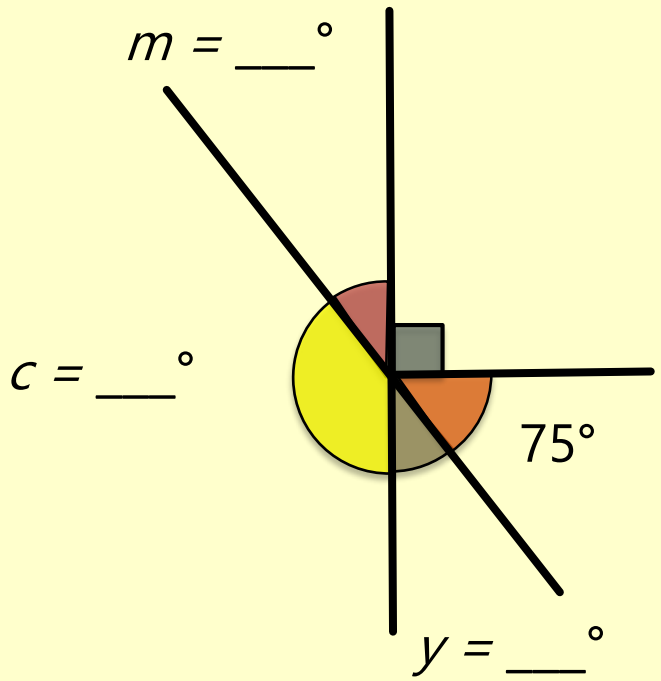
Angles on a straight line equal 180°, therefore 180° - 140° = 40°. Angle z = 40°.

Angle c = 40° as vertically opposite angles are equal.

180° - 40° = 140°, therefore angle x = 140°.

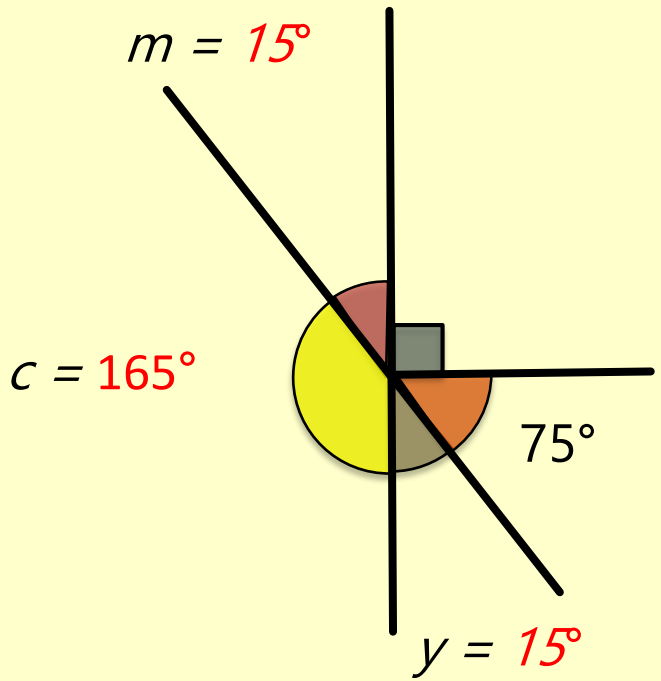
Reflective Doing

Find the missing angles.



Remember a right angle is 90°.

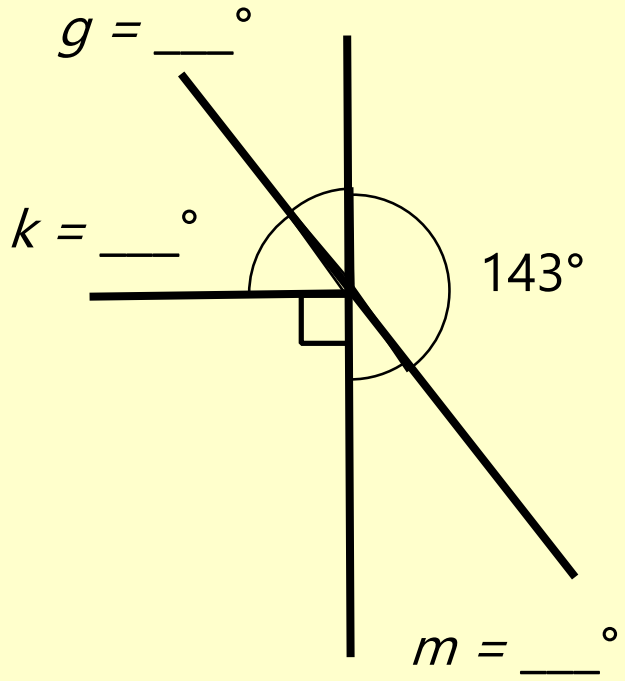
Reflective Doing - ANSWERS



Reflective Doing

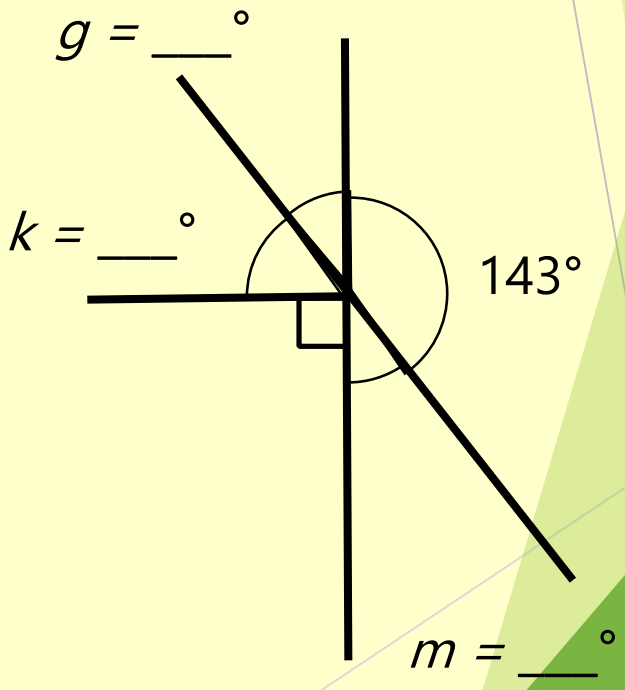
James says, “It’s impossible to find the missing values.”

Do you agree?
Explain your answer.



Reflective Doing - ANSWERS

No, I do not agree. We can find *g* by calculating:
180° - 143° = 37°, as *m* is vertically opposite *g* it is 37°.
k can be found by calculating:
180° - (90° + 37°) = 180° - 127° = 53°.



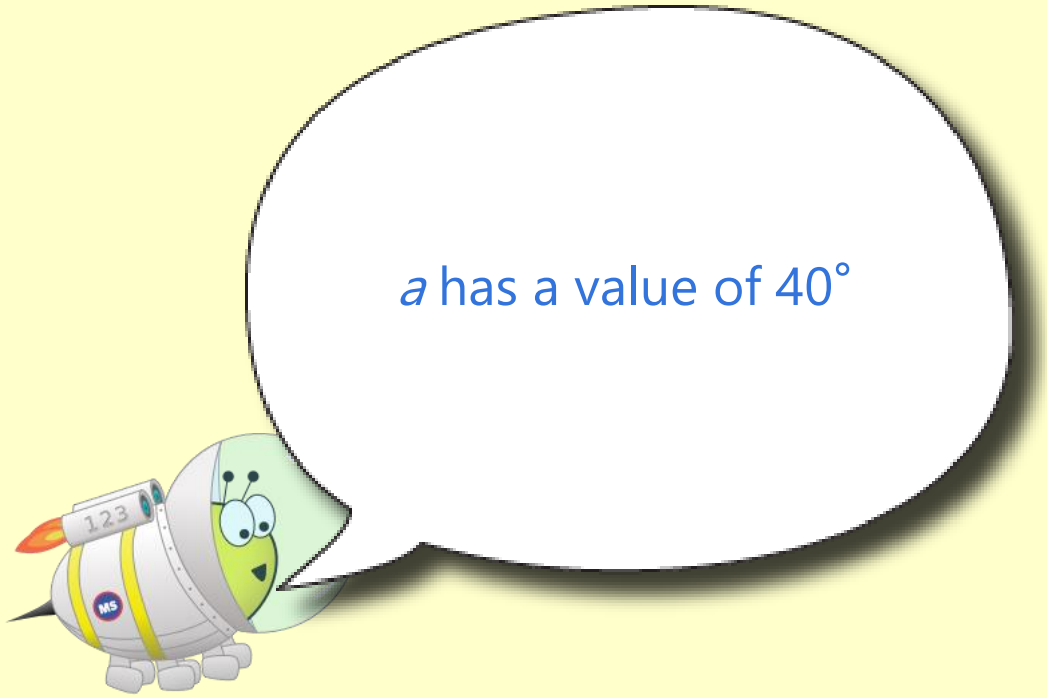
Choose your challenge

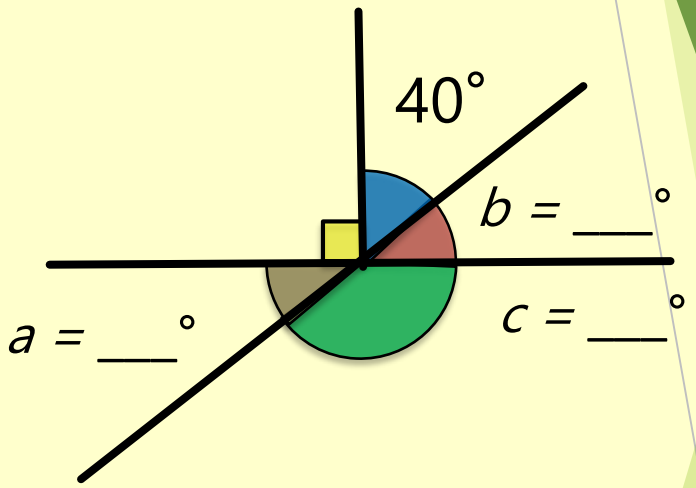
Challenges can be found on the document named ‘Maths Challenges Day 1’.

Choose an appropriate challenge OR work through green, orange and red.

Answers can be found at the bottom of the document.

Reflection Time





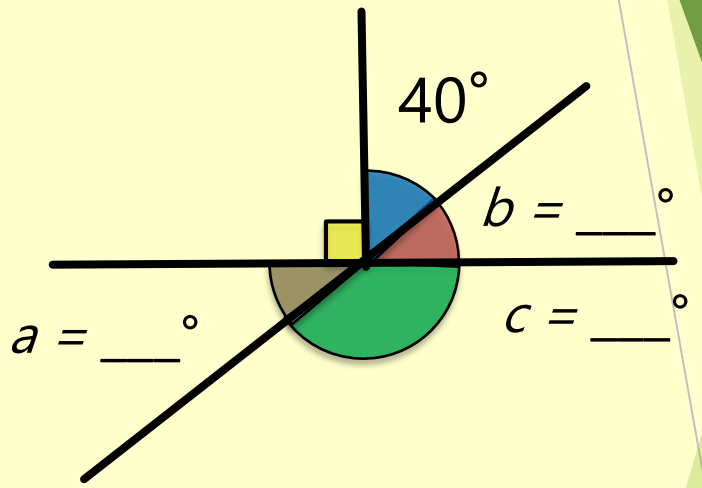
Do you agree?

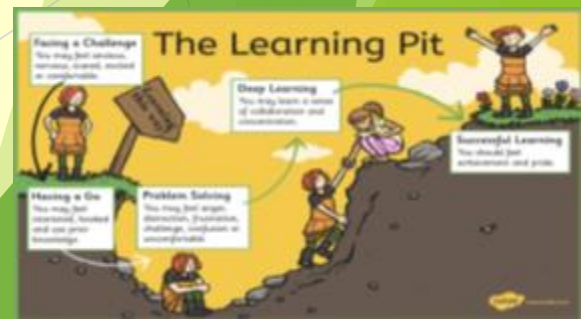
Provide calculations to help explain your answer.

I agree/disagree because…

Reflection Time - ANSWERS

No, I do not agree, *a* is not vertically opposite 40°, it is opposite the angle *b*.
a has a value of 50°, because 180° - (90° + 40°) = 180° - 130° = 50°.



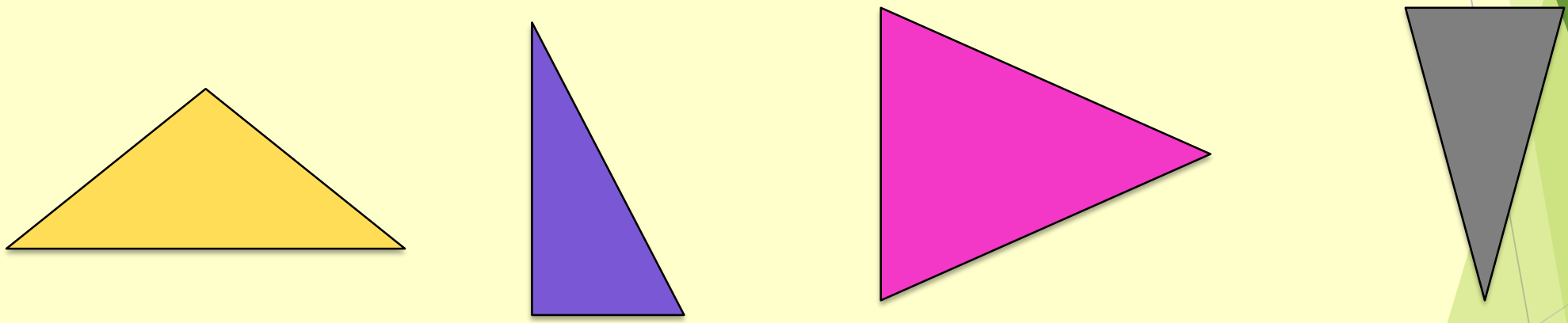


Properties of Shape

Day 2

Starter

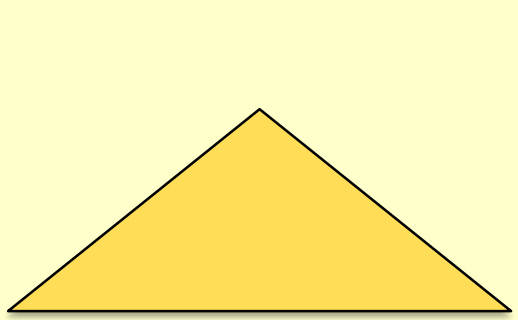
Which one doesn't belong?

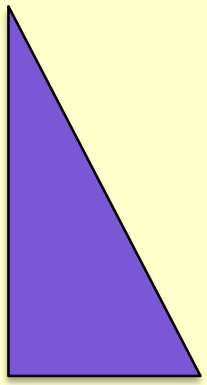


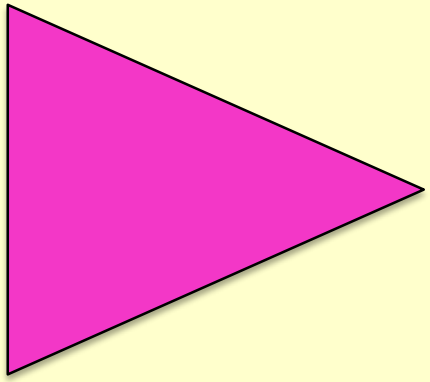
Explain your answer.

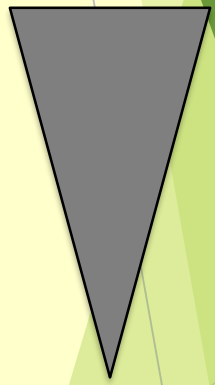
Starter - ANSWERS

The blue triangle doesn't belong as it is a right-angled triangle, whereas the other triangles are isosceles triangles.









Key Vocabulary

Date: Day 2

LO: To calculate missing angles in triangles.

Success Criteria

I can explore the total value of the interior angle of a triangle and apply that knowledge to calculate a missing angle in a triangle.

I can explain my reasoning.

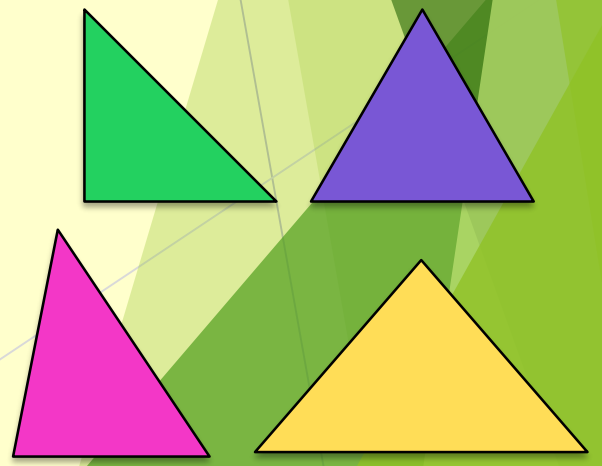
Descriptive Doing

Cut various pieces of card to make different types of triangles: equilateral, right-angled, isosceles and scalene triangles.

Classify each triangle by naming it by type.

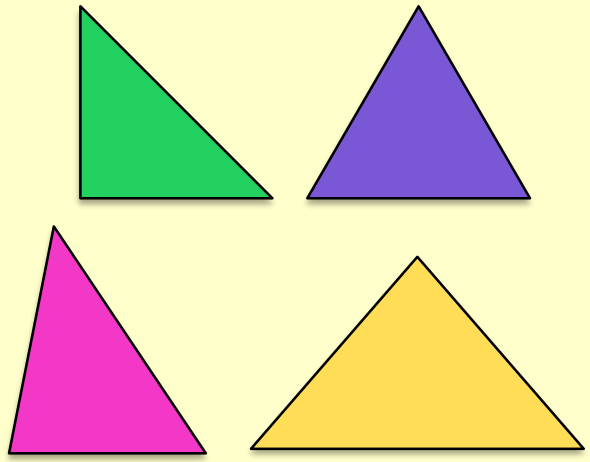
Using a protractor, measure the three angles in each triangle.

What do you notice?
Explain your answer with examples.



Descriptive Doing - ANSWERS

The total interior angle of any triangle is 180°.



Descriptive Teaching

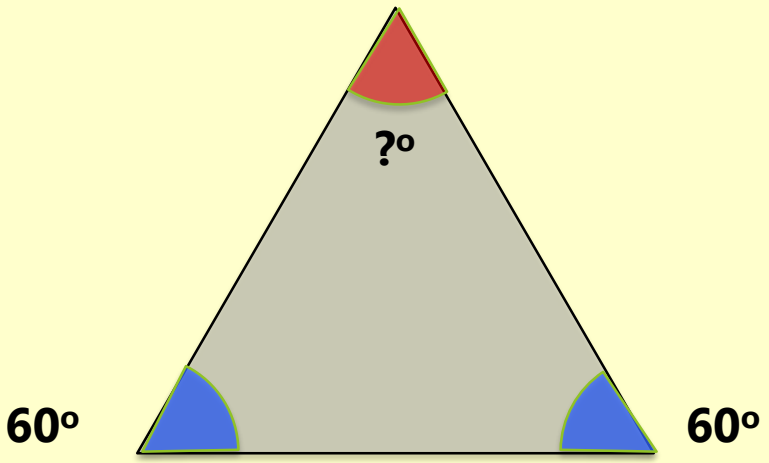
Calculate the value of the missing angle.

The interior angles of a triangle equal 180°.

60°+ 60° = 120°.

180° - 120° = 60°.

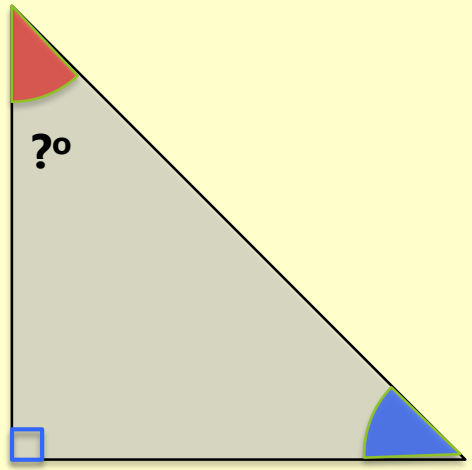
This missing angle is 60°.



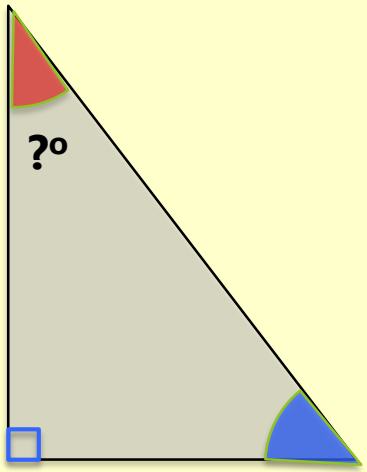
Descriptive Doing

Remember angles in a triangle add up to 180°.

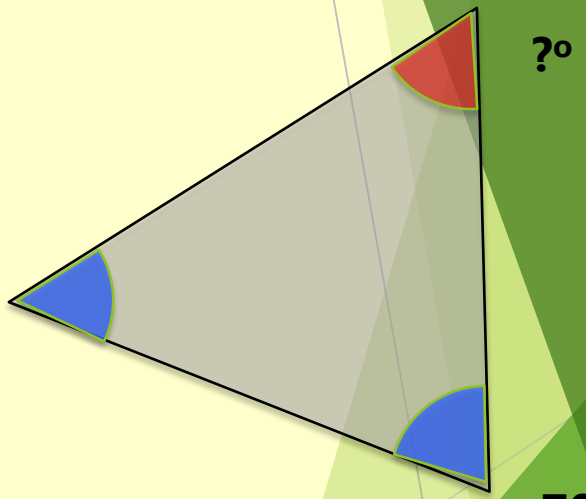
Calculate the value of the missing angle.



90° 60°

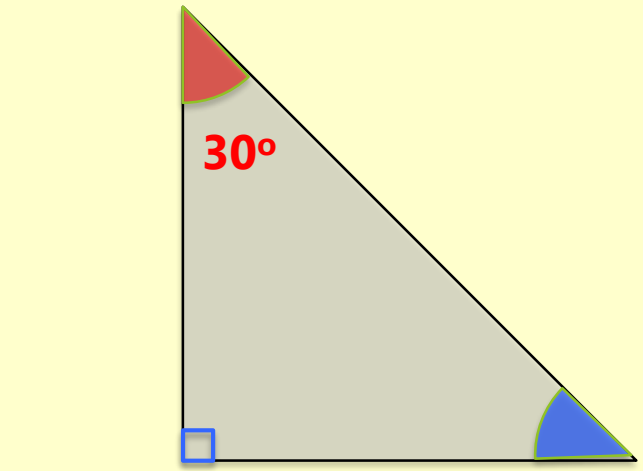


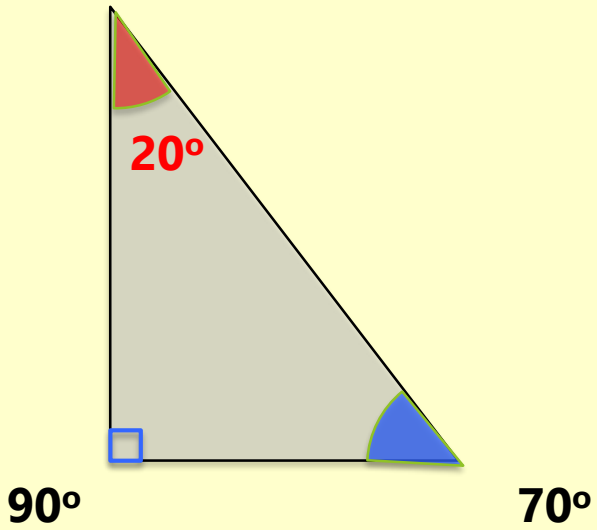
90° 70°

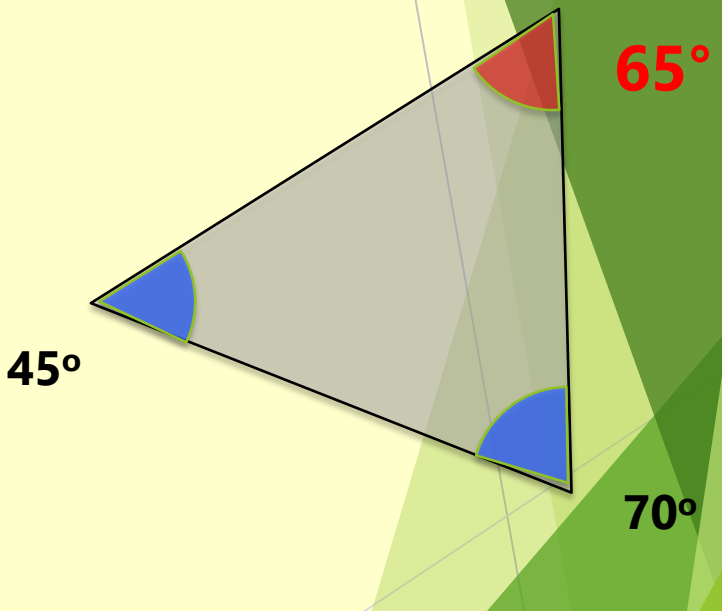


Descriptive Doing - ANSWERS

Calculate the value of the missing angle.







Reflective Doing

Are the following statements true or false?

a) Triangles can have two obtuse angles.

b) Triangles may contain a right-angle.

c) Triangles can have three or four angles in total.

Explain your answers.

Reflective Doing

a) Triangles can have two obtuse angles.
False – obtuse angles are greater than 90^{o}, so there can be one maximum!

b) Triangles may contain a right-angle.
True – all right-angled triangles contain a right angle.

c) Triangles can have three or four angles in total.
False – triangles must have three angles.
A shape with four angles is a quadrilateral.

Reflective Doing

Ruth says, “I have drawn a scalene triangle. One of its angles is obtuse. Another angle is 48^{o}. The obtuse angle is three times greater than the smallest angle.”

What are the values of the obtuse angle and smallest angle in Ruth’s triangle?

Explain your answer.

Reflective Doing - ANSWERS

The smallest angle is worth 33^o as $(180^o - 48^o) \div 4 = 132^o \div 4 = 33^o$.

So, the obtuse angle is 99^o as $3 \times 33^o = 99^o$.

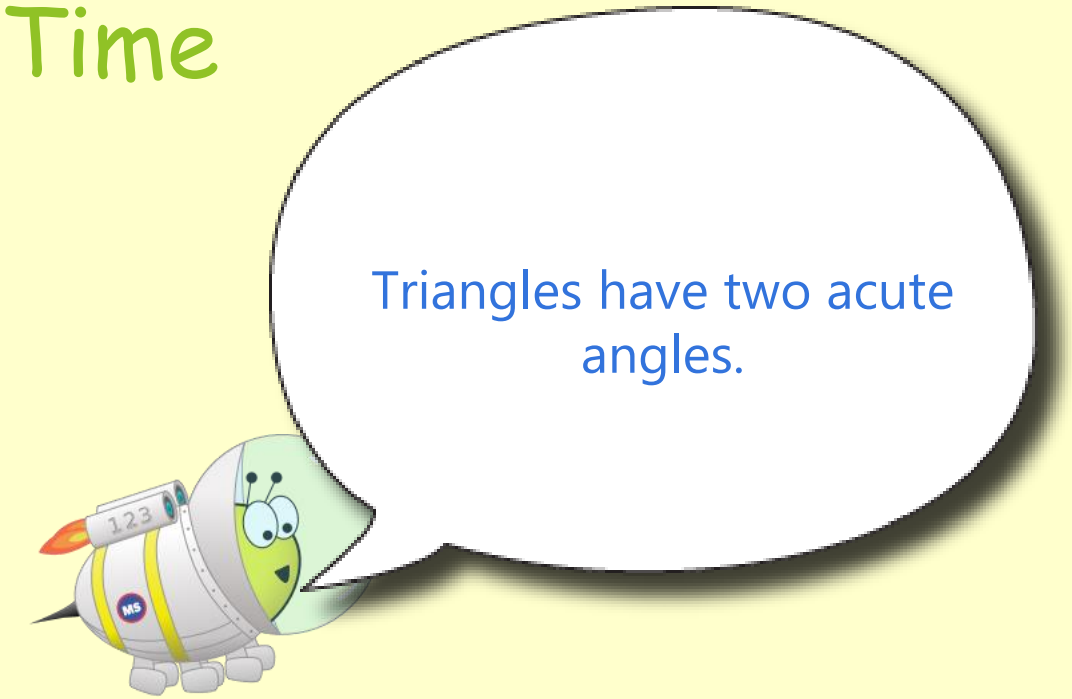
Choose your challenge

Challenges can be found on the document named ‘Maths Challenges Day 2’.

Choose an appropriate challenge OR work through green, orange and red.

Answers can be found at the bottom of the document.

Reflection Time



Is Astrobee's statement always, sometimes or never true?

Provide examples to explain your answer.

Astrobee's statement is ___ true because…

Reflection Time - ANSWERS

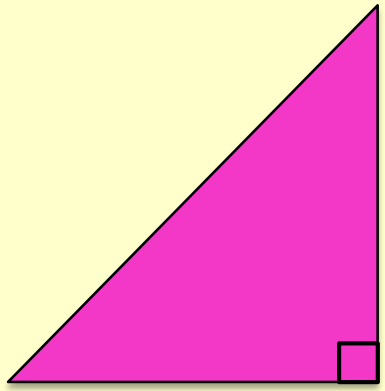
Astrobee's statement is only sometimes true. For example, right-angled triangles have two acute angles and one right-angle (some scalene and isosceles triangles also have just two acute angles). However, equilateral triangles, as well as many scalene and isosceles triangles have three acute angles.

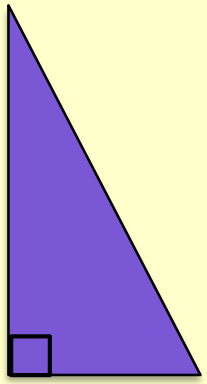
Properties of Shape

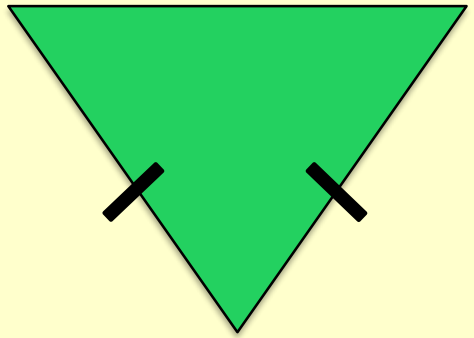
Day 3

Starter

Which one doesn't belong?



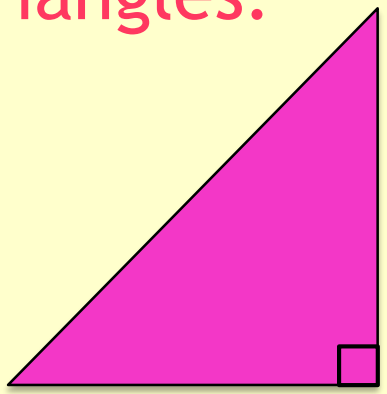


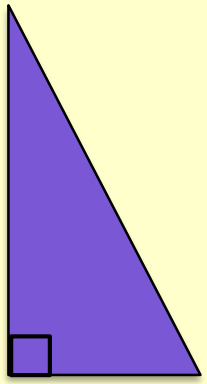


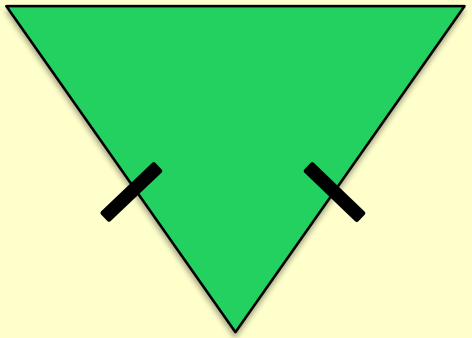
Explain your answer.

Starter - ANSWER

The green triangle doesn't belong as it is an isosceles triangle (as it has hatch marks to show two equal sides), the other triangles are all right-angled triangles.







Key Vocabulary

Date: Day 3

LO: To calculate missing angles in triangles.

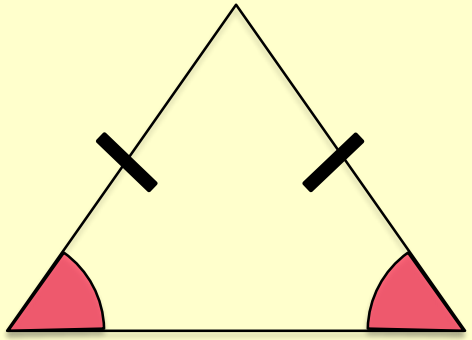
Success Criteria

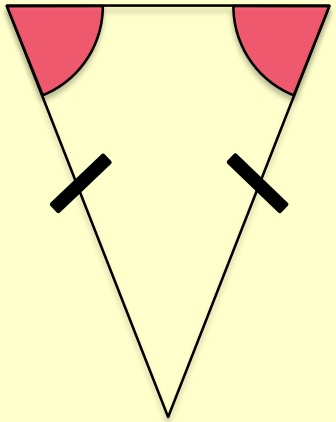
I can explore the total value of the interior angle of a triangle and apply that knowledge to calculate a missing angle in an isosceles triangle.

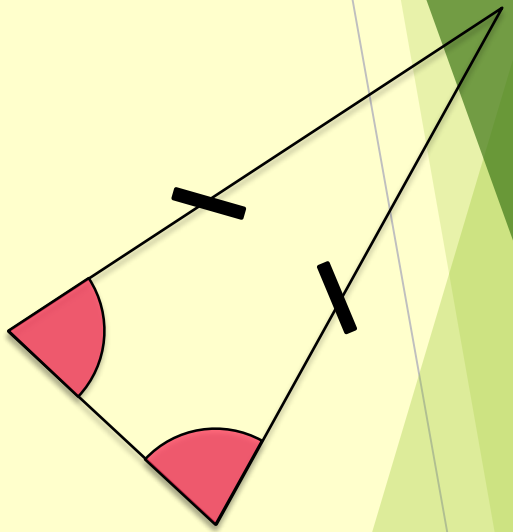
I can explain my reasoning.

Descriptive Teaching

Which angles in the triangles below are equal?



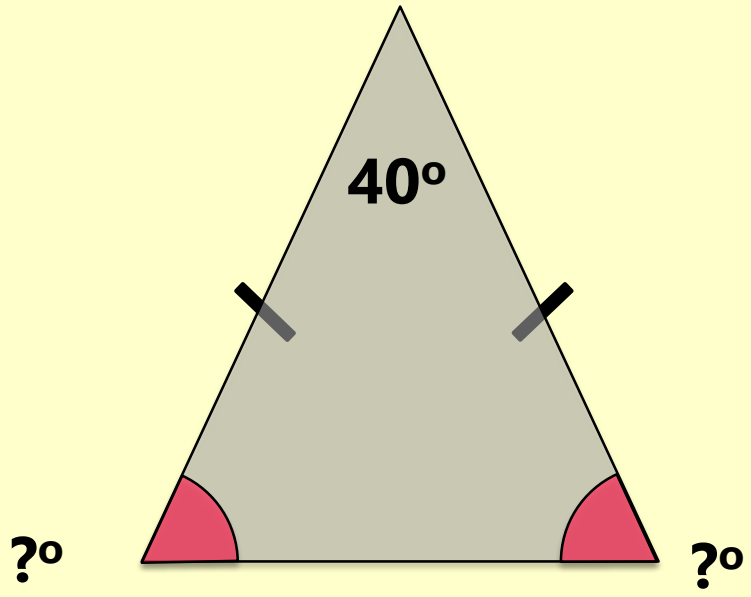


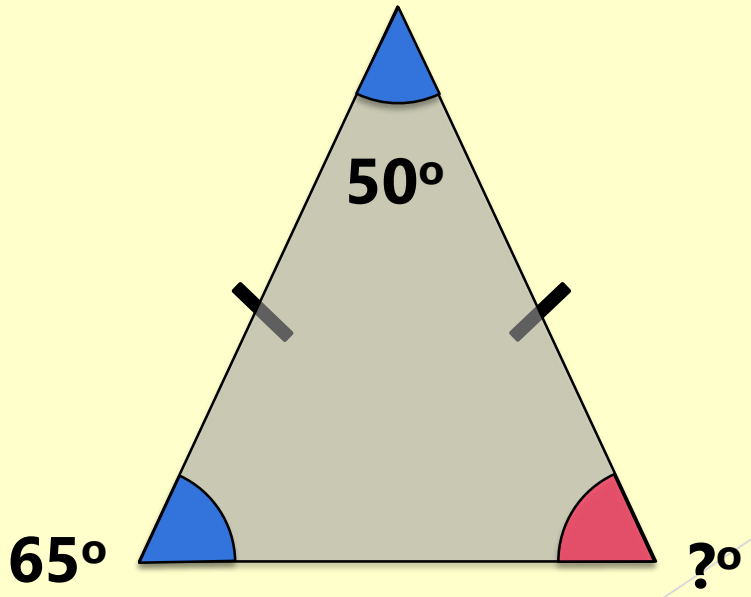


The base angles in an isosceles triangle are equal.

Descriptive Doing

What is the value of the missing angle in the isosceles triangle below?

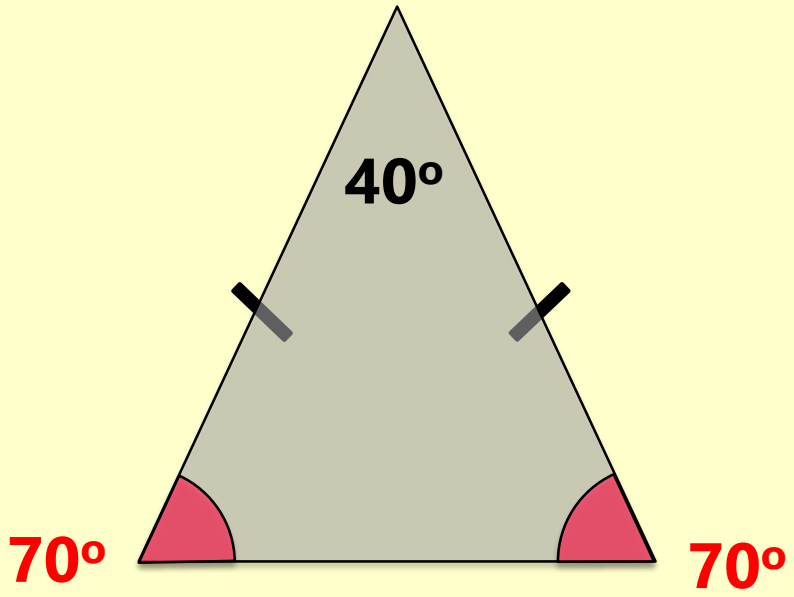


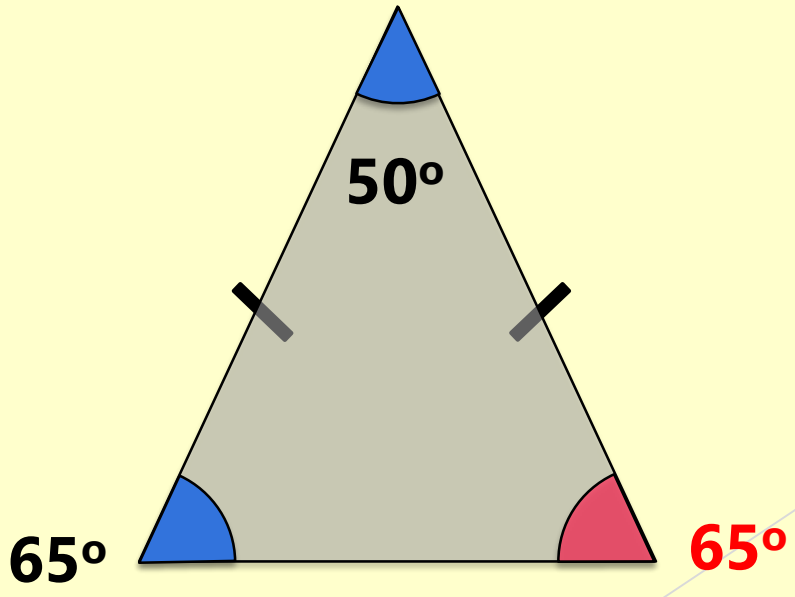


Remember angles in a triangle add up to 180°.

Descriptive Doing - ANSWERS

What is the value of the missing angle in the isosceles triangle below?

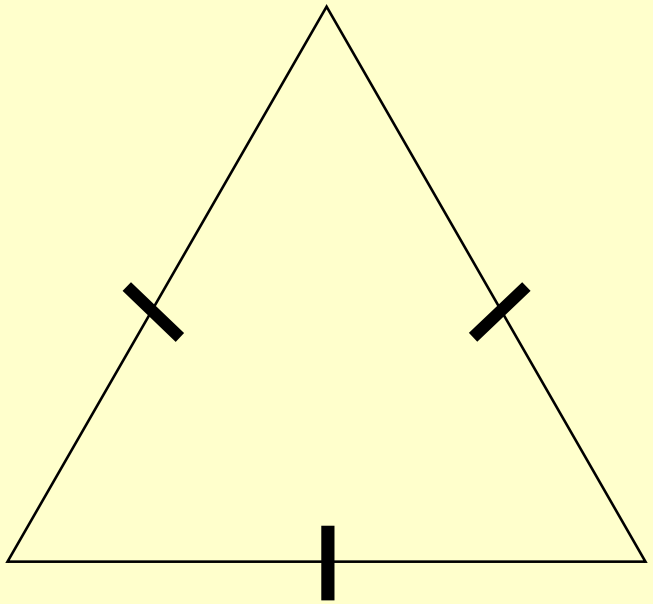




Descriptive Doing

What type of triangle is shown?
What are the values of its angles?

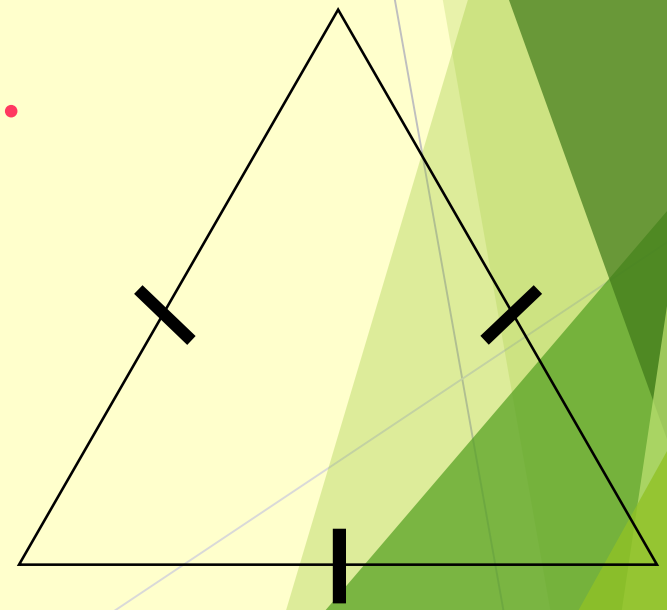
Explain your answer.



Descriptive Doing - ANSWERS

An equilateral triangle is shown as all three of its sides are equal, as shown by the three hatch marks.

So, each of its three angles is worth 60^{o}.
$180^{o} \div 3 = 60^{o}$



Reflective Doing

Ruth says, “I have drawn an isosceles triangle. One of its angles is 56^{o}.”

What are the other angles in Ruth’s triangle? How many solutions did you find?

Explain your answer.

Reflective Doing – ANSWERS

Either Ruth's triangle has angles of 56^o, 56^o and 68^o.
Alternatively, her triangle has the angles 56^o, 62^o and 62^o.

Reflective Doing

Jamal says, “My triangle has the angles 23^o, 56^o and 101^o.”
Yasmin says, “Each of my triangle’s angles are 60^o.”
Chen says, “My triangle has the angles 43^o, 43^o and 94^o.”
Ahmed says, “My triangle has the angles 90^o, 33^o and 57^o.”

What types of triangles are each of the friends describing? Explain your answer.

Reflective Doing - ANSWER

Jamal is describing a scalene triangle as all three angles are different.

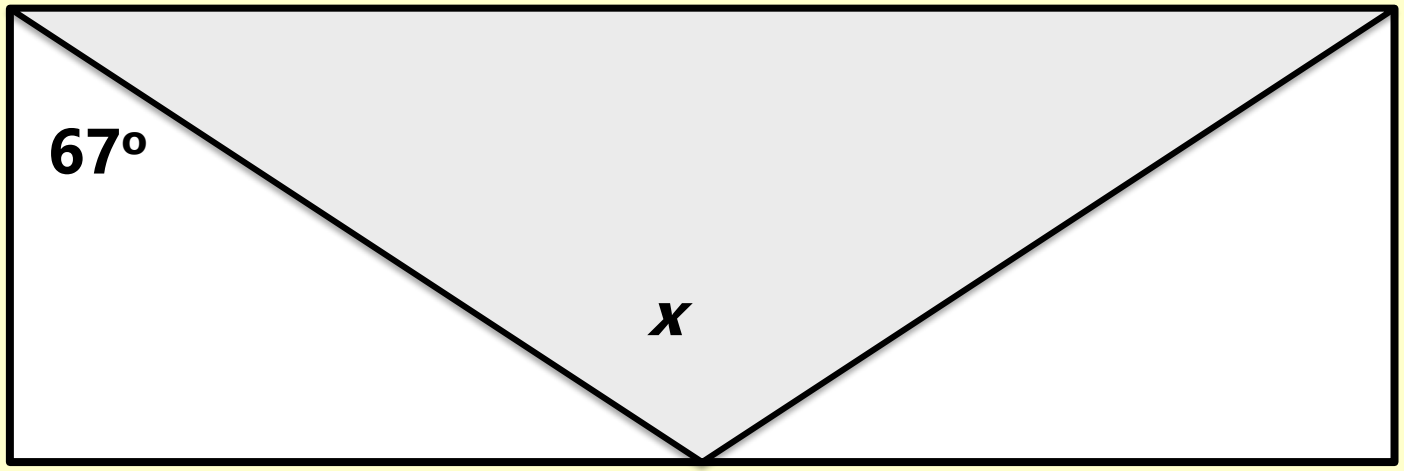
Yasmin is describing an equilateral triangle as all three angles are the same.

Chen is describing an isosceles triangle as two of the angles are the same.

Ahmed is describing a right-angled triangle as it has a right-angle.

Reflective Doing

The image below shows an isosceles triangle within a rectangle.



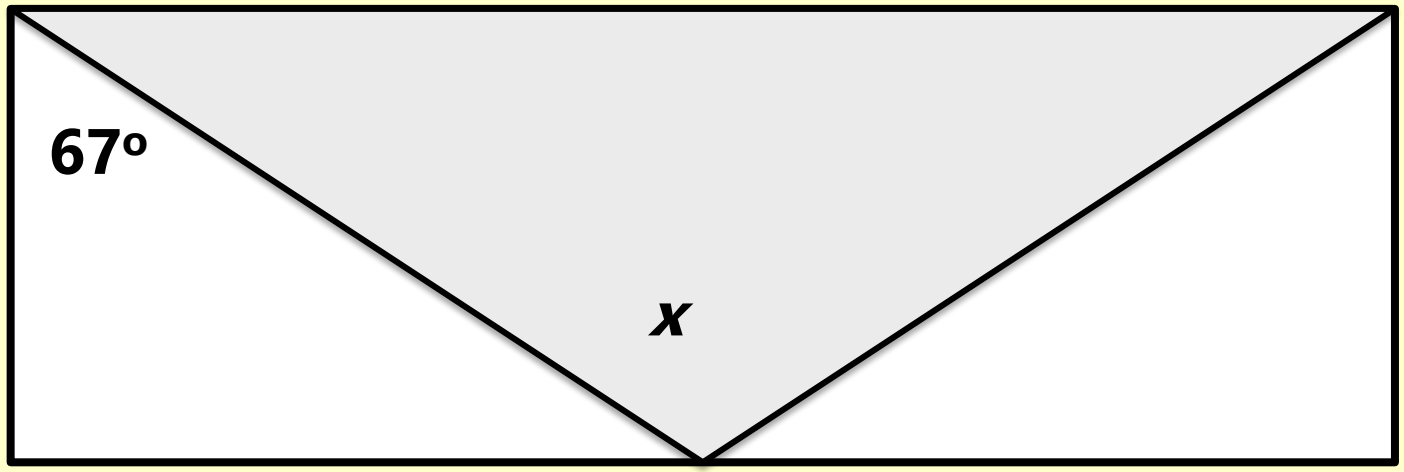
not
to scale

What is the value of angle *x*?

Explain your answer.

Reflective Doing - ANSWERS

Angle *x* has a value of 134°.
90° - 67° = 23°. So, *x* = 180° – (2 x 23°) = 180° - 46° = 134°



not
to scale

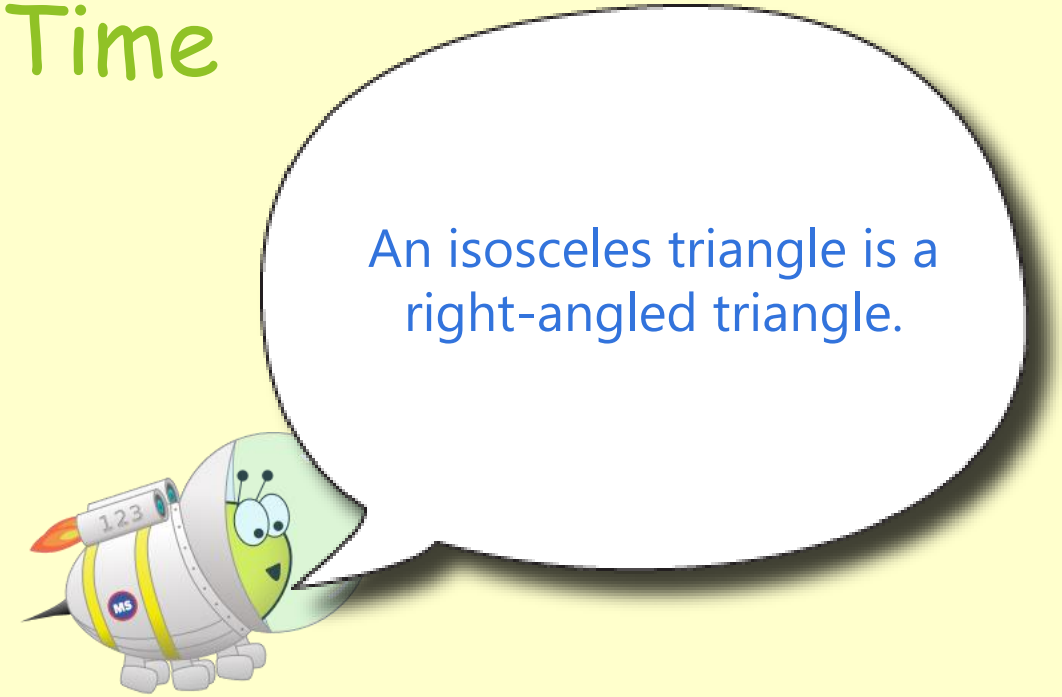
Choose your challenge

Challenges can be found on the document named ‘Maths Challenges Day 3’.

Choose an appropriate challenge OR work through green, orange and red.

Answers can be found at the bottom of the document.

Reflection Time



Astrobee's statement is ___ true because…

Is Astrobee's statement always, sometimes or never true?

Provide examples to explain your answer.

Reflection Time - ANSWERS

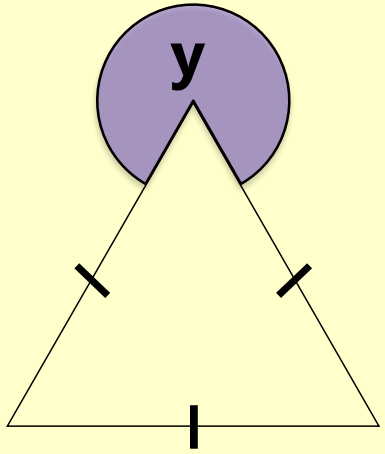
Astrobee's statement is sometimes true – only in one circumstance, in fact.
If a triangle has a right-angle and two angles of 45º, it is both a right-angled triangle and an isosceles triangle. All other triangles are non-examples.

Properties of Shape

Day 4

Starter

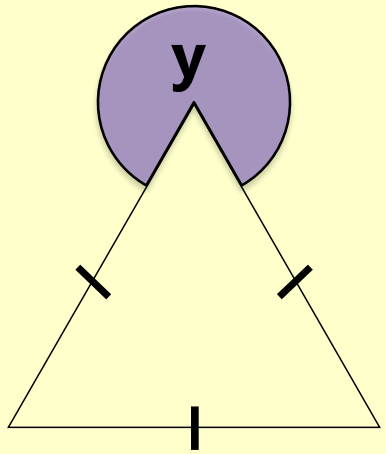
What is the value of the angle *y*?



Explain your answer by providing each step of your calculation.

Starter - ANSWERS

Angle y must be equal to 300° as the triangle shown is an equilateral triangle, so the other angle around the point is 60° and 360° - 60° = 300°.



Key Vocabulary

Date: Day 4

LO: To calculate missing angles in triangles.

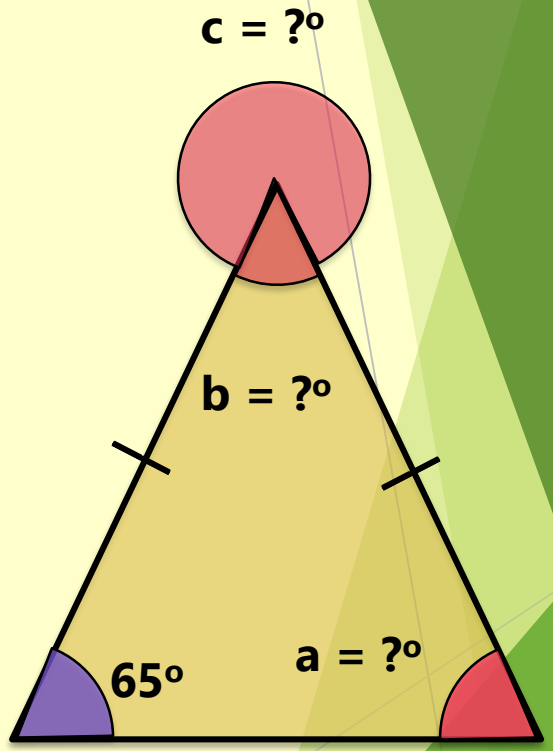
Success Criteria

I can explore the total value of the interior angle of a triangle and apply that knowledge to calculate missing angles in or around various triangles.

I can explain my reasoning.

Descriptive Teaching

Calculate the values of the missing angles.



a = 65° as it is equal to the purple angle.

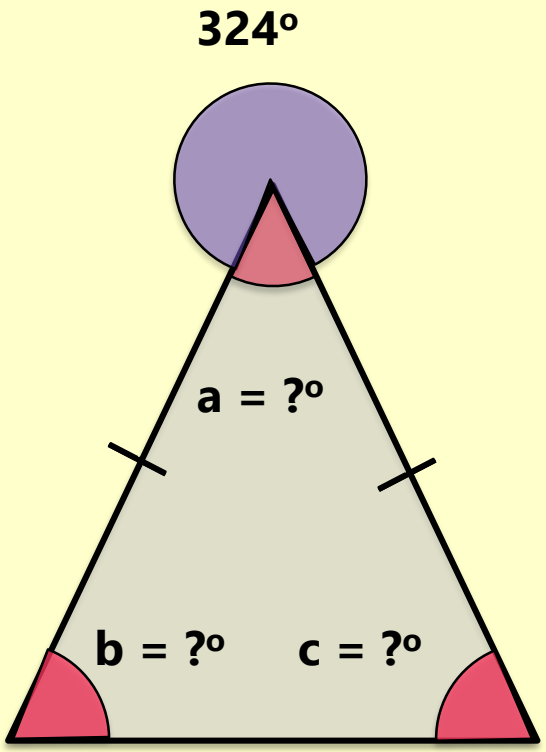
65° + 65° = 130°

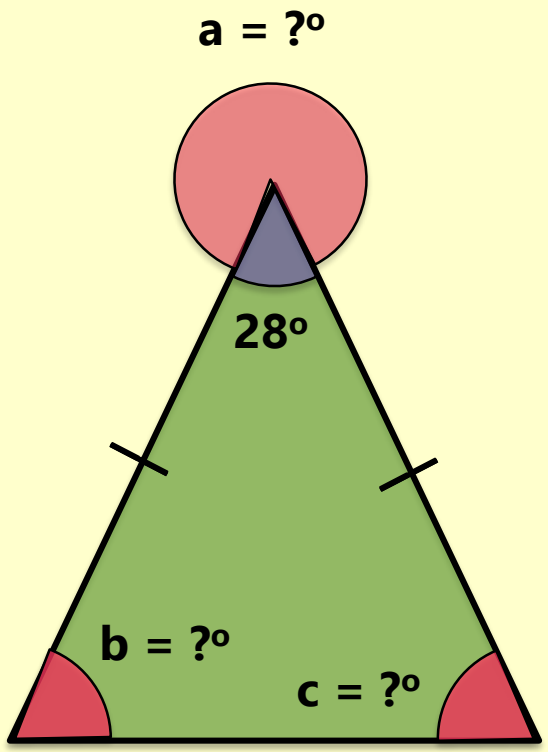
b = 50° as 180° - 130° = 50°

c = 310° as 360° - 50° = 310°

Descriptive Doing

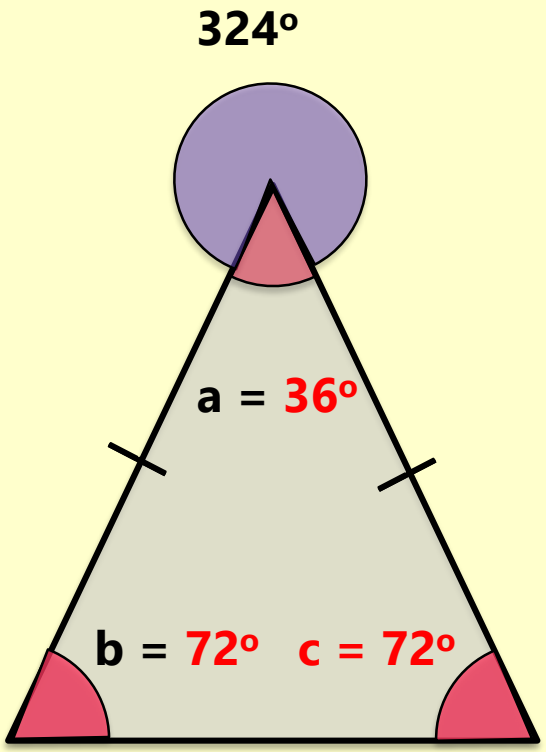
Calculate the values of the missing angles.

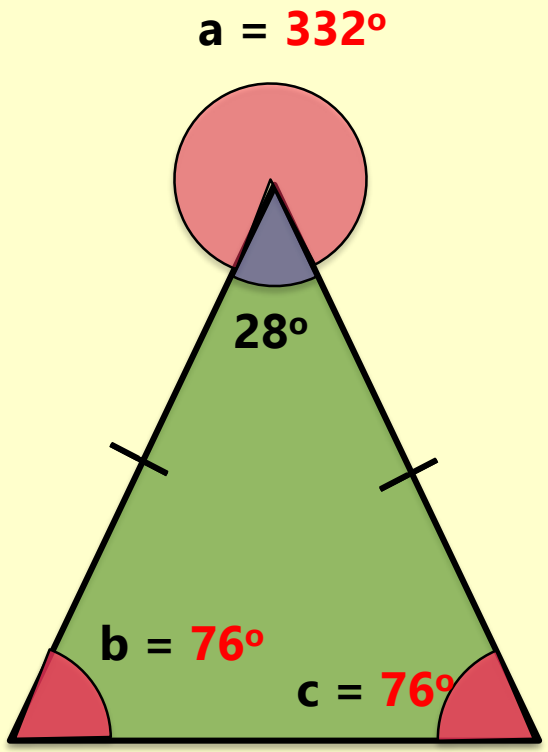




Descriptive Doing - ANSWERS

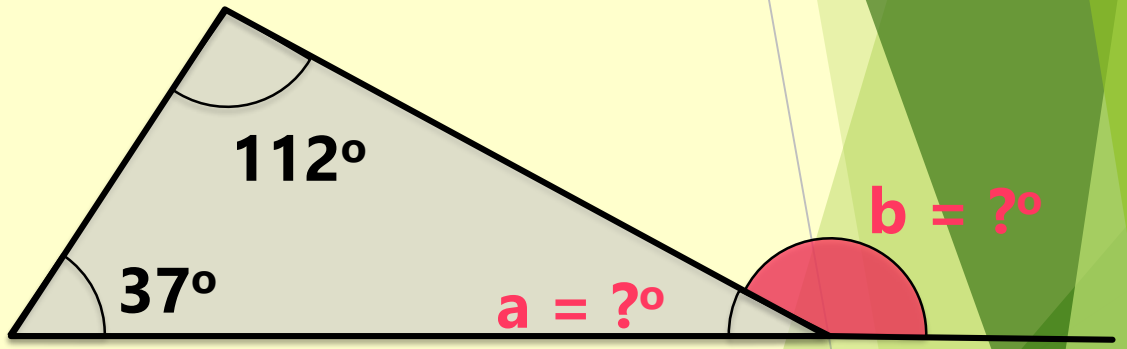
Calculate the values of the missing angles.





Descriptive Teaching

What are the values of the missing angles?



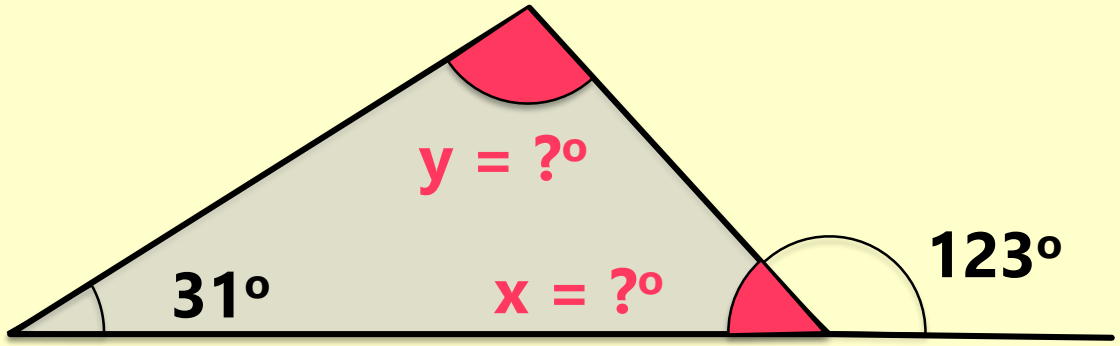
112° + 37° = 149°

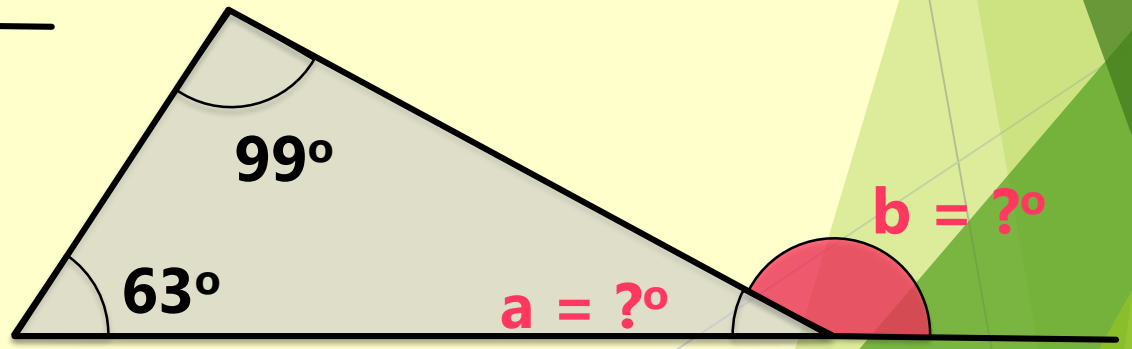
180° - 149° = 31°

Angles on a straight line equal 180°. Therefore,
180° - 31° = 149°

Descriptive Doing

What are the values of the missing angles?

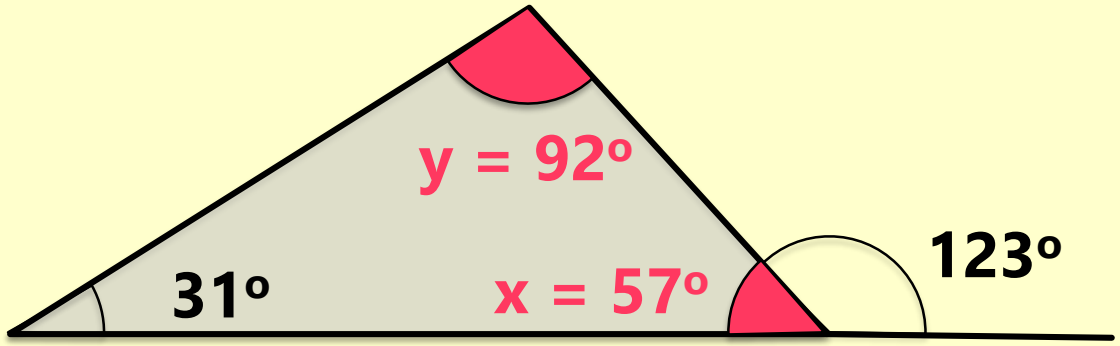


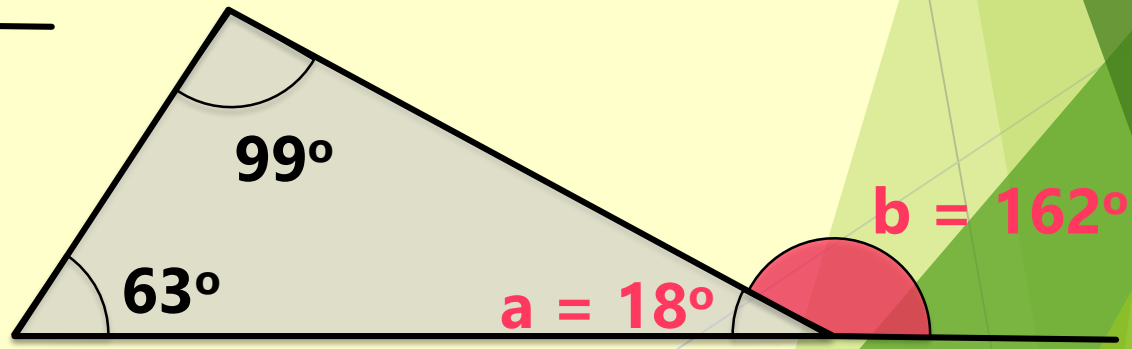


Remember angles on a straight line add up to 180°.

Descriptive Doing - ANSWERS

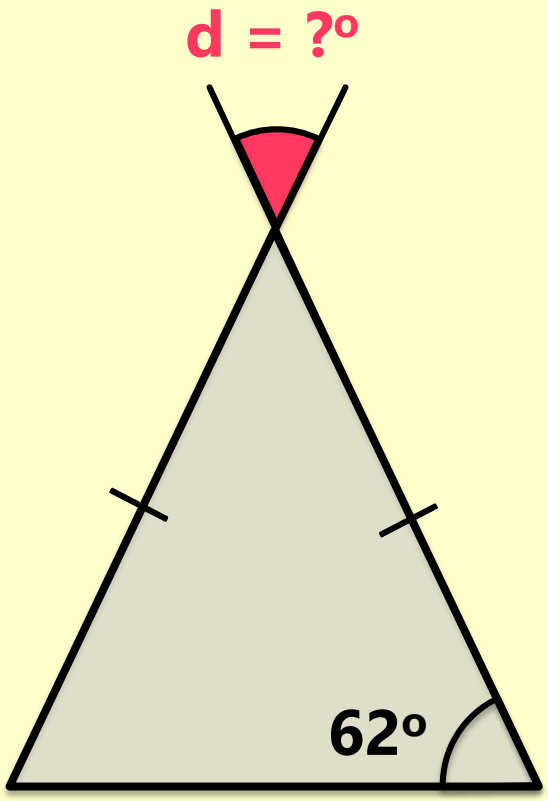
What are the values of the missing angles?

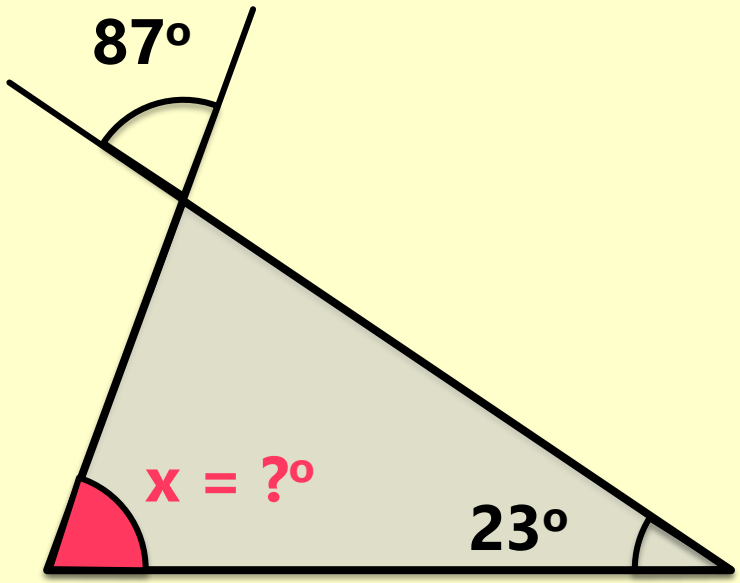




Descriptive Doing

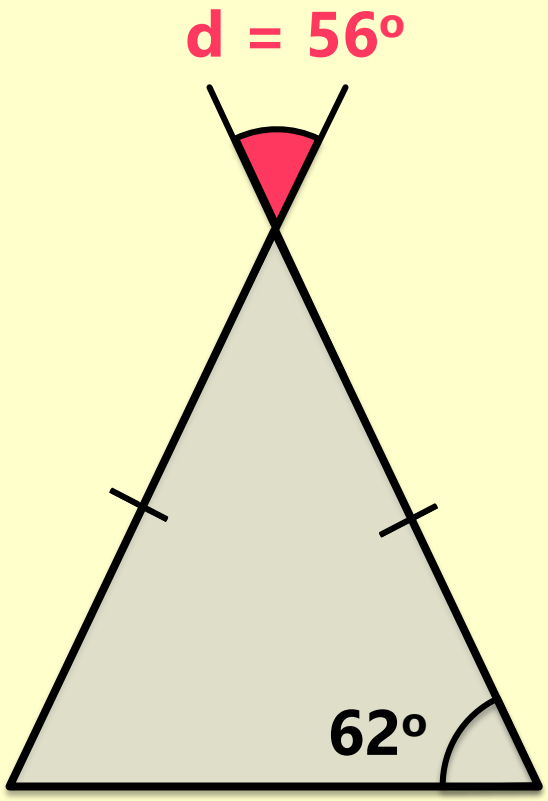
What are the values of the missing angles?

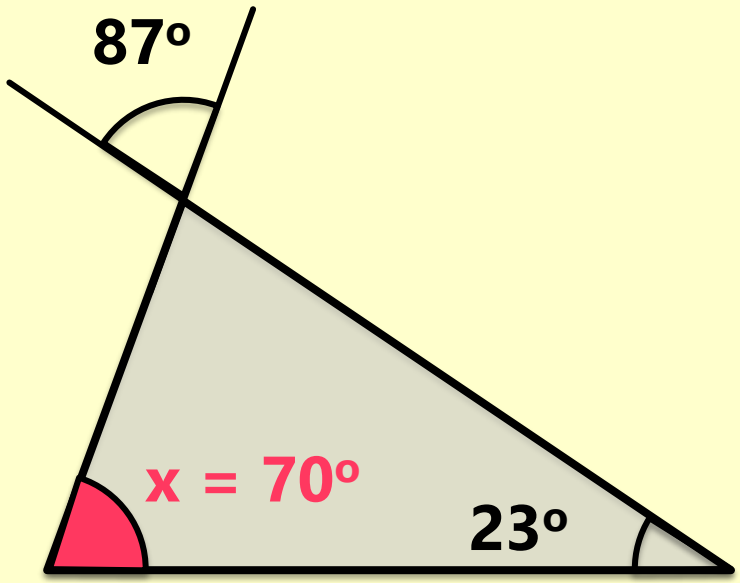




Descriptive Doing - ANSWERS

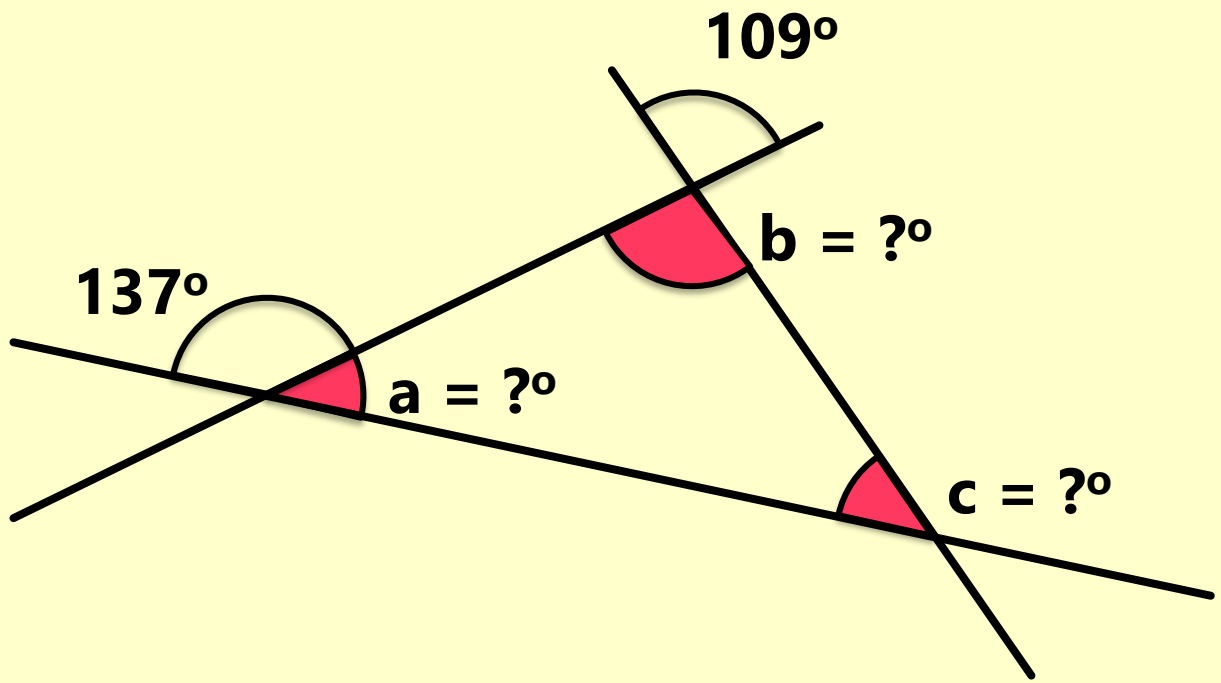
What are the values of the missing angles?



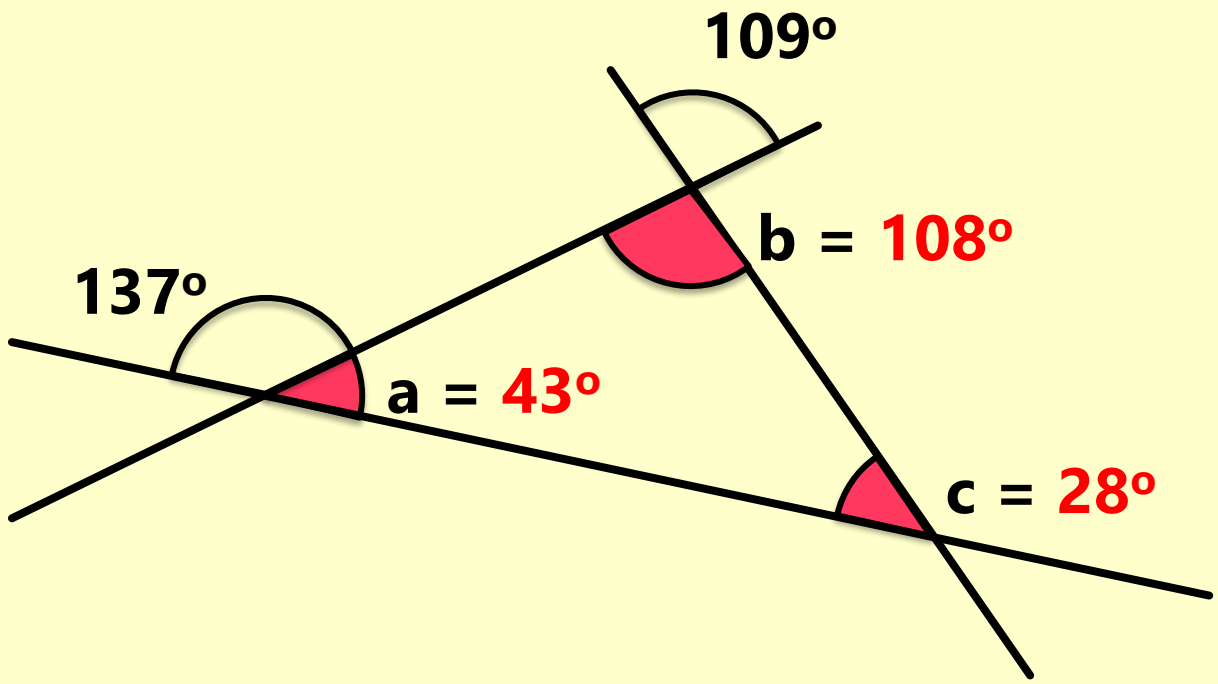


Reflective Doing

What are the values of the missing angles?

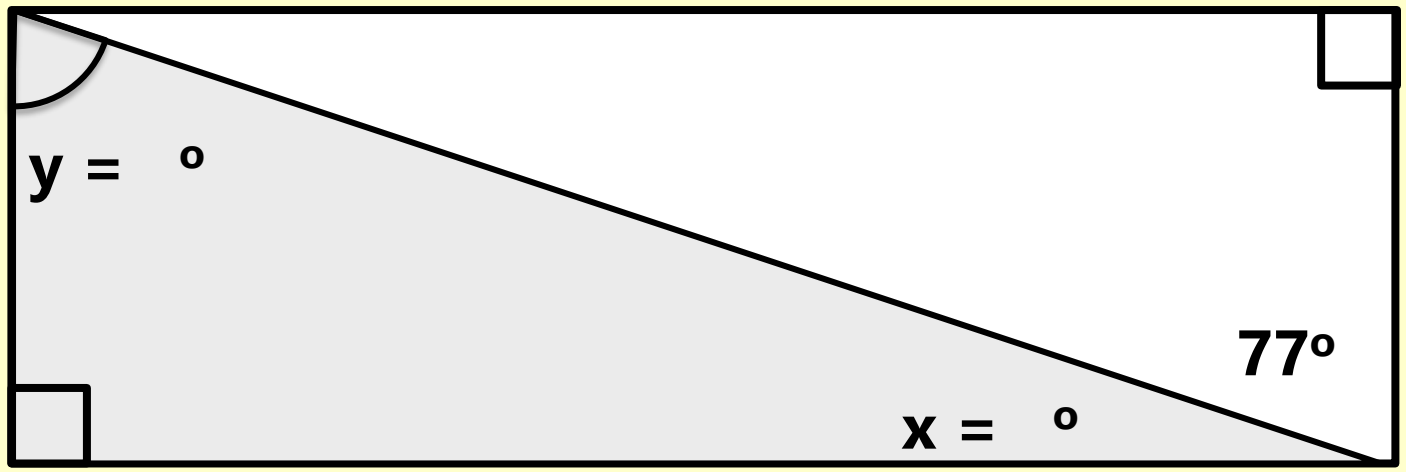


Reflective Doing - ANSWERS



Reflective Doing

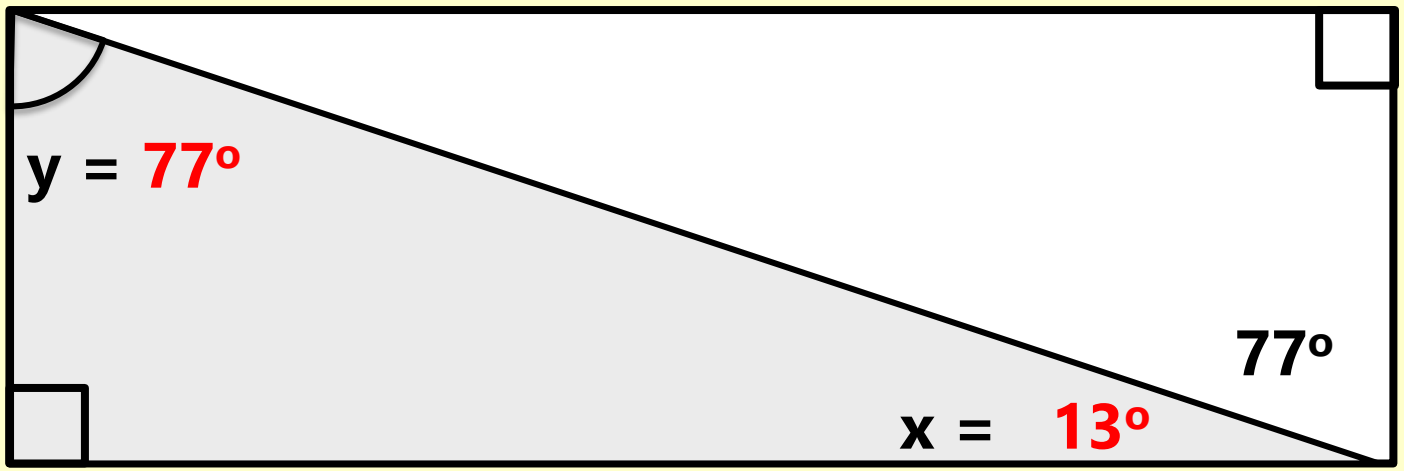
The image below shows a right-angled triangle within a rectangle.



not
to scale

Calculate the values of the missing angles.
Explain your answer.

Reflective Doing - ANSWERS



not
to scale

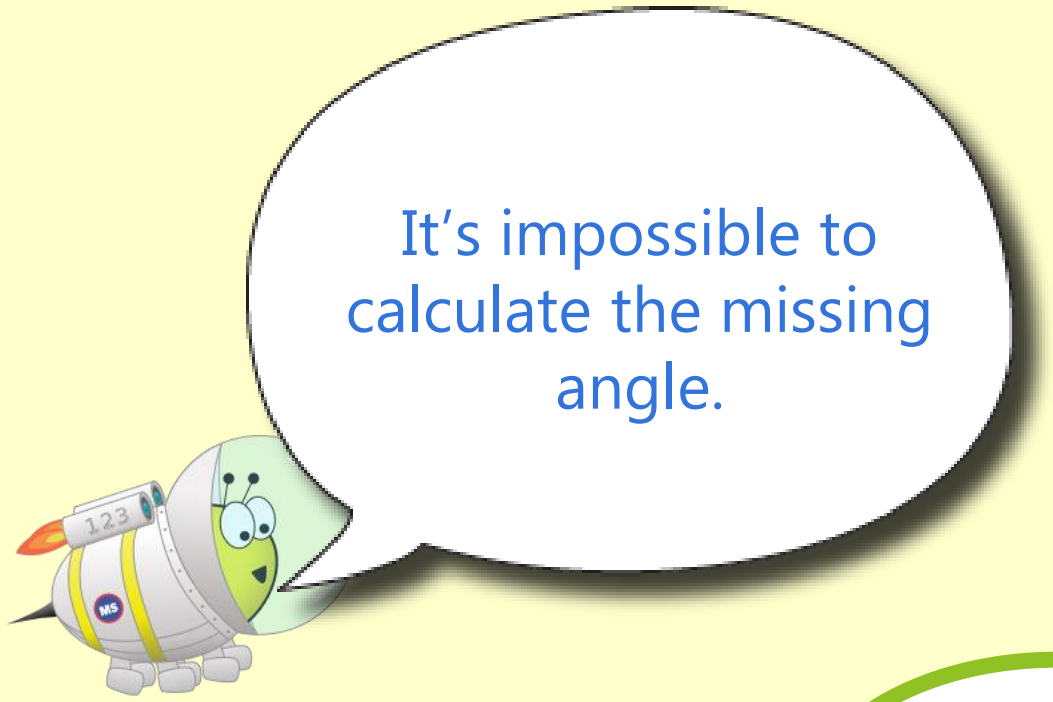
Choose your challenge

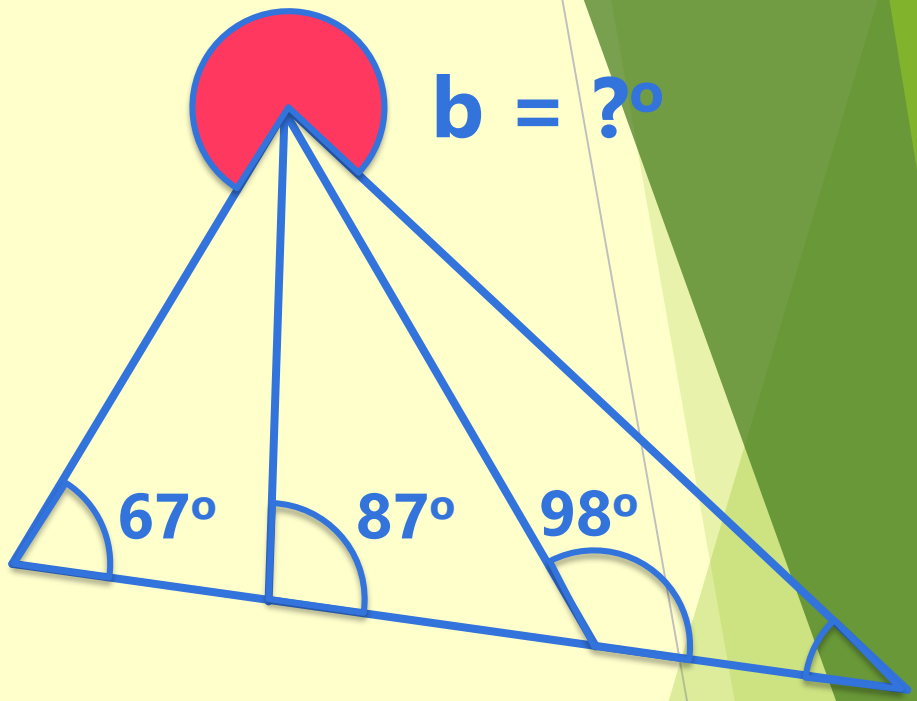
Challenges can be found on the document named ‘Maths Challenges Day 4’.

Choose an appropriate challenge OR work through green, orange and red.

Answers can be found at the bottom of the document.

Reflection Time





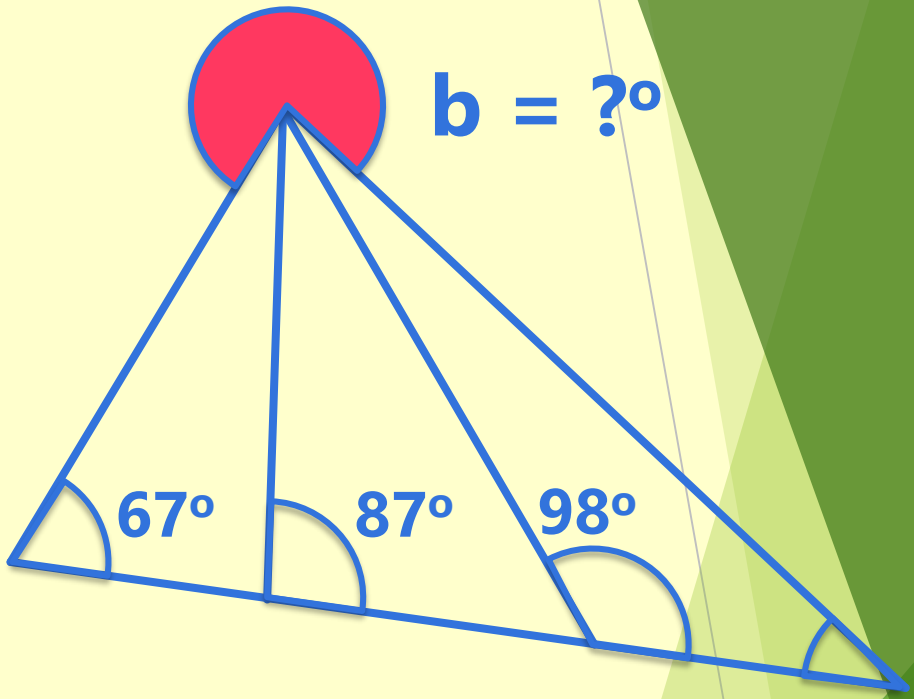
Do you agree?

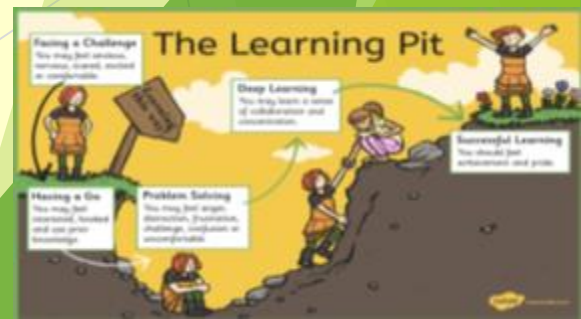
Explain your answer.

I agree/disagree because...

Reflection Time - ANSWERS

No, I do not agree. There is one larger triangle made up from the three smaller triangles. So, $b = 180^o - (67^o + 16^o) = 180^o - 83^o = \underline{97^o} = 360^o - 97^o = 263^o$



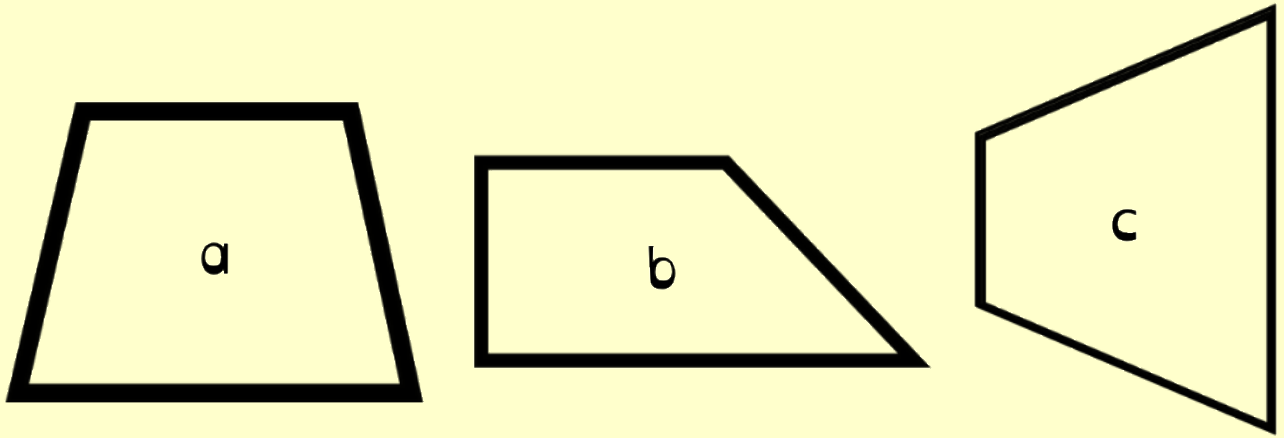


Properties of Shape

Day 5

Starter

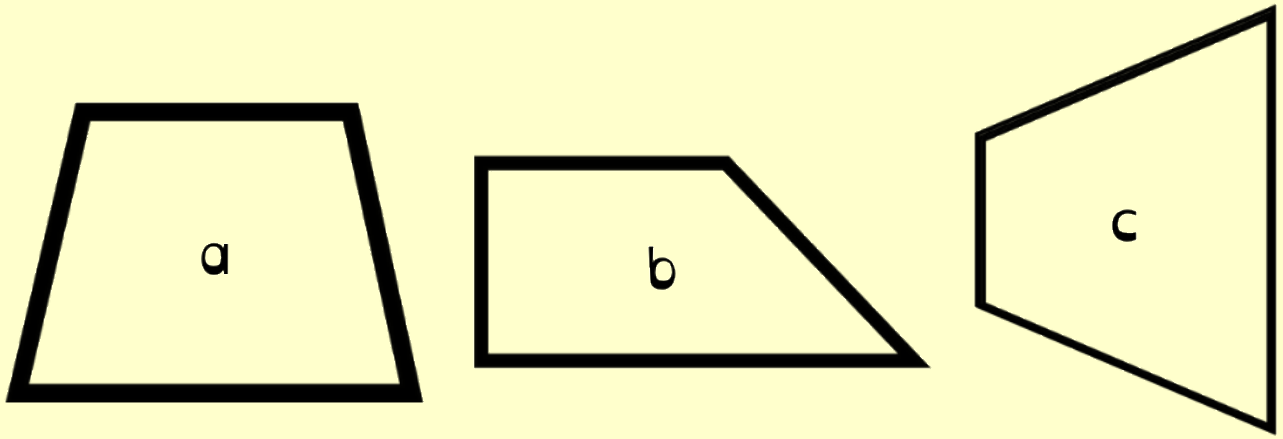
Which one doesn't belong?



Explain your answer by referring to the properties of the shapes above.

Starter - ANSWERS

Shape b doesn't belong as it is a right-angled trapezium (trapezoid). Whereas, Shape a and Shape c are both isosceles trapeziums (trapezoids).



Key Vocabulary

Date: Day 5

LO: To calculate missing angles in quadrilaterals.

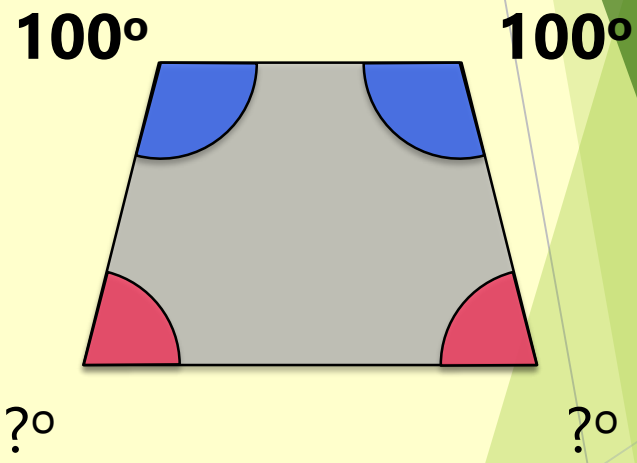
Success Criteria

I can explore the total value of the interior angles of quadrilaterals and apply that knowledge to calculate missing angles in various quadrilaterals.

I can explain my reasoning.

Descriptive Teaching

Calculate the missing angles in the quadrilateral below.



The angles in a quadrilateral equal 360°.

100° + 100° = 200°

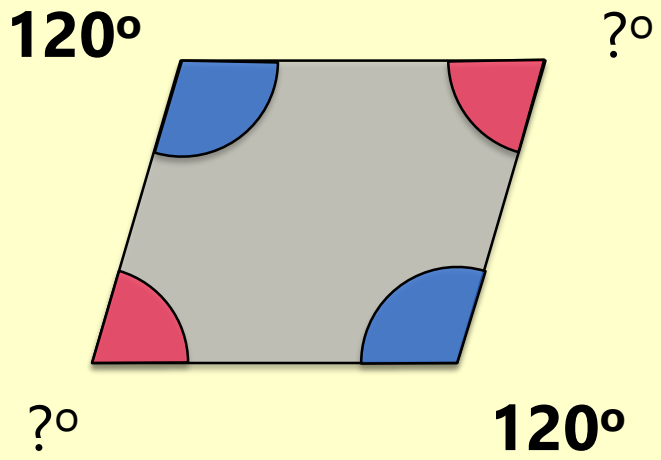
360° - 200° = 160°

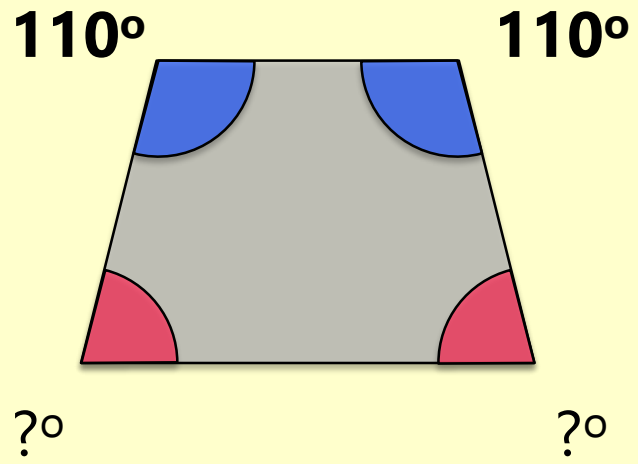
160° ÷ 2 = 80°

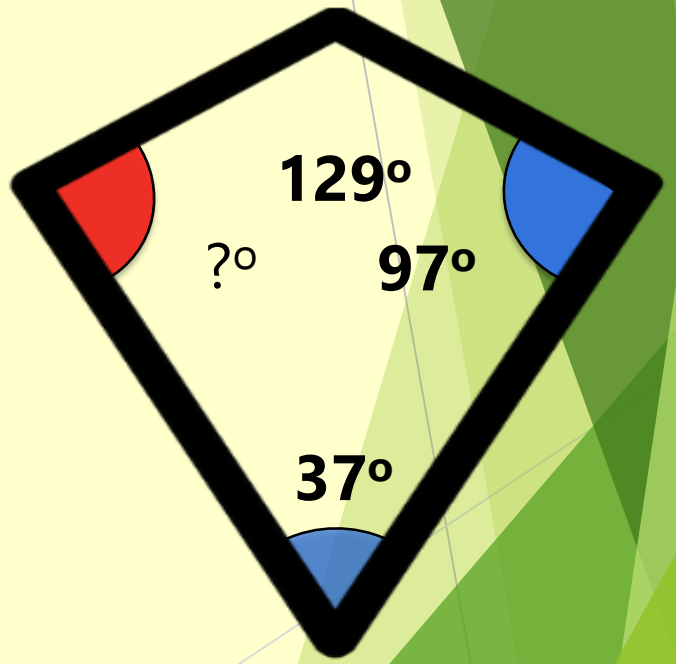
Descriptive Doing

Remember angles in quadrilaterals add up to 360°.

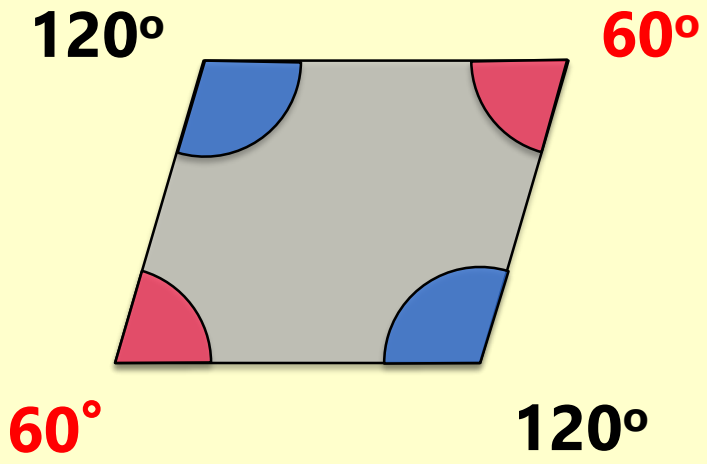
Calculate the missing angles in the quadrilaterals below.

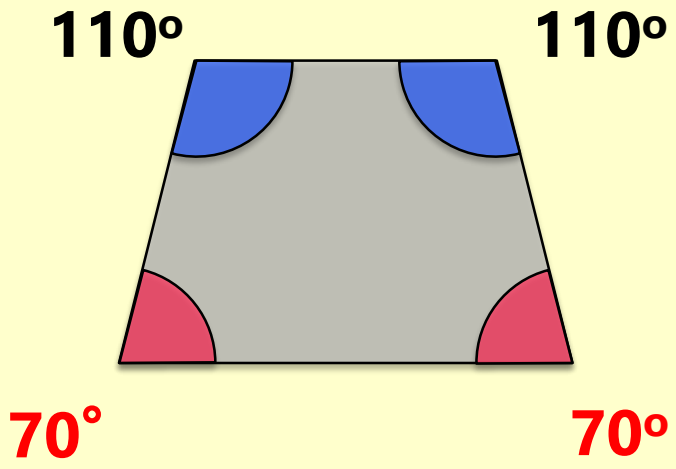


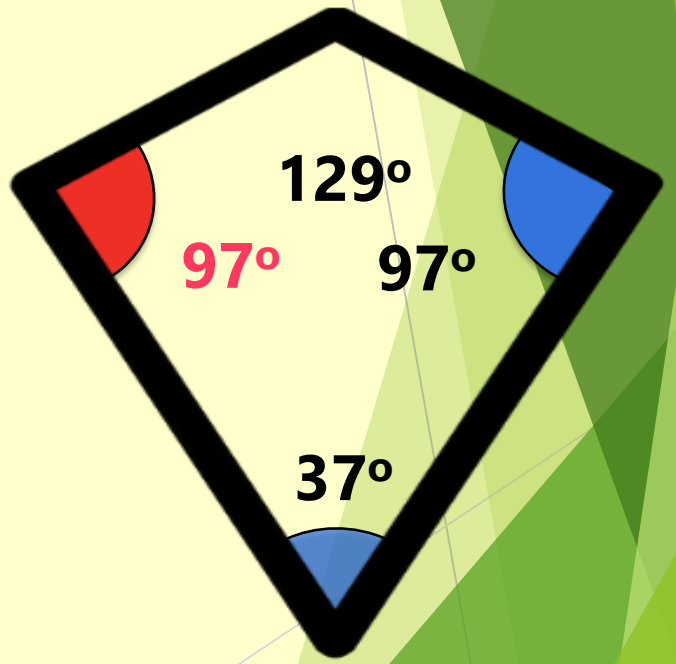




Descriptive Doing - ANSWERS

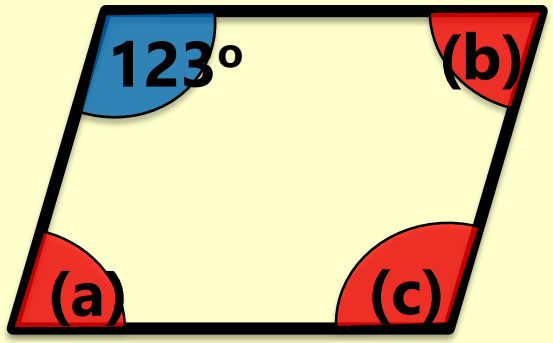


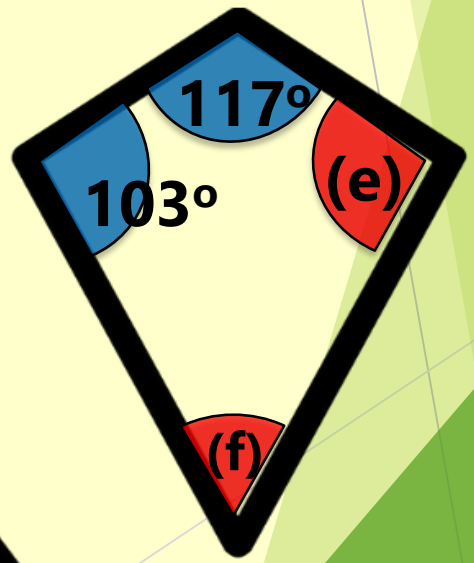


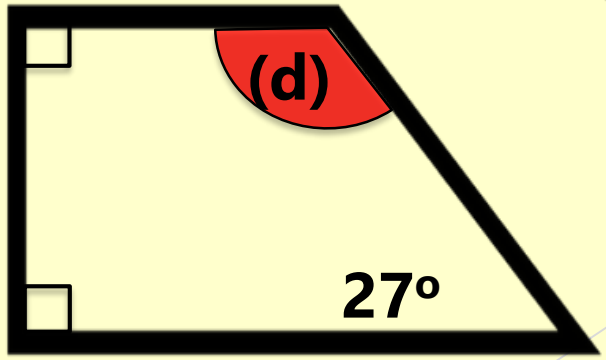


Descriptive Doing

Calculate the missing angles in the quadrilaterals below.







Descriptive Doing - ANSWERS

Angle (a) = 57°

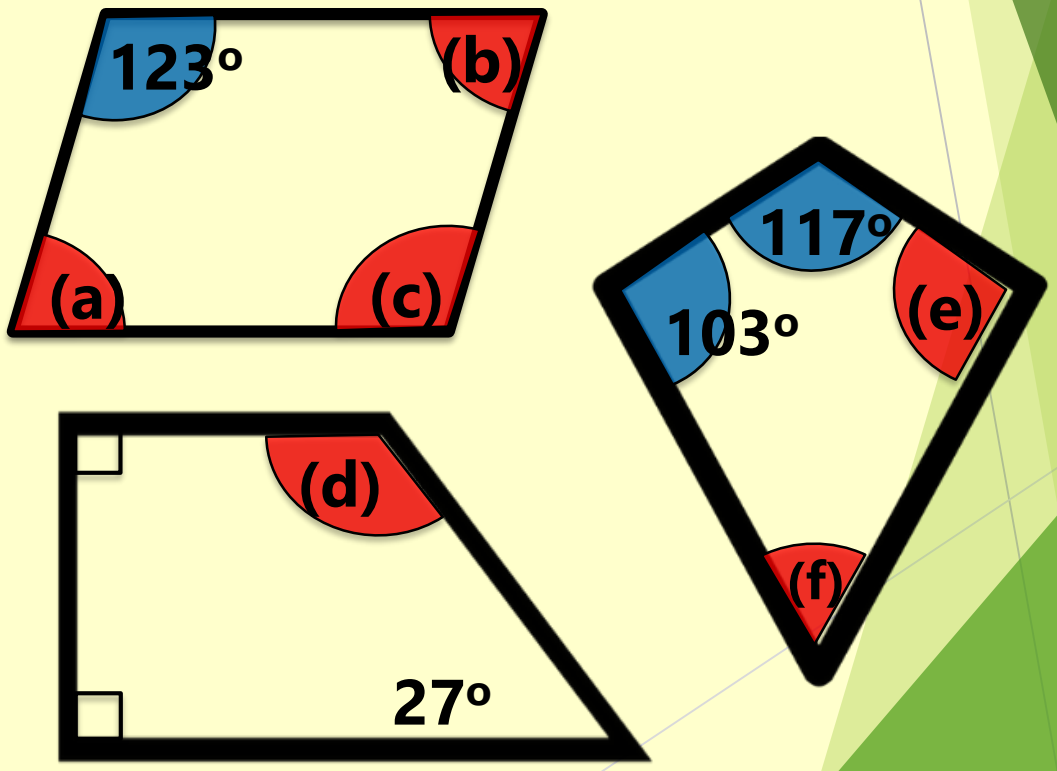
Angle (b) = 57°

Angle (c) = 123°

Angle (d) = 153°

Angle (e) = 103°

Angle (f) = 37°



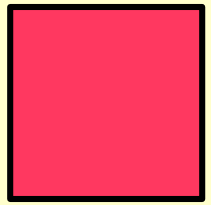
Reflective Doing

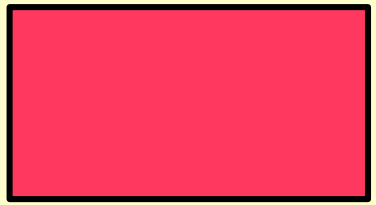
a) Ruth says, “All quadrilaterals have at least one acute angle.”
Draw two different quadrilaterals that show Ruth’s statement to be incorrect.

b) Yasmin says, “It’s possible to have a quadrilateral with a reflex angle.”
Draw a shape to prove her right!

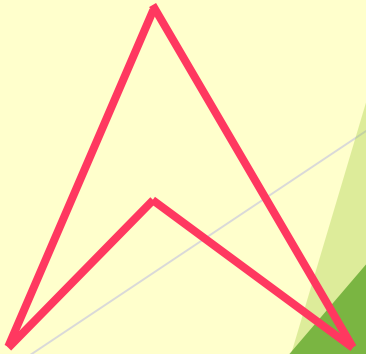
Reflective Doing - ANSWERS

a) Ruth says, “All quadrilaterals have at least one acute angle.”
Draw two different quadrilaterals that show Ruth’s statement to be incorrect.



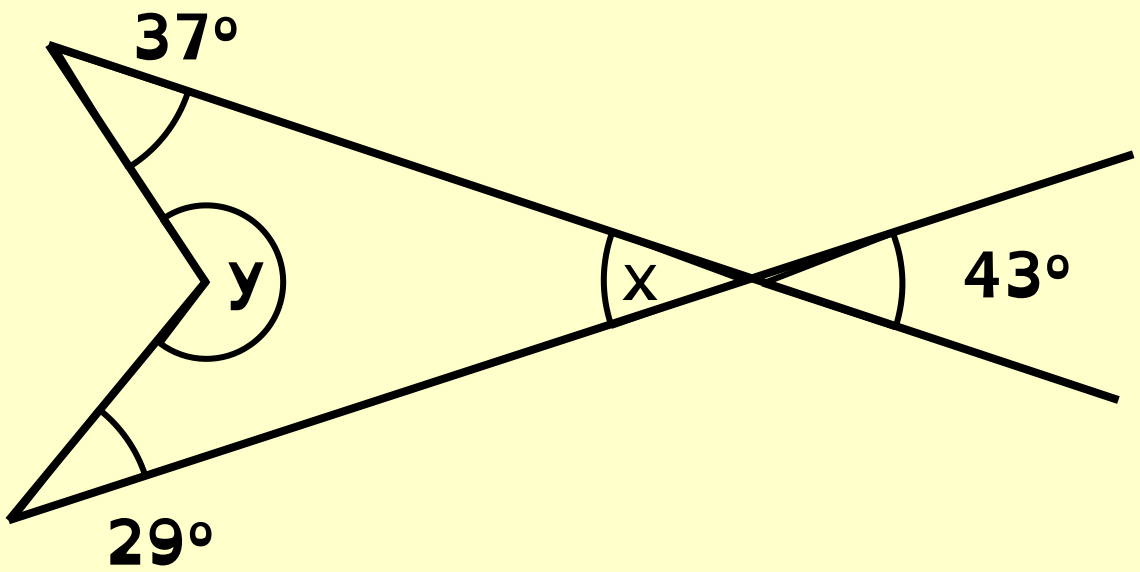


b) Yasmin says, “It’s possible to have a quadrilateral with a reflex angle.”
Draw a shape to prove her right!



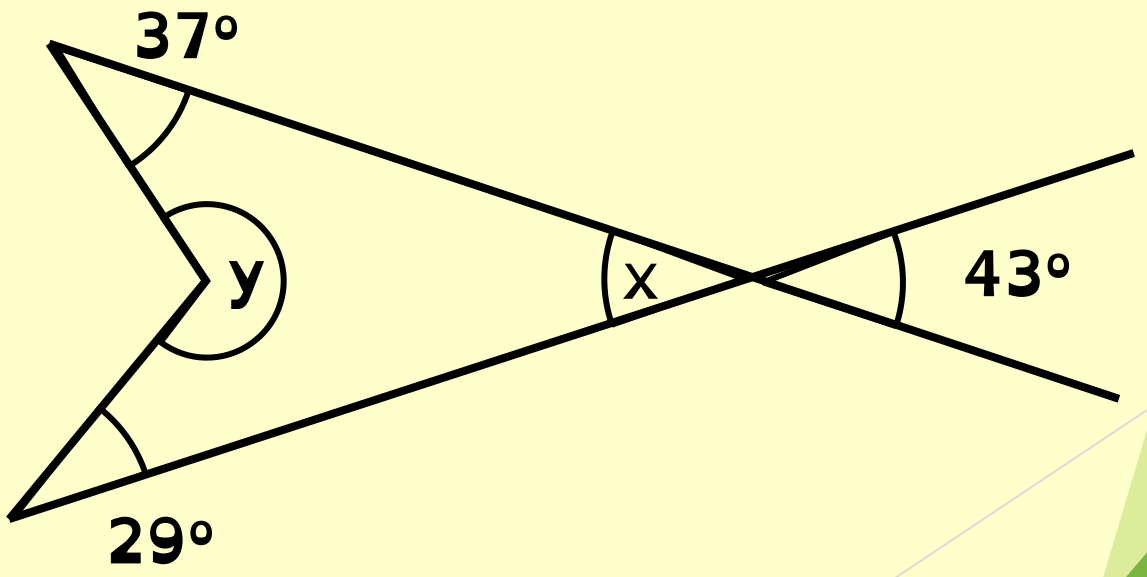
Reflective Doing

Calculate the sizes of angles *x* and *y* in the image shown below (not to scale).



Reflective Doing - ANSWERS

Angle x is 43° due to it being vertically opposite the given angle.
Angle y is 251° (360° - (43° + 37° + 29°) = 360° - 109° = 251°).



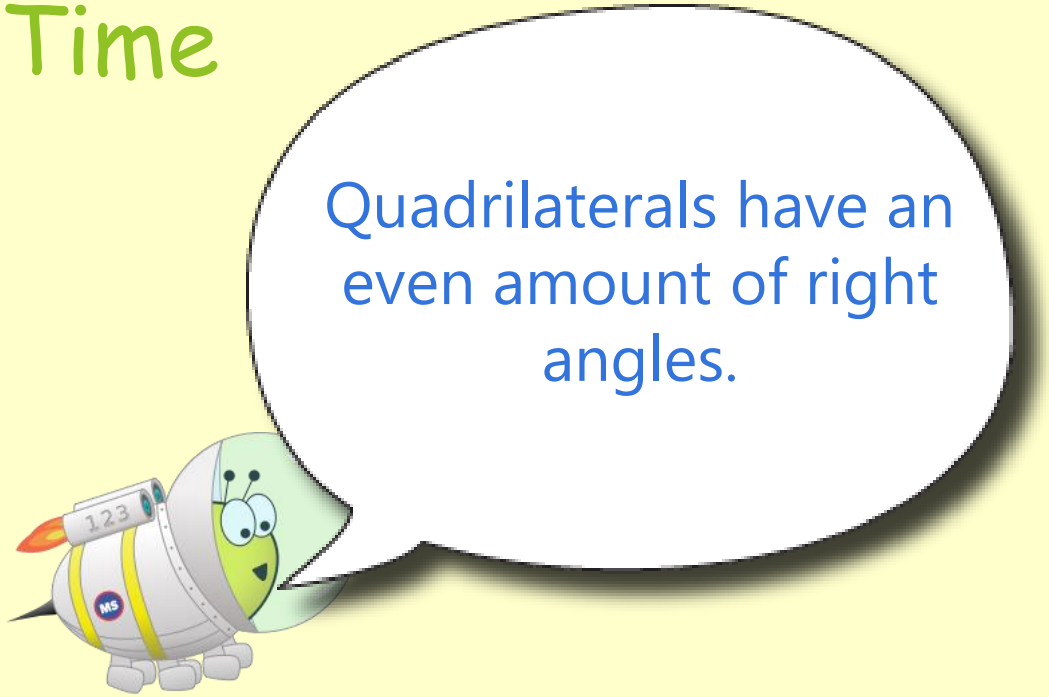
Choose your challenge

Challenges can be found on the document named ‘Maths Challenges Day 5’.

Choose an appropriate challenge OR work through green, orange and red.

Answers can be found at the bottom of the document.

Reflection Time



Astrobee's statement is ___ true because...

Is Astrobee's statement always, sometimes or never true?

Provide examples to explain your answer.

Reflection Time - ANSWERS

Astrobee's statement is only sometimes true. For example, rectangles have four right angles and right-angled trapeziums (trapezoids) have two right angles. However, other parallelograms, kites, rhombuses and irregular quadrilaterals tend not to have pairs or quads of right angles.