Planner

Angles

- Identifying alternate and corresponding angles
- Proving that the angles of any triangle add up to 180° and that the angles of any quadrilateral add up to 360°
- Knowing that the exterior angle of a triangle is equal to the sum of the two interior opposite angles
- Solving problems using properties of angles formed by parallel and intersecting lines
- Calculating the sum of the interior angles of quadrilaterals, pentagons and hexagons
- Calculating the interior and exterior angles of a regular polygon

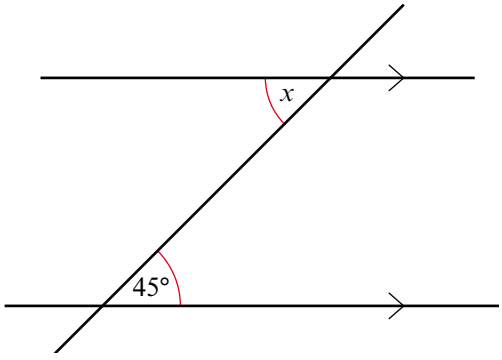
Keywords

You should know

explanation 1a | explanation 1b | explanation 1c | online

1 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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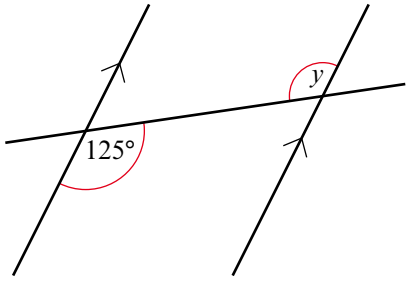

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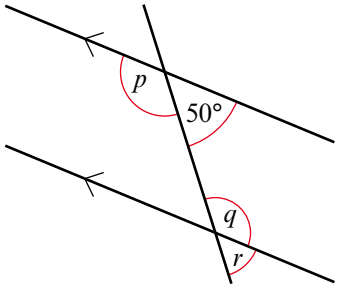

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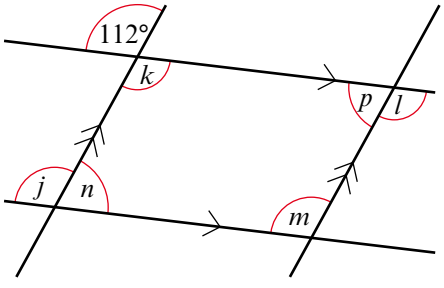
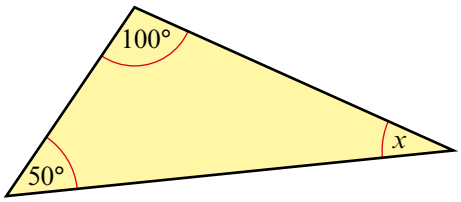


explanation 2a | explanation 2b | explanation 2c | explanation 2d | online

2 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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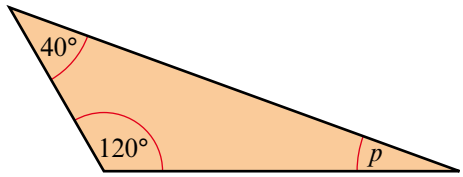

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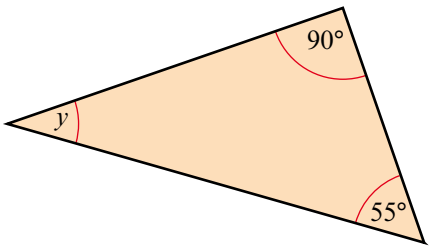

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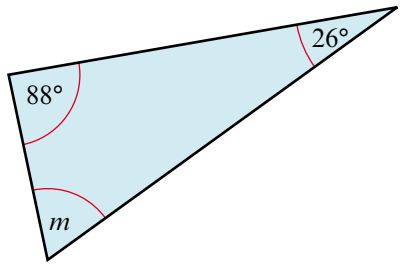
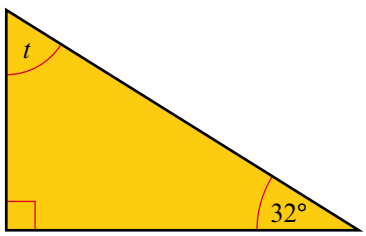


3 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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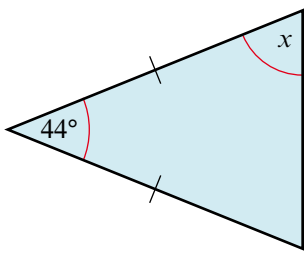
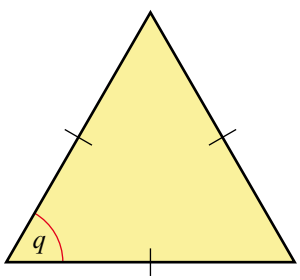


4 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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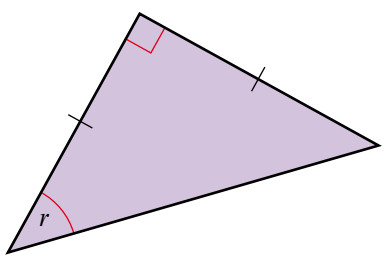
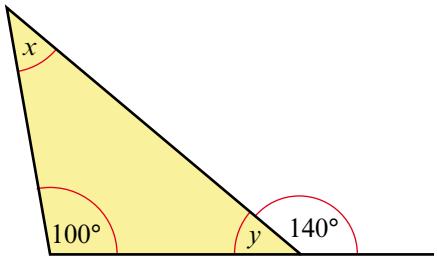


5 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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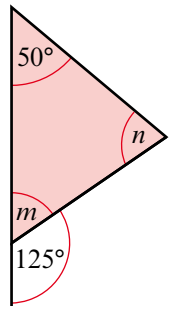

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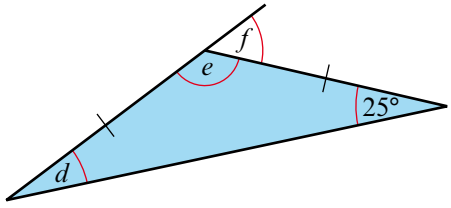

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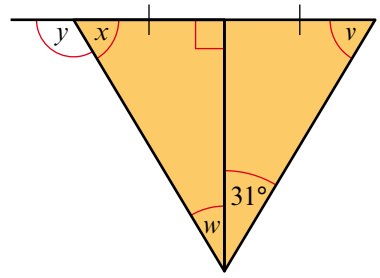
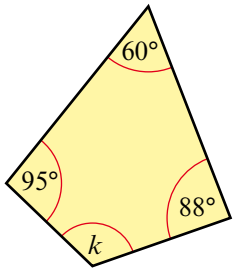


explanation 3 — online

6 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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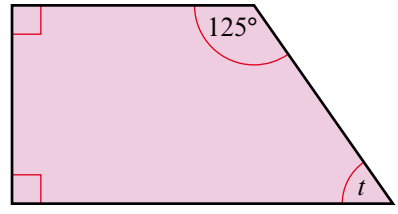

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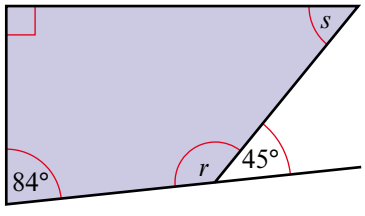

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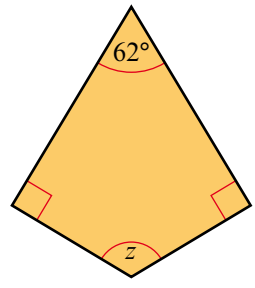
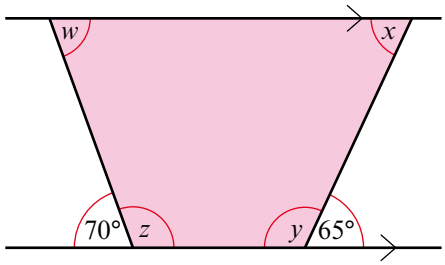


7 Calculate the size of each angle marked by a letter.
Give reasons for your answers.

a



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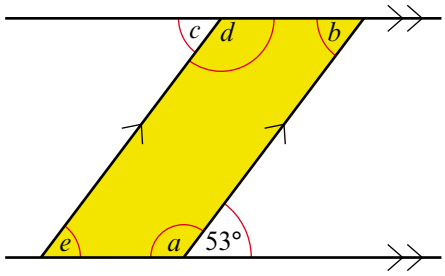

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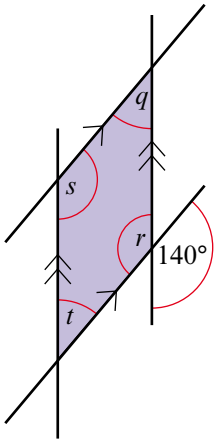

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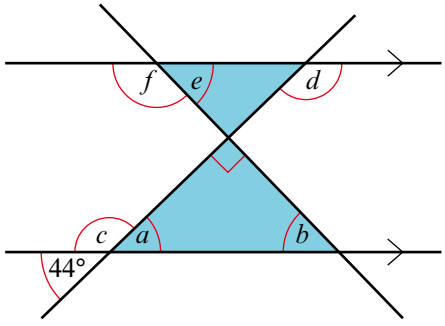

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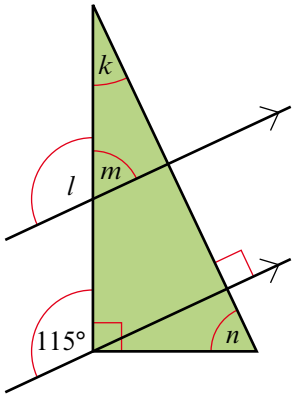

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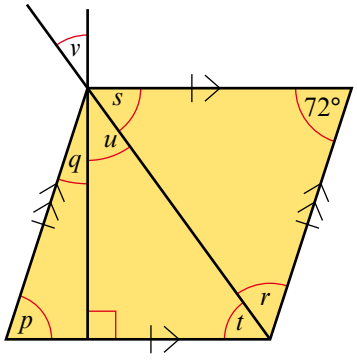

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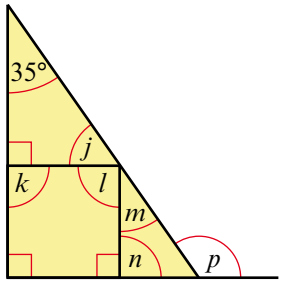

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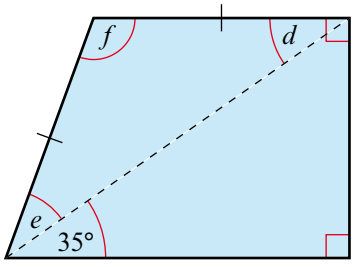


explanation 4a | explanation 4b

8 Draw a pentagon. From one vertex, draw all the possible diagonals.

a How many triangles have you made?

b What does this tell you about the sum of the interior angles of any pentagon?

9 Repeat question **8** for a hexagon.

10 A polygon is regular if all its interior angles (and its sides) are the same size. Copy and complete the table. Use what you discovered in questions **8** and **9**.

Regular polygon	Number of sides	Sum of interior angles	Size of each interior angle	Size of each exterior angle	Sum of exterior angles
Equilateral triangle	3	$1 \times 180° = 180°$	$180° \div 3 = 60°$	$180° - 60° = 120°$	$120° \times 3 = 360°$
Square	4				
Pentagon	5				
Hexagon	6				
Heptagon	7				
Octagon	8				
Nonagon	9				
Decagon	10				
Dodecagon	12				

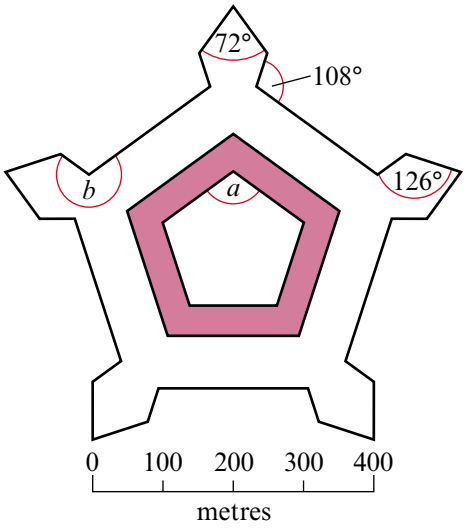
11 Write a general statement about the interior and exterior angles of any regular polygon. Use your answers to question **10** to help you.

12 Each interior angle of a regular polygon is 178°.

a What is the size of each exterior angle?

b How many sides does the regular polygon have?

13 The Citadelle of Lille, France, was built by Vauban between 1667 and 1670. The diagram shows a plan of it. It is based on a regular pentagon, has 5 lines of symmetry, and has rotation symmetry of order 5.



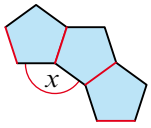
a How many sides does the outside wall have?

b Calculate the size of angles a and b.

c What is the sum of all the interior angles of the outside wall?

14 Bhavna has some tiles shaped like regular pentagons. Each one has two red edges. She fits them together so that the red edges meet, as shown.

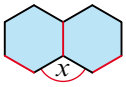
a **i** Calculate the angle x.



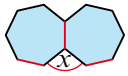
ii She continues the pattern by adding more tiles. Will the pattern join up with the first tile again, without overlapping? Explain how you decided. You may find your table from question **10** useful.

iii If the pattern does join up, how many tiles will it contain?

b Repeat part **a** using regular hexagons instead of pentagons.



c Repeat part **a** using regular heptagons.



d Repeat part **a** using regular octagons.