

Exercise walk-through

4.5.2

Congruence Reasoning

AQA · GCSE · Mathematics

67. Angle facts and polygon reasoning · Foundation

Angle facts and polygon reasoning · Foundation

If a straight-line angle is 68° , its neighbour is 112° ; its vertically opposite angle is 68° . A parallel-line corresponding angle is also 68° , with the reason named. Drawing a line through a triangle vertex parallel to the opposite side transfers its two base angles by alternate-angle equality; the three angles then form a straight line and sum to 180° . A pentagon splits into three triangles, giving 540° . A regular hexagon has total 720° , each interior angle 120° and each exterior turn 60° .

74. Triangle congruence and geometric proof · Foundation

Triangle congruence and geometric proof · Foundation

For an isosceles triangle ABC with $AB=AC$, let D be the midpoint of BC . Triangles ABD and ACD have $AB=AC$, $BD=DC$ and shared AD , so SSS gives congruence. Matching base angles ABC and BCA are therefore equal; the two angles at D are equal and form 180° , so each is 90° . To derive Pythagoras, arrange four congruent right triangles with legs a, b around a tilted square of side c inside a square of side $a+b$. Area gives $(a+b)^2 = 4(ab/2) + c^2$, hence $a^2 + b^2 = c^2$. For $a=3, b=4$, $c^2 = 9 + 16 = 25$, so $c=5$. These arguments establish results independently of a scale drawing.

86. Geometric reasoning on coordinate axes · Foundation

Geometric reasoning on coordinate axes · Foundation

For $A=(1,2)$, $B=(5,2)$, $C=(5,5)$, $D=(1,5)$, $AB=4$ and $BC=3$. AB is horizontal, BC vertical, so they are perpendicular; opposite sides have matching directions and lengths, establishing a rectangle. Diagonal AC has length $\sqrt{(4^2+3^2)}=5$. Its midpoint is $((1+5)/2, (2+5)/2)=(3,3.5)$. Diagonal BD has the same midpoint, confirming that the diagonals bisect each other. A translation by $(2,-1)$ sends A to $(3,1)$ and C to $(7,4)$, preserving the diagonal length. A square would additionally need adjacent side lengths equal; these lengths 4 and 3 exclude it.

Exercises 2.1·2.3

2.1 (Foundation) An isosceles triangle has apex angle 40° . Find either base angle.

2.2 (Foundation) Find c^2 for right-triangle legs 3 and 4.

2.3 (Foundation) Find each angle at the foot D in the isosceles proof.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Foundation) An isosceles triangle has apex angle 40° . Find either base angle.

2.1 The base angles agree, so $(180-40)/2=70^\circ$.

2.2 (Foundation) Find c^2 for right-triangle legs 3 and 4.

2.2 The area proof gives $c^2=3^2+4^2=25$.

2.3 (Foundation) Find each angle at the foot D in the isosceles proof.

3 Exam-style questions

2.3 Congruence makes them equal; a straight line sums to 180° .

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Two triangles with equal angles must be congruent.

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3.1 False. Equilateral triangles of sides 1 and 2 have equal 60° angles but different side lengths. They are similar, not congruent.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.