Angles and parallel lines

Mark the parallel lines and trace the transversal before naming an angle fact.

Two alternate interior angles are 3x + 10° and 70°. Find x.

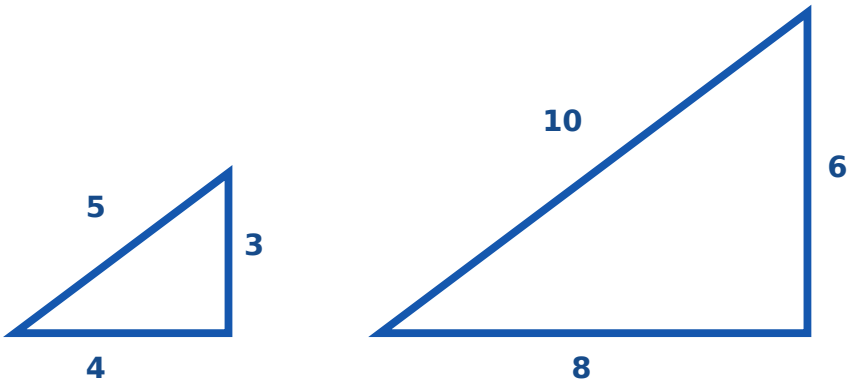
$3x+10=70$	Alternate angles are equal on parallel lines.
$3x=60$	Subtract 10.
$x=20$	

Remember

Corresponding angles are equal. Co-interior angles sum to 180°. Three interior triangle angles sum to 180°.

Congruent and similar triangles

Congruent triangles have the same shape and size. Similar triangles have the same shape.



The larger triangle’s corresponding sides are twice as long.

One triangle has sides 3, 4, 5. Another has sides 6, 8, 10. Compare them.

$\frac{6}{3} = \frac{8}{4} = \frac{10}{5} = 2$

Match shortest to shortest, and so on.

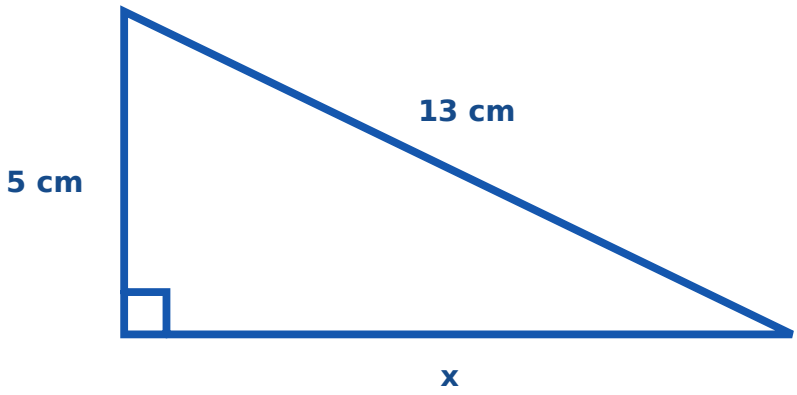
Similar, not congruent

Remember

For congruence look for SSS, SAS, ASA or RHS. Equal angles give similarity. Lengths scale by k; areas scale by k².

Pythagoras: finding a missing side

Only use this theorem in a right-angled triangle. The hypotenuse is opposite the right angle.



The little square marks the 90° angle.

The hypotenuse is 13 cm and one shorter side is 5 cm. Find the other shorter side.

$x^2 + 5^2 = 13^2$	Put the hypotenuse on its own side.
$x^2 = 169 - 25 = 144$	Subtract the square of the known shorter side.
$x = \sqrt{144}$	Take the positive square root for a length.

$12\,\text{cm}$

Remember

To check the converse, test the longest side: if its square equals the sum of the other squares, the triangle is right-angled.

Proof, converses and midpoints

State facts, show how they connect, then state what you proved.

M and N are the midpoints of AB and AC. If BC = 14 cm, find MN.

$AM = MB, \quad AN = NC$	This is what midpoint means.
$MN = \frac{1}{2}BC$	The segment joining the midpoints is parallel to BC and half as long.
$MN = 7\,\text{cm}$	

Remember

An axiom is a starting assumption; a theorem is proved; a corollary follows from another result. A converse swaps the condition and conclusion and needs its own justification.

Exterior angles and isosceles triangles

Equal sides have equal opposite angles. Vertically opposite angles are equal.

An isosceles triangle has a 44° angle between its equal sides. Find the exterior angle at a base vertex.

$180-44=136$	The triangle angles sum to 180°.
$136\div2=68$	Both base angles are equal.
$180-68=112$	The base angle and the exterior angle make a straight line.

112°

Remember

Check using the exterior angle theorem: 44° + 68° = 112°. Equal base angles also imply that the opposite sides are equal.

Proving a parallelogram fact

Use a diagonal to turn a quadrilateral problem into a pair of triangle problems.

Explain why opposite sides of parallelogram ABCD are equal.

$\angle BAC = \angle DCA$	AB is parallel to CD; AC is a transversal.
$\angle BCA = \angle DAC$	BC is parallel to AD; AC is a transversal.
$AC = CA$	The triangles share their included side.

$\triangle ABC \cong \triangle CDA$

Remember

By ASA the triangles are congruent, so AB = CD and BC = DA. The diagonals of a parallelogram bisect each other. Both opposite side pairs being equal also gives a parallelogram.

JUNIOR CYCLE HIGHER LEVEL · CHAPTER PRACTICE

Triangles and Proof

Try the questions before opening the separate answer key. Show one step per line.

16.1 · Fluency

Two triangle angles are 43° and 79°. Find the third.

16.2 · Variation

Check whether sides 7, 24 and 25 form a right triangle.

16.3 · Choose a method

Two similar triangles have corresponding sides 6 cm and 9 cm. The smaller area is 20 cm². Find the larger area.

Check your work: are the sign, units and level of accuracy appropriate?