

Triangle Lengths and Angles

Connect side lengths, coordinates, and angle relationships.

GRADE 8 • MA.8.GR.1

MA.8.GR.1 "Develop an understanding of the Pythagorean Theorem and angle relationships involving triangles."

NAME _____

DATE _____

CHOOSE THE RIGHT RELATIONSHIP

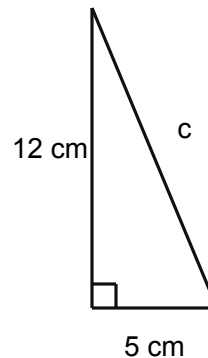
Right triangle: $a^2 + b^2 = c^2$, with c opposite the right angle. Any two triangle sides must sum to more than the third. Complementary angles total 90° ; supplementary angles total 180° ; vertical angles are equal. A triangle totals 180° inside, and an exterior angle equals the sum of the two remote interior angles. Show a supporting equation.

WORKED EXAMPLE

Find the hypotenuse of the pictured right triangle.

1. The legs are 5 cm and 12 cm.
2. $c^2 = 5^2 + 12^2 = 25 + 144 = 169$.
3. Take the positive square root because c is a length.

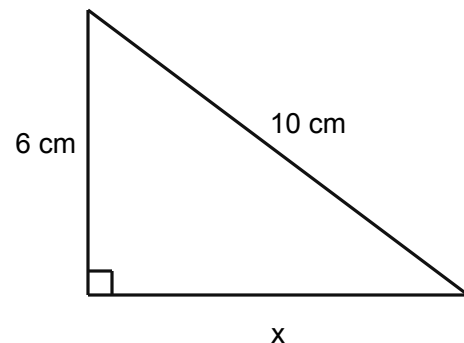
Answer: $c = 13$ cm.



PRACTICE 5 problems

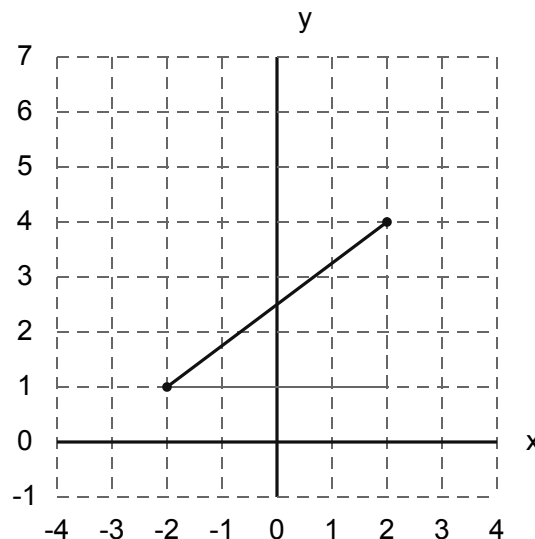
- 1** The right triangle has hypotenuse 10 cm and one leg 6 cm. Find the missing leg.

ANSWER _____



- 2 Find the distance from $(-2, 1)$ to $(2, 4)$. Use the horizontal and vertical legs of the shown right triangle.

ANSWER _____

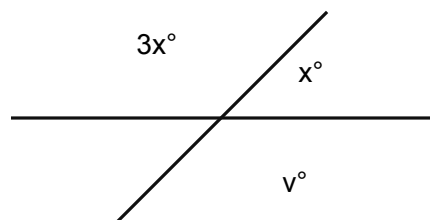


- 3 Set A has sides 3, 4 and 8 cm. Set B has sides 5, 6 and 7 cm. Can each form a triangle? If so, is it a right triangle? Justify.

ANSWER _____

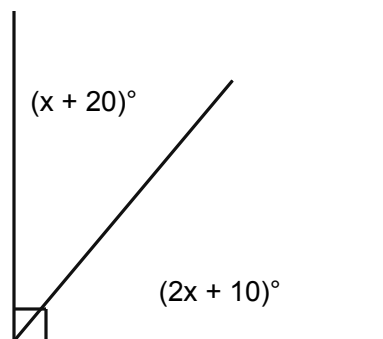
- 4 Two straight lines intersect as shown. Find x , both upper angles, and v . Name the relationships used.

ANSWER _____



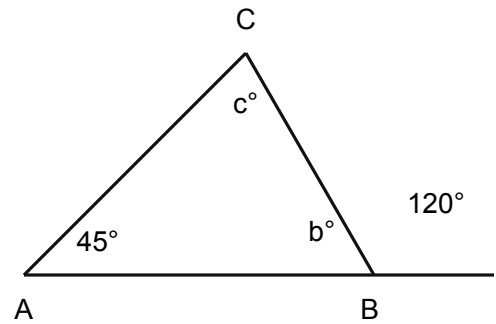
- 5 The square marks a right angle. Find x and the measure of each smaller angle.

ANSWER _____



APPLY IT Show your work

- 1** A triangular sign has the shown 45° interior angle and 120° exterior angle at B. Find b and c. Explain with angle relationships.



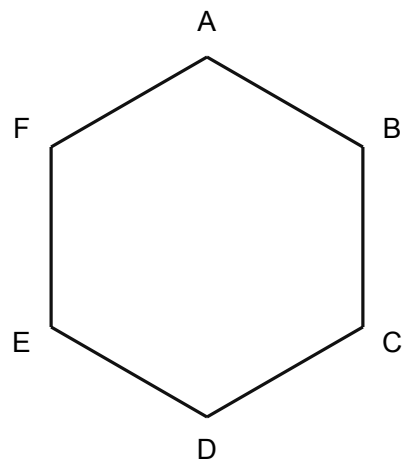
- 2** A rectangular sign is 9 cm wide and 12 cm tall. Find its diagonal length. Explain why the Pythagorean Theorem applies.

WORK SPACE

CHALLENGE One step up

Draw diagonals from A in this regular hexagon. Use the resulting triangles to find its interior-angle sum. Each interior angle is $(3x + 15)^\circ$. Find x .

WORK SPACE AND ANSWER



Require a relevant equation and correct units. Distinguish the hypotenuse from the legs and triangle inequality from the right-triangle test. The graph has equal physical axis scales. Side-length square-root radicands stay at or below 225. Angle drawings match their relationships; algebraic x values are not necessarily the angle measure. For the hexagon, require four triangles from one vertex.

PRACTICE 1

8 cm; $10^2 - 6^2 = 64$ and $\sqrt{64} = 8$.

PRACTICE 2

5 units; the legs are 4 and 3, so $d^2 = 4^2 + 3^2 = 25$.

PRACTICE 3

A cannot: $3 + 4 < 8$. B can, since $5 + 6 > 7$; it is not right because $5^2 + 6^2 = 61 \neq 49 = 7^2$.

PRACTICE 4

$x = 45$; upper angles 45° and 135° ; $v = 135^\circ$. Adjacent upper angles sum to 180° ; vertical angles are equal.

PRACTICE 5

$(2x + 10) + (x + 20) = 90$, so $x = 20$. The angles are 50° and 40° .

APPLY IT 1

$b = 60^\circ$ because $b + 120^\circ = 180^\circ$. $c = 75^\circ$ because $45^\circ + c = 120^\circ$.
Use supplementary angles at B and the exterior-angle rule.

APPLY IT 2

15 cm. The diagonal and the perpendicular sides form a right triangle: $d^2 = 9^2 + 12^2 = 225$.
The corner of a rectangle is a right angle.

CHALLENGE

Four triangles give 720° . Each of six equal angles is 120° ,
so $3x + 15 = 120$ and $x = 35$.

