8.7C The student uses geometry to model and describe the physical world. The student is expected to use pictures or models to demonstrate the Pythagorean Theorem.

8.9A The student uses indirect measurement to solve problems. The student is expected to use the Pythagorean Theorem to solve real-life problems.
Pythagorean Theorem

Vocabulary.

The sides that form the right angle are called LEGS. Legs can be labeled a or b.

Hypotenuse: the side opposite the right angle. It is the LONGEST SIDE of the triangle. It is always labeled side c.

The symbol $\perp$ indicates a right angle.
Pythagorean Theorem

Key Concept

\[ a^2 + b^2 = c^2 \] which means \[ a \times a + b \times b = c \times c \]

The Pythagorean Theorem describes the relationship between the lengths of the legs and the hypotenuse for any right triangle.

In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.
Write an equation you could use to find the length of the missing side of the right triangle. Then find the missing length. Round to the nearest tenth if necessary.

1. \( a^2 + b^2 = c^2 \)  
2. \( 5^2 + 12^2 = c^2 \)  
3. \( 25 + 144 = c^2 \)  
4. \( 169 = c^2 \)  
5. \( \sqrt{169} = \sqrt{c^2} \)  
6. \( 13 = c \)

Write down the Pythagorean Theorem

Replace \( a \) and \( b \) with known values (Substitution)

Evaluate (solve) for both \( 5^2 \) and \( 12^2 \)

Add 25 and 144 together

Take the square root of both sides of the equation

Simplify (estimate the square root to the nearest tenth)
The leg of a triangle is 5 cm. The other leg is given at 7 cm. What is the length of the hypotenuse of the given triangle.

1. \(a^2 + b^2 = c^2\) Write down the Pythagorean Theorem
2. \(5^2 + 7^2 = c^2\) Replace \(a\) and \(b\) with known values (Substitution)
3. \(25 + 49 = c^2\) Evaluate (solve) for both \(5^2\) and \(7^2\)
4. \(74 = c^2\) Add 25 and 49 together
5. \(\sqrt{74} = \sqrt{c^2}\) Take the square root of both sides of the equation
6. \(\approx 8.5 = c\) Simplify (estimate the square root to the nearest tenth)
The leg of a triangle is 10 cm. The other leg is given at 8 cm. What is the length of the hypotenuse of the given triangle.

\[ a^2 + b^2 = c^2 \]
\[ 10^2 + 8^2 = c^2 \]
\[ 100 + 64 = c^2 \]
\[ 164 = c^2 \]
\[ \sqrt{164} = \sqrt{c^2} \]
\[ \sim 12.8 = c \]

\[ \sqrt{144} < \sqrt{164} < \sqrt{169} \]
\[ 12 < \sim 12.8 < 13 \]