Unit 8, Lesson 9

Finding Unknown Side Lengths

Let's find missing side lengths of right triangles.

9.1 Which Three Go Together: Equations

Which three go together? Why do they go together?

A

$$5^2 = 3^2 + b^2$$

B

$$5^2 - 3^2 = b^2$$

C

$$3^2 + 5^2 = b^2$$

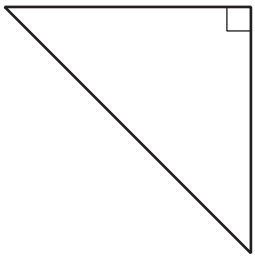
D

$$3^2 + 4^2 = 5^2$$

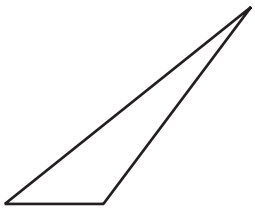
9.2 Which One Is the Hypotenuse?

Label all the hypotenuses with c.

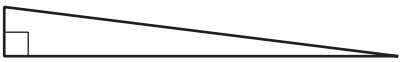
A



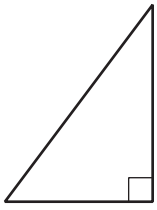
B



C



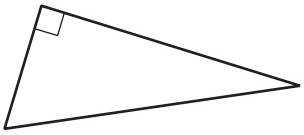
D



E



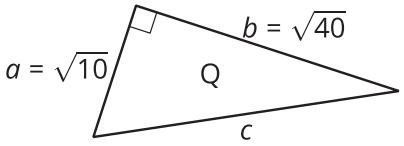
F



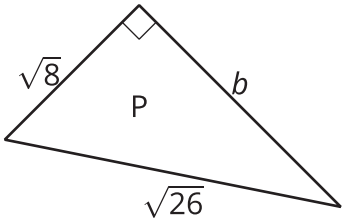
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9.3 Find the Unknown Side Lengths

1. Find c.



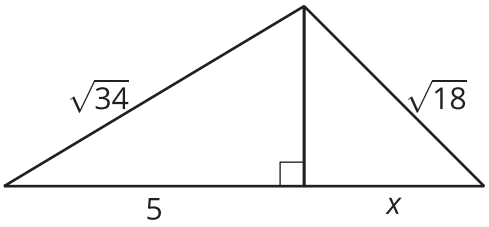
2. Find b.



3. A right triangle has sides of length 2.4 cm and 6.5 cm. What is the length of the hypotenuse?

4. A right triangle has a side of length $\frac{1}{4}$ and a hypotenuse of length $\frac{1}{3}$. What is the length of the other side?

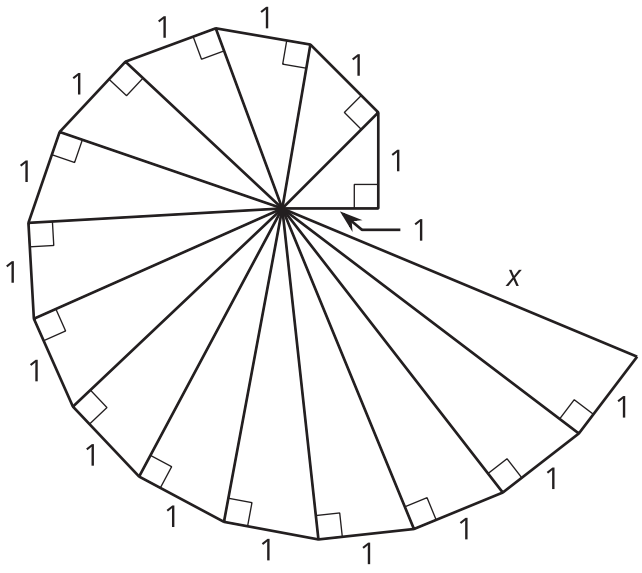
5. Find the value of x in the figure.



Are you ready for more?

The spiral in the figure is made by starting with a right triangle with both legs measuring 1 unit each. Then a second right triangle is built with one leg measuring 1 unit, and the other leg being the hypotenuse of the first triangle. A third right triangle is built on the second triangle's hypotenuse, again with the other leg measuring 1 unit, and so on.

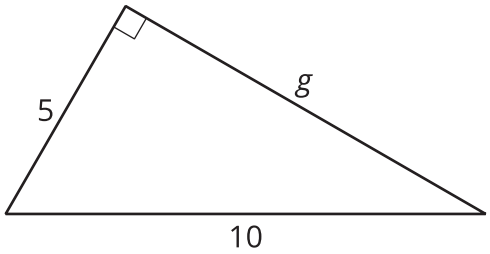
Find the length, x, of the hypotenuse of the last triangle constructed in the figure.



Lesson 9 Summary

The Pythagorean Theorem can be used to find an unknown side length in a right triangle as long as the length of the other two sides is known.

For example, here is a right triangle, where one leg has a length of 5 units, the hypotenuse has a length of 10 units, and the length of the other leg is represented by g.



Start with $a^2 + b^2 = c^2$, make substitutions, and solve for the unknown value. Remember that c represents the hypotenuse, the side opposite the right angle. For this triangle, the hypotenuse is 10.

$$
\begin{aligned}
a^2 + b^2 &= c^2 \\
5^2 + g^2 &= 10^2 \\
g^2 &= 10^2 - 5^2 \\
g^2 &= 100 - 25 \\
g^2 &= 75 \\
g &= \sqrt{75}
\end{aligned}
$$

Use estimation strategies to know that the length of the other leg is between 8 and 9 units, since 75 is between 64 and 81. A calculator with a square root function gives $\sqrt{75} \approx 8.66$.

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