EUREKA MATH™ TIPS FOR PARENTS

KEY CONCEPT OVERVIEW

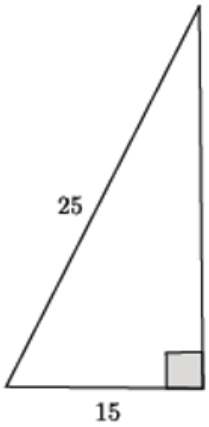
In Topic D, students are introduced to the **Pythagorean theorem**, $a^2 + b^2 = c^2$, a rule about right triangles. Students will perform the basic rigid motions and apply what they have learned about congruence to prove the Pythagorean theorem (i.e., to verify it). After proving the theorem, students will use it to find the length of one side of a right triangle, given the lengths of the other two sides.

You can expect to see homework that asks your child to apply the Pythagorean theorem to do the following:

- Determine the missing length of the **hypotenuse of a right triangle**.
- Determine the missing length of a **leg of a right triangle**.
- Determine the lengths of segments in a graph as well as in real-life situations (e.g., the length of a ladder leaning against a wall that creates a right triangle with the wall and the floor).

SAMPLE PROBLEMS *(From Lesson 16)*

Use the Pythagorean theorem to find the missing length of the leg in the right triangle.

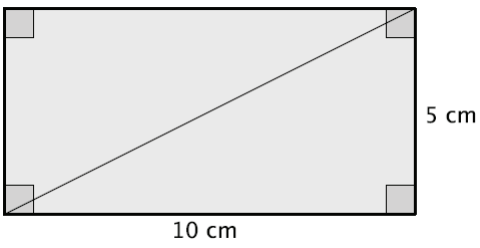


Let b represent the missing leg length.

$$\begin{aligned} 15^2 + b^2 &= 25^2 \\ 15^2 - 15^2 + b^2 &= 25^2 - 15^2 \\ b^2 &= 625 - 225 \\ b^2 &= 400 \\ b &= 20 \end{aligned}$$

The length of the leg is 20 units.

Given a rectangle with dimensions 5 cm and 10 cm, as shown, find the length of the diagonal, if possible.



Let c represent the length of the diagonal, in centimeters.

$$\begin{aligned} c^2 &= 5^2 + 10^2 \\ c^2 &= 25 + 100 \\ c^2 &= 125 \end{aligned}$$

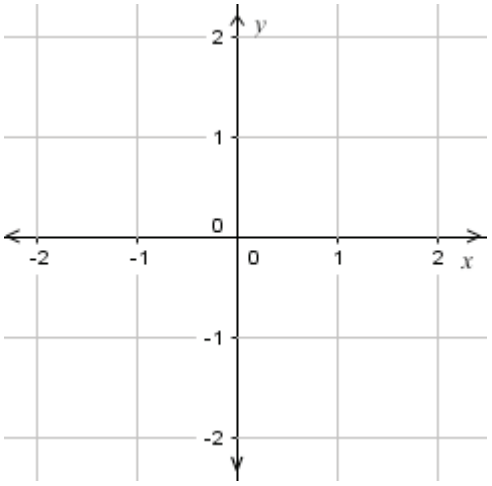
The length of the diagonal in centimeters is the positive number c that satisfies $c^2 = 125$.

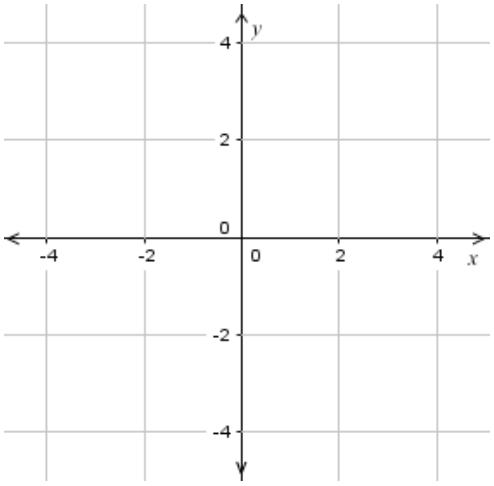
Additional sample problems with detailed answer steps are found in the *Eureka Math Homework Helpers* books. Learn more at GreatMinds.org.

HOW YOU CAN HELP AT HOME

You can help at home in many ways. Here are some tips to help you get started.

- Many mathematicians have argued that the Pythagorean theorem is the most useful discovery in mathematics. Here's a way to test the theorem at home. Gather a measuring tape, a pencil, and a piece of string exactly 5 feet long. Determine a place in your home where a right angle should exist, such as where the wall meets the floor. Working with your child, start at the floor and measure 3 feet up the wall. Mark this point lightly with a pencil. Then, starting from the same point on the floor, measure 4 feet along the floor, and make another pencil mark. Stretch the string from the mark on the wall to the mark on the floor, making it the hypotenuse in the triangle you just created. If the wall meets the floor at an exact 90° angle, the distance from mark to mark should be exactly 5 feet; thus, the string should reach exactly from one mark to the other. Have your child describe what type of triangle you just created. It is a 3–4–5 triangle—a right triangle in which the lengths of the sides have a ratio of 3 to 4 to 5. We have worked with these right triangles in class.
- Your child will continue to work with the coordinate plane throughout Grade 8. Continue to practice plotting points using graph paper, a tile floor, or a grid of your own invention. Try assigning different scales to the axes. For example, instead of having each square on the graph paper (or tile on the floor, etc.) represent one unit, have each square represent two, five, or ten units. Challenge your child to graph points based on the new axis scale.





TERMS

Hypotenuse of a right triangle: The longest side of the right triangle; it is opposite the right angle.

Leg of a right triangle: One of the two shorter sides of the right triangle. Together, the legs form the right angle.

Pythagorean theorem: If the triangle is a right triangle, then $leg_1^2 + leg_2^2 = hypotenuse^2$, or $a^2 + b^2 = c^2$.