Module 4: Expanding Number Systems

TOPIC 2: THE PYTHAGOREAN THEOREM

In this topic, students explore the Pythagorean Theorem and its converse. They learn that in the case of right triangles, knowing two side lengths allows them to determine the third side length, therefore forming a unique triangle. Students practice applying the theorem to determine unknown side lengths in right triangles and apply the converse of the theorem: if three side lengths are given, determine if the triangle is a right triangle. Students apply the Pythagorean Theorem to real-world and mathematical problems.

Where have we been?

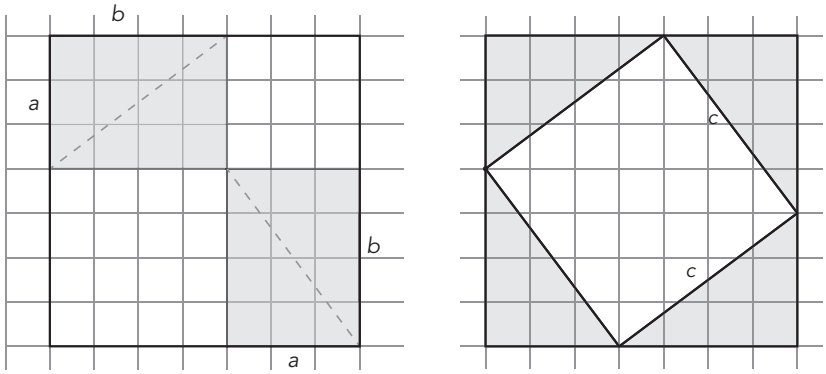
Students learned about right angles and right triangles in grade 4 and evaluated numerical expressions with whole-number exponents in grade 6, and they have continued to use these skills in subsequent courses.

Where are we going?

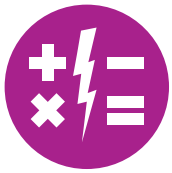
In high school, students will use right triangles and similarity to define ratios of sides, the trigonometric ratios. These new ratios, along with the Pythagorean Theorem, will be used to solve application problems. Students will use the Pythagorean Theorem in the study of analytic geometry when they use coordinates to prove geometric theorems algebraically, including deriving the Distance Formula.

Studying Visual Proofs of the Pythagorean Theorem

The triangles on the left, with leg lengths a and b and hypotenuse length c, can be rearranged as shown on the right. The space not occupied by the triangles in each figure is equal to $a^2 + b^2$ (on the left) and c^2 (on the right), proving that $a^2 + b^2 = c^2$, which is the Pythagorean Theorem.



Myth: "I'm not smart."



The word "smart" is tricky because it means different things to different people. For example, would you say a baby is "smart"? On the one hand, a baby is helpless and doesn't know anything. But on the other hand, a baby is exceptionally smart because they are constantly learning new things every day.

This example is meant to demonstrate that "smart" can have two meanings. It can mean "the knowledge that you have," or it can mean, "the capacity to learn from experience." When someone says they are "not smart," are they saying they do not have lots of knowledge, or are they saying they lack the capacity to learn? If it's the first definition, then none of us are smart until we acquire that information. If it's the second definition, then we know that is completely untrue because everyone has the capacity to grow as a result of new experiences.

So, if your student doesn't think that they are smart, encourage them to be patient. They have the capacity to learn new facts and skills. It might not be easy, and it will take some time and effort. But the brain is automatically wired to learn. Smart should not refer only to how much knowledge you currently have.

#mathmythbusted

Talking Points

You can further support your student's learning by asking questions about the work they do in class or at home. Your student is learning about the Pythagorean Theorem.

Questions to Ask

- How does this problem look like something you did in class?
- Can you show me the strategy you used to solve this problem? Do you know another way to solve it?
- Does your answer make sense? How do you know?
- Is there anything you don't understand? How can you use today's lesson to help?

Key Terms

hypotenuse

The side opposite the right angle in a right triangle is called the hypotenuse. The other two sides are called legs of the right triangle.

Pythagorean Theorem

The special relationship that exists between the squares of the lengths of the sides of a right triangle is known as the Pythagorean Theorem. The sum of the squares of the lengths of the legs of a right triangle equals the square of the length of the hypotenuse: $a^2 + b^2 = c^2$.

Pythagorean triple

Any set of three positive integers a, b, and c that satisfies the equation $a^2 + b^2 = c^2$ is a Pythagorean triple.