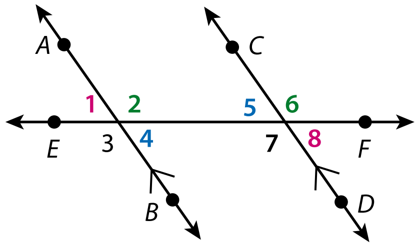
Dear Family,

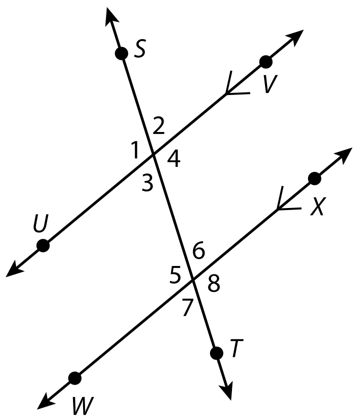
This week your student is learning about angle relationships. Angles are formed when two lines are intersected, or cut, by a third line. The third line is called a **transversal**. When the two lines are parallel, some of the angles formed by the transversal are congruent.

In the figure below, $\overleftrightarrow{AB}$ is parallel to $\overleftrightarrow{CD}$. $\overleftrightarrow{EF}$ is the transversal. Three types of congruent angles are formed when parallel lines are cut by a transversal:



- $\angle 4$ and $\angle 5$ are **alternate interior angles**. Alternate interior angles are on opposite sides of the transversal and between the two lines cut by the transversal.
- $\angle 1$ and $\angle 8$ are **alternate exterior angles**. Alternate exterior angles are on the opposite sides of the transversal and outside the two lines cut by the transversal.
- $\angle 2$ and $\angle 6$ are **corresponding angles**. Corresponding angles are in the same relative position when two lines are cut by a transversal.

Your student will learn to use angle relationships to identify angle measurements. In the figure below, $\overleftrightarrow{UV}$ is parallel to $\overleftrightarrow{WX}$. Can you name a pair of angles that have the same measure?



➤ **ONE WAY** to use angle relationships is to identify alternate interior angles.

$\angle 3$ and $\angle 6$ are alternate interior angles.
$m\angle 3$ and $m\angle 6$ are equal.

➤ **ANOTHER WAY** to use angle relationships is to identify alternate exterior angles.

$\angle 1$ and $\angle 8$ are alternate exterior angles.
$m\angle 1$ and $m\angle 8$ are equal.

Use the next page to start a conversation about angle relationships.

Activity Thinking About Angle Relationships

➤ **Do this activity together to investigate angle relationships in real life.**

There are many places in the world around you where angles and their relationships are important. One example is a truss bridge. Part of the structure of a truss bridge is shown. These bridges are built using a design involving parallel lines cut by transversals. The angles formed by this structure meet the required safety standards for strength and stability!

? What angle relationships do you see in the picture of the truss bridge? What are other real-world examples of angle relationships?

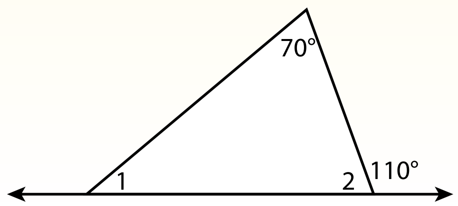
LESSON 7

Describe Angle Relationships in Triangles

Dear Family,

This week your student is learning about angle relationships in triangles. Students will learn that the sum of the three angle measures in a triangle is 180°. They will use this new knowledge and what they know about angle relationships to solve problems, like the one below.

Use what you know about angle relationships to find the measures of $\angle 1$ and $\angle 2$ in the figure below.



➤ **ONE WAY** to find the unknown angle measures is to use the properties of linear pairs of angles.

$\angle 2$ and the angle labeled 110° form a linear pair. A linear pair is two adjacent angles that together measure 180°.

$$m\angle 2 + 110° = 180°$$
$$m\angle 2 = 180° - 110°$$
$$m\angle 2 = 70°$$

➤ **ANOTHER WAY** is to use the properties of angle measures in a triangle.

The sum of the three angle measures in a triangle is 180°.

$$m\angle 1 + m\angle 2 + 70° = 180°$$
$$m\angle 1 + 70° + 70° = 180° \quad \longleftarrow \; \boldsymbol{m\angle 2 = 70°}$$
$$m\angle 1 = 180° - 140°$$
$$m\angle 1 = 40°$$

Use the next page to start a conversation about angle relationships in triangles.

Activity Thinking About Angle Relationships in Triangles

➤ **Do this activity together to investigate angle measures in triangles in the real world.**

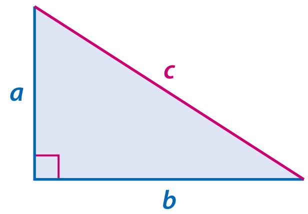
Triangles are common in many patterns, such as in the tile pattern shown. It is important to know the relationships of the angles when making the triangular tiles. For example, should the angles have the same measure? Should they sum to 180°? If the angles are not measured correctly, there will be spaces or overlapping tiles in the finished pattern!

? How might the tile pattern be affected if angle measures changed? Draw a new pattern with triangles that have different angle measures.

LESSON 26

Dear Family,

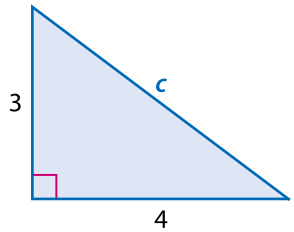
This week your student is exploring the **Pythagorean Theorem**. This theorem describes a relationship between the side lengths of a right triangle. The side of a right triangle opposite the right angle is called the **hypotenuse**. The two sides that meet to form the right angle are called the **legs**.



Consider a right triangle with legs of lengths a and b and a hypotenuse of length c. The relationship $a^2 + b^2 = c^2$ is true based on the Pythagorean Theorem. The **converse of the Pythagorean Theorem** uses this relationship in reverse. Consider a triangle with side lengths p, q, and r, where $p^2 + q^2 = r^2$. According to the converse of the Pythagorean Theorem, this triangle is a right triangle.

➤ **ONE WAY** to use the Pythagorean Theorem is to find an unknown side length.

The legs of a right triangle are 4 units and 3 units long. You can use the Pythagorean Theorem to find the length of the hypotenuse.



$4^2 + 3^2 = c^2$

$16 + 9 = c^2$

$25 = c^2$

$5 = c$ — The hypotenuse is 5 units long.

➤ **ANOTHER WAY** is to use the converse of the Pythagorean Theorem to check if a triangle is a right triangle.

Consider a triangle with side lengths **6** units, **8** units, and **10** units. Square each side length. If the sum of the two lesser squares equals the third square, then the triangle is a right triangle.

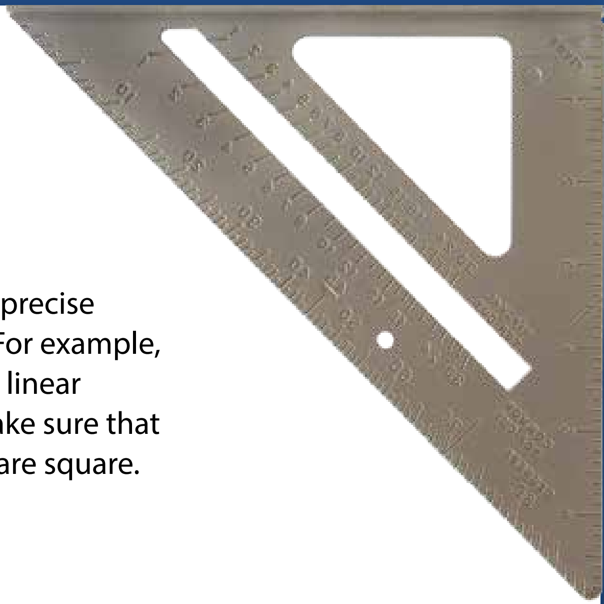
$6^2 = 36,\ 8^2 = 64,\ 10^2 = 100$

$36 + 64 = 100$, so $6^2 + 8^2 = 10^2$ — The triangle is a right triangle.

Using either method, the Pythagorean Theorem is helpful when working with right triangles.

Use the next page to start a conversation about the Pythagorean Theorem.

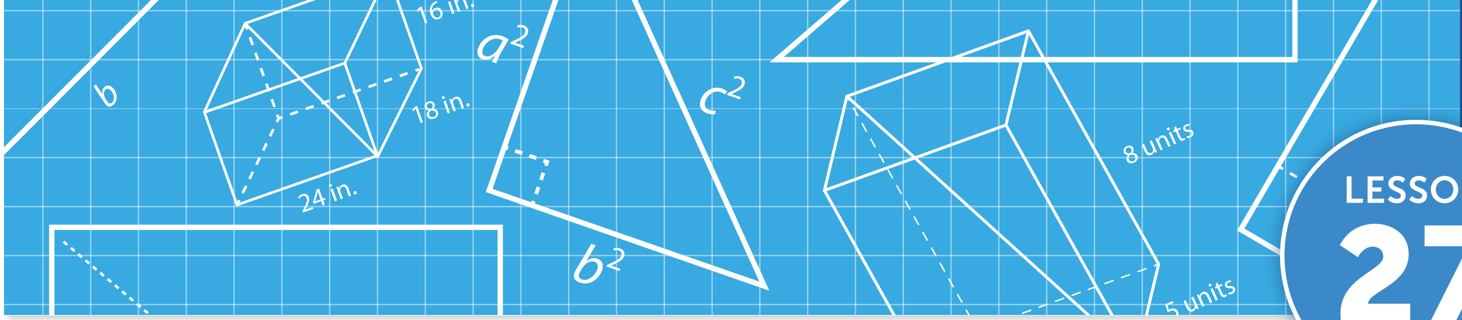
Activity Thinking About the Pythagorean Theorem



➤ **Do this activity together to investigate the Pythagorean Theorem in the real world.**

The Pythagorean Theorem is a useful tool whenever precise measurements are needed to create right triangles. For example, builders and carpenters can use a speed square tool, linear measurements, and the Pythagorean Theorem to make sure that floors are level, walls are perpendicular, and corners are square.

? Can you think of other situations where right triangles can be found?



LESSON 27

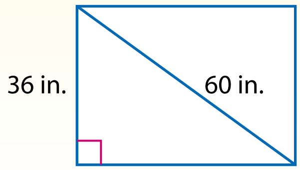
Apply the Pythagorean Theorem

Dear Family,

This week your student is learning how to apply the Pythagorean Theorem. Previously, students learned the Pythagorean Theorem: In any right triangle, the sum of the squares of the lengths of the legs, a and b, is equal to the square of the length of the hypotenuse, c. So, $a^2 + b^2 = c^2$.

Students will see that the Pythagorean Theorem can be used to find unknown lengths in problems involving right triangles, as in the problem below.

> Arturo is buying a flat-screen monitor to hang in a 3-foot high by 4-foot wide area of wall space. He sees an ad for a monitor with a 60-inch diagonal and a 36-inch height. Will the monitor fit in the wall space?



ONE WAY to solve the problem is to find the width of the monitor.

Let the diagonal length of the monitor be c, the length of the hypotenuse of a right triangle. Let the height of the monitor be a, one leg length, and the unknown width be b, the other leg length. Use $a^2 + b^2 = c^2$.

$$36^2 + b^2 = 60^2$$
$$1{,}296 + b^2 = 3{,}600$$
$$b^2 = 2{,}304$$
$$b = \sqrt{2{,}304} = 48$$

The width of the monitor is 48 in. or 4 ft.

ANOTHER WAY is to find the diagonal length of the wall space.

Let a and b be the width and height of the wall space. Find c, the length of the diagonal, using $a^2 + b^2 = c^2$.

$$3^2 + 4^2 = c^2$$
$$9 + 16 = c^2$$
$$25 = c^2$$
$$c = \sqrt{25} = 5$$

The diagonal length of the wall space is 5 ft or 60 in.

Using either method, the monitor will fit in the wall space.

Use the next page to start a conversation about applying the Pythagorean Theorem.

Activity Thinking About the Pythagorean Theorem

➤ **Do this activity together to investigate applications of the Pythagorean Theorem.**

The Pythagorean Theorem can also help you find an unknown length in a three-dimensional object. For example, will an 11-inch long screwdriver fit in a toolbox that is 8 inches long, 6 inches wide, and 5 inches deep? You can apply the Pythagorean Theorem twice to find out that it will fit!

? In what other situations can it be helpful to find an unknown length of a right triangle?

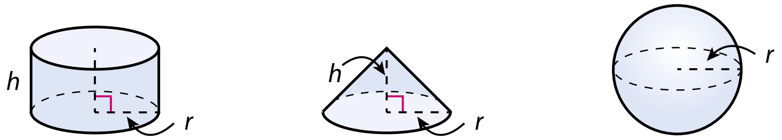
LESSON 28

Solve Problems with Volumes of Cylinders, Cones, and Spheres

Dear Family,

Previously, your student learned about the volumes of right prisms. Now your student will learn about the volumes of cylinders, **cones,** and **spheres**.

Cylinder **Cone** **Sphere**



The volume, V, of a cylinder is $V = \pi r^2 h$, where r is the radius of the base and h is the height of the cylinder.

The volume, V, of a cone is $V = \frac{1}{3}\pi r^2 h$, where r is the radius of the base and h is the height of the cone.

The volume, V, of a sphere is $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere.

Students will learn to solve volume problems like the one below.

> The volume of a cylinder with radius 6 in. and height 8 in. is 288π in.^{3}. What is the volume of a cone with the same radius and height?

➤ **ONE WAY** to find the volume is to use the relationship between the volume of a cylinder and a cone with the same radius and height.

The volume of the cone is $\frac{1}{3}$ the volume of the cylinder.

$\frac{1}{3}(288\pi) = 96\pi$

➤ **ANOTHER WAY** is to use the volume formula for a cone.

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi(6^2)(8) = 96\pi$

Using 3.14 for π, the volume of the cone is about 301.44 in.^{3}.

Using either method, the volume of the cone is 96π in.^{3}, or about 301.44 in.^{3}.

Use the next page to start a conversation about volume.

Activity Thinking About Volume

➤ **Do this activity together to investigate solving problems using volume.**

You can use what you know about the volume of cylinders, cones, and spheres to think about the amount of space inside these figures. For example, if you want a flower vase that can hold a lot of water, you can find the volumes of different-shaped vases to find which one can hold the most water.

? Can you think of other situations where thinking about volume is useful?