Dear Family,

The next Unit in your child's mathematics class this year is ***Looking for Pythagoras: The Pythagorean Theorem.*** Students' work in this Unit develops the Pythagorean Theorem, a fundamentally important relationship connecting geometry and algebra.

Unit Goals

In this Unit, students explore the Pythagorean Theorem, square roots, cube roots, and strategies for estimating square roots and cube roots. The set of real numbers is extended from only rational numbers to also include irrational numbers.

The presentation of ideas in the Unit reflects the historical development of the concept of irrational numbers. Early Greek mathematicians recognized the need for such numbers as they searched for a ratio of integers to represent the length of the sides of a square with certain given areas, such as 2 square units. The square root of 2 is an irrational number, which means that it cannot be written as a ratio of two integers.

Helping With Homework

You can help with homework by asking questions such as the following:

- How is the area of a square related to its side length?
- How is the volume of a cube related to its edge length?
- How can you estimate the square root of a number?
- When is it appropriate to use the Pythagorean Theorem?
- How can you find the side or edge length of a figure without directly measuring it?
- How can you find the distance between two points?

In your child's notebook, you can find worked-out examples, notes on the mathematics of the Unit, and descriptions of the vocabulary words.

Having Conversations About the Mathematics in *Looking for Pythagoras*

You can help your child with his or her work for this Unit in several ways:

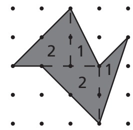
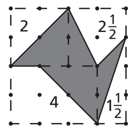
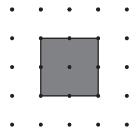
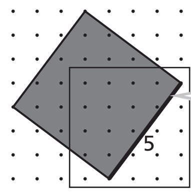
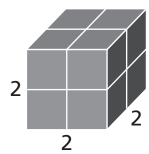
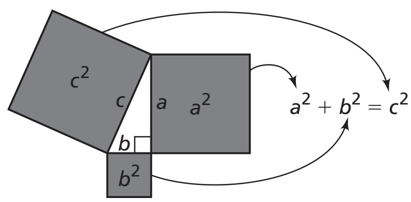
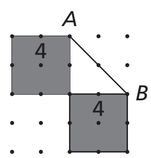
- Help your child find some examples of right triangles at home or in your community and apply the Pythagorean Theorem to find the length of one side of a right triangle when the other two are known or can be measured.
- Ask your child to explain the ideas presented in the text about finding distances.
- Discuss with your child how the Pythagorean Theorem is applied by people in some careers, such as carpenters, architects, and pilots.

Common Core State Standards

Students develop and use all of the Standards for Mathematical Practice throughout the curriculum. In *Looking for Pythagoras*, particular attention is paid to constructing viable arguments, critiquing the reasoning of others, and justifying responses, as students make conjectures about the Pythagorean Theorem. *Looking for Pythagoras* focuses largely on the Geometry domain in the Common Core State Standards. The Unit also addresses parts of The Number System and the Expressions and Equations domains.

A few important mathematical ideas that your child will learn in *Looking for Pythagoras* are given on the next page. As always, if you have any questions or concerns about this Unit or your child's progress in the class, please feel free to call.

Sincerely,

Important Concepts	Examples
Finding Area Students find areas of irregular figures drawn on grids. One method is to subdivide the shape and add the areas of the component shapes. Another method is to enclose the shape in a rectangle and subtract the area outside the figure from the area of the rectangle.	 Subdivide to find the area: $2 + 2 + 1 + 1 = 6$  Enclose in a square to find the area: $16 - (4 + 2 + 2\frac{1}{2} + 1\frac{1}{2}) = 6$
Square Roots If the area of a square is known, its side length is the number whose square is equal to the area. The side length of a square is not always a whole number. You can use the $\sqrt{}$ symbol to represent these nonwhole numbers.	 This square has an area of 4 square units. The length of each side is the square root of 4 units, which is equal to 2 units.
Estimating Square Roots Students develop benchmarks for estimating square roots. Students also estimate square roots with a number line ruler, which helps them to develop a sense of the size of irrational numbers, such as $\sqrt{3}$, $\sqrt{5}$, and $\sqrt{7}$.	$\sqrt{5}$ is between 2 and 3 because $2^2 < 5 < 3^2$. It is closer to 2. Try 2.25: $2.25^2 = 5.0625$. So $\sqrt{5}$ is between 2 and 2.25, but closer to 2.25. Try 2.24: $2.24^2 = 5.0176$. This estimate is even closer. Continue until the desired accuracy is obtained.
Finding Distances To find various lengths of line segments, students begin by drawing a square that is associated with the length.	 This segment is the side of a square with area 25 square units. So its area is $\sqrt{25}$, or 5 units
Cube Roots If the volume of a cube is known, its edge length is the number that when multiplied by itself 3 times is equal to the volume. The edge length of a cube is not always a whole number. You can use the $\sqrt[3]{}$ symbol to represent these nonwhole numbers.	 This cube has the volume of 8 cubic units. The length of each edge is the cube root of 8 units, which is equal to 2 units.
Pythagorean Theorem In a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the longest side, called the hypotenuse. Symbolically, this is $a^2 + b^2 = c^2$, where a and b are the lengths of the legs and c is the length of the hypotenuse.	
Finding the Length of a Line Segment On a grid, you can find the length of a horizontal or vertical line segment by counting the distance. If a segment is not vertical or horizontal, you can treat it as the hypotenuse of a right triangle. You can use the Pythagorean Theorem to find the length of the hypotenuse.	 The length of line segment AB can be the hypotenuse of a right triangle, c. $2^2 + 2^2 = c^2$, so $4 + 4 = 8 = c^2$. $\sqrt{8} = c$
Irrational and Rational Numbers An irrational number is a number that cannot be written as a quotient of two integers where the denominator is not 0. Decimal representations of irrational numbers never end and never show a repeating pattern for a fixed number of digits. Rational numbers can be written as a ratio of two integers. Decimal representations of rational numbers terminate or show a repeating pattern.	The numbers $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, and π are examples of irrational numbers. The decimal form of $\sqrt{2}$ is 1.41421356237 . . . . The decimal part goes on forever without any repeating pattern. The numbers $\frac{1}{3}$, -2.7, and $\sqrt{4}$ are examples of rational numbers.