Unit 2: Squares, Square Roots, Triangles and Real Numbers

Dear Parents/Guardians,

Unit 2 introduces square roots and different number sets within the real number system. In Lesson 1, students explore the inverse relationship between squares and square roots of numbers. In Lesson 2, they investigate the Pythagorean Theorem and its converse. In Lesson 3, students convert numbers into different forms (such as decimals to fractions) and determine whether numbers are rational or irrational.

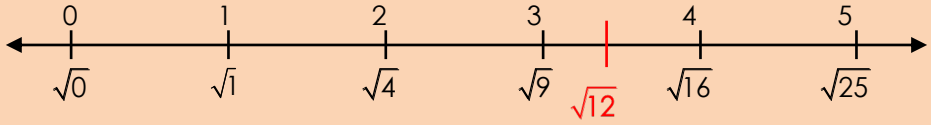
Squares and Square Roots

When a number is taken to the second power, we refer to it as 'squaring the number'. (Think of the area of a square. If it's side length is 5 units, then the area is 5^2 (or 5 squared).

4^2 is '4 to the second power' or '4 squared'. $4^2 = 16$	The square root of 16 is 4. $\sqrt{16} = 4$

Students will observe that most numbers do not have a whole number square root and will need to approximate the quantity.

Example: Approximate $\sqrt{12}$.



$\sqrt{12}$ is between 3 and 4.

To find a better approximation, subtract the closest perfect square that is less than the given number and the next perfect square.

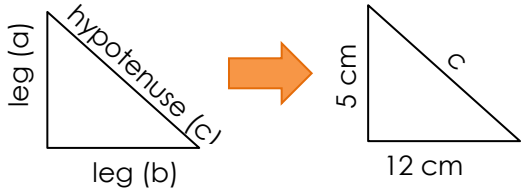
$\sqrt{12}$ lies between $\sqrt{9}$ and $\sqrt{16}$.

Estimate the fractional part of $\sqrt{12} \rightarrow \frac{12-9}{16-9} = \frac{3}{7}$. $\sqrt{12} \approx 3\frac{3}{7} \approx 3.43$.

Using a calculator, $\sqrt{12} \approx 3.46$, which is extremely close!

The Pythagorean Theorem

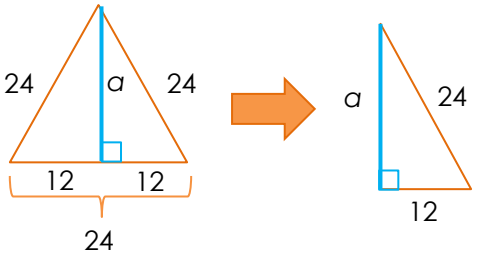
Students explore right triangles to prove the Pythagorean Theorem, which states for any right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse.



$c^2 = a^2 + b^2$
$c^2 = 5^2 + 12^2$
$c^2 = 25 + 144$
$c^2 = 169$
$c = \sqrt{169} = 13\,cm$

Students will use the Pythagorean Theorem to solve problems.

Example: Find the height of an isosceles triangle that each measure 24 inches and a base that is 24 inches long.



$c^2 = a^2 + b^2$
$24^2 = a^2 + 12^2$
$576 = a^2 + 144$
$a^2 = 432$
$a = \sqrt{432} \approx 20.78\,in$

Center For Mathematics And Teaching

Math Links GRADE 8

By the end of the unit, your student should know…

- How to find squares and square roots of whole numbers [Lesson 2.1]
- How to approximate square roots as fractions and decimals [Lesson 2.1]
- The meaning of the Pythagorean theorem, and how to use it and its converse [Lesson 2.2]
- That numbers that are not rational are called irrational numbers [Lesson 2.3]
- How to change repeating decimals to fractions [Lesson 2.3]
- How to locate irrational numbers on a number line [Lesson 2.3]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of this unit.
- For more on the Pythagorean Theorem: https://youtu.be/ibkR4PHpylg