EUREKA MATH™ TIPS FOR PARENTS

KEY CONCEPT OVERVIEW

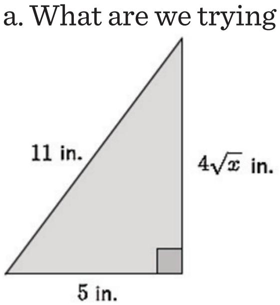
Welcome to the last module of Grade 8. In this topic, students are introduced to **irrational numbers**. As they continue using the Pythagorean theorem to determine side lengths of right triangles, students learn about **square roots** and about irrational numbers in general. Students have previously applied the Pythagorean theorem by using **perfect squares**. Now they learn to estimate the length of an unknown side of a right triangle by determining between which two perfect squares a squared number falls. This leads to the introduction of the notation and meaning of square roots. Students then solve simple equations that require them to find the square root or **cube root** of a number. They then solve multi-step equations by using the properties of equality to transform an equation until it is in the form $x^2 = p$ or $x^3 = p$, where they can use square roots or cube roots to calculate an answer.

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

- Determine the length of one side of a right triangle by using the Pythagorean theorem.
- Determine which two **integers** a square root is between and to which integer it is closest.
- Estimate square roots and place them on a number line.
- Solve and check solutions to equations that can be converted to the form $x^2 = p$ or $x^3 = p$.

SAMPLE PROBLEM *(From Lesson 5)*

a. What are we trying to determine in the diagram?



Student work may vary.

We need to determine the value of x so that its square root, when multiplied by 4, satisfies the equation $5^2 + \left(4\sqrt{x}\right)^2 = 11^2$.

b. Determine the value of x. Then check your answer.

$$5^2 + (4\sqrt{x})^2 = 11^2$$
$$25 + 4^2(\sqrt{x})^2 = 121$$
$$25 + 16x = 121$$
$$25 - 25 + 16x = 121 - 25$$
$$16x = 96$$
$$\left(\frac{1}{16}\right)16x = \left(\frac{1}{16}\right)96$$
$$x = 6$$

The value of x is 6.

Check:

$$5^2 + (4\sqrt{x})^2 = 11^2$$
$$5^2 + (4\sqrt{6})^2 = 11^2$$
$$25 + 16(6) = 121$$
$$25 + 96 = 121$$
$$121 = 121$$

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.

- Have your child review the laws of integers from Module 1. There are many instances in which students will be asked to square a term, such as $(8x)^2$. The third law of exponents says that $(8x)^2 = 8^2(x^2) = 64x^2$.
- There are many applications of square roots and cube roots in geometry besides the Pythagorean theorem. Play a memory game to review area and volume formulas with your child. Draw a shape on an index card. On another card, write its area or volume formula. (An online search for *area and volume formula sheet* will produce images and formulas to use.) Place all shape cards facedown in one row and all formula cards facedown in another row. Flip over one card from each row. If the formula card shows the correct formula for calculating the area or volume of the chosen shape, you keep the cards; if not, turn the cards facedown again. Play continues until all matches have been made. The person who collects the most pairs wins.

TERMS

Cube root: The symbol $\sqrt[3]{b}$ denotes the cube root of b. This expression represents a number whose cube is equal to b (e.g., $\sqrt[3]{125} = \sqrt[3]{5^3} = 5$). Not all numbers beneath the cube root symbol are perfect cubes, which means some solutions are not integers and may need to be estimated (e.g., $\sqrt[3]{249} \approx 6.3$).

Infinite decimal: A number with a decimal expansion that never ends. Infinite decimals are usually indicated by a line over the repeating block (e.g., $0.6\overline{75}$) or by an ellipsis following the number (e.g., 0.479456…).

Integer: The whole numbers and their opposites, including zero. The set of integers is $\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$.

Irrational number: A number with a decimal expansion that is infinite and that does not have a repeating block of numbers.

Negative exponents: When a base, x, is raised to a negative power, $-y$, it is equivalent to the fraction $\frac{1}{x^y}$ (e.g., $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$).

Perfect square: A number that is the result of squaring an integer. The first fifteen perfect squares are 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, and 225.

Square root: The symbol $\sqrt{b}$ automatically denotes a positive number called the positive square root of b. This expression represents a positive number whose square is equal to b (e.g., $\sqrt{64} = \sqrt{8^2} = 8$). Not all numbers beneath the square root symbol are perfect squares, which means some solutions are not integers and may need to be estimated (e.g., $\sqrt{42} \approx 6.5$).