

Eureka Math Parent Guide

A GUIDE TO SUPPORT PARENTS AS THEY WORK WITH THEIR STUDENTS IN MATH.

**GRADE 8
MODULE 1**

GRADE FOCUS

Eighth grade mathematics is about (1) formulating and reasoning about expressions and equations, with a special focus on linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

» Module 1: Integer Exponents and Scientific Notation

- Module 2: The Concept of Congruence
- Module 3: Similarity
- Module 4: Linear Equations
- Module 5: Examples of Functions from Geometry
- Module 6: Linear Functions
- Module 7: Introduction to Irrational Numbers Using Geometry

LET'S CHECK IT OUT!

MODULE 1 FOCUS

In this 13-lesson module, students expand their knowledge of operations on numbers to include integer exponents and use this knowledge to transform expressions. Students will also make conjectures about how zero and negative exponents of a number should be defined and prove the properties of integer exponents. Students will also make sense out of very large numbers and very small numbers and will use the number line to guide them in determining the relationship between numbers.

MORE SPECIFICALLY, CHILDREN WILL LEARN HOW TO:

- Work with radicals and integer exponents.
- Know and apply the properties of integer exponents to general equivalent numerical expressions.
- Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
- Use, interpret and perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.

TOPIC OVERVIEW

Topics are the lessons within a module that help children master the skills above. Here are the lessons that will guide your child through Module 1:

- Topic A: Exponential Notation and Properties of Integer Exponents
- Topic B: Magnitude and Scientific Notation

WORDS TO KNOW

- **Scientific Notation:** The scientific notation is the representation of a number as the product of a finite decimal, d , and a power of 10. The decimal d must be greater than or equal to 1 and less than 10. The exponent of the power of 10 must be an integer. For example, the scientific notation for 192.7 is 1.927×10^2 . *An example of a number that is not written in scientific notation is 0.234567×10^3 because 0.234567 is not greater than or equal to 1 and less than 10.*
- **Order of Magnitude:** The order of magnitude of a *finite decimal* is the exponent in the power of 10 when that decimal is expressed in scientific notation. *For example, the order of magnitude of 192.7 is 2 because when 192.7 is expressed in scientific notation as 1.927×10^2 , 2 is the exponent of 102.*

SAMPLE PROBLEMS

SAMPLE 1: THE LAWS OF EXPONENTS

For $x, y > 0$, and all integers a, b , the following holds:

$$x^a \cdot x^b = x^{a+b}$$

$$(x^b)^a = x^{ab}$$

$$(xy)^a = x^a y^a$$

For any positive number x and for any positive integer n , we define:

$$x^{-n} = 1/x^n$$

x^{-1} is just the reciprocal, $1/x$, of x .

We use the definition above to prove that the following statement is true for *all integer* exponents b .

In general, if x is any number and m, n are positive integers then:

$$x^m \cdot x^n = x^{m+n}$$

In general, if x is nonzero and m, n are positive integers then:

$$x^m/x^n = x^{m-n}, \text{ if } m > n.$$

SAMPLE 2

Sprinting Towards Fluency!

Sprints help develop fluency, build excitement towards mathematics, and encourage students to do their personal best! They are not necessarily a competition among classmates, but a quest to improve upon a student's previous time, ultimately helping them achieve the desired fluency when they are working with numbers as well as provide a feeling of achievement when their second sprint shows improvement.

During the Sprint activity below, your role as the parent will be the same as the role of the teacher when the class is completing this activity. You will keep track of the time as well as be an exciting and encouraging coach for your child. You will give your child the following: a copy of Sprint A and Sprint B. You can make a copy of this newsletter or use the original and fold the newsletter in half so your child only sees one Sprint at a time. You can use a stopwatch to record the time. For these modified sprints, please give your child 15 seconds to complete the 11 problems. The answers for both Sprints are provided at the bottom of the newsletter. Have fun!

Sprint A			Sprint B		
1.	$2^2 \cdot 2^3$		1.	$5^2 \cdot 5^3$	
2.	$2^2 \cdot 2^4$		2.	$5^2 \cdot 5^4$	
3.	$2^2 \cdot 2^5$		3.	$5^2 \cdot 5^5$	
4.	$99^5 \cdot 99^2$		4.	$11^{12} \cdot 11^2$	
5.	$99^6 \cdot 99^3$		5.	$11^{12} \cdot 11^4$	
6.	$99^7 \cdot 99^4$		6.	$11^{12} \cdot 11^6$	
7.	$r^8 \cdot r^2$		7.	$x^7 \cdot x^3$	
8.	$s^8 \cdot s^2$		8.	$y^7 \cdot y^3$	
9.	$x^3 \cdot x^2$		9.	$z^9 \cdot z^8$	
10.	$5^4 \cdot 125$		10.	$2^{11} \cdot 4$	
11.	$8 \cdot 2^9$		11.	$2^{11} \cdot 16$	

HOW YOU CAN HELP AT HOME

- Ask your child what they learned in school today and ask them to show you an example.
- Complete the *Sprint* activity on the next page with your child.
- Ask your child to show you why this equation is true: $x^{-5} \cdot x^{-7} = x^{-12}$
- Ask your child to determine the value of n and explain to you why they think their solution is correct.
 $2^3 \cdot 4^3 = 2^3 \cdot 2^n = 2^9$