Algebra 1B Live Lesson

U1L2 – Review of Foundations for Algebra

CONNECTIONS ACADEMY®

Agenda

1. Review selected problems and topics from U1L2

2. Use the 2-column note system to take better notes in math class. Bring your math notebook and pen or pencil to each math LiveLesson class.

2-Column Notes Template

1. Announcements/To Do’s	1. Write down important details.
2. School-Wide Learner Outcomes	2. What are you going to work on this week?
3. LL Objectives	
4. Vocabulary words	4. Definitions (fill in as we go)
5. Problems	5. Steps to solving problems
6. Summary (End of class)	6. 1 or 2 sentences about the LL class.

Reminders and To – Do's

Information	What to do
1. Complete 1 math lesson per day.	1. Go to your Planner in Connexus to find the math lesson for the day
2. Check your WebMail every day	2. Go to Connexus to find WebMail
3. Be prepared to spend 4 - 6 hours per day on schoolwork.	3. Complete lessons for the day from your Planner. Do not get behind on lessons.
4. Remind your Learning Coach to take daily attendance	4. Have your Learning Coach log into Connexus daily.

Reminders and To – Do's

Information	What to do
5. Go to the Message Board first for information about our math class.	
6. Contact Mr. Elizondo for math questions. Remember: You need at least 2 phone calls with Mr. Elizondo per semester.	6. Call (559) 549 - 3244 and leave a voicemail if call is not answered. Make an appointment at: https://elizondo.youcanbook.me Send a WebMail

California Common Core State Standards

- HSA-SSE.A.1a: Interpret parts of an expression, such as terms, factors, and coefficients.
- HSA-SSE.A.1b: Interpret complicated expressions by viewing one or more of their parts as a single entity.
- HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.
- HSA-SSE.A.2: Use the structure of an expression to identify ways to rewrite it.
- HSN-RN.B.3: Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

U1L2 - Objectives

1. Writing algebraic expressions
2. Simplify powers
3. Simplify using order of operations
4. Simplify square roots
5. Classifications of real numbers (Number families)
6. Properties of algebra (commutative, associative and distributive)
7. Adding, subtracting, multiplying and dividing real numbers
8. Evaluating algebraic expressions
9. Deductive reasoning and counterexamples

U1L2 - Introduction

- Algebra uses symbols to represent quantities that are unknown or that vary.
- You can represent mathematical phrases and real-world relationships using symbols and operations.

U1L2 - Definitions

- A **variable** is a symbol, usually a letter that represents the value (x, a, etc.)
- An **algebraic expression** is a mathematical phrase that includes one or more variables (ex. $x+5$)
- A **numerical expression** is a mathematical phrase that includes numbers and operational symbols (+, -, etc.) but no variables

U1L2 - Writing expressions with two operations

What is an algebraic expression for the word phrase?

Word Phrase	Expression
3 more than twice a number x	$2x+3$
9 less than the quotient of 6 and a number x	$\frac{6}{x}-9$
the product of 4 and the sum of a number x and 7	$4(x+7)$

U1L2 – Powers

You can use *powers* to shorten how you represent repeated multiplication, such as 2 X 2 X 2 X 2 X 2 X 2.

A **power** has two parts, a *base* and an *exponent*. The **exponent** tells you how many times to use the **base** as a factor. You read the power 2^3 as "two to the third power" or "two cubed." You read 5^2 as "five to the second power" or "five squared."

base

exponent

$$\underbrace{2^3}_{\text{power}} = 2 \cdot 2 \cdot 2$$

You **simplify** a numerical expression when you replace it with its single numerical value. For example, the simplest form of $2 \cdot 8$ is 16. To simplify a power, you replace it with its simplest name.

U1L2 - Order of Operations

- When simplifying an expression, you need to perform operations in the correct order.

take note

Key Concept **Order of Operations**

1. Perform any operation(s) inside grouping symbols, such as parentheses ( ) and brackets [ ]. A fraction bar also acts as a grouping symbol.
2. Simplify powers.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

U1L2 - Order of Operations

What is the simplified form of the expression?

$$\frac{2^4 - 1}{5 - 2} = \frac{(2^4 - 1)}{(5 - 2)}$$

$$= \frac{(16 - 1)}{(5 - 2)}$$

$$= \frac{15}{3}$$

$$= 5$$

U1L2 - Square Roots

take note

Key Concept Square Root

Algebra A number a is a **square root** of a number b if $a^2 = b$.

Example $7^2 = 49$, so 7 is a square root of 49.

Essential Understanding You can use the definition above to find the exact square roots of some nonnegative numbers. You can approximate the square roots of other nonnegative numbers.

The radical symbol $\sqrt{}$ indicates a nonnegative square root, also called a *principal square root*. The expression under the radical symbol is called the **radicand.**

radical symbol $\rightarrow \sqrt{a} \leftarrow$ radicand

Together, the radical symbol and radicand form a **radical.**

U1L2 - Estimating a square root

Estimate the square root by finding the 2 closest perfect squares.

$$\sqrt{386}$$

$19^2 = 361$

386

$20^2 = 400$

Since 386 is closer to 400,

$$\sqrt{386} \approx 20$$

approximately

Estimate the square root by finding the 2 closest perfect squares.

$$\sqrt{34}$$

$5^2 = 25$

34

$6^2 = 36$

Since 34 is closer to 36,

$$\sqrt{34} \approx 6$$

approximately

U1L2 - Classifying Numbers

- Numbers can be classified by their characteristics. Some types of numbers can be represented on the number line.
- You can classify numbers using *sets*. A **set** is a well-defined collection of objects.
- Each object is called **an element of a set**.
- A **subset** of a set consists of elements from the given set. You can list the elements of a set within braces {}

U1L2 - Sets (Families) of Numbers

Real Numbers

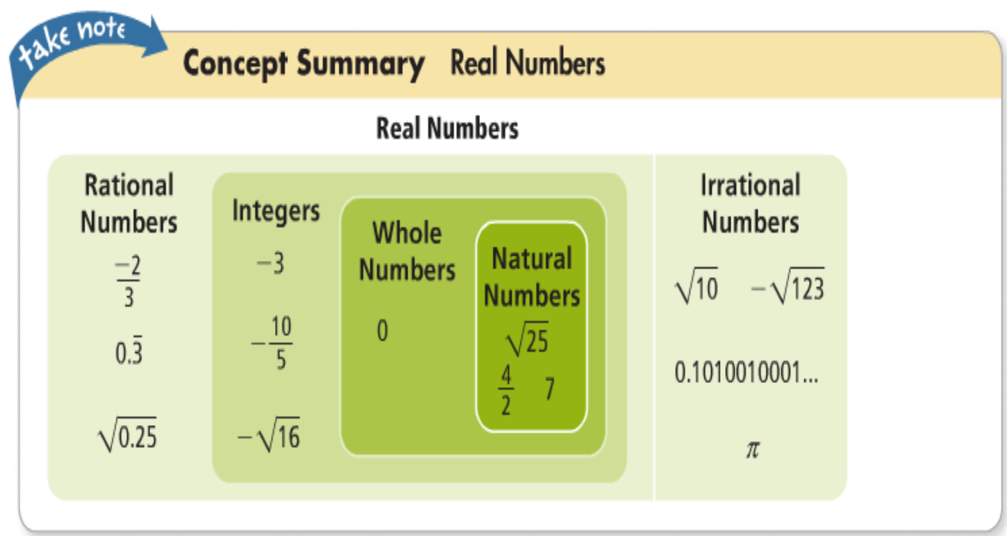
Rational Numbers

Irrational Numbers

Integers
{… ,-3, -2, -1, 0, 1, 2, 3,…}

Whole Numbers
{0, 1, 2, 3,…}

Natural Numbers
{1, 2, 3,…}



U1L2 - Using Deductive Reasoning and Counterexamples

- **Deductive Reasoning** is the process of reasoning logically from given facts to a conclusion.
- To show a statement is not true, find an example for which it is not true. An example showing that a statement is false is a **counterexample**. You only need one counterexample to prove that a statement is false.

Is the statement *true* or *false*? If it is false, give a counterexample.

A **For all real numbers a and b, $a \cdot b = b + a$.**

False. $5 \cdot 3 \neq 3 + 5$ is a counterexample.

B **For all real numbers a, b, and c, $(a + b) + c = b + (a + c)$.**

True. Use properties of real numbers to show that the expressions are equivalent.

$$(a + b) + c = (b + a) + c \quad \text{Commutative Property of Addition}$$

$$= b + (a + c) \quad \text{Associative Property of Addition}$$

U1L2 - Subtracting Real Numbers

take note

Key Concept **Subtracting Real Numbers**

To subtract a real number, add its opposite: $a - b = a + (-b)$.

Examples $3 - 5 = 3 + (-5) = -2$ $3 - (-5) = 3 + 5 = 8$

"Copy, change, change"

- Same as an addition problem

  "Same signs, add and keep.
  Different signs, subtract,
  Take the sign of the higher number,
  Then you'll be exact!"

U1L2 - Multiplying Real Numbers

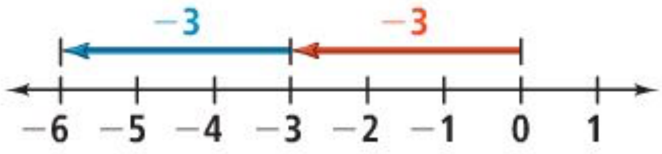
take note

Key Concept Multiplying Real Numbers

Words The product of two real numbers with *different* signs is *negative*.

Examples $2(-3) = -6$ $\qquad -2 \cdot 3 = -6$

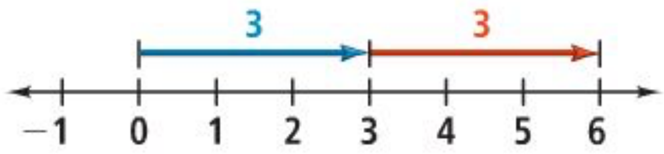
Model $2(-3) = -6$



Words The product of two real numbers with the *same* sign is *positive*.

Examples $2 \cdot 3 = 6$ $\qquad -2(-3) = 6$

Model $2 \cdot 3 = 6$



U1L2 - Dividing Real Numbers

take note

Key Concept Dividing Real Numbers

Words The quotient of two real numbers with *different* signs is *negative*.

Examples $-20 \div 5 = -4$ $20 \div (-5) = -4$

Words The quotient of two real numbers with the *same* sign is *positive*.

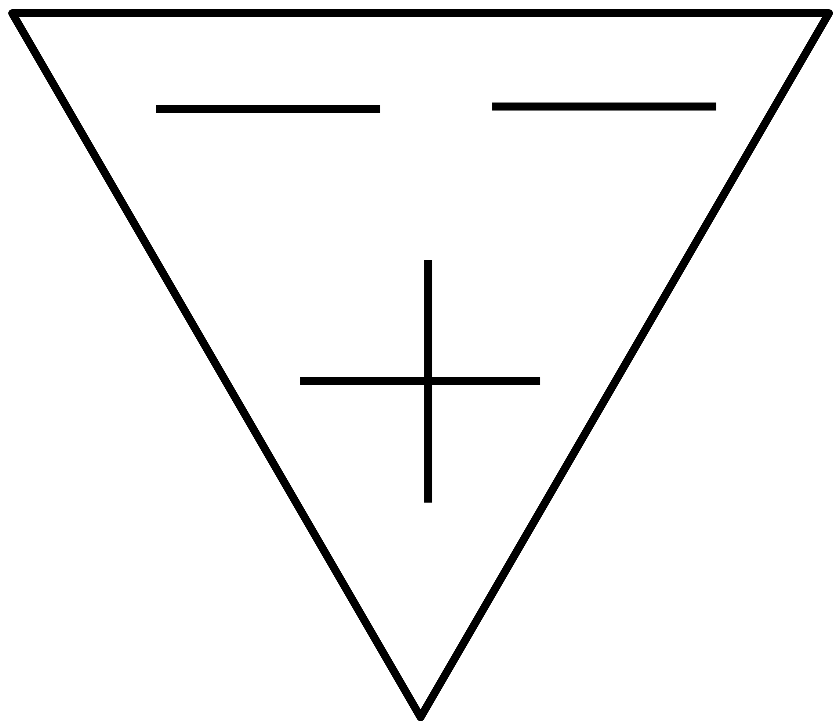
Examples $20 \div 5 = 4$ $-20 \div (-5) = 4$

Division Involving 0

Words The quotient of 0 and any nonzero real number is 0. The quotient of any real number and 0 is undefined.

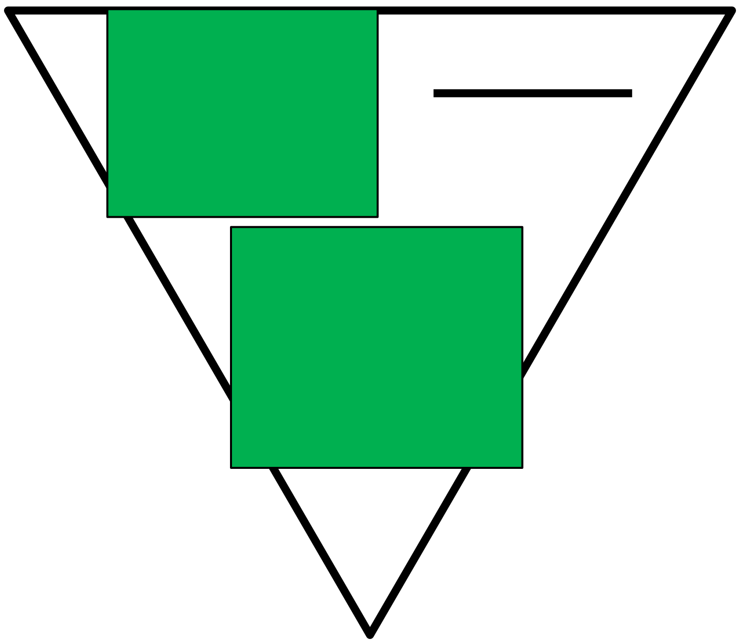
Examples $0 \div 8 = 0$ $8 \div 0$ is undefined.

U1L2 - Multiplying and Dividing Real Numbers



I call this the “Helpful Cat.”
I’ll show you how he is helpful.

U1L2 - Multiplying Real Numbers



Simplify.

$$-4 \cdot 7$$

$$= -28$$

U1L2 – Distributive Property

take note

Property Distributive Property

Let a, b, and c be real numbers.

Algebra

$a(b + c) = ab + ac$

$(b + c)a = ba + ca$

$a(b - c) = ab - ac$

$(b - c)a = ba - ca$

Examples

$4(20 + 6) = 4(20) + 4(6)$

$(20 + 6)4 = 20(4) + 6(4)$

$7(30 - 2) = 7(30) - 7(2)$

$(30 - 2)7 = 30(7) - 2(7)$

U1L2 - Inequalities

An **inequality** is a mathematical sentence that compares the values of two expressions using an inequality symbol. The symbols are:

$<$, less than
$>$, greater than
$\leq$, less than or equal to
$\geq$, greater than or equal to

What is an inequality that compares the numbers $\sqrt{17}$ and $4\frac{1}{3}$?

$\sqrt{17} = 4.12310\ldots$ Write the square root as a decimal.

$4\frac{1}{3} = 4.\overline{3}$ Write the fraction as a decimal.

$\sqrt{17} < 4\frac{1}{3}$ Compare using an inequality symbol.

U1L2 - Properties of Real Numbers: Commutative and Associative

take note

Properties — Properties of Real Numbers

Let a, b, and c be any real numbers.

Commutative Properties of Addition and Multiplication

Changing the order of the addends does not change the sum. Changing the order of the factors does not change the product.

	Algebra	Example
Addition	$a + b = b + a$	$18 + 54 = 54 + 18$
Multiplication	$a \cdot b = b \cdot a$	$12 \cdot \frac{1}{2} = \frac{1}{2} \cdot 12$

Associative Properties of Addition and Multiplication

Changing the grouping of the addends does not change the sum. Changing the grouping of the factors does not change the product.

Addition	$(a + b) + c = a + (b + c)$	$(23 + 9) + 4 = 23 + (9 + 4)$
Multiplication	$(a \cdot b) \cdot c = a \cdot (b \cdot c)$	$(7 \cdot 9) \cdot 10 = 7 \cdot (9 \cdot 10)$

U1L2 - Properties of Real Numbers: Identities

take note

Properties Properties of Real Numbers

Let a be any real number.

Identity Properties of Addition and Multiplication

The sum of any real number and 0 is the original number. The product of any real number and 1 is the original number.

	Algebra	Example
Addition	$a + 0 = a$	$5\frac{3}{4} + 0 = 5\frac{3}{4}$
Multiplication	$a \cdot 1 = a$	$67 \cdot 1 = 67$

Zero Property of Multiplication

The product of a and 0 is 0.	$a \cdot 0 = 0$	$18 \cdot 0 = 0$

Multiplication Property of -1

The product of -1 and a is $-a$.	$-1 \cdot a = -a$	$-1 \cdot 9 = -9$

Questions?

- Check the Message Board first
- Send a WebMail
- You can also make an appointment at https://elizondo.youcanbook.me
- You can also call me at (559) 549-3244. If I'm not available to answer your call, please leave a voicemail with your full name and phone number.