

What We Are Learning

The Language of Algebra

VOCABULARY

These are the math words we are learning:

absolute value the distance a number is from zero on a number line

additive inverse a number and its opposite

algebraic expression an expression that may include variables, constants, and operations

constant a value that does not change

irrational numbers numbers that are neither repeating nor terminating decimals

rational numbers numbers that can be expressed in the form $\frac{a}{b}$, where a and b are both integers and $b \neq 0$

real numbers any number on the number line

variable a letter or symbol used to represent a value that can change

Dear Family,

Welcome to Algebra! Throughout this course the student will learn an appreciation for how each new skill builds upon previously-learned concepts. The student initially may not always understand “why” they are learning a particular skill, but each of these skills is necessary for comprehension of the bigger picture.

At the outset of this course, the student will be reviewing and mastering previously-learned skills in preparation for learning algebraic concepts. You can use this table to help the student translate word phrases into math symbols

Operation	Key Word Phrases	Expression
Addition	a number plus 4 add 4 to a number the sum of 4 and a number 4 more than a number a number increased by 4	$m + 4$ $4 + m$
Subtraction	a number minus 4 4 less a number the difference of a number and 4 a number decreased by 4	$m - 4$
Multiplication	4 times a number a number multiplied by 4 the product of a number and 4	$4m$
Division	a number divided by 4 4 divided into a number the quotient of a number and 4	$m \div 4$ or $\frac{m}{4}$

John works d days. Tracy works 3 times as many days as John. Write an expression to show how many days Tracy works.

Step 1 Define the variable.

Let d represent the number of days John works.

Step 2 Look for key words.

Tracy works 3 **times** as many days as John.

Think: “times” \rightarrow multiplication.

Step 3 Write the expression: $3d$

Knowing how to evaluate algebraic expressions will prepare the student for solving equations—an algebraic concept covered throughout this text.

To evaluate an expression, substitute a numerical value for the variable(s) in the expression. Then perform the necessary mathematical operation(s).

Evaluate the expression $3d$ for $d = 40$.

$3d$	Write the expression.
$3(40)$	Substitute 40 for d .
120	Multiply.

The student will also be reviewing operations with real numbers. Encourage the student to remember these rules to build competence and confidence and to avoid common errors.

Adding Real Numbers

- When **adding** numbers with the **same sign**, add their absolute values and use the sign of the numbers.

$$3 + 4 = 7 \qquad -3 + (-4) = -7$$

- When adding numbers with **different signs**, find the difference of the absolute values and use the sign of the number with the greatest absolute value.

$$3 + (-4) = -1 \qquad -3 + 4 = 1$$

Subtracting Real Numbers

- When **subtracting** a number, add its opposite and follow the rules for adding numbers.

$$3 - 4 = 3 + (-4) = -1$$

Multiplying and Dividing Real Numbers

- When **multiplying or dividing** numbers with the **same sign**, the product or quotient will be positive.

$$3(4) = 12 \qquad (-3)(-4) = 12 \qquad -12 \div (-4) = 3$$

- When multiplying or dividing numbers with **different signs**, the product or quotient will be negative.

$$(-3)(4) = -12 \qquad 12 \div (-4) = -3$$

Help the student recognize the importance of these fundamental skills as part of developing a solid mathematical foundation. Please encourage the student to work diligently and complete assignments, as practice will ensure successful comprehension.

Sincerely,

What We Are Learning

The Tools of Algebra

VOCABULARY

These are the math words we are learning:

coefficient a number multiplied by a variable

counterexample an example that disproves a statement or shows a statement to be false

like terms terms that contain the same variable raised to the same power; constants are also like terms

order of operations tells which operation is to be performed first when an expression contains more than one operation

term parts of an expression that are being added or subtracted

Dear Family,

The student will continue to review properties of real numbers. These properties are important because they reinforce how expressions can be rearranged yet still produce the same result.

Property	Definition	Example
Associative Property of Addition	When adding real numbers, the sum is the same no matter how the numbers are grouped.	For real numbers a , b , and c , $a + (b + c) = (a + b) + c$ $2 + (4 + 6) = (2 + 4) + 6$ $2 + 10 = 6 + 6$ $12 = 12$
Associative Property of Multiplication	When multiplying real numbers, the product is the same no matter how the numbers are grouped.	For real numbers a , b , and c , $a(bc) = (ab)c$ $2(4 \times 6) = (2 \times 4)6$ $2 \times 24 = 8 \times 6$ $48 = 48$
Commutative Property of Addition	Real numbers can be added in any order.	For real numbers a and b , $a + b = b + a$ $3 + 4 = 4 + 3$ $7 = 7$
Commutative Property of Multiplication	Real numbers can be multiplied in any order.	For real numbers a and b , $a \times b = b \times a$ $3 \times 4 = 4 \times 3$ $12 = 12$
Distributive Property	When multiplying a number by a sum, one can multiply each number in the sum and then add those two sums.	For real numbers a , b , and c , $a(b + c) = ab + ac$ $3(4 + 5) = 3(4) + 3(5)$ $3(9) = 12 + 15$ $27 = 27$

The student will show that these properties are true for only addition and multiplication by providing **counterexamples** that prove that the properties are not true for subtraction and division.

These properties will also aid the student when asked to simplify expressions. The student will use the **order of operations** to simplify and evaluate expressions. The order of operations is a set of rules that tell which operation to perform first when an expression contains more than one operation. When working with the student, use the order of operations listed below to help the student correctly evaluate algebraic expressions.

Simplify: $4 + 3(6 - 2)^2 \div 2 - 3$

1. Perform operations inside grouping symbols.

$$4 + 3(\mathbf{4})^2 \div 2 - 3$$

2. Evaluate powers.

$$4 + 3(\mathbf{16}) \div 2 - 3$$

3. Perform multiplication and division from left to right.

$$4 + \mathbf{48} \div 2 - 3$$

$$4 + \mathbf{24} - 3$$

4. Perform addition and subtraction from left to right.

$$\mathbf{28} - 3$$

$$\mathbf{25}$$

The order of operations also applies to algebraic expressions. However, when simplifying algebraic expressions, the student must remember to combine **like terms**, terms that have the same variable raised to the same power. When combining like terms, add or subtract **coefficients**, the number being multiplied by a variable.

The Numbers 4, 5, and 9 are coefficients.

Like terms: $4a + 5a = 9a$

Not like terms: $4a + 5b \neq 9ab$

A variable standing alone has a coefficient of 1.

The coefficient is 1.

$$a + 3a = 4a$$

Remind the student that combining terms is like adding apples and oranges. Only apples can be added or subtracted from other apples, and so on. Fully comprehending this concept will help the student throughout this textbook.

Sincerely,