

Name: _____

Unit #1: Algebraic Expressions

After completion of this unit, you will be able to...

- Simplify an algebraic expression
- Evaluate an Algebraic Expression Using Order of Operations and/OR substitution
- Create an expression from a verbal description
- Identify parts of an expression as variables, coefficients, or constants
- Interpret parts of an expression in terms of a context

Timeline for Unit 1

Monday	Tuesday	Wednesday	Thursday	Friday
26th Day 1 Order of Operations	27th Day 1 Order of Operations	28th Day 2 Interpreting Expressions, Terms, & Coefficients	29th Day 3 Combining Like Terms	30th Day 4 Distributive Property
2nd No School	3rd Practice Day	4th Day 5 Translating Algebraic Expressions	5th Day 6 Creating Expressions from a Context	6th Day 6/7 Creating Expressions from a Context
9th Practice Day	10th Day 7 Creating Expressions from a Context	11th Day 8 Interpreting Expressions	12th Review Day	13th Unit 1 Assessment

Day 1 – Order of Operations Notes

Order of Operations is the order to which you perform operations in a math problem. Order of operations is CRUCIAL for all types of Algebra 1 topics – linear equations, quadratic equations, etc.

Order of Operations

1. Parenthesis or Grouping Symbols
2. Exponents
3. Multiplication or Division – whichever comes first
4. Addition or Subtraction – whichever comes first

Order of Operations - Parenthesis

- Things to Consider
 - Brackets can be used as parenthesis: $3 \times [7 + 1]$
 - You ALWAYS work from inside parenthesis to outside parenthesis: $3 + [4 - (2 \times 1)]$

a. $7 + (8 \times 4)$

b. $3(20 - 14) + (9 \cdot 1)$

c. $[(5 + 2) - 2] \times 6$

Order of Operations - Exponents

- Things to Consider
 - Any integer that has 0 as an exponent is always equal to 1: $5^0 = 1$
 - Any integer that has 1 as an exponent is always equal to itself: $7^1 = 7$
 - The exponent tell you how many times you are multiplying a number times itself: $4^3 = 4 \times 4 \times 4$

a. $4(1 + 3)^2$

b. $70 - 3 - (4 \div 2)^2$

c. $(5 + 2)^2 - 2 + [4^2 + 3]$

Order of Operations – Multiplication & Division

- Things to Consider
 - You multiply or divide depending on whichever operation comes first as you work from left to right.

a. $7 \div 1 \times 3$

b. $2^2 \cdot (4 \times 3)$

c. $6 \div 2[1 + (3 \times 2)]$

Order of Operations – Multiplication & Division

- Things to Consider
 - You add or subtract depending on whichever operation comes first as you work from left to right.

a. $3 \times 5 - 8 \div 4 + 6$

b. $6 + 2(4 + 1)^2$

c. $3^2 \div 3 + 4 \times 4 - 2$

Order of Operations – Fractions

- Things to Consider
 - Simplify everything in the numerator using order of operations
 - Simplify everything in the denominator using order of operations
 - Divide to find answer

a. $\frac{(2+3)^2 + 3}{2+15 \div 3}$

b. $\frac{(3 \cdot 3) - 4}{12 \div 4 + 1^4}$

Day 1 – Order of Operations Practice

1. Evaluate each of the following expressions:

a. $35 - (17 - 2) \div 5$

b. $24 - 9 \cdot 2 + 6 \div 3$

c. $12(2 + 7) - 24 \div 12$

d. $4(9 - 3) \div (8 - 2)$

e. $26 - [(25 - 11) - 2^3]$

f. $\frac{5(16 - 5) - 1}{4^2 - 7}$

2. Describe the error in evaluating the expression when $m = 8$.



$$\begin{aligned} 5m + 3 &= 5 \cdot 8 + 3 \\ &= 5 \cdot 11 \\ &= 55 \end{aligned}$$

Day 2 – Intro to Algebraic Expressions Notes

An expression containing variables (letters), numbers, and operation symbols is called an _____ . An expression does NOT contain an equal sign.

An example of an algebraic expression is $5x + 7y - 3$.

In an algebraic expression, there are four different parts: coefficients, variables, constants, and terms.

$$8x^2 - 5x + 7y - 3$$

Variables are the letters in an expression.

Coefficients are the numbers in front of the variables.

Constants are the “plain numbers” or terms without variables.

Terms are separated by a + or – sign and can be numbers and/or variables.

Practice: Complete the table below.

Expression	List Terms	List Coefficients	List Variables	List Constants
$2x + 5z - 3$				
13				
$6m^3 - 9m^2 + s - 4$				
$x^2 + 7x - 1$				

Evaluating Expressions

When you **evaluate** an expression, you are replacing the variable with what the variable equals:

Evaluate $4x - 5$ when $x = 6$

Practice: Evaluate the following expressions if $m = 7$, $r = 8$, and $t = -2$.

a. $5m - 6$

b. $\frac{r}{t}$

c. $3m - 5t$

d. $t^2 - 4r$

Application: Answer the following questions:

1. You earn $15n$ dollars for mowing n lawns.

a. How much do you earn for mowing 1 lawn?

b. How much do you earn for mowing 9 lawns?

2. After m months, the length of a fingernail is $10 + 3m$ millimeters.

a. How long is the fingernail, in centimeters, after 8 months?

b. How long is the fingernail after three years?

Day 2 – Intro to Algebraic Expressions Practice

1. Complete the table.

Expression	List the Terms	List the Factors	List the Variables	List the Coefficients	List the Constants
$3y^3 + 4y^2 - 7y + 1$					
$5x^4 - 9x^2$					
$-a^2 + 6a - 3$					
15					

2. Write an expression with exactly 5 terms, containing the coefficients 7, 21, -15, and 8. (Answers will vary.)

3. Evaluate the following expressions when $a = 10$, $b = 9$, and $c = 4$.

a. $a^2 - 18$

b. $bc + 12.3$

c. $3a + 2b - 6c$

4. Given $a = 8$, $b = -6$, $d = 3$, $x = -4$, $y = 0.5$, evaluate the following:

a. $x^2 + 3d$

b. $y(a - 2)$

c. $d(x - b)$

5. Evaluate the following expressions:

a. $6(3x - 5)$ if $x = 4$

b. $4(8 + 5x) + 2x$ if $x = -2$

c. $4 - 8(-2 - 6x)$ if $x = -1$

6. The expression $20a + 13c$ is the cost for a adults and c students to enter the science museum.

a. Find the total cost for 4 adults and 24 students.

b. You figure out the cost for the group, but then the number of adults and students in the group both double. Does the cost double? Explain your answer using an example.

c. In part A, the number of adults doubles, but the number of students is cut in half. Does the cost remain the same? Explain why or why not.

7. Answer the following using the scenario:

You really want to purchase the skateboard shown at the left. Your aunt gives you \$45 to start and you save \$3 each week. The expression $45 + 3w$ gives the amount of money you save after w weeks. Answer the following:



a. How much will you have after 4 weeks? 10 weeks? 20 weeks?

b. What does the 45 represent in the expression? What does the $3w$ represent?

c. Challenge: After how many weeks will you have enough money? Show how you arrived at your answer.

Day 3 – Simplifying Expressions: Combining Like Terms Notes

Terms with the same variable raised to the same exponent are **like terms**.

Like: $3x$ and $-7x$	Like: $2y^2$ and $6y^2$	Not Like: $4x$ and $6x^2$ Why???
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Directions: Simplify the following expressions:

1. $-3x + 6x$

2. $y - 3 + 6 - 2y$

3. $\frac{4x+6y}{2} - 3y$

4. $8m + 1n - 3 + 10$

5. $9x - 10x^2 + 7x - 3$

6. $x + 2y + \frac{3x-9y}{3}$

Day 3 – Simplifying Algebraic Expressions: Combining Like Terms Practice

1. Simplify each expression.

a. $5f + 8 - 13f$

b. $2x - 5x^2 + 3 + 4x$

c. $3x^2 + 6x - 2y + 4x^2 + 3y - x$

d. $\frac{4x+9-x}{3}$

e. $\frac{8x-20+2x}{5} - 7x + 2$

f. $\frac{6-5x-x+10}{2}$

2. Give an example of two like terms and two unlike terms. Explain why they would or would not be classified as like terms.

Like

Unlike

Day 4 – Simplifying Expressions: Distributive Property Notes

DISTRIBUTIVE PROPERTY STATES....

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

1. $5(x + 2)$

2. $-3(x - 4)$

3. $-6(-2x - 3)$

4. $4x - 5(x - 1)$

5. $-2(4 + x) + 4(2 - 8x) + 5$

6. $2(3 + x) - 3(1 - 4x) + 5$

7. $\frac{5-4(6x+2)}{3}$

8. $\frac{7(12+8x)-20}{4}$

9. $\frac{8x+3(7+x)+9x-1}{10}$

Connect: Take the simplified expression from number 6 and answer the following questions:

a. Identify all the terms: _____ b. Identify all the variables: _____

c. Identify all the coefficients: _____ d. Identify all the constants: _____

Day 4 – Simplifying Algebraic Expressions: Distributing Practice

1. Simplify each expression.

a. $3(2x - 4) + 2x$

b. $-2(8y - 4) + 9y + 6$

c. $\frac{13 + 2(7x - 3)}{7}$

d. $-(12 - 4x) + 8(10 - x)$

e. $7(2x - 4) - (10 - 3x)$

f. $\frac{6x + 9}{3} - 5 + 4(-x - 3)$

2. Stretch your thinking - Simplify the following expression: $5(x - 4) - (2x - 7) + x - 2(x + 3)$

Day 5 – Translating Algebraic Expressions Notes

Review: The Commutative and Associative Properties

<p><u>Commutative Property of Addition</u> (order doesn't matter)</p> <p>$5 + 6$ can be written as $6 + 5$</p> <p><u>Commutative Property of Multiplication</u> (order doesn't matter)</p> <p>5×6 can be written as 6×5</p>	<p><u>Associative Property of Addition</u> (grouping order doesn't matter)</p> <p>$2 + (5 + 6)$ can be written as $(2 + 6) + 5$</p> <p><u>Associative Property of Multiplication</u> (grouping order doesn't matter)</p> <p>$(2 \times 5) \times 6$ can be written as $2 \times (6 \times 5)$</p>
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Addition	Subtraction	Multiplication	Division	Exponents
Sum	Difference	Of	Quotient	Power
Increased by	Decreased by	Product	Ratio of	Squared
More than	Minus	Times	Each	Cubed
Combined	Less	Multiplied by	Fraction of	
Together	Less than	Double, Triple	Out of	
Total of	Fewer than	Twice	Per	
Added to	How many more	As much	Divided by	
Gained	Left	Each	Split	
Raised	Use Parenthesis: The quantity of			
Plus				

Subtraction and **Division** can be very tricky because order DOES matter unlike **Addition** and **Multiplication**. Take a look at the following verbal descriptions:

Addition	Multiplication	Subtraction	Division
The sum of x and 4.	The product of x and 3.	The difference of x and 5.	The quotient of x and 7
		x decreased by 5	The ratio of x and 7
		Five less than x	

Practice: Write the expression for each verbal description:

1. The difference of a number and 5
2. The quotient of 14 and 7
3. y decreased by 17
4. x increased by 6
5. The sum of a number and 8
6. 6 squared
7. Twice a number
8. 8 more than a third of a number
9. 6 less than twice k
10. Five divided by the sum of a and b .
11. The quotient of k decreased by 4 and 9.
12. 2 minus the quantity 3 more than p
13. Half of the quantity 1 less than w
14. Nine less than the total of a number and 2.
15. The product of a number and 3 decreased by 5

Practice: Write each as a verbal expression. You may not use the words add, subtract (minus), times, or divide.

1. $\frac{x}{2}$
2. $a + 9$
3. $5n - 7$
4. $3(y + 7)$

Day 5 – Translating Algebraic Expressions Practice

1. Write each phrase as an algebraic expression:a. Fourteen decreased by a number p .

b. Five more than twice a number.

c. 14 less than m .d. 18 more than y .

e. The quotient of a number and 9

f. The product of 5 and y added to 3

g. 4 times a number cubed decreased by 7

h. 3 more than four times a number

i. Nine less than twice a number

j. A number decreased by four

k. One less than three times a number

l. The ratio of c to d

m. Twelve subtracted from a number

n. The sum of three times a number and five

o. Three times the difference of a number cubed & ten

p. Two times the quantity of p and three

q. Four times the difference of a number square and six

r. Eight times the sum of a number and five

Day 6 - Creating Expressions from a Context Notes

Think About It: At the post office, it costs \$5.95 to ship a package that weighs up to five pounds. If Sarah wanted to ship _____ boxes, how much would it cost? (Show your calculations)

a. 3 boxes

b. 5 boxes

c. 8 boxes

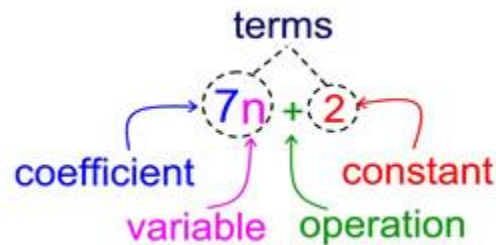
d. x boxes

e. In the above problem, what value remained constant? _____

f. What did that value represent? _____

g. In the above problem, what continued to change? _____

As we begin studying Algebra, one of the most important concepts you will encounter is the use of a symbol, typically a letter, to represent a quantity that varies or changes. The use of letters or symbols is called **variables**. When you perform the same mathematical process over and over, you can use an **algebraic expression** to represent the situation.



Practice: Use the tables below to create an expression to represent each situation. Then answer the questions on the right.

Scenario A: A school lunch costs \$2.10 per student. Determine how much is collected for each number of students. Show your work in the table

# of students	Cost
52	
78	
429	
x	

a. What value remains constant?

b. What does that value represent?

c. What continuously changes?

d. What expression represents the situation?

e. What does the variable, x, represent?

Scenario B: The cost to rent a skating rink is \$215. The cost will be shared equally among all the people who attend the party. Determine how much each person will pay if the following amount of people attend.

# of people	Cost
25	
43	
81	
x	

- What value remains constant?
- What does that value represent?
- What continuously changes?
- What expression represents the situation?
- What does the variable, x, represent?

Scenario C: A water tank hold 100 gallons of water. The tank is leaking at a rate of two gallons a minute. Determine how many gallons of water will be left in the tank if it leaks for the following amount of minutes.

# of minutes	# of gallons remaining
1	
10	
34	
x	

- What value(s) remains constant?
- What does that value represent?
- What continuously changes?
- What expression represents the situation?
- What does the variable, x, represent?

Scenario D: For competing in the Spelling Bee, I get \$3 for each correct word I spell in addition to \$50 for participating. Determine how much money I will make for each of the correct words I spell.

# of words	Amount of \$ I get
6	
18	
30	
x	

- What value(s) remains constant?
- What does that value represent?
- What continuously changes?
- What expression represents the situation?
- What does the variable, x, represent?

Day 6 – Creating Expressions from a Context Practice

For each word problem, show the work to how you arrived at your answer for parts A and B. Define the quantity that is changing each time in part C. Using your work, create an algebraic expression for part D.

a. *You buy 100 yo-yos to give away as prizes at a carnival.*

- If 12 people win a prize, how many yo-yos will you have left?
- How many yo-yos will you have if 34 people win a price?
- What quantity is changing each time? What variable will you use to represent this quantity?
- Write an expression to represent the scenario.

b. *Bulk trail mix costs \$1.95 per pound.*

- If you purchase 4 pounds of trail mix, how much will that cost?
- If you purchase 7 pounds of trail mix, how much will that cost?
- What quantity is changing each time? What variable will you use to represent this quantity?
- Write an expression to represent the scenario.

c. *The charge for ice skating is \$3 for the skate rental and \$2 per hour to skate.*

- How much will you pay for 4 hours of skating?
- How much will you pay for $5\frac{1}{2}$ hours of skating?
- What quantity is changing each time? What variable will you use to represent this quantity?
- Write an expression to represent the scenario.

d. You have \$15 to spend at the snack bar. All of the snacks at the snack bar cost \$1.50 each.

- a. How much money will you have left if you buy 3 snacks?
- b. How much money will you have left if you buy 6 snacks?
- c. What quantity is changing each time? What variable will you use to represent this quantity?
- d. Write an expression to represent the scenario.

e. Atlanta City Cab charges \$3.30 as an initial fee the minute the customer enters the cab. The company then charges \$2.40 per mile.

- a. How much will it cost to ride if the cab travels 10 miles?
- b. How much will it cost to ride if the cab travels 13.5 miles?
- c. What quantity is changing each time? What variable will you use to represent this quantity?
- d. Write an expression to represent the scenario.

f. Caitlin has \$200 in her savings account. She withdraws \$15 each week.

- a. How much will she have remaining after 5 weeks?
- b. How much will she have remaining after 9 week?
- c. What quantity is changing each time? What variable will you use to represent this quantity?
- d. Write an expression to represent the scenario.

Day 7 – Creating Algebraic Expressions from a Context Notes

Yesterday, you explored creating algebraic expressions from looking at patterns and using tables. Today, you are going to continue to create algebraic expressions, but at a much deeper level.

Scenario A: A local restaurant is busiest on Saturday evenings. The restaurant has three cooks who work during this time. The cooks divide the incoming orders among themselves. So far, they have prepared 27 total.

- If 15 additional orders come in, how many meals will each cook prepare?
- If 42 additional orders come in, how many meals will each cook prepare?
- Write an expression to represent the unknown number of meal each cooks prepare. Let m represent the number of additional orders.

Scenario B: Trey is selling candy bars to raise money for his basketball team. The team receives \$1.25 for each candy bar sold. He has already sold 25 candy bars.

- If Trey sells 10 more candy bars, how much money will he raise for the basketball team?
- If Trey sells 45 more candy bars, how much money will he raise for the basketball team?
- Write an expression to represent the unknown amount of money Trey will raise for the basketball team. Let c represent the additional candy bars sold.

Scenario C: Four friends decide to start a summer business of yardwork for their neighborhood. They will split all their earnings evenly. They have lawnmowers, but need to invest some money into rakes, trash bags, rakes, and hedge trimmers. They have to spend \$75 on these supplies.

a. How much profit will each friend receive if they earn \$350 the first week?

b. How much profit will each friend receive if they earn \$475 the first week?

c. Write an expression that represents the unknown profit for each friend. Let d represent the amount of money earned.

Scenario D: Rebekah, Daily, Savannah, and Faith each collect DVDs.

Daily says "I have twice as many DVDs as Rebekah."

Savannah says "I have four more DVDs than Daily."

Faith says "I have three times as many as Savannah."

# of DVDs for Rebekah	# of DVDs for Daily	# of DVDs for Savannah	# of DVDs for Faith	Total # of DVDs
2				
5				
8				
x				

Day 7 – Creating Expressions from a Context Practice

For each word problem, show the work to how you arrived at your answer for parts A and B. Define the quantity that is changing each time in part C. Using your work, create an algebraic expression for part D.

1. *Conner gets \$20 per week allowance. He also makes \$10 per lawn he mows. He saves half of his money each week. Let's look at what he gets for ONE week.*

- If he mows 3 lawns, how much will he have to spend?
- If he mows 8 lawns, how much will he have to spend?
- What quantity is changing each time? What variable will represent this quantity?
- Write an expression to represent the scenario.

2. *Katherine is trying to read as many books as possible this semester. Her father will give her a quarter for every book she reads. She has already read 17 books.*

- If she reads 30 more books, how much money will her father owe her?
- If she reads 42 more books, how much money will her father owe her?
- What quantity is changing each time? What variable will represent this quantity?
- Write an expression to represent the scenario.

3. *Four students are assigned a project. They must each write an even portion of their summary paper. They each already wrote one page of introduction.*

- If the paper is to be 32 pages long, how many more pages does each student need to write?
- If the paper is to be 64 pages long, how many more pages does each student need to write?
- What quantity is changing each time? What variable will represent this quantity?
- Write an expression to represent the scenario.

Day 8 – Interpreting Expressions Notes

a. Hot dogs sell for \$1.80 apiece and hamburgers sell for \$3.90 apiece. This scenario can be represented by the expression $1.80x + 3.90y$. Identify what the following parts of the expression represent.

1.80	
3.90	
x	
y	
$1.80x$	
$3.90y$	
$1.80x + 3.90y$	

b. Noah and his friends rent a sailboat for \$15 per hour plus a basic fee of \$50. This scenario can be represented by the expression $15h + 50$.

15	
h	
$15h$	
50	
$15h + 50$	

c. A teacher has \$600 to spend on supplies. They plan to spend \$40 per week on supplies. This scenario can be represented by the expression $600 - 40w$.

600	
-40	
w	
$-40w$	
$600 - 40w$	

Day 8 – Interpreting Expressions Practice

a. Alex goes to a soccer game and can buy candy for \$1.50 and soda for \$2.25. This scenario can be modeled by the expression $1.50x + 2.25y$. Identify what the following parts of the expression represent.

1.50	
2.25	
x	
y	
$1.50x$	
$2.25y$	
$1.50x + 2.25y$	

b. Haylie loves to watch movies. She joined a movie club where she pays \$5 to join the club and each movie she watches is \$2. The expression that models her scenario is $5 + 2d$. Identify what the following parts of the expression represent.

2	
d	
$2d$	
5	
$5 + 2d$	

c. Oleg is on a strict budget for grocery shopping. He has set aside \$600 and has budgeted that he can spend \$75 per week on groceries. The expression that models his scenario is $600 - 75w$. Identify what the follow parts of the expression represent.

600	
-75	
w	
$-75w$	
$600 - 75w$	

d. Kylie is going shopping and finds that sweaters cost her \$25 and jeans cost her \$30. She has a coupon for 20% off her total purchase. The expression that models her scenario is $.80(25s + 30j)$. Identify what the following parts of the expression represent.

25	
s	
25s	
30	
j	
30j	
.80	
$.80(25s + 30j)$	