ALGEBRAIC EXPRESSIONS

$3(x - 8)$
is
$3x + (-24)$ or $3x - 24$

$-2x + 5x - 9 + 10$
is
$3x + 1$

$4x + 12$
is
$4(x + 3)$

S	Survey
P	Parentheses
C	Catch & Combine
=	...in equations...
A	Clear Add/Subtract
D/M	Clear Division/Multiplication

Name _____

Period _____

Simplifying Algebraic Expressions by Combining Like Terms

+ C

Objective: Students will identify like terms.
Students will simplify algebraic expressions by combining like terms.

Term	Definition	Picture/Example
Terms	Quantities that you ADD to form an algebraic expression are called terms.	There are 3 terms in 4n + 6b – 8 The terms are:
Like Terms **You can COMBINE Like Terms** ****COMBINE means add, so use the addition rules (SSS, DSD)**	terms with the **same variable** raised to the **same power** **You CAN add/subtract like terms.**	
Unlike Terms	terms whose variables are not the same, or who have the same variable, but it's raised to a different power **You CANNOT add/subtract unlike terms.**	

For each algebraic expression, identify the number of terms. Then list the coefficients and any constant terms.

Expression	$6a + 3$	$6a - 3$	$0.2x - y + 8z$	$\frac{1}{2}n$
Number of Terms				
Coefficient(s)				
Constant(s)				

Identify the number of terms, the coefficients, and the constant term of the expressions below.

1. **$7p - 6pc + 3c - 2$**

Number of terms: _____

Coefficients: _____

Constant terms: _____

2. **$8 + 4ab - 5b$**

Number of terms: _____

Coefficients: _____

Constant terms: _____

To simplify by combining like terms:

+ C

1. Search for like terms (**same variable** raised to the **same power; and constants with other constants**).

2. Catch the first term and any like terms.

3. Combine them using the addition rules. (SSS, DSD)

4. Continue with other like terms.

*Remember that an "invisible 1" lurks in front of variables that appear to have no coefficient attached to them.

1) $4x + 5x + 7 + x + 2$

_____

2) $2n + 3 - 5n + 6$

_____

3) $-9b + 2n - 4 + 2b$

_____

4) $-7g + 3 - 8 - 3g + 7h$

_____

5) $-8 + 2d - 7 - 5d + 12$

_____

_____

6) $5b + 7 - 3b - 4$

_____

_____

HOMEWORK

+ C

Identify the number of terms, the coefficient(s), and the constant term(s) of the expressions below.

1. **6p – 7pc + 9c – 4**

Number of terms: _____

Coefficients: _____

Constant terms: _____

2. **3 + 4ab - 5b + m**

Number of terms: _____

Coefficients: _____

Constant terms: _____

3. Sarah was asked to identify all coefficients and constants of the expression **4 + n + 7m**. She said that 4 is a constant, and 7 is a coefficient.

What is her error?

a. She did not include the constant 1.
b. She said 4 is a constant. It is actually a coefficient.
c. She did not include the coefficient 1.
d. She said 7 is a coefficient. It is actually a constant.

4. Add. 2a + 8 + 4b + 5

5. Add. 8x – 7 + 6x + 8

6. Find the sum. 8x + 2 -9x + 7

7. Find the sum. **3n + 4 – 8n -1**

Variable	**A symbol used to represent an unknown amount.** **The symbol is usually a letter of the alphabet.**	
Coefficient	**The number being multiplied by a variable.** **It is the number attached to the variable, and is *usually* in front.**	
***Special note!**	**A variable with no coefficient has an "INVISIBLE 1" attached to it!**	
Constant	**A number that doesn't change. There is no variable attached to a constant.**	
Algebraic Expression	**An expression that contains variables.**	

Expanding Algebraic Expressions (The Distributive Property) day 1

Objective: Students will simplify algebraic expression using the distributive property.

Term	Definition	Example
Distributive Property	The distributive property combines multiplication with addition and subtraction	

You can **multiply constants and algebraic terms** simply by **multiplying the constant and the coefficient**.
The variable remains the same.

Remember, if the variable has **no coefficient, it's an invisible 1**.

a. $2(3x) =$ _____ b. $-2(3d) =$ _____

c. $5(n) =$ _____ d. $-3y(4) =$ _____

You can also **multiply variables** by one another.

e. $a \bullet t =$ _____ f. $b(y) =$ _____

g. $3c(b) =$ _____ h. $2n(4x) =$ _____

But what happens when you have more than one term inside the parentheses?

Examples: $2(n + 4)$ $3(x - 8)$

The Distributive Property

x P (clear Parentheses)

KISS  YOUR PARENTHESES GOODBYE!

Step 1: Catch the number touching the parentheses (on the outside) and any number inside that has a sign.

Step 2: Multiply the number on the *outside* of the parentheses by the FIRST number *inside* the parentheses.

I "times" over the rainbow ☺

Step 3: Multiply the number on the *outside* by the SECOND number that's inside.

Examples:

1. 3(4x + 2)
2. -3(4x + 2)
3. -3(4x - 2)

x P

1. 5(x + 3) b. 2(x + 1) c. 4(x + 5)

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

3. -4(x - 4) b. -8(x - 3) c. -1(x - 7)

4. -3(2x - 5) b. -2(4x - 7) c. -2(6x - 8)

5. a(b - 4) b. n(d + 1) c. y(5 - z)

6. 2a(3p - 5) b. 4n(6d + k) c. 5y(6h - w)

HOMEWORK | x P

a. $3(x + 2)$ b. $5(2y - 7)$ c. $-2(n + 9)$

d. $-3(k - 1)$ e. $-4(1 + a)$ f. $3(d - 4)$

g. $-1(3x + 4)$ h. $-3(b - 9 + 2y)$ i. $-5(2 - m)$

j. $3(n - 4 + 5y)$ k. $-6(j - 2 + 3k)$ l. $-1(3 - h)$

Expanding Algebraic Expressions (The Distributive Property) day 2

x P

Let's review using the distributive property:

1. 3(x – 4)
2. 4(n + 1)
3. -5(x – 5)
4. $\frac{1}{2}(10)$
5. $\frac{1}{2}(12)$
6. $\frac{1}{3}(9)$
7. $\frac{1}{4}(16)$
8. $\frac{1}{2}(6x+10)$
9. $\frac{1}{2}(8x-4)$
10. $\frac{1}{3}(12x+9)$
11. $\frac{1}{3}(15x-3)$
12. 5(2x + 1 – n)

Objective: Students will simplify algebraic expression using the distributive property. Students will recognize that a problem can be written in different forms. Students will recognize that some problems that have parentheses, may NOT require the dist. property.

Remember!

The distributive property is **multiplication** over **addition** or **subtraction**. This means that in order to distribute, you must have a term (constant or variable) that is touching parentheses that contain more than one term. Those terms must be separated by addition or subtraction signs, NOT multiplication or division signs.

ERROR ALERT!

Some addition and subtraction problems *look very similar* to distributive property problems.

Ex. -3(x + 7) This expression requires the distributive property.

(5 – x)(-2) This expression requires the distributive property.

(5 – x) – 8 and 2(n • 4) These expressions do not!

1. Circle the problems that require the distributive property. Put an X through those that do NOT require the distributive property.

-a(3 + b)	(-a)(3) + (b)	(3 + b) - a	(3 + b)(-a)
4(2 • n)	(3 – g)(-5)	(-4)(6) + n	(8 + h) - 2

SHOULD I USE THE DISTRIBUTIVE PROPERTY??

YES	NO
-3(x + 1)	-3 + (x + 1)
(2x – 4)(3)	(2x – 4) + 3
(3 + y)(-2)	$(3 \cdot y)(-2)$

Use the Distributive Property to expand each expression.

x P

Ex. $-4(2n + 5)$

a. $3(4x + 2)$

b. $-5(y - 7)$

c. $-2(n + 9)$

d. $3(-1 - 5c)$

e. $x(3 + 4y)$

f. $-1(a - 1)$

g. $\frac{1}{2}(4x - 6)$

h. $-\frac{1}{4}(8x + 12)$

i. $\frac{3}{4}(8x - 12)$

HOMEWORK

Expand the expressions that require the distributive property.
Put an X through the expressions that do not require the distributive property.
REMEMBER—you can only distribute (multiply) over addition or subtraction!

1. $-6(a + 8)$
2. $4(1 + 8x + a)$
3. $(-5n + 7)6$
4. $2 + (4k - 3)$
5. $(9m + 10) \bullet 2$
6. $-8(-b - 4)$
7. $(3)(y)(-2)$
8. $5(3 \bullet y)$
9. $-4(-6p + 7)$
10. $-4(n \div 5)$
11. $\frac{1}{3}(9n + 15)$
12. $\frac{1}{2}(6b - 10)$

Simplifying Algebraic Expressions by Distributing and Combining Like Terms

Simplifying Algebraic Expressions by Distributing and Combining Like Terms

S
P
C
=
A
D/M

Objective: Students will simplify algebraic expressions by combining like terms.

Students will recognize when the distributive property is required to simplify an expression and when it is not.

Before simplifying an expression that contains parentheses, you must determine whether or not you need to use the distributive property. If so, **DO IT FIRST**!

A. Simplify the expressions below (Hint: **ONE** of them needs dist. property).

a. $2x + 5 + (6x + 1)$

b. $2x + 5 + 6(x + 1)$

B. Sometimes you will need to CATCH the term (including a subtraction sign) before you distribute.

1. $x - 2(x + 3)$

2. $3n - 2(n + 5)$

3. $4h - 3(2h + 5)$

Simplify. (Ask… Do I need to distribute? If so, do it FIRST!)

S
P
C
=
A
D/M

1. $3(x + 6y - 7)$

2. $-7(2x - 4)$

3. $4(3x + 7) - 5x$

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

S
P
C
=
A
D/M

Extra Practice

Rewrite the expressions *without parentheses*.

(Hint: check for dist. property first!) Then simplify.

1. $8 + (2x - 1)7$

2. $-3(3x - 5) + 8x$

3. $9x + 2 + (3x - 7)$

4. $12x + (-4x + 1)3$

5. $2y + 7(2y - 3)$

6. $-8y + 4(3y + 3) - 5$

7. $-4 + (3n - 5) - 7n$

Notice the difference between #7 and #8.

8. $-4(3n - 5) - 7n$

HOMEWORK

S
P
C
=
A
D/M

Simplify.

1a. $-3(2x - 3y - 5)$

1b. $-4(2y - 3) + 7y$

2a. $(b - 7) + (3b - 9)$

2b. $(-6x - 11) + (5x + 12)$

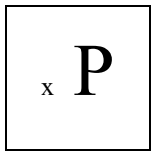
3a. $-2(-4x + 5) + 6x$

3b. $7x + 3(-2x + 3)$

4. For each algebraic expression, identify the number of terms. Then list the coefficients and any constant terms.

Expression	$8x - 3$	$4x + y + 11$
Number of Terms		
Coefficient(s)		
Constant(s)		

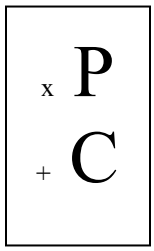
Simplifying Algebraic Expressions by Distributing and Combining Like Terms



1.a 3(x + 6y – 7)

1.b. -7(2x – 4)

Distribute first…. then catch and combine like terms.



2a. 4(3x + 7) - 5x

2.b. -2(-4x + 5) + 3x

Ask… Do I need to distribute? If not, Catch and Combine Like Terms.

3a. 5x + 6y – 4x + 3y – 9

3.b. - 9x + 7 –x + 5x - 4y

Ask… Do I need to distribute? If so, do it first. Then "Bring Down the Junk." If not, drop the parenthesis and then catch and combine like terms.

4a. (x – 5) + (4x – 2)

4b. 6x + 4(-2x + 3)

HOMEWORK

Rewrite the expression *without parentheses*. Ask…
Do I need to distribute? If so, do it first. Then "Bring Down the Junk." If not, drop the parenthesis and then catch and combine like terms.

x P
+ C

1. 7(2x – 1) + 8

2. -3(3x – 5) + 8x

3. 9x + 2(2x – 7)

4. 12x + 3(-4x + 1)

5. 12y + 7(2y – 3)

Adding and Subtracting Algebraic Expressions

Objective: Students will add and subtract algebraic expressions.

Recall that only ***like terms*** can be added or subtracted.

Simplify the following problem by combining like terms.

Ex 1: $(2n + 3) + (4n + 5)$

Ex 2: $(-3h + 2) + 3(4h - 2)$

***Subtraction of expressions can be especially difficult!

Note the difference between the two problems below.
Which problem requires the distributive property to simplify it? _____

Rewrite using the distributive property where necessary.

$(8x - 3) + 2(3x + 1)$ and $(8x - 3) - 2(3x + 1)$

Note the difference between the two problems below.
Which problem requires the distributive property to simplify it? _____

Rewrite using the distributive property where necessary.

$(7x - 3) + 1(4x + 1)$ and $(7x - 3) - 1(4x + 1)$

Recall that often times in math the 1 is "invisible", as is a -1.

Here are the same problems rewritten with an "invisible" 1.

$(7x - 3) + (4x + 1)$ and $(7x - 3) - (4x + 1)$

HOWEVER, that means ***when there is a subtraction sign between expressions***, you must think of it is as ***distributing a*** -1.

a. Distribute the -1

$(6n - 5) - (2n + 1)$

b. Distribute the -1

$(8a + 1) - (2a + 4)$

c. Distribute the -1

$(5h - 4) - (2h + 1)$

d. Distribute the -1

$(2n + 4) - (n - 1)$

e. Distribute the -1

$(-2x - 5) - (6x + 3)$

f. Distribute the -1

$(-3y + 1) - (4y + 8)$

HOMEWORK

1. Distribute the -1

$(6h + 4) - (2h + 3)$

x P
+ C

2. Distribute the -1

$(6h + 4) - (2h - 3)$

3. Distribute the -1

$(6h - 4) - (2h - 3)$

Factoring Algebraic Expressions

Objective:

Students will factor algebraic expressions by **REVERSING the distributive property.**

Term	Definition	Example
Factor (as a noun)	**A number that is multiplied by another number to get a product.**	**List the factors of 18 and of 12.**
Factor (as a verb)	**When you factor an expression, you reverse the distributive property.** **The number on the outside of the parentheses is the GCF.**	**Factor: 18n + 12** Skeleton: **____ (_____+_____)** 1. Find the GCF of the numbers. 2. Find the GCF of the variables. 3. The GCF's go on the outside. 4. The leftovers go on the inside.
Greatest Common Factor	**The largest factors that is shared by two or more numbers.**	**The GCF of 18 and 12 is ____.** **(See top example.)**
Factored Form	**An expression in factored form has the GCF on the outside of the parentheses, and a sum or difference on the inside.**	**The factored form of 18n + 12 is _____.** **(See 2nd example.)**

Ex 1. Factor. $14xy + 21x$

To factor an algebraic expression you **use division to undo the distributive property**.

1. **Make the "skeleton" of a distributive property problem under the given one. It will look like this: __ (___ + ___) or __ (___ - ___) this.**

2. **Look for a variable that is shared by the terms (they may share more than one); circle it and then place the shared variable on the outside, next to the parentheses.**

3. **Bring down any variables not circled.**

4. **Find the GCF of the coefficients. (Check to see if the smallest # you see is a factor of the others. If so, it's the GCF. Otherwise, use the "rainbow" method.)**

5. **Place the GCF on the outside of the parentheses. If there are any letters already there, the GCF will become their coefficient.**

To fill the inside:

6. **Divide the 1st term by the GCF you found. Place the quotient on the line.**

7. **Divide the 2nd term by the GCF you found. Place the quotient on the line.**

8. **Repeat until all terms have been divided by the GCF.**

9. **Check your work by applying the distributive property to your answer to see if it matches the original expression.**

Ex 2. $\mathbf{12x + 6}$

Ex. 3 **5b – 15n**

Ex. 4 **3n – nj**

Use the distributive property to check.

1. 10n + 15

Check:

2. 8y - 12y

Check:

3. 8n – 2

Check:

4. 14z + 21

Check:

5. 4h - 12

Check:

6. $8a + 4$

Check:

7. $12a + 16b - 10c$

Check:

8. $12x - 24y - 3$

Check:

9. $9n + 7n$

Check:

10. $-5xy + 25x$

Check:

11. $18b + 3$

Check:

HOMEWORK

1. Write the factored form of each expression.
2. Check using distributive property.

a. **18a + 3**

Check:

b. **-2c + 6d**

Check:

c. **20xy + 10x**

Check:

Error analysis: Ali factored the above problem, c, and got **2x(10y + 5)**. When she checked it using the distributive property, she got the original problem! Since her check worked, she thinks she has the correct answer. How can that be? Explain her mistake.

3. **Error analysis**: Jamie incorrectly factored **15x – 20xy**. She got 5x(3 – 4xy). Factor the expression correctly.

What error did she likely make?

a. She did not have the correct operation inside parentheses.
b. She did not factor the variable from the first term.
c. She did not factor the variable from the second term.
d. She did not simplify the terms inside the parentheses.

HOMEWORK

More factoring practice.

1. $24xy + 10x$

2. $15m - 18mn$

3. $4x - xy$

4. $42x + 7y$

5. $4x - 2xy$

6. $32xyz + 12xy$