Introduction to Variables, Terms, and Expressions

Interactive Math Notebook Activities and Scaffolded Notes

- What is a Variable?
- What is an Expression?
- What is an Exponent?
- Exponents: the Short Way vs. the Long Way
- Exponents: Do Parentheses Make a Difference?
- What is an Equivalent Expression?
- Terms and Coefficients
- Multiplying Terms
- Simplifying Expressions Taken to a Power
- Like Terms and Unlike Terms
- Match the Like Terms
- Combining Like Terms (Match)
- Combining Like Terms (Expressions with only one type of term)

Combining Like Terms (Expressions with more than one type of term)

- What is the Distributive Property?
- Distributive Property (Match)
- How do you evaluate an expression?
- What is the difference between $5b$ and b^5?
- What is the difference between $2ab^3$ and $2(ab)^3$ and $(2ab)^3$?
- Evaluating Expressions Practice

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Scaffolded Notes

What is a variable?

Example

What is an expression?

Write an example of an expression with one variable.

Write an example of an expression with two variables.

Substitute the values from the table into your expression with one variable.

-3	
0	
5	

Substitute the values from the table into your expression with two variables.

-3	1	
0	2	
5	-4	

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What is a variable?

Letters that represent unknown values

Example

x a b y

What is an expression?

Numbers, symbols, and operations that are grouped together to represent a pattern

Write an example of an expression with one variable.

$2x + 1$

Write an example of an expression with two variables.

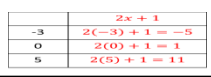
$2a + 3b - 1$

Substitute the values from the table into your expression with one variable.

x	$2x + 1$
-3	$2(-3) + 1 = -5$
0	$2(0) + 1 = 1$
5	$2(5) + 1 = 11$

Substitute the values from the table into your expression with two variables.

a	b	$2a + 3b - 1$
-3	1	$2(-3) + 3(1) - 1 = -4$
0	2	$2(0) + 3(2) - 1 = 5$
5	-4	$2(5) + 3(-4) - 1 = -3$



What is an exponent? What does the base tell you? What does the exponent tell you?	Exponential Form	Exponential Form
	Factored Form	Factored Form
	Multiplied Form	Multiplied Form

Use exponents to shorten an expression with multiplication in one variable.		Write out an expression with multiplication in one variable the long way.	
Use exponents to shorten an expression with multiplication of two variables in parentheses.		Write out an expression with multiplication of two variables in parentheses the long way.	
Use exponents to shorten an expression with multiplication of a variable and a number in parentheses.		Write out an expression with multiplication of a variable and a number in parentheses the long way.	
Use exponents to shorten an expression with multiplication of the sum of a variable and a number in parentheses.		Write out an expression with multiplication of the sum of a variable and a number in parentheses the long way.	
Use exponents to shorten an expression with multiplication of a mix of variables.		Write out an expression with multiplication of a mix of variables the long way.	
Use exponents to shorten an expression with multiplication of a mix of numbers and variables.		Write out an expression with multiplication of a mix of numbers and variables the long way.	

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What is an exponent? A number that tells you how many times a number or expression is supposed to be multiplied by itself. What does the base tell you? The number that is going to be multiplied over and over again. What does the exponent tell you? The exponent tells you how many times you multiply the base by itself.	Exponential Form 4^2	Exponential Form 7^3
	Factored Form $4 \cdot 4$	Factored Form $7 \cdot 7 \cdot 7$
	Multiplied Form 16	Multiplied Form 343

Use exponents to shorten an expression with multiplication in one variable.	$aaaa$ can be written as a^4	Write out an expression with multiplication in one variable the long way.	b^3 can be written as bbb
Use exponents to shorten an expression with multiplication of two variables in parentheses.	$(ab)(ab)(ab)$ can be written as $(ab)^3$	Write out an expression with multiplication of two variables in parentheses the long way.	$(xy)^4$ can be written as $(xy)(xy)(xy)(xy)$
Use exponents to shorten an expression with multiplication of a variable and a number in parentheses.	$(3b)(3b)(3b)$ can be written as $(3b)^3$	Write out an expression with multiplication of a variable and a number in parentheses the long way.	$(5g)^2$ can be written as $(5g)(5g)$
Use exponents to shorten an expression with multiplication of the sum of a variable and a number in parentheses.	$(x+2)(x+2)$ can be written as $(x+2)^2$	Write out an expression with multiplication of the sum of a variable and a number in parentheses the long way.	$(5+g)^4$ can be written as $(5+g)(5+g)\ (5+g)(5+g)$
Use exponents to shorten an expression with multiplication of a mix of variables.	$mmnnppp$ can be written as $m^2n^2p^3$	Write out an expression with multiplication of a mix of variables the long way.	x^3y^4 can be written as $xxxyyyy$
Use exponents to shorten an expression with multiplication of a mix of numbers and variables.	$2 \cdot 4 \cdot xxyyz$ can be written as $8x^2y^2z$	Write out an expression with multiplication of a mix of numbers and variables the long way.	$12c^4d^2$ can be written as $12ccccdd$

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Write out the expression $3a^4$ the long way.	Write out the expression $(3a)^4$ the long way.	Is there a difference between the first and second expression? Explain.
Give another example of the difference between a term with an exponent attached to parentheses and an exponent that does not have parentheses.		

What is an equivalent expression?	Example

What is a term? Give an example.	What is a coefficient? Give an example.

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Write out the expression $3a^4$ the long way.	Write out the expression $(3a)^4$ the long way.	Is there a difference between the first and second expression? Explain.
$3aaaa$	$(3a)(3a)(3a)(3a)$	Because of the parentheses, the second expression also takes 3 to the 4th power.

Give another example of the difference between a term with an exponent attached to parentheses and an exponent that does not have parentheses.

$4v^2$ vs. $(4v)^2$

$4vv \neq 16vv$

What is an equivalent expression?	Example
An expression that has the same value as the equation you are working with	$2(x+4)\ and\ 2x+8$ are equivalent expressions

What is a term? Give an example.	What is a coefficient? Give an example.
A number, a variable, a product of a number and variables, or a quotient of a number and variables $6xy^2, 3c, x, -8m$	The number in your term $3c$

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Multiplying Terms

Example 1 Write out the problem.	Example 2 Write out the problem.	Example 3 Write out the problem.	Example 4 Write out the problem.
Step 1: Multiply the number terms together.	Step 1: Multiply the number terms together.	Step 1: Multiply the number terms together.	Step 1: Multiply the number terms together.
Step 2: Multiply the variable parts together.	Step 2: Multiply the variable parts together.	Step 2: Multiply the variable parts together.	Step 2: Multiply the variable parts together.
Answer	Answer	Answer	Answer

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Simplifying Expressions Taken to a Power

Example 1 Write out the problem.	Example 2 Write out the problem.	Example 3 Write out the problem.	Example 4 Write out the problem.
Write out the problem the long way.	Write out the problem the long way.	Write out the problem the long way.	Write out the problem the long way.
Step 1: Multiply the number terms together.	Step 1: Multiply the number terms together.	Step 1: Multiply the number terms together.	Step 1: Multiply the number terms together.
Step 2: Multiply the variable parts together.	Step 2: Multiply the variable parts together.	Step 2: Multiply the variable parts together.	Step 2: Multiply the variable parts together.
Answer	Answer	Answer	Answer

Multiplying Terms

Example 1	Example 2	Example 3	Example 4
Write out the problem. $(2mn)(3n)$	Write out the problem. $(6t)(2st)$	Write out the problem. $(-2j)(4j)$	Write out the problem. $(7uv)(2u^2v)$
Step 1: Multiply the number terms together. $(2 \cdot 3)(mnm)$ $(6)(mnm)$	Step 1: Multiply the number terms together. $(6 \cdot 2)(tst)$ $(12)(tst)$	Step 1: Multiply the number terms together. $(-2 \cdot 4)(jj)$ $(-8)(jj)$	Step 1: Multiply the number terms together. $(7 \cdot 2)(uvu^2v)$ $(14)(uvu^2v)$
Step 2: Multiply the variable parts together. $6(mnm)$ $6(m^2n)$	Step 2: Multiply the variable parts together. $12(tst)$ $12(t^2s)$	Step 2: Multiply the variable parts together. $-8(jj)$ $-8(j^2)$	Step 2: Multiply the variable parts together. $14(uvu^2v)$ $14(u^3v^2)$
Answer $6m^2n$	Answer $12t^2s$	Answer $-8j^2$	Answer $14u^3v^2$

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Simplifying Expressions Taken to a Power

Example 1	Example 2	Example 3	Example 4
Write out the problem. $(2xy)^3$	Write out the problem. $(2a^2b)^2$	Write out the problem. $(3b)^4$	Write out the problem. $(4v)^5$
Write out the problem the long way. $(2xy)(2xy)(2xy)$	Write out the problem the long way. $(2a^2b)\ (2a^2b)$	Write out the problem the long way. $(3b)(3b)(3b)(3b)$	Write out the problem the long way. $(4v)(4v)(4v)(4v)(4v)$
Step 1: Multiply the number terms together. $(2 \cdot 2 \cdot 2)(xy)(xy)(xy)$ $(8)(xy)(xy)(xy)$	Step 1: Multiply the number terms together. $(2 \cdot 2)(a^2b)(a^2b)$ $(4)(a^2b)(a^2b)$	Step 1: Multiply the number terms together. $(3 \cdot 3 \cdot 3 \cdot 3)(b)(b)(b)(b)$ $(81)(b)(b)(b)(b)$	Step 1: Multiply the number terms together. $(4 \cdot 4 \cdot 4 \cdot 4 \cdot 4)(v)(v)(v)(v)(v)$ $(1024)(v)(v)(v)(v)(v)$
Step 2: Multiply the variable parts together. $8(xxx)(yyy)$ $8x^3y^3$	Step 2: Multiply the variable parts together. $4(a^2a^2)(bb)$ $4a^4b^2$	Step 2: Multiply the variable parts together. $81(b)(b)(b)(b)$ $81b^4$	Step 2: Multiply the variable parts together. $1{,}024(v)(v)(v)(v)(v)$ $1{,}024v^5$
Answer $8x^3y^3$	Answer $4a^4b^2$	Answer $81b^4$	Answer $1{,}024v^5$

Like Terms and Unlike Terms

Terms that have variable parts that match are **like terms**. (8ab, -7ba, and 2ab are like terms)
Terms with variable parts that are not the same are **unlike terms**. (4b, $3b^2$, and, -4a are not like terms)

Write a term.		Write a term.		Write a term.		Write a term.	
Give a like term.	Give an unlike term.	Give a like term.	Give an unlike term.	Give a like term.	Give an unlike term.	Give a like term.	Give an unlike term.

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Match the Like Terms

Draw lines to connect like terms.

$2aa$	$5ab^2$
$7x^2$	$9c$
$17mn$	$5a^2$
9	xy
$-6g^3h$	$9mn$
$17jkk$	$5jk^2$
$2abb$	$6xx$
$3xy$	-8
$7c$	$7gggh$
$9c^2$	cc
$8uuu$	$9kj$
$17jk$	$7u^3$

Combining Like Terms

Draw lines to connect equivalent expressions.

$10xy + 7xy$	$9a + 11a$
$9x^4 + (-5x^4)$	$2bc + (-3bc)$
$20a$	$17xy$
$8y^2z + -7y^2z$	$2b + (-9b)$
$-7b$	$-9x + 7x$
$-5xyz + 11xyz$	$4y^3z^4$
$-4y^3z^4 + 8y^3z^4$	$6xyz$
$-2x$	y^2z
$-bc$	$4x^4$

Like Terms and Unlike Terms

Terms that have variable parts that match are **like terms**. (8ab, -7ba, and 2ab are like terms)
Terms with variable parts that are not the same are **unlike terms**. (4b, $3b^2$, and, -4a are not like terms)

Write a term. $6xy^2$		Write a term. $3c$		Write a term. x		Write a term. $-8m$	
Give a like term. $6xy^2$	Give an unlike term. $6x$	Give a like term. $-4c$	Give an unlike term. d	Give a like term. $2x$	Give an unlike term. xyz	Give a like term. $7m$	Give an unlike term. $2a$

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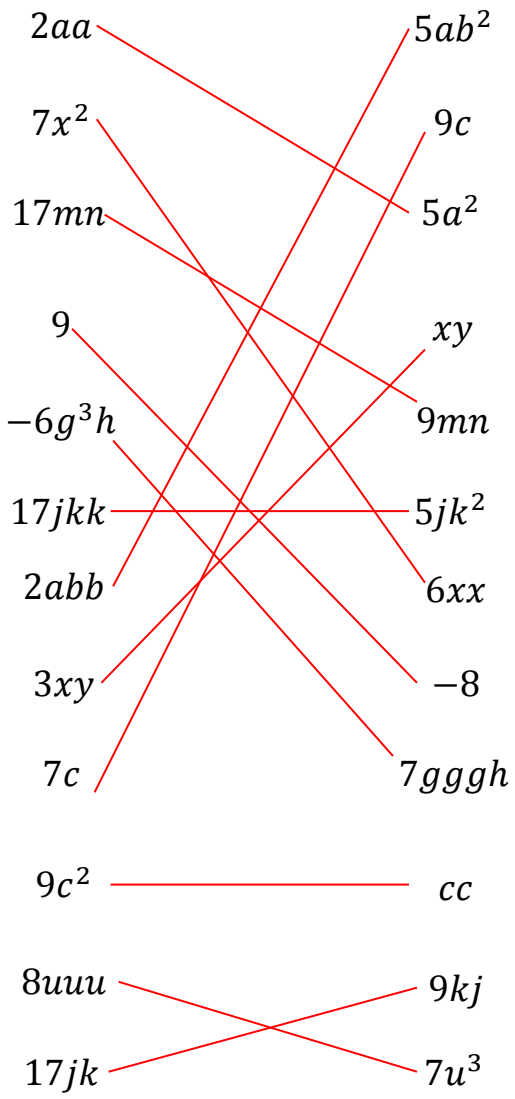
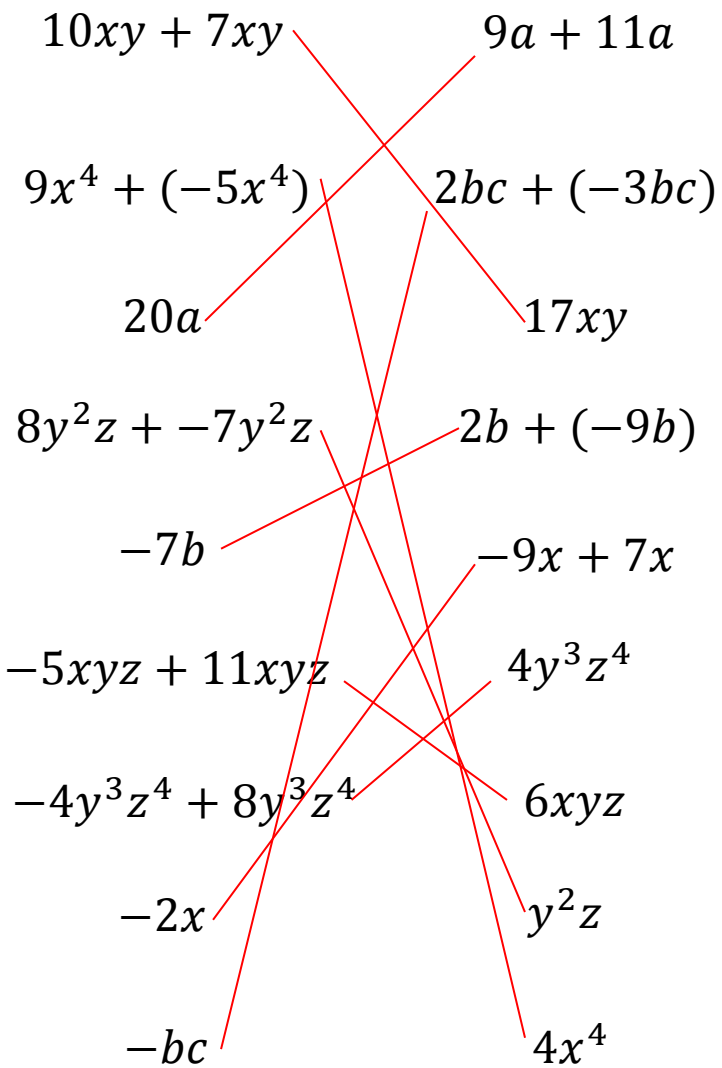
Match the Like Terms

Draw lines to connect like terms.



Combining Like Terms

Draw lines to connect equivalent expressions.



Example 1	Combining Like Terms with Positive Coefficients	Example 2
Example 1	Combining Like Terms with Negative Coefficients	Example 2
Example 1	Combining Like Terms with a Positive Coefficient and a Negative Coefficient	Example 2
Example 1	Combining Like Terms with a Negative Coefficient and a Positive Coefficient	Example 2

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Example	Combining Like Terms with Positive Coefficients and more than type of term
Example	Combining Like Terms with Negative Coefficients and more than type of term
Example	Combining Like Terms with a Positive Coefficient and a Negative Coefficient and more than one type of term

Example I $2a + 3a$ $5a$	Combining Like Terms with Positive Coefficients	Example 2 $7bc + bc$ $8bc$
Example I $(-9j) + (-7j)$ $-16j$	Combining Like Terms with Negative Coefficients	Example 2 $(-2mn) + (-5mn)$ $-7mn$
Example I $4x + (-2x)$ $2x$	Combining Like Terms with a Positive Coefficient and a Negative Coefficient	Example 2 $4rs + (-8rs)$ $-4rs$
Example I $(-9v) + 7v$ $-2v$	Combining Like Terms with a Negative Coefficient and a Positive Coefficient	Example 2 $(-d) + 8d$ $7d$

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Example $2x + 3xy + 4x + 3 + 5xy$ $(2x + 4x) + (3xy + 5xy) + 3$ $6x + 8xy + 3$	Combining Like Terms with Positive Coefficients and more than type of term
Example $(-2x) + (-3xy) + (-4x) + (-3) + (-5xy)$ $(-2x + (-4x)) + (-3xy + (-5xy)) + (-3)$ $-6x + (-8xy) + (-3)$	Combining Like Terms with Negative Coefficients and more than type of term
Example $2x+(-3xy) + (-4x) + (-3) + 5xy$ $(2x + (-4x)) + (-3xy + 5xy) + (-3)$ $-2x + 2xy + (-3)$	Combining Like Terms with a Positive Coefficient and a Negative Coefficient and more than one type of term

What is the distributive property?	When do you need to use the distributive property?	Example

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Distributive Property

Draw lines to connect equivalent expressions.

$2(x+6)$	$5x+35$
$12\ (x-2)$	$3x-3$
$5(x+7)$	$2x-5$
$6(2x+3)$	$12x+18$
$3(x-1)$	$15x+10$
$-7(x\ -2)$	$9x+27$
$-2(-x+5)$	$12x-24$
$5(3x+2)$	$-7x+14$
$9(x+3)$	$2x+12$

What does it mean to evaluate an expression?

Example

What is the distributive property?	When do you need to use the distributive property?	Example
To multiply a sum by a number, multiply each addend of the sum by the number outside the parentheses. For any numbers a, b, and c, a(b + c) = ab + ac and a(b - c) = ab - ac.	When you cannot simplify the addition or subtraction inside of the parentheses because you have a variable in the parentheses.	$2(a+5)$ $(2 \cdot a)+(2 \cdot 5)$ $2a+10$ or $2(a-5)$ $(2 \cdot a)-(2 \cdot 5)$ $2a-10$

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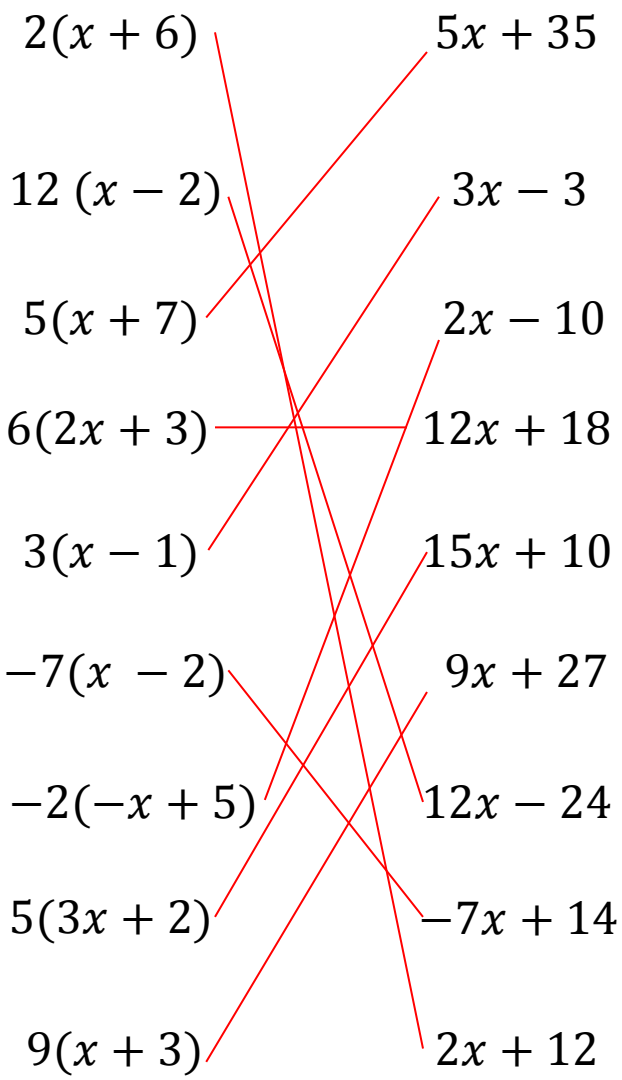
Distributive Property

Draw lines to connect equivalent expressions.



What does it mean to evaluate an expression?

When you evaluate an expression, you are substituting values in for your variables and simplifying.

Example

$a=10, b=2\ and\ c=5$

$a+b+c$
$10+2+5$
17

What is the difference between $5b$ and b^5?	
$5b$	b^5

What is the difference between $2ab^3$ and $2(ab)^3$ and $(2ab)^3$?		
$2ab^3$	$2(ab)^3$	$(2ab)^3$

Evaluating Expressions Practice Find the value of each expression when $a = 10, b = 2$ *and* $c = 5$.		
$a + b + c$	$a(b + c)$	$(a + b)(b + c)$
$-a - b - c$	$a(b - c)$	$(a - b)(b - c)$

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What is the difference between $5b$ and b^5?	
$5b$ $b+b+b+b+b$	b^5 $b \cdot b \cdot b \cdot b \cdot b$

What is the difference between $2ab^3$ and $2(ab)^3$ and $(2ab)^3$?		
$2ab^3$ $2 \cdot a \cdot b \cdot b \cdot b$	$2(ab)^3$ $2(ab)(ab)(ab)$	$(2ab)^3$ $(2ab)(2ab)(2ab)$

Evaluating Expressions Practice Find the value of each expression when $a = 10, b = 2$ *and* $c = 5$.		
$a+b+c$ $10+2+5$ 17	$a(b+c)$ $10(2+5)$ $10(7)$ 70	$(a+b)(b+c)$ $(10+2)(2+5)$ $(12)(7)$ (84)
$-a-b-c$ $-(10)-(2)-(5)$ -17	$a(b-c)$ $10(2-5)$ $10(-3)$ -30	$(a-b)(b-c)$ $(10-2)(2-5)$ $(8)(-3)$ (-24)

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Interactive Math Notebook Review Activities

Math Words: Variable and Expression

Variable

Define and give an example.

Expression

Define and give an example.

Directions:

1. Cut along the bold lines and fold along the dotted lines.
2. Use a little bit of glue underneath the top flap to insert the flap book into your math notebook.
3. Flip up each flap and write your examples directly onto your math notebook page.

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Directions:

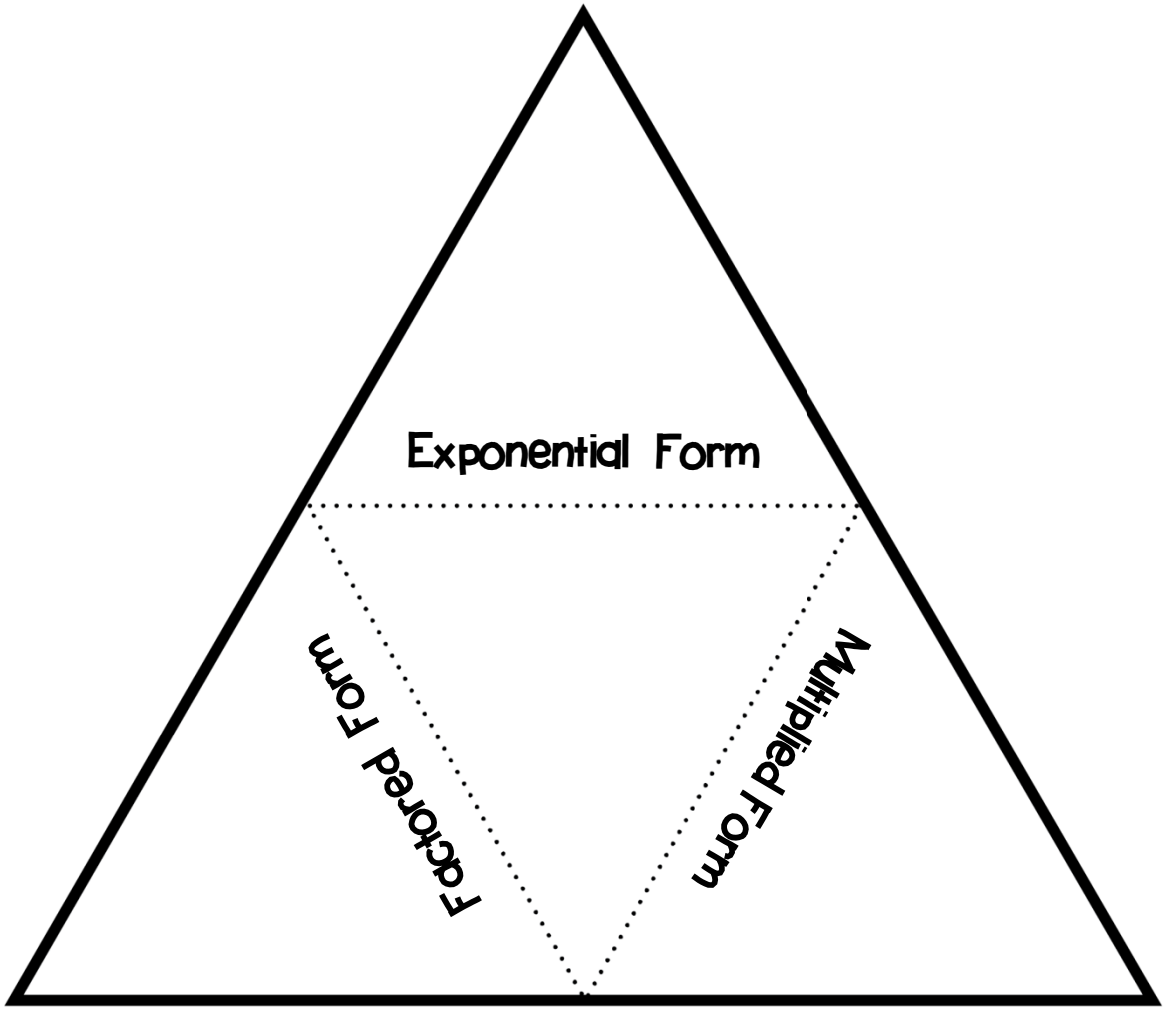
1. Cut along the bold lines and fold along the dotted lines.
2. When you fold along the dotted line you will have a mini-book.
3. Flip up each flap and write your definitions and examples in the inside pages.
4. Insert your finished book into your math notebook.

Exponent

Define and give an example

What part of the exponent is the base?

What part of the exponent is the exponent or power?



Directions:

1. Cut along the bold lines and fold along the dotted lines.
2. When you fold along the dotted line you will have a triangle flap book.
3. Flip up each flap and write your examples in the inside pages.
4. Insert your finished book into your math notebook.

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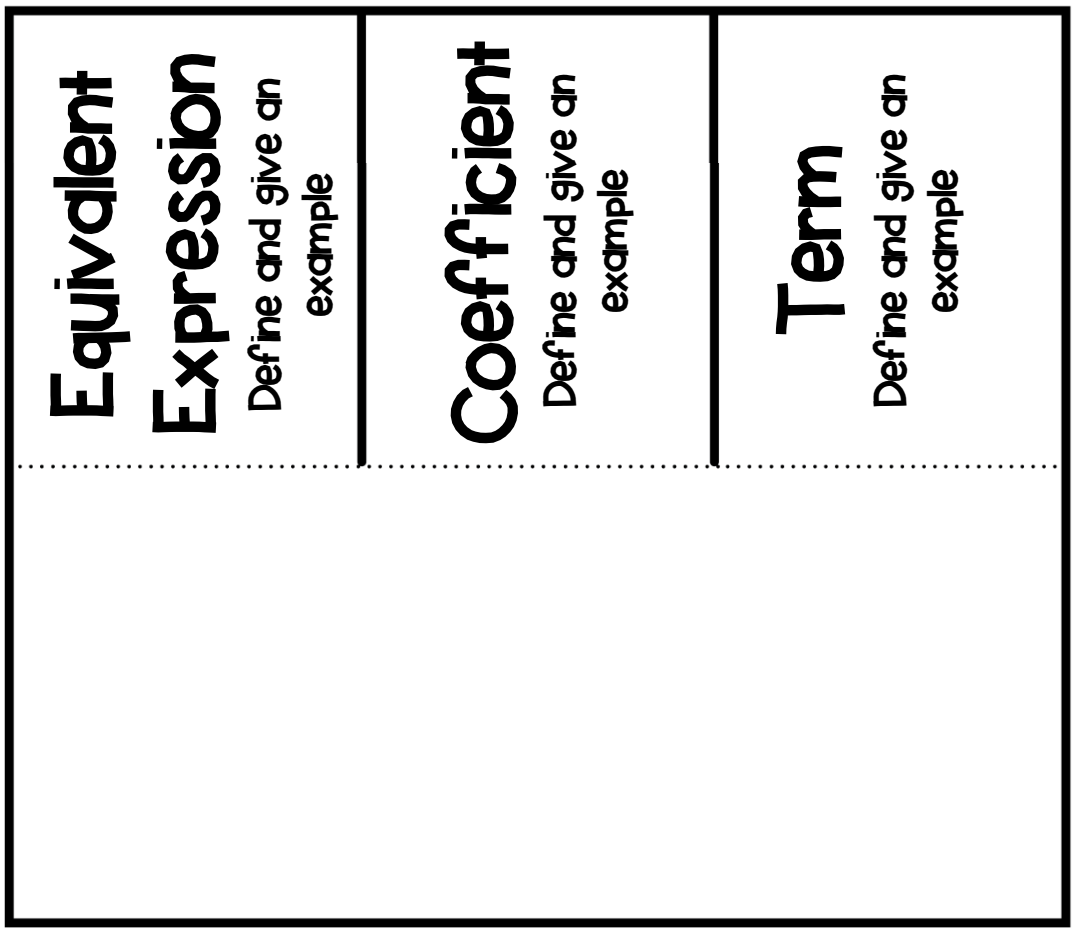
Directions:

1. Cut along the bold lines and fold along the dotted lines.
2. When you fold along the dotted line you will have a mini-book.
3. Flip up each flap and write your definitions and examples in the inside pages.
4. Insert your finished book into your math notebook.



Math Words: Like Terms and Unlike Terms

Like Terms

Define and give an example.

Unlike Terms

Define and give an example.

Directions:

1. Cut along the bold lines and fold along the dotted lines.
2. Use a little bit of glue underneath the top flap to insert the flap book into your math notebook.
3. Flip up each flap and write your examples directly onto your math notebook page.

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Directions:

1. Cut along the bold lines and fold along the dotted lines.
2. When you fold along the dotted line you will have a mini-book.
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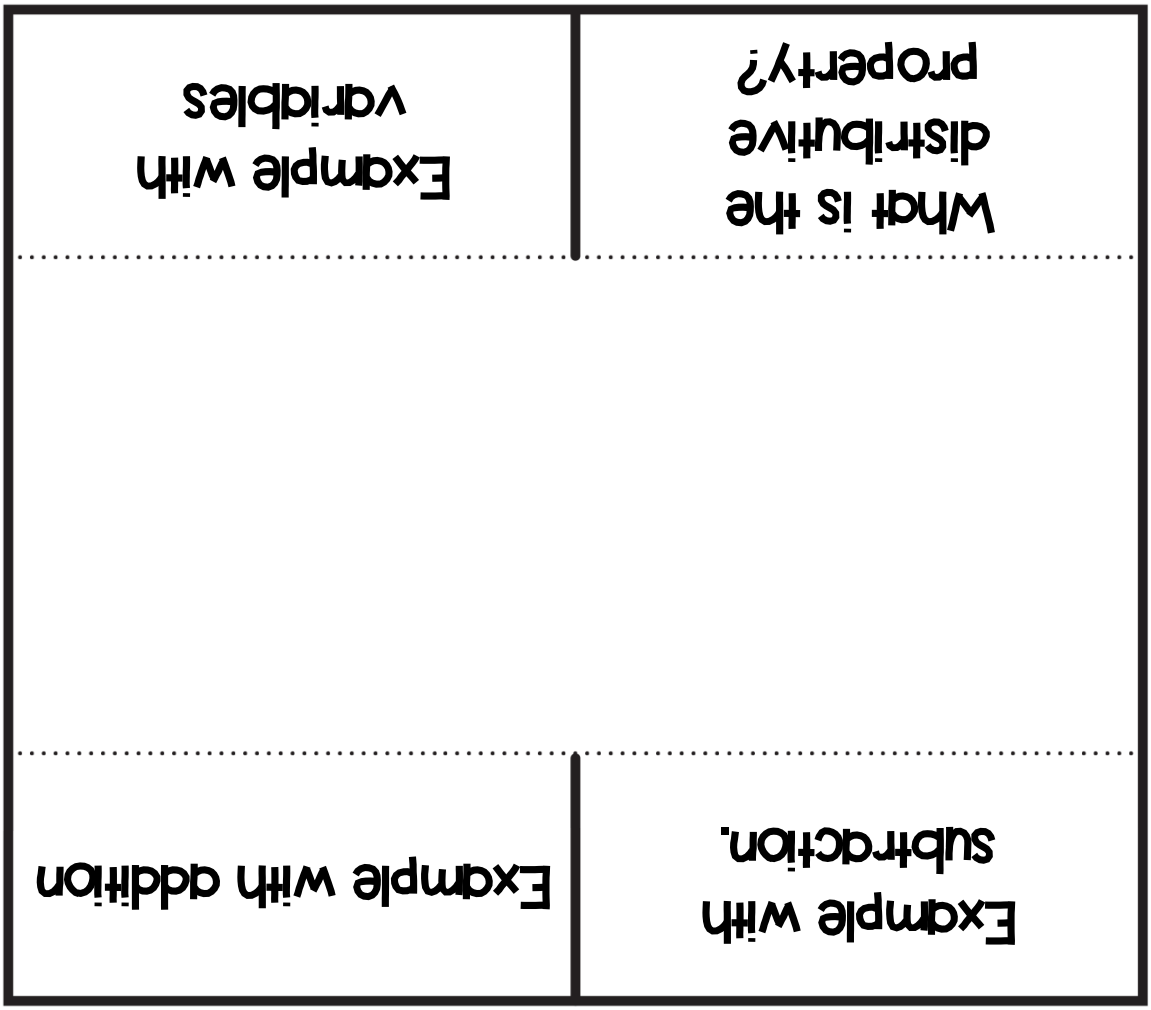
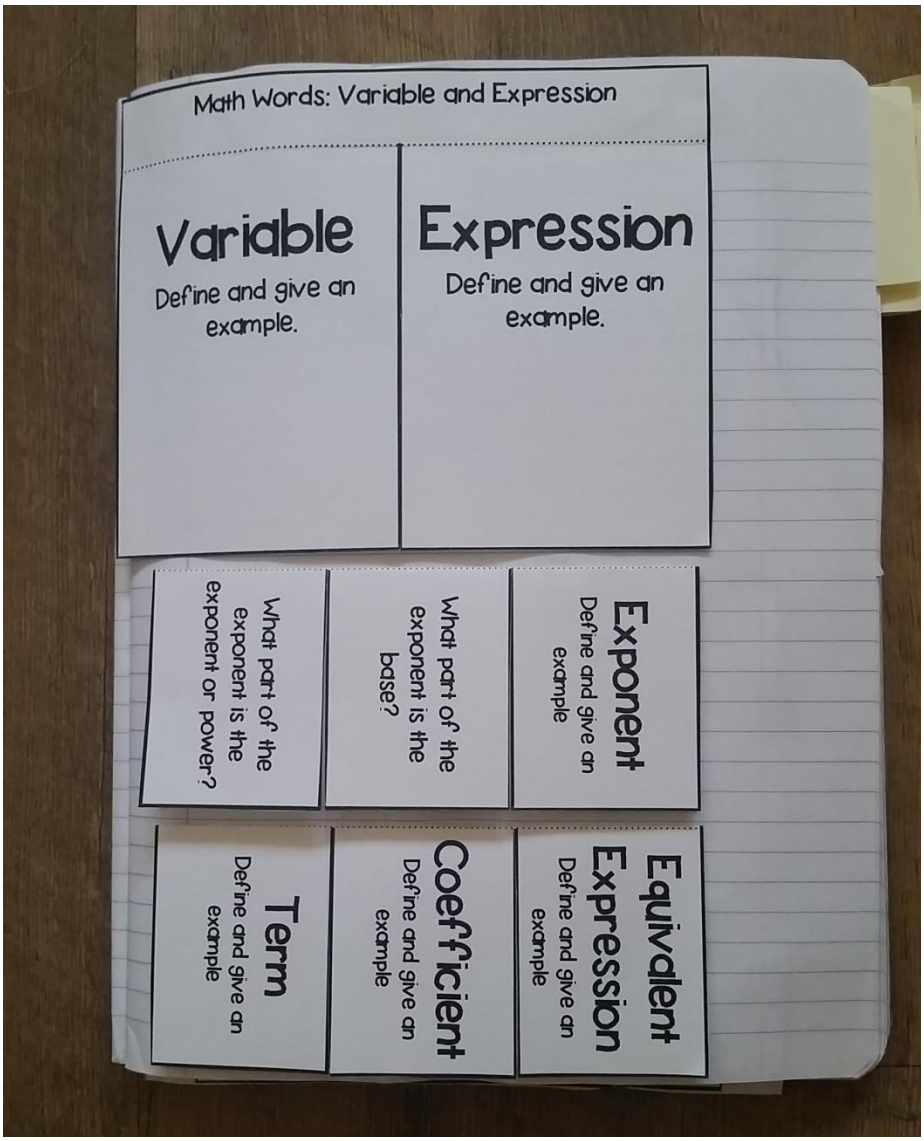
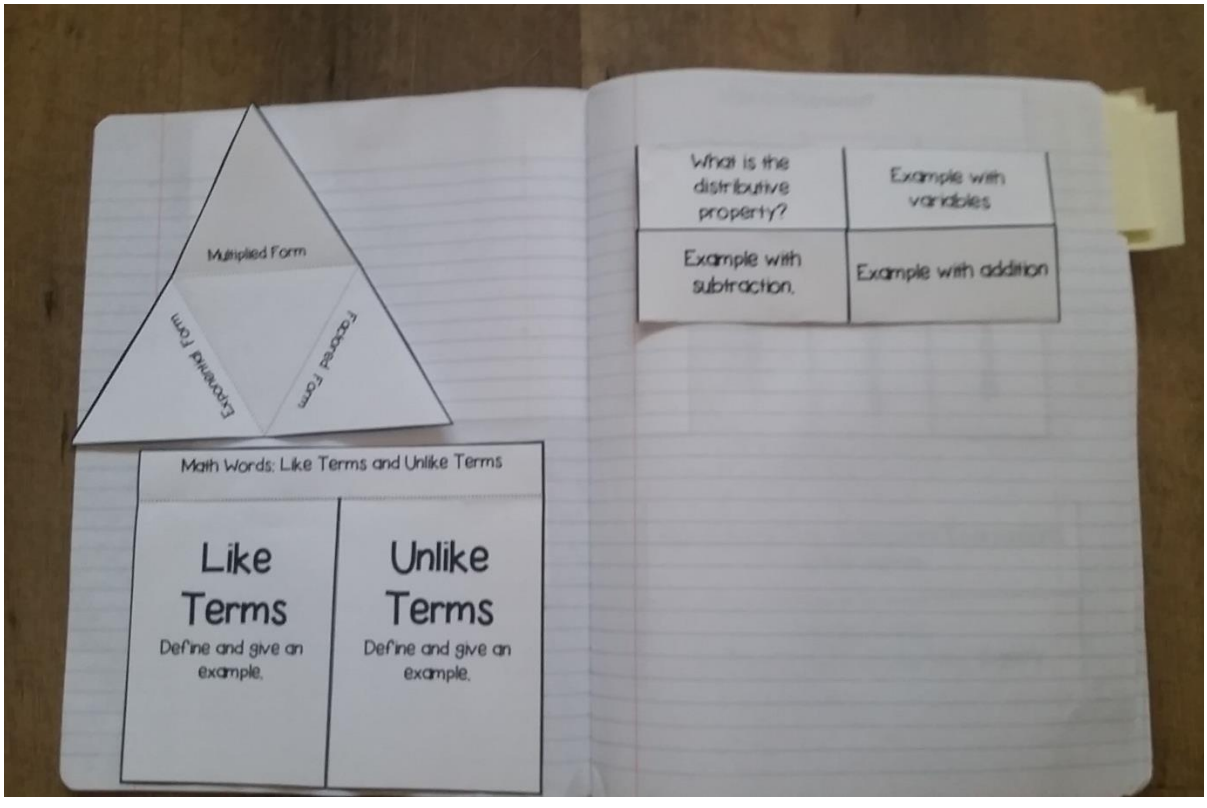



Math Words: Variable and Expression
Variable
Define and give an example.
Expression
Define and give an example.
What part of the exponent is the exponent or power?
What part of the exponent is the base?
Exponent
Define and give an example
Term
Define and give an example
Coefficient
Define and give an example
Equivalent Expression
Define and give an example

INB SAMPLES


Multiplied Form
Expanded Form
Factored Form
What is the distributive property?
Example with variables
Example with subtraction.
Example with addition
Math Words: Like Terms and Unlike Terms
Like Terms
Define and give an example.
Unlike Terms
Define and give an example.

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