ALGEBRAIC EXPRESSIONS

What is the difference between a numeric expression and an algebraic or variable expression?

Numeric Expression
 -3 + 2 + 4 – 5

Algebraic Expression
 -3x + 2y – 4z - 5

An **algebraic or variable expression** consists of three parts

- Variable
- Coefficient
- Constant

The **variable** is a symbol or letter that represents a number.

What are the variables in the expression below?

$$-4x + 3y - 8z + 9$$

The **coefficient** is the number that multiplies the variable. More plainly, it is the number in front of a variable.

What are the coefficients in the expression below?

- 4x + 3y - 8z + 9

The **constant** is any term that does not have a variable.

What is the constant in the expression below?

- 8 + 5y + 3x

An algebraic expression may be classified as a monomial. A **monomial** only has one term. It is an expression consisting of a number and a variable or the product of numbers and variables that have whole number exponents. A monomial cannot have a variable in the denominator.

Comprehension Check

Identify the expressions that are **<u>not</u>** monomials. Justify your answer.

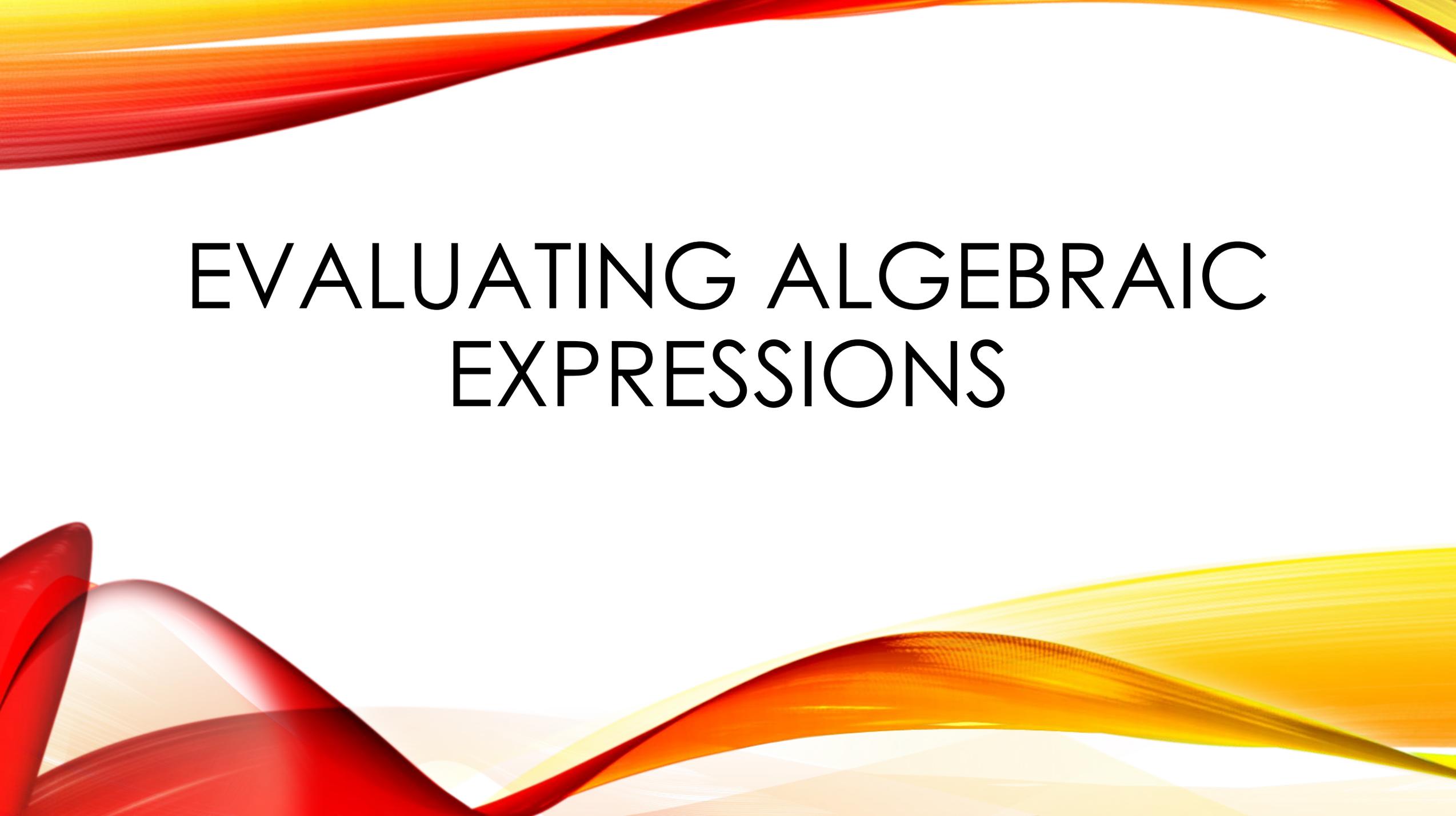$-4xy$ $xy/4$ $4 + x$ $0.7x^{-1}$ y/x

An algebraic expression can also be classified as a polynomial which is an expression that consists of more than one term. Two types of polynomials are **binomials and trinomials**.

A binomial has two terms.   Ex: 3x + 4

A trinomial has three terms. Ex: $4a^2 + 3a + 7$

EVALUATING ALGEBRAIC EXPRESSIONS

Evaluating an algebraic/variable expression involves solving it when the variable/s in that expression are given a numeric value.

To **evaluate** a variable expression, you first replace each variable with the numbers to which they are equal. Then you use the **order of operations** to simplify.

Remember!	**P**lease	**E**xcuse	**M**y	**D**ear	**A**unt	**S**ally
	Parentheses	Exponents	x	/	+	-

(Multiplication and Division are done in the order in which they appear. Which ever operation appears first, is done first. The same applies for addition and subtraction when both operations are found within a problem.)

EVALUATING EXPRESSIONS EXAMPLES

Example 1

Evaluate $4y - 15$ for $y = -9$

- $4y - 15$
- $4(-9) - 15$
- $-36 - 15 =$ **- 51**

Example 2

Evaluate $3ab + c^2$ for $a = 2$, $b = -10$, and $c = 5$.

- $3ab + c^2$
- $3(2)(-10) + 5^2$
- $-60 + 25 =$**-45**

Example 3

Evaluate $6(g + h)$ for $g = 8$ and $h = 7$.

- $6(8 + 7)$
- $6(15) =$ **90**

LET'S PRACTICE!

- Evaluate each expression for x = -2, y = 3 and z = -10

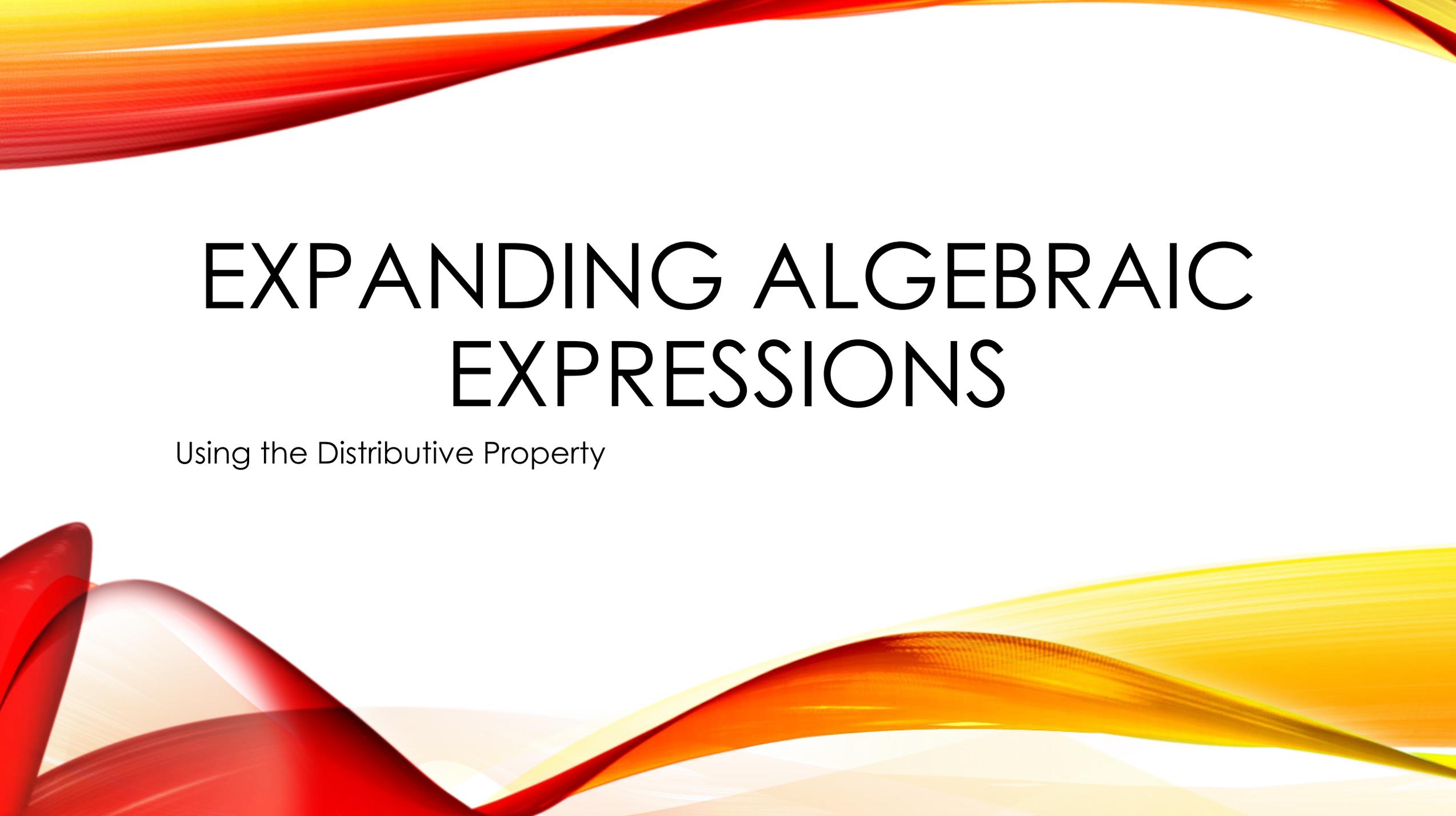|			
xyz	$8y + z^2$	$z/5 + 2$	$4y - x$
$2z + xy$	$\dfrac{9 + y^2}{x}$	$4xy - z$	$-5(y + z)^2$

EXPANDING ALGEBRAIC EXPRESSIONS

Using the Distributive Property

Distributive Property

Expanding an algebraic expression involves using the **distributive property**. When the distributive property is used, you multiply the quantity in front(or sometimes in the back) of the parentheses by each term in the parentheses. **Remember** to use integer rules for multiplication (if multiplying **same signs – answer is positive**, if multiplying **different signs – answer is negative**).

Examples

$4(2x – 3) =$ _8x - 12_ $-5(4x – 9)=$ _-20x +45_

$0.2 (3b – 15c) =$ _.6b – 3c_ $- (5x – 3y + 8z) =$ _-5x + 3y – 8z_

$(2x + 5)7 =$ _14x + 35_ $½ (6e + 8f – 14g) =$ _3e + 4f – 7g_
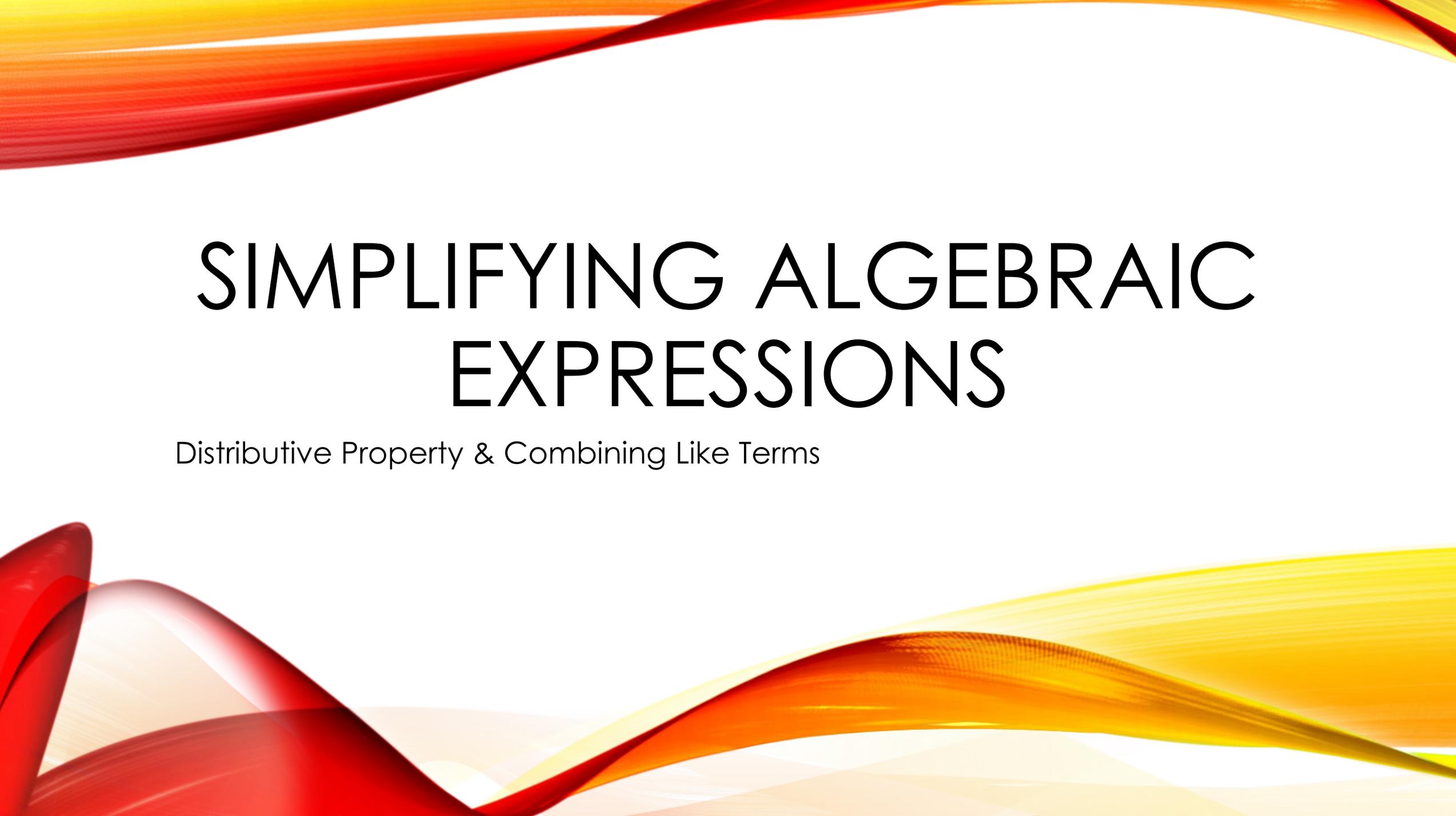
LET'S PRACTICE! EXPAND EACH EXPRESSION

- -3(x + 5) =

- 2(-8x + 10) =

- -(4x – 3y + 7z) =

- -8(-2x – 3) =

- 1/3(6x – 45) =

SIMPLIFYING ALGEBRAIC EXPRESSIONS

Distributive Property & Combining Like Terms

Simplifying expressions involves combining like terms.
Like Terms are monomials that have variables raised to the same powers.

What terms are like terms with $4a^2b$?

$-16ab$ $3ab^2$ $-7a^2b$ $11a^2b^2$ $5a^2b$

When combining like terms, you group like terms together. Then you use addition rules to combine the coefficients. Keep the variables.

Simplify each polynomial

Ex 1:   **- 6x + 5y – 3x + y – 8**

=   -6x – 3x + 5y + y – 8

=   <u>- 9x + 6y – 8</u>

Ex 2:   **-2x – 8y + 5x – 4y**

=   - 2x + 5x - 8y – 4y

=   <u>3x - 12y</u>

EX 3:   **5a – 2b + c – 5b + 4b**

=   5a – 2b + 4b + c

=   <u>5a + 3b + c</u>

Ex 4:   **$4x^2$ - 6x + 3x – $4x^2$ + $7x^2$ + 1 - 5**

= $4x^2 – 4x^2 + 7x^2 – 6x + 3x + 1 – 5$

=   <u>$7x^2$ - 3x - 4</u>

LET'S PRACTICE!- SIMPLIFY EACH EXPRESSION

- -5x + 4x – 7 – x – 2 =

- 3m – 8m – 5d – 2d – 4m =

- - 8 – b – 5d – 2d – 4m =

- 3y – 2y + 9 – 5y – 4 =

- - 23g – 12 + 8d – 9g + 3d =