

## Lesson 2: Algebraic Expressions—Combining Like Terms

### Exploratory Activity

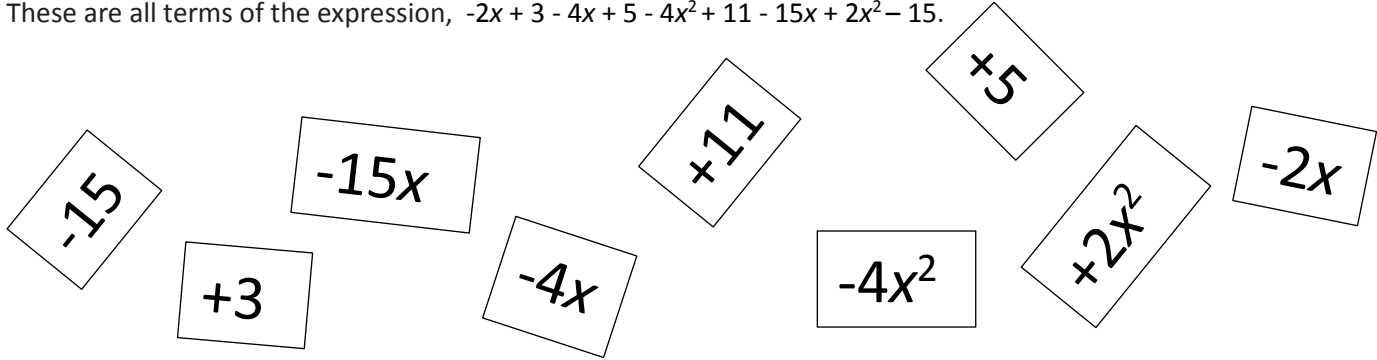
In the last lesson, we were working with expressions like  $x + x + 10 + x + 20 + x + 9 + x + 11$ . We then combined the  $x$  terms together to get  $5x$  and the numbers together to get 50. Our expression became  $5x + 50$ . In this lesson, we'll look at expressions where there are more complicated terms, such as  $-4x^2$ . Our first task will be to determine which of these terms are “like” another.

1. Take a look at the following expression:

$$-2x + 3 - 4x + 5 - 4x^2 + 11 - 15x + 2x^2 - 15$$

- A. Using a pen or pencil, divide the expression above into smaller units. We'll call these smaller units “terms” of an expression or equation.
- B. Describe the meaning of the word “term”.
- C. Check with your team to see if everyone divided the expression the same way. Be sure to explain how you determined your division marks.
2. Joey says that a lot of these terms are “like terms”. What do you think Joey means by this?

These are all terms of the expression,  $-2x + 3 - 4x + 5 - 4x^2 + 11 - 15x + 2x^2 - 15$ .



3. Use the table provided below to sort the terms into *like terms*. You do not need to use all of the space provided, but make sure you justify your grouping by explaining why they belong together.

Group 1	Group 2	Group 3	Group 4	Group 5
$-4x^2$ $+2x^2$	$-15x$ $-4x$ $-2x$	$-15$ $+3$ $+11$ $+5$		
Reason: They both have " $x^2$ "	Reason: They all have the " $x$ "	Reason: They don't have any variables.	Reason:	Reason:

4. Should everyone in class have grouped the terms together in the same way? Explain why.

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5. Now that we have our like terms grouped, it is time to simplify. Add together the terms in each group separately and then write them as one expression. Don't forget to write in the sign of each term.

$$-2x + 3 - 4x + 5 - 4x^2 + 11 - 15x + 2x^2 - 15 = \underline{-2x^2 - 21x + 4}$$

6. For each expression below, simplify by combining like terms.

A.  ~~$3x^4 - 8x^2 + 12x - 5x^3 + 2x - 7x^2 + 3 - 4x$~~   
 $15x^4 - 5x^3 - 15x^2 - 2x + 3$

B.  ~~$10b^3 + 3b^2 - 2b + 17b - 22 + 3b - b^4$~~   
 $2b^4 + 8b^2 + 20b - 22$

C.  ~~$11y^3 - 4y^2 + 6y^2 + 9y^2 - 1 + y - 3y + 8$~~   
 $6y^3 + 5y^2 + 9y + 7$

D.  ~~$24z^2 - 3z + 9z - 6 + 5 - z$~~   
 $31z - 33$

7. Fill in the blank so that the expressions on the right side of the table are equivalent to the expressions on the left side of the table. The first one has been done for you.

A. $5z^2 + 3z$ $3z^2 - 6z + 9z + 2z^2$	$4z^2 + \underline{z^2} - 7z + \underline{10z}$
B. $5ab$ $4ab + 9ab - 6ab - 2ab$	$5ab + \underline{ab} - ab + 2ab^2 + \underline{-2ab^2}$
C. $-5xyz + 7xyz$ $-2xy - 3xy + 7xyz$	$6xyz + \underline{xyz} - 4xy + \underline{-xy}$
D. $-m + 9n - 7m - 2n + 3mn - 5n$	$2mn + \underline{mn} + 4n + \underline{-2n} - 10m + \underline{2m}$

$-8m + 2n + 3mn$

## Lesson Summary

Like terms have the same variables with the same exponents.

Examples

Like Terms	Unlike Terms
3, -7, 8	3 apples, -7 dollars, 8 dogs
$-2y$ , $5y$ , $88y$	$-2x$ , $5y$ , $88xy$
$16a^2$ , $-3a^2$ , $\frac{1}{2}a^2$	$16z^2$ , $-3mn^2$ , $\frac{1}{2}x^2$

## Homework Problem Set

Simplify each expression by combining like terms.

1.  $-6b + 4a + 8b - 3a$

2.  $5m - 4n - 7mn + 8n - m + 10n$

3.  $7x^2y + 14x^2 - 3y + 2y - 8x^2 - 9xy + 3x^2y$

4.  $8k - 13k^2 + 4k^3 + 2k - 6k^2 - 9$

5. Using the terms  $a^2$ ,  $b$  and  $c^3$ , write two different expressions where once they are simplified will give a result of  $3a^2 - b + 10c^3$ .

6. Sam says that  $2x^3 - 6x^2 + 4x - 7$  is always a negative number for any value of  $x$ . Prove Sam is wrong by finding a value of  $x$  that will make the expression positive or equal to zero.

**Spiral Review – Evaluating Expressions**

For each expression below,  $a = 3$ ,  $b = 5$ ,  $c = -1$  and  $d = 0$ . Substitute the value for each variable and then evaluate the expression.

7.  $4a - 2b$

8.  $-7c + 14d$

9.  $5c - 3b$

10.  $a - b$

11.  $a + b + c + d$

12.  $a - b - c - d$

13.  $b - a$

14.  $ab$

15.  $cd$

16.  $abcd$

17.  $-a + b$

18.  $2b - 4a$

19. Which of the expressions above gave the same value?