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Unit 6, Lesson 22: Combining Like Terms (Part 3)

Let’s see how we can combine terms in an expression to write it with less terms.

22.1: Are They Equal?

Select **all** expressions that are equal to $8 - 12 - (6 + 4)$.

1. $8 - 6 - 12 + 4$
2. $8 - 12 - 6 - 4$
3. $8 - 12 + (6 + 4)$
4. $8 - 12 - 6 + 4$
5. $8 - 4 - 12 - 6$

22.2: X’s and Y’s

Match each expression in column A with an equivalent expression from column B. Be prepared to explain your reasoning.

A	B
A. $(9x + 5y) + (3x + 7y)$	1. $12(x + y)$
B. $(9x + 5y) - (3x + 7y)$	2. $12(x - y)$
C. $(9x + 5y) - (3x - 7y)$	3. $6(x - 2y)$
D. $9x - 7y + 3x + 5y$	4. $9x + 5y + 3x - 7y$
E. $9x - 7y + 3x - 5y$	5. $9x + 5y - 3x + 7y$
F. $9x - 7y - 3x - 5y$	6. $9x - 3x + 5y - 7y$

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22.3: Seeing Structure and Factoring

Write each expression with fewer terms. Show or explain your reasoning.

1. $3 \cdot 15 + 4 \cdot 15 - 5 \cdot 15$

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

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

4. $3\left(\frac{5}{2}x + 6\frac{1}{2}\right) + 4\left(\frac{5}{2}x + 6\frac{1}{2}\right) - 5\left(\frac{5}{2}x + 6\frac{1}{2}\right)$

Lesson 22 Summary

Combining like terms is a useful strategy that we will see again and again in our future work with mathematical expressions. It is helpful to review the things we have learned about this important concept.

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- Combining like terms is an application of the distributive property. For example:

$$\begin{aligned} &2x + 9x \\ &(2+9) \cdot x \\ &11x \end{aligned}$$

- It often also involves the commutative and associative properties to change the order or grouping of addition. For example:

$$\begin{aligned} &2a + 3b + 4a + 5b \\ &2a + 4a + 3b + 5b \\ &(2a + 4a) + (3b + 5b) \\ &6a + 8b \end{aligned}$$

- We can't change order or grouping when subtracting; so in order to apply the commutative or associative properties to expressions with subtraction, we need to rewrite subtraction as addition. For example:

$$\begin{aligned} &2a - 3b - 4a - 5b \\ &2a + \text{-}3b + \text{-}4a + \text{-}5b \\ &2a + \text{-}4a + \text{-}3b + \text{-}5b \\ &\text{-}2a + \text{-}8b \\ &\text{-}2a - 8b \end{aligned}$$

- Since combining like terms uses properties of operations, it results in expressions that are equivalent.

- The like terms that are combined do not have to be a single number or variable; they may be longer expressions as well. Terms can be combined in any sum where there is a common factor in all the terms. For example, each term in the expression $5(x+3) - 0.5(x+3) + 2(x+3)$ has a factor of $(x+3)$. We can rewrite the expression with fewer terms by using the distributive property:

$$\begin{aligned} &5(x+3) - 0.5(x+3) + 2(x+3) \\ &(5 - 0.5 + 2)(x+3) \\ &6.5(x+3) \end{aligned}$$

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Unit 6, Lesson 22: Combining Like Terms (Part 3)

1. Jada says, "I can tell that $\frac{-2}{3}(x+5)+4(x+5)-\frac{10}{3}(x+5)$ equals 0 just by looking at it." Is Jada correct? Explain how you know.

2. In each row, decide whether the expression in column A is equivalent to the expression in column B. If they are not equivalent, show how to change one expression to make them equivalent.

A	B
A. $3x-2x+0.5x$	1. $1.5x$
B. $3(x+4)-2(x+4)$	2. $x+3$
C. $6(x+4)-2(x+5)$	3. $2(2x+7)$
D. $3(x+4)-2(x+4)+0.5(x+4)$	4. 1.5

3. For each situation, write an expression for the new balance using as few terms as possible.

   a. A checking account has a balance of -$126.89. A customer makes two deposits, one $3\frac{1}{2}$ times the other, and then withdraws $25.

   b. A checking account has a balance of $350. A customer makes two withdrawals, one $50 more than the other. Then he makes a deposit of $75.

   (from Unit 6, Lesson 20)

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4. Tyler is using the distributive property on the expression $9 - 4(5x - 6)$. Here is his work:

$9 - 4(5x - 6)$
$9 + (-4)(5x + -6)$
$9 + -20x + -6$
$3 - 20x$

Mai thinks Tyler's answer is incorrect. She says, "If expressions are equivalent then they are equal for any value of the variable. Why don't you try to substitute the same value for x in all the equations and see where they are not equal?"

a. Find the step where Tyler made an error.

b. Explain what he did wrong.

c. Correct Tyler's work.

(from Unit 6, Lesson 21)

5. a. If $(11 + x)$ is positive, but $(4 + x)$ is negative, what is one number that x could be?

b. If $(-3 + y)$ is positive, but $(-9 + y)$ is negative, what is one number that y could be?

c. If $(-5 + z)$ is positive, but $(-6 + z)$ is negative, what is one number that z could be?

(from Unit 6, Lesson 13)