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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

A. $(9x + 5y) + (3x + 7y)$

B. $(9x + 5y) - (3x + 7y)$

C. $(9x + 5y) - (3x - 7y)$

D. $9x - 7y + 3x + 5y$

E. $9x - 7y + 3x - 5y$

F. $9x - 7y - 3x - 5y$

B

1. $12(x + y)$
2. $12(x - y)$
3. $6(x - 2y)$
4. $9x + 5y + 3x - 7y$
5. $9x + 5y - 3x + 7y$
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.

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

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

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- 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:

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