Combining Like Terms (Part 2)

Let's see how to use properties correctly to write equivalent expressions.

21.1 Which Three Go Together: Equivalent Expressions

Which three go together? Why do they go together?

A

$-6x + 9$

B

$-7x + 9y + x$

C

$10x + 7 - 4x + 2$

D

$-2(3x - 4) + 1$

21.2 Seeing It Differently

Some students are trying to write an expression with fewer terms that is equivalent to $8 - 3(4 - 9x)$.

Noah says, "I worked the problem from left to right and ended up with $20 - 45x$."

$$8 - 3(4 - 9x)$$
$$5(4 - 9x)$$
$$20 - 45x$$

Lin says, "I started inside the parentheses and ended up with $23x$."

$$8 - 3(4 - 9x)$$
$$8 - 3(-5x)$$
$$8 + 15x$$
$$23x$$

Jada says, "I used the distributive property and ended up with $27x - 4$."

$$8 - 3(4 - 9x)$$
$$8 - (12 - 27x)$$
$$8 - 12 - (-27x)$$
$$27x - 4$$

Andre says, "I also used the distributive property, but I ended up with $-4 - 27x$."

$$8 - 3(4 - 9x)$$
$$8 - 12 - 27x$$
$$-4 - 27x$$

1. Do you agree with any of them? Explain your reasoning.

2. For each strategy that you disagree with, find and describe the errors.

Are you ready for more?

1. Jada's neighbor said, "My age is the difference between twice my age in 4 years and twice my age 4 years ago." How old is Jada's neighbor?

2. Another neighbor said, "My age is the difference between twice my age in 5 years and twice my age 5 years ago." How old is this neighbor?

3. A third neighbor had the same claim for 17 years from now and 17 years ago, and a fourth for 21 years. Determine those neighbors' ages.

21.3 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. $9x - 3x + 5y - 7y$

21.4 Grouping Differently

A question on a math quiz had the expression $8x - 9 - 12x + 5$. The teacher told the class there was a typo and the expression was supposed to have one set of parentheses in it.

1. Where could you put parentheses in $8x - 9 - 12x + 5$ to make a new expression that is still equivalent to the original expression? How do you know that your new expression is equivalent?

2. Where could you put parentheses in $8x - 9 - 12x + 5$ to make a new expression that is not equivalent to the original expression? List as many different answers as you can.

Lesson 21 Summary

When we combine like terms, we add terms that are numbers or terms that have the same variable. Combining like terms allows us to write expressions more simply with fewer terms.

Examples:

- $6x - x$ can be combined as $x(6 - 1)$, or $5x$.
- $7 - 6x - 2$ can be rewritten as $5 - 6x$ because the like terms 7 and -2 can be combined: $7 - 6x - 2 = 7 + (-2) - 6x = 5 - 6x$.

Sometimes it is helpful to be aware of common errors so that we can try to avoid them.

Examples:

- $6x - x$ is not equivalent to 6. The expression is really saying to take 1 x away from 6 x's. The distributive property tells us that $6x - x$ is equivalent to $(6 - 1)x$, or $5x$.
- $7 - 2x$ is not equivalent to $5x$. The expression $7 - 2x$ tells us to double an unknown amount and subtract it from 7. This expression cannot be written with fewer terms.
- $7 - 4(x + 2)$ is not equivalent to $3(x + 2)$. The expression tells us to subtract 4 copies of an amount from 7, not to take $(7 - 4)$ copies of the amount. Using the distributive property before combining like terms tells us that this expression is equivalent to $-1 - 4x$.

Thinking about the meaning of expressions and the properties of operations when rewriting expressions helps us make sure that the value of the expression does not change and the new expression is equivalent.