LESSON MAKER PRO

Expression Detectives

Simplify expressions and justify each move.

GRADE 8 · PA.A.3.2

PA.A.3.2 "Justify steps in generating equivalent expressions by combining like terms and using order of operations (to include grouping symbols). Identify the properties used, including the properties of operations (associative, commutative..."

NAME _____ DATE _____

THE BIG IDEA

Work inside grouping symbols first, then use the distributive property to multiply across a sum or difference. The commutative property lets you change the order of terms, and the associative property lets you change how terms are grouped so you can combine like terms.

WORKED EXAMPLE

Simplify 11(9x + 8) + 6x. Name the property used in each step.

1. 11(9x + 8) + 6x = 99x + 88 + 6x. Distributive property.
2. 99x + 88 + 6x = 99x + 6x + 88. Commutative property of addition.
3. 99x + 6x + 88 = 105x + 88. Combine like terms.

Answer: 105x + 88

PRACTICE 6 problems

1 Simplify 4(3x + 2) + 5x. Name the property used to remove the parentheses.

ANSWER _____

2 Simplify (2x + 5x) + 3x. Name the property that lets you regroup the terms as 2x + (5x + 3x).

ANSWER _____

3 Simplify 5x + 4 + 2x. Name the property that lets you reorder the terms as 5x + 2x + 4.

ANSWER _____

4 Simplify 3(2x + 4) - 5(x - 2). Name the property used to remove the parentheses.

ANSWER _____

5 Simplify 2[3(x + 4) - x] + 5. Name the property used to expand 3(x + 4).

ANSWER _____

6 Simplify 4x + 2(5 - x) + 3. Name the property used to expand 2(5 - x).

ANSWER _____

APPLY IT Show your work

1 For game night, you order x snack packs at $4 each and x drinks at $2 each. A single $3 service fee is added. Write a simplified expression for the total cost. Explain why it is equivalent to the cost before you simplify.

WORK SPACE

ANSWER _____

2 A dance team buys x hoodies for one group and (x + 3) hoodies for another. Each hoodie costs $12, and a coupon takes $5 off the whole order. Write and simplify an expression for the total cost. Name the property you use to remove parentheses.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student claims 3[2x - (x + 4)] + 2(x + 5) = 5x + 2. Is the claim correct? Show the correct simplification and name a property that justifies one of your steps.

WORK SPACE AND ANSWER

ANSWER KEY

Expression Detectives

GRADE 8 · PA.A.3.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simplify 4(3x + 2) + 5x. Name the property used to remove the parentheses.	**17x + 8; distributive property.**
2	Simplify (2x + 5x) + 3x. Name the property that lets you regroup the terms as 2x + (5x + 3x).	**10x; associative property of addition.**
3	Simplify 5x + 4 + 2x. Name the property that lets you reorder the terms as 5x + 2x + 4.	**7x + 4; commutative property of addition.**
4	Simplify 3(2x + 4) - 5(x - 2). Name the property used to remove the parentheses.	**x + 22; distributive property.**
5	Simplify 2[3(x + 4) - x] + 5. Name the property used to expand 3(x + 4).	**4x + 29; distributive property.**
6	Simplify 4x + 2(5 - x) + 3. Name the property used to expand 2(5 - x).	**2x + 13; distributive property.**

PART 2 · APPLY IT

1. **6x + 3 dollars. The x snack packs cost 4x dollars, and the x drinks cost 2x dollars. Combining those like terms gives 6x; the $3 fee stays the same.** Write 4x + 2x + 3. Combine the like terms 4x and 2x to get 6x + 3.
2. **24x + 31 dollars; distributive property.** The cost is 12[x + (x + 3)] - 5 = 12(2x + 3) - 5. Distribute 12, then combine 36 and -5 to get 24x + 31.

CHALLENGE

No. 3[2x - (x + 4)] + 2(x + 5) = 3(x - 4) + 2x + 10 = 3x - 12 + 2x + 10 = 5x - 2. The distributive property justifies 3(x - 4) = 3x - 12.

Accept equivalent expressions and accurate property names. In the challenge, students may name the distributive property at a different valid step.