1.3 Algebraic Properties

ALGEBRA

EXPRESSIONS

Numeric Expression | Algebraic Expression

COMMUTATIVE PROPERTY

ADDITION | MULTIPLICATION

ASSOCIATIVE PROPERTY

ADDITION | MULTIPLICATION

Determine if the expressions are equivalent. If so, state the property used to show equivalence.

$$8 - 6 = 6 - 8 \qquad\qquad 8 - 6 = -6 + 8$$

| $4 \cdot (x \cdot y) = (4 \cdot x) \cdot y$ | $5 + (x + 2) = (5 + x) + 2$ | $a + (b \cdot c) = (b \cdot c) + a$ |

PROVE $(xy)z = (zy)x$

$(xy)z$ Given

$z(xy)$ _____

$z(yx)$ _____

$(zy)x$ _____

PROVE $x + (y + z) = z + (x + y)$

$x + (y + z)$ Given

$(x + y) + z$ _____

$z + (x + y)$ _____

DISTRIBUTIVE PROPERTY

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

Distribute and combine like terms.

	$2h - 4(3h - 7)$	$-4(2x + 3) - 6$
$7d + 2(5 + 3d)$	$8 - 3(2t - 5)$	$\frac{2}{3}(3x + 6) + 12$

PROVE $(3 + x)(2) = 6 + 2x$

$(3 + x)(2)$ Given

$(2)(3 + x)$ _____

$6 + 2x$ _____

SUMMARY:

Now, summarize your notes here!

1.3 Algebraic Properties

PRACTICE

TRUE/FALSE Circle true or false. If true, circle the property used to determine the expressions equivalent.

1. $7 + 9 = 9 + 7$	2. $(8 \cdot 3)4 = 8(3 \cdot 4)$	3. $a + (9 + b) = (a + 9) + b$
TRUE or FALSE	TRUE or FALSE	TRUE or FALSE
If true, equivalent by…	If true, equivalent by…	If true, equivalent by…
Commutative Property	Commutative Property	Commutative Property
Associative Property	Associative Property	Associative Property
Distributive Property	Distributive Property	Distributive Property
4. $x - 8 = 8 - x$	5. $ac + dc = dc + ac$	6. $(a + b)^2 = a^2 + b^2$
TRUE or FALSE	TRUE or FALSE	TRUE or FALSE
If true, equivalent by…	If true, equivalent by…	If true, equivalent by…
Commutative Property	Commutative Property	Commutative Property
Associative Property	Associative Property	Associative Property
Distributive Property	Distributive Property	Distributive Property

Fill in the reasons for each proof with the correct property used.

7.   Prove: $x^2(2y) = (2x^2)y$

$x^2(2y)$ Given

$(x^2 2)y$ _____

$(2x^2)y$ _____

8.   Prove: $3(5 - x) = -3x + 15$

$3(5 - x)$ Given

$15 - 3x$ _____

$-3x + 15$ _____

9.   Prove: $t + (2 + t) = 2t + 2$

$t + (2 + t)$ Given

$t + (t + 2)$ _____

$(t + t) + 2$ _____

$2t + 2$ Combine Like Terms

10.   Prove: $2(h + 5) + 4h = 6h + 10$

$2(h + 5) + 4h$ Given

$2h + 10 + 4h$ _____

$2h + 4h + 10$ _____

$6h + 10$ Combine Like Terms

Analyze student work.

11. Mr. Kelly and Mr. Sullivan love the associative property. They refuse to believe that the associative doesn't work for subtraction and division. They both work a problem incorrectly in a weak attempt to prove that the associative property does indeed work for subtraction and division. THEY ARE BOTH WRONG! Correct their feeble attempts at a real mathematical proof by showing both sides do NOT equal each other.

KELLY'S PROOF

$9 - (8 - 4) = (9 - 8) - 4$
$9 - 12 = 1 - 4$
$-3 = -3$

SMP #3

Sully's Proof

$16 \div \left(8 \div \frac{1}{2}\right) = (16 \div 8) \div \frac{1}{2}$
$16 \div 16 = 2 \div \frac{1}{2}$
$1 = 1$

Simplify the expression by using the distributive property.

12. $4(x + 3)$

13. $5(m + 5)$

14. $-8(p - 3)$

15. $(2r - 3)(2)$

16. $6.5(v + 1)$

17. $-(3 + x)$

18. $\frac{3}{2}(8m - 4)$

19. $-(6n - 9)$

20. $-\frac{2}{3}(6n - 9)$

Simplify the expression using distributive property and combine like terms.

21. $6 + 2(y + 1)$	22. $2(4a - 1) + a$	23. $6r - 2(r + 4)$
24. $-3(m + 5) - 10$	25. $3 - 8(w - 5)$	26. $(s - 3)(2) + 17s$
27. $\frac{1}{2}(2m + 6) - 10$	28. $3(2a + 4) - 5(3a + 1)$	29. $5 + 3\left(2u + \frac{1}{3}\right)$

Analyze student work.

30. Mr. Bean and Mr. Brust are really, really bad at the distributive property. They both make huge mistakes using the distributive property. Identify their mistakes and show them how to distribute correctly.

BEAN

$8 + 2(3p + 1)$

$10(3p + 1)$

$30p + 10$

BRUST

$3d - 2(d - 4)$

$3d - 2d - 8$

$1d - 8$

1.3 Algebraic Properties

State the property used below.

1. $a(5 \cdot b) = (a \cdot 5)b$

Simplify

2. $3 + 2(b - 4)$

3. The expression $2m - (8 - 4m) + 5$ is equivalent to which of the following expressions?

   A) $6m + 13$

   B) $-2m - 3$

   C) $6m - 3$

   D) $-2m + 13$

   E) none of the above

4. Tommy is planning to make a tomato garden. The rectangular garden must be 4 foot wide. Tommy doesn't how long the garden will be, but would like 3 feet per tomato plant plus 1 foot extra at each end of the garden. Tommy doesn't know how many tomato plants he will buy. The diagram below shows the dimensions of the garden for x amount of tomato plants. Create a simplified expression to represent both the area and perimeter of the garden.

   Area: Perimeter:

   $3x + 2$

   4
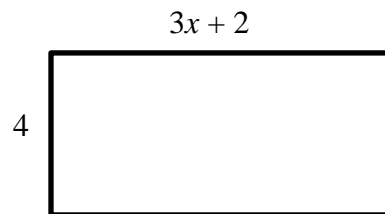
   SMP #4

   Now, use your expression to determine both the area and perimeter of the garden if Tommy plants 8 tomato plants.

EXIT TICKET

$(t \cdot t) \cdot 2$

$(2 \cdot t) \cdot t$

$(t \cdot 2) \cdot t$

YES WE

$2 \cdot (t \cdot t)$

SMP #7

$t \cdot (2 \cdot t)$