Essential Question: What are the properties of real numbers and how can we use them to demonstrate equivalence?

Do Now: Let's see what you learned from the flip. Complete #'s 1 – 6. 

1. $x + 9 = 9 + x$ is an example of which property?

   (1) identity property of addition
   (2) associative property of addition
   (3) commutative property of addition
   (4) distributive property

2. Which is an example of the associative property of multiplication?

   (1) $6 + 7 = 7 + 6$
   (2) $6(7 + 3) = 6(7) + 6(3)$
   (3) $x \bullet (8 \bullet 3) = (x \bullet 8) \bullet 3$
   (4) $(ab) \bullet c = c \bullet (ab)$

3. What property is illustrated by the statement $-y + y = 0$?

   (1) identity property of addition
   (2) associative property of addition
   (3) commutative property of addition
   (4) inverse property of addition

4. Which number represents the additive inverse of $-3\frac{3}{4}$?

   (1) $\frac{4}{15}$
   (2) $-\frac{4}{15}$
   (3) $3\frac{3}{4}$
   (4) -3.75

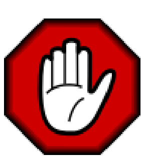
5. Which property is illustrated by the statement? $2x \bullet \frac{1}{2x} = 1$

   (1) identity property of multiplication
   (2) associative property of multiplication
   (3) commutative property of multiplication
   (4) inverse property of multiplication

6. Which of the following equations illustrates an identity property?

   (1) $5(2 + 3) = 10 + 15$
   (2) $11 + 0 = 11$
   (3) $22 + -22 = 0$
   (4) $\frac{1}{6} \bullet 6 = 1$

STOP HERE



Applications with Properties

7. Sarah used the steps shown below to solve the following equation.

$$\frac{3}{4} \bullet 7a \bullet \frac{4}{3} = 49$$

Step 1: $\frac{3}{4} \bullet \frac{4}{3} \bullet 7a = 49$

Step 2: $1 \bullet 7a = 49$

Step 3: $7a = 49$

Step 4: $a = 7$

a. Which step demonstrates the commutative property of multiplication?

b. Which property does Sarah use to go from Step 2 to Step 3?

8. The following portion of a flow diagram shows that the expression **ab + cd** is equivalent to the expression **dc + ba**.

$$ab + cd \longrightarrow ba + cd \longrightarrow ba + dc \longrightarrow dc + ba$$

Fill in each circle with the appropriate symbol:

C+ (for the "Commutative Property of Addition")

C× (for the "Commutative Property of Multiplication")

9. Consider the following expressions labeled A – D.

A. x(z + y) B. xz + xy C. zx + yx D. yx + zx

Which statement is *false*?

(1) Expression B is equivalent to expression C.
(2) Expression C is equivalent to expression D but not to expression A.
(3) Expressions B, C and D are equivalent.
(4) All the expressions are equivalent.

10. *The following is a proof of the algebraic equivalence of* $c(a+b)\cdot\frac{1}{ca}$ *and* $\frac{cb}{ca}+1$.

a. Fill in the missing lines with the full name of the property being used.

$c(a+b)\cdot\frac{1}{ca}$

$= (ca+cb)\cdot\frac{1}{ca}$ The Distributive Property

$= (cb+ca)\cdot\frac{1}{ca}$ ______________________________

$= \frac{cb}{ca}+\frac{ca}{ca}$ ______________________________

$= \frac{cb}{ca}+1$ Any number or term divided by itself is always 1

b. What is another way to prove that $c\,(a+b)\cdot\frac{1}{ca}$ and $\frac{cb}{ca}+1$ are equivalent?

TAKE AWAY

Properties of real numbers help us simplify numerical and algebraic expressions. They also help us prove ______________________________among mathematical expressions.

8 Algebra CC **HW # ______**

1. **The following flow diagram shows that the expression (MV)Q is equivalent to the expression (VQ)M.**

$$(MV)Q \xrightarrow{\bigcirc} M(VQ) \xrightarrow{\bigcirc} (VQ)M$$

Fill in each circle with the appropriate symbol.

C_X = commutative property of multiplication

A_X = associative property of multiplication

2. **Martha's proof to show the algebraic equivalence between *a(c + b)* and *ab + ac* is shown below. Examine the proof and indicate which properties Martha used in her process.**

$a(c + b)$

$ac + ab$ ______________________________

$ab + ac$ ______________________________

3. **Franny measured the dimensions of the rectangular solid below and used the formula SA = 2lw + 2lh + 2wh to calculate its surface area. John did the same but he used the formula SA = 2(lw + lh + wh) to calculate the surface area. Do you think Franny and John will get the same answer? Explain why or why not.**