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

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 $-3\frac{3}{4}$? opposites/zero pair

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

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: $\frac{3}{4} \bullet \frac{4}{3} \bullet 7a = 49$ commutative property of x

Step 2: $1 \bullet 7a = 49$ inverse property of x

Step 3: $7a = 49$ identity property of x

Step 4: $a = 7$ division property of equality

a. Which step demonstrates the commutative property of multiplication?

step 1

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

identity property of x

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

$$ab + cd \xrightarrow[C_x]{} ba + cd \xrightarrow[C_x]{} ba + dc \xrightarrow[C_+]{} dc + ba$$

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

xz + xy

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

$= (cb+ca)\cdot\frac{1}{ca}$ commutative property of +

$= \frac{cb}{ca}+\frac{ca}{ca}$ distributive property

$= \frac{cb}{ca}+1$ 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?

$\boxed{\text{evaluate}}$ the expressions to see if they get the same result

ex. If a = 2, b = 3, c = 4

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

$4(2+3)\cdot\frac{1}{4(2)}$ $\frac{4(3)}{4(2)}+1$

$4(5)\cdot\frac{1}{8}$ $\frac{12}{8}+1 \rightarrow 2.5$

$\frac{20}{8}\rightarrow 2.5$

TAKE AWAY

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