Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why. (Examples 1–4)

1. $(35 + 17) + 43$ and $35 + (17 + 43)$ **yes; Associative Property**

2. $(25 - 9) - 5$ and $25 - (9 - 5)$ **No; the first expression is equal to 11 and the second is equal to 21.**

3. 59×1 and 59 **yes; Identity Property**

4. At a gymnastics meet, a gymnast scored an 8.95 on the vault and a 9.2 on the uneven bars. Write two equivalent expressions that could be used to find her total score. (Example 5)

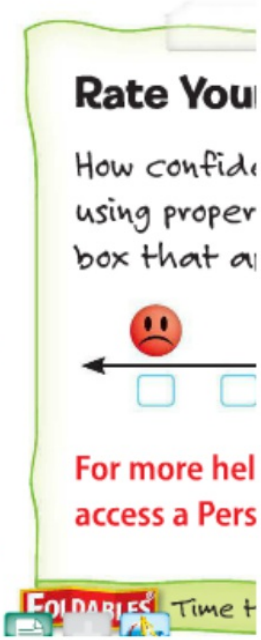
   8.95 + 9.2 and 9.2 + 8.95

5. Nadia bought suntan lotion for $12, sunglasses for $15, and a towel for $18. Use the Associative Property to mentally find the total of her purchases. (Example 6) **$45;**

   The expression 12 + 15 + 18 can be rewritten as (18 + 12) + 15.

6. **Building on the Essential Question** How can using properties help you to simplify expressions?

   Sample answer: The properties can help you to mentally solve problems.



Independent Practice

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Determine whether the two expressions are equivalent. If so, tell what property is applied. If not, explain why. (Examples 1–4)

1. $(8 + 27) + 52$ and $8 + (27 + 52)$ **yes; Associative Property**

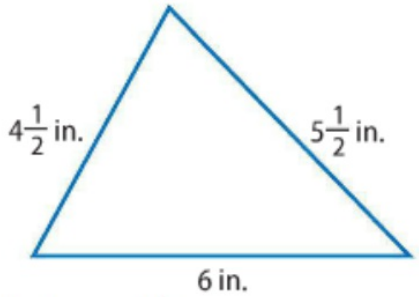
2. $(3 \cdot 6) \cdot 9$ and $3 \cdot (6 \cdot 9)$ **yes; Associative Property**

3 $72 - (63 - 8)$ and $(72 - 63) - 8$ **no; The first expression is equal to 17 and the second is equal to 1.**

4. $36 \div (12 \div 3)$ and $(36 \div 12) \div 3$ **No; the first expression is equal to 9 and the second is equal to 1.**

5. $0 + 32$ and 0 **No; the first expression is equal to 32, not 0.**

6. STEM Find the perimeter of the triangle shown. (Example 6)



$\left(4\frac{1}{2} + 5\frac{1}{2}\right) + 6 = 16$ in.

7 Each day, about 75,000 people visit Paris, France. Use the Commutative Property to write two equivalent expressions that could be used to find the number of people that visit over a 5-day period. (Example 5)

75,000 • 5 and 5 • 75,000

Use one or more properties to rewrite each expression as an expression that does not use parentheses.

8. $(y + 1) + 4 =$ $y + 5$

9. $(6 \cdot r) \cdot 7 =$ $42r$

Find the value of *x* that makes a true statement.

10. $24 + x = 24$ 0

11 $17 + x = 3 + 17$ 3

12. **Reason Abstractly** The graphic shows the driving distance between certain cities in Florida.

a. Write a number sentence that compares the mileage from Miami to Jacksonville to Tampa, and the mileage from Tampa to Jacksonville to Miami.

338 + 188 = 188 + 338

b. Refer to part a. Name the property that is illustrated by this sentence.

Commutative Property

H.O.T. Problems Higher Order Thinking

13. **Reason Abstractly** Write two equivalent expressions that illustrate the Associative Property of Addition. **Sample answer: 12 + (8 + 5) and (12 + 8) + 5**

14. **Construct an Argument** Determine whether (18 + 35) × 4 = 18 + 35 × 4 is *true* or *false*. Explain. **false; Using the order of operations, (18 + 35) • 4 = 212 and 18 + 35 • 4 = 158.**

15. **Persevere with Problems** A *counterexample* is an example showing that a statement is not true. Provide a counterexample to the following statement.

Division of whole numbers is commutative.

Sample answer: $24 \div 12 = 2$ and $12 \div 24 = 0.5$

16. **Justify Conclusions** Do $(4 + 9) + 5 = (9 + 4) + 5$ and $(4 + 9) + 5 = 4 + (9 + 5)$ illustrate the same property? Justify your response.

no; Sample answer: The first sentence illustrates the Commutative Property because the order of the numbers in the grouping symbols changes. The second sentence illustrates the Associative Property because the numbers that are grouped together change.

17. **Reason Inductively** How can the Associative Property be used to mentally find $48 + 82$?

Sample answer: Rewrite $48 + 82$ as $48 + (52 + 30)$. By using the Associative Property, $48 + (52 + 30) = (48 + 52) + 30$. So, $48 + 82 = 130$.