LESSON 2.1

Properties *and* Operations

BEFORE | *Now* | **WHY?**

You found sums and products of numbers. | You'll use properties of addition and multiplication. | So you can compare the lengths of two fish, as in Ex. 48.

Vocabulary

additive identity, p. 64

Commutative and Associative Properties	
Commutative Property of Addition **Words** In a sum, you can add the numbers in any order. **Numbers** $4 + (-7) = -7 + 4$ **Algebra** $a + b = b + a$	**Commutative Property of Multiplication** **Words** In a product, you can multiply the numbers in any order. **Numbers** $8(-5) = -5(8)$ **Algebra** $ab = ba$
Associative Property of Addition **Words** Changing the grouping of the numbers in a sum does not change the sum. **Numbers** $(9 + 6) + 2 = 9 + (6 + 2)$ **Algebra** $(a + b) + c = a + (b + c)$	**Associative Property of Multiplication** **Words** Changing the grouping of the numbers in a product does not change the product. **Numbers** $(3 \cdot 10) \cdot 4 = 3 \cdot (10 \cdot 4)$ **Algebra** $(ab)c = a(bc)$

$3+4 = 4+3$ $\quad 7-8 \neq 8-7$

$(3+7)+2 = 3+(7+2)$

$(8 \cdot 7) \cdot 5 = 8(7 \cdot 5)$

Identity Properties When 0 is added to any number, or when any number is multiplied by 1, the result is *identical* to the original number. These properties of 0 and 1 are called *identity properties*, and the numbers 0 and 1 are called *identities*.

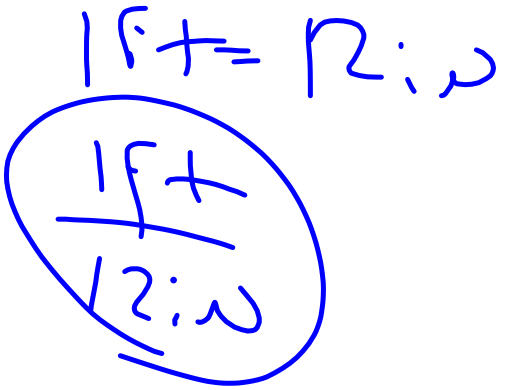
Identity Properties	
Identity Property of Addition	**Identity Property of Multiplication**
Words The sum of a number and the **additive identity**, 0, is the number.	**Words** The product of a number and the **multiplicative identity**, 1, is the number.
Numbers $-6 + 0 = -6$	**Numbers** $4 \cdot 1 = 4$
Algebra $a + 0 = a$	**Algebra** $a \cdot 1 = a$

$7+0=7$ $10 \cdot 1 = 10$

Unit Analysis You can use *unit analysis* to find a *conversion factor* that converts a given measurement to different units. A conversion factor, such as $\frac{1 \text{ foot}}{12 \text{ inches}}$, is equal to 1:

$$\frac{1 \text{ foot}}{12 \text{ inches}} = \frac{12 \text{ inches}}{12 \text{ inches}} = 1$$

So, the identity property of multiplication tells you that multiplying a measurement by a conversion factor does not change the measurement.



LESSON 2.1

Name _____ Date _____

Practice A

For use with pages 63–68

Evaluate the expression using mental math. Justify each of your steps.

1. $23 + 19 + 7$

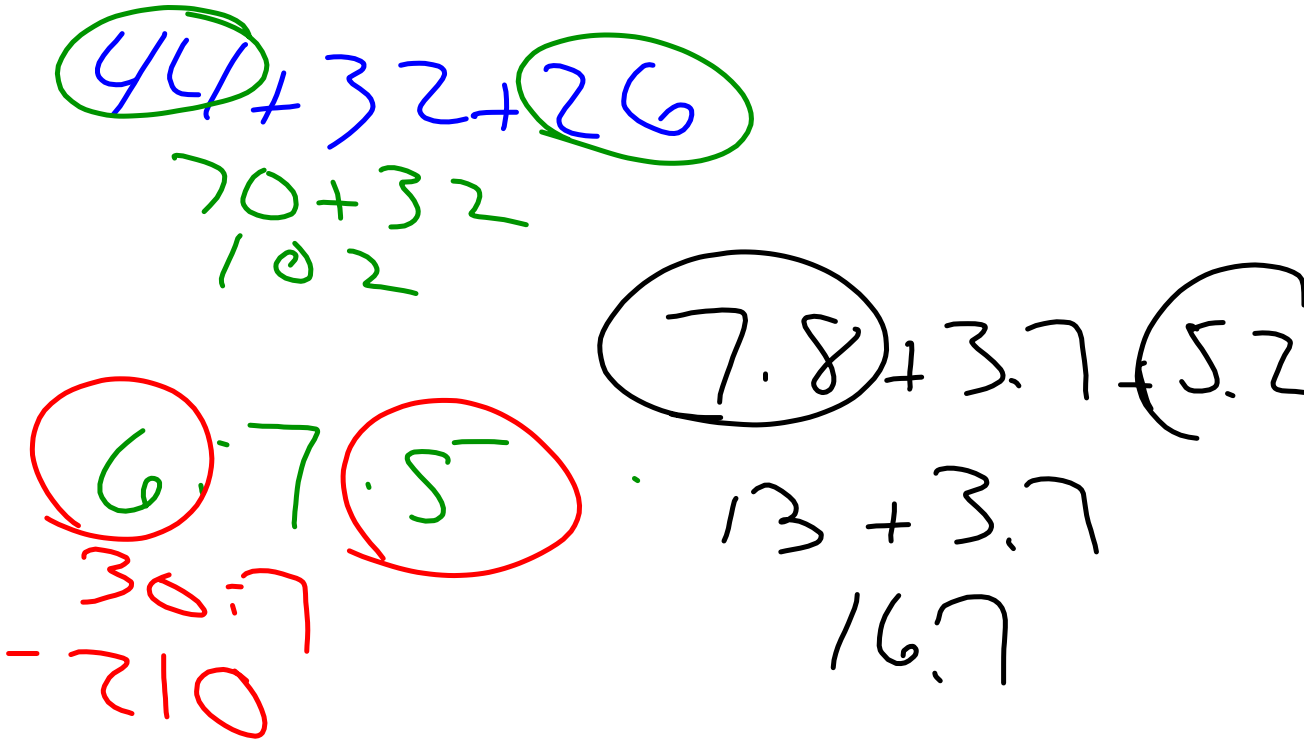
2. $44 + 32 + 26$

3. $6(-7)(5)$

4. $12(9)(-5)$

5. $7.8 + 3.7 + 5.2$

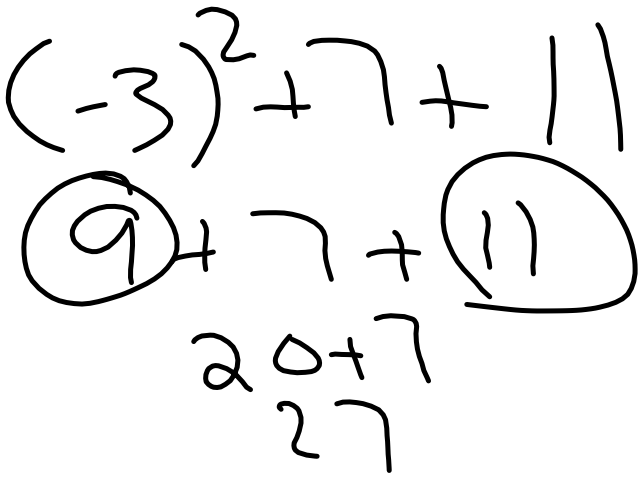
6. $1.5(-3.2)(4)$



Evaluate the expression when $x = -3$ and $y = 5$.

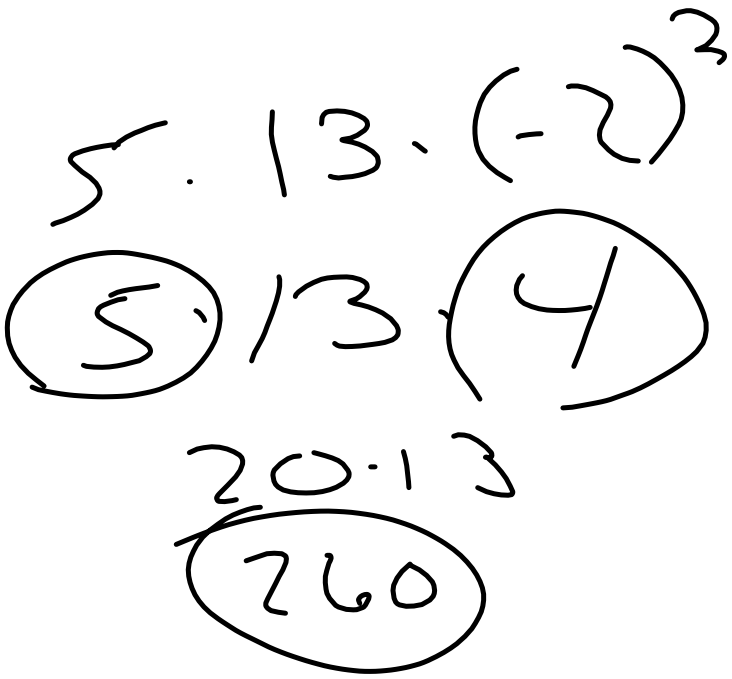
7. $3y + 41 + y$

8. $x^2 + 7 + 11$



9. $y^2(4)(-23)$

10. $y \cdot 13 \cdot (-2)^2$



11. $y(20x^2)$

$y(20x^2)$

$5 \cdot 20(-3)^2$

$5 \cdot 20 \cdot 9$

$100 \cdot 9$

900

12. $20xy$

Simplify the expression.

13. $x + 7 + 15$

14. $-3 + z + 17$

$x + 7 + 15$

$x + 22$

15. $6(-4b)$

16. $-9(8a)$

$-9\cdot(8A)$

$-9\cdot 8A$

$-72A$

17. $(5s)(-2)$

18. $11 + c + (-27)$

$11 + c = -27$

$c = -16$

19. Identify the property illustrated by the statement $m + 3 = 3 + m$.

20. Identify the property illustrated by the statement $26 \cdot 1 = 26$.

$m+3=3+m$

Commutative Property of Addition

$26 \cdot 1 = 26$

Identity Prop. of Multiplication

Use a conversion factor to perform the indicated conversion.

21. 240 minutes to hours

22. 2 miles to feet

$$\frac{240\ \text{min}}{1} \cdot \frac{1\ \text{hr}}{60\ \text{min}} = 4\ \text{hr}$$

$$2\ \text{mi} \cdot \frac{5280\ \text{ft}}{1\ \text{mi}} = 10560\ \text{ft}$$

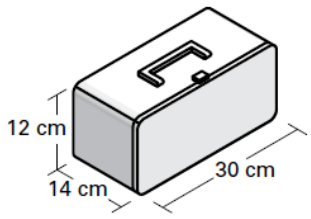
23. 144 ounces to pounds

24. 157 millimeters to centimeters

$$144\text{oz} \cdot \frac{1\text{ lb}}{16\text{oz}} = 9\text{ lb}$$

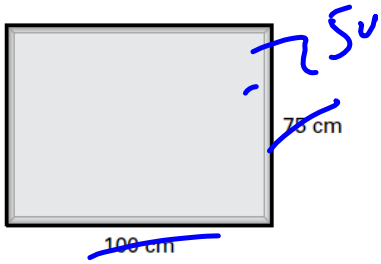
$$157\text{ mm} \cdot \frac{1\text{ cm}}{10\text{ mm}} = 15.7\text{ cm}$$

25. A lunch box is 30 centimeters long, 14 centimeters wide, and 12 centimeters high. The formula for the volume of a box is $V = \ell wh$. Find the volume of the lunch box, in cubic centimeters.



26. You earn \$15 on Monday, \$20 on Tuesday, and \$11 on Wednesday for mowing lawns. Find the total amount earned for the 3 days.

27. The surface of the table at the right has an area of 7500 square centimeters. Use a conversion factor to find the area of the surface of the table in square meters.



$7500\ cm^2$ $1\ m$

$(1\ m)(.75\ m) = .75\ m^2$

$7500\ cm^2 \cdot \left(\frac{1\ m}{100\ cm}\right)^2$

$7500\ cm^2 \quad \frac{1\ m^2}{10000\ cm^2}$

$.75\ m^2$