Have your homework out and ready to check. Warm Up on the two problems below. #4 is on p. 360 and #7 is on p. 361.

Classwork - Properties of Operations

Guided Practice p.360

4. Hannah has a doll collection. The table shows the total number of dolls in her collection for three years. Suppose this pattern continues. Write an algebraic expression to find the number of dolls in her collection after *n* years. How many dolls will Hannah have after 25 years?

(Example 3)

n = # of years $\quad 6 \cdot n$ or $6n$

$n = 25$ $\quad 6(25) = 150$ dolls

Year	Number of Dolls
1	6
2	12
3	18

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7 Refer to the table shown. If the pattern continues, what algebraic expression can be used to find the plant's height for any month? What will be the plant's height at 12 months? (Example 3)

m = # of months $\quad 3m$ or $3 \cdot m$

$3(12) = 36$ in.

Month	Height (in.)
1	3
2	6
3	9

Describe the relationship between the terms in each arithmetic sequence. Then write the next three terms in each sequence.

1. 0, 5, 10, 15, …

Adding 5

20, 25, 30

2. 1, 3, 5, 7, …

Adding 2

9, 11, 13

3. 18, 27, 36, 45, …

Adding 9

54, 63, 72

4. 7, 19, 31, 43, …

Adding 12

55, 67, 79

5. 8, 18, 28, 38, …

Adding 10

48, 58, 68

6. 25, 26, 27, 28, …

Adding 1

29, 30, 31

NUMBER SENSE Find the 40th term in each arithmetic sequence.

1334

7. 4, 8, 12, 16, …

Adding 4

$4n$

$4 \cdot 40$

160

8. 13, 26, 39, 52, …

Adding 13

$13n$

$13 \cdot 40$

520

9. 6, 12, 18, 24, …

Adding 6

$6n$

$6 \cdot 40$

240

10. Refer to the table to the right.

Days	Cost ($)
1 • 8	8
2 • 8	16
3 • 8	24

+8
+8

A) If the arithmetic sequence will continue, what algebraic expression can be used to find the cost for any number of days?

d = days d • 8 or 8d

B) How much will the cost be after 9 days?

8 • 9 ($72)

11. Refer to the table to the right.

Seconds	Feet
1 • 5	5
2 • 5	10
3 • 5	15

+5
+5

A) If the arithmetic sequence will continue, what algebraic expression can be used to find the distance traveled in feet for any number of seconds?

s = seconds 5s or 5 • s

B) How far will the object have traveled after 15 seconds?

5 • 15

(75 feet)

12. Refer to the table to the right.

Pounds	Cost ($)
1 • 4	4
2 • 4	8
3 • 4	12

+4
+4

A) If the arithmetic sequence will continue, what algebraic expression can be used to find the cost for any number of pounds?

p = pounds 4p or 4 • p

B) How much will the cost be for 10 pounds?

4 • 10

($40)

13. **GEOMETRY** The lengths of the sides of a 6-sided polygon are an arithmetic sequence. The length of the shortest side is 3 meters. If the length of the next longer side is 5 meters, what is the length of the longest side?

3, 5, . . .

3, 5, 7, 9, 11, 13

1 2 3 4 5 6

13 meters

14. **FREE FALLING OBJECT** A free falling object increases speed by a little over 22 miles per hour each second. The arithmetic sequence 22, 44, 66, …, represents the speed after each second, in miles per hour, of a dropped object. How fast is a rock falling after 8 seconds if it is dropped over the side of a cliff?

22, 44, 66, . . .

+22 +22

22(8) = 176 mi/h

S = seconds

22S

Real-World Link

Driving Miss Ricardo drives up and down her street to complete different errands. Some of the places on her street are shown below. The number of blocks between the places are also shown.

1. Suppose Miss Ricardo drives from home to the game store and back. Write an expression for each distance.

   from home to the game store: $2+1$ from the game store to home: $1+2$

2. Circle the property that is illustrated in Exercise 1.

   Commutative Associative

3. On Monday, Miss Ricardo drives from home, stops at the library, and then drives to the football field. On Tuesday, she drives from home, stops at the game store, and then drives to the football field. Write an expression for each distance.

   Monday: $2+(1+3)$ Tuesday: $(2+1)+3$

4. Circle the property that is illustrated in Exercise 3.

   Commutative Associative

Properties of Operations

Words The **Commutative Property** states that the order in which numbers are added or multiplied does not change the sum or product.

	Addition	Multiplication
Symbols	$a + b = b + a$	$a \cdot b = b \cdot a$
Examples	$6 + 1 = 1 + 6$	$7 \cdot 3 = 3 \cdot 7$

Words The **Associative Property** states that the way in which numbers are grouped when they are added or multiplied does not change the sum or product.

	Addition	Multiplication
Symbols	$a + (b + c) = (a + b) + c$	$a \cdot (b \cdot c) = (a \cdot b) \cdot c$
Examples	$2 + (3 + 8) = (2 + 3) + 8$	$3 \cdot (4 \cdot 5) = (3 \cdot 4) \cdot 5$

A **property** is a statement that is true for any number. The following properties are also true for any numbers.

Property	Words	Symbols	Examples
Additive Identity	When 0 is added to any number, the sum is the number.	$a + 0 = a$ $0 + a = a$	$9 + 0 = 9$ $0 + 9 = 9$
Multiplicative Identity	When any number is multiplied by 1, the product is the number.	$a \cdot 1 = a$ $1 \cdot a = a$	$5 \cdot 1 = 5$ $1 \cdot 5 = 5$
Multiplicative Property of Zero	When any number is multiplied by 0, the product is 0.	$a \cdot 0 = 0$ $0 \cdot a = 0$	$8 \cdot 0 = 0$ $0 \cdot 8 = 0$

Example

1. **Name the property shown by the statement $2 \cdot (5 \cdot n) = (2 \cdot 5) \cdot n$.**

The order of the numbers and variable did not change, but their grouping did. This is the Associative Property of Multiplication.

Got It? **Do these problems to find out.**

a. $42 + x + y = 42 + y + x$

Commutative Property of Addition

b. $3x + 0 = 3x$

Additive Identity

You may wonder if any of the properties apply to subtraction or division. If you can find a **counterexample**, an example that shows that a conjecture is false, the property does not apply.

Example

2. **State whether the following conjecture is *true* or *false*. If *false*, provide a counterexample.**

Division of whole numbers is commutative.

Write two division expressions using the Commutative Property.

$15 \div 3 \stackrel{?}{=} 3 \div 15$ State the conjecture.

$5 \neq \frac{1}{5}$ Divide.

The conjecture is false. We found a counterexample. That is, $15 \div 3 \neq 3 \div 15$. So, division is *not* commutative.

Got It? **Do this problem to find out.**

c. The difference of two different whole numbers is always less than both of the two numbers.

Subtract

False

(c) $74 - 6 = 68$

$4 - 2 = 2$

$6 - 0 = 6$

Example

3. **Alana wants to buy a sweater that costs $38, sunglasses that costs $14, a pair of jeans that costs $22, and a T-shirt that costs $16. Use mental math to find the total cost before tax.**

Write an expression for the total cost. You can rearrange the numbers using the properties of math. Look for sums that are multiples of ten.

$38 + 14 + 22 + 16$

$= 38 + 22 + 14 + 16$ Commutative Property of Addition

$= (38 + 22) + (14 + 16)$ Associative Property of Addition

$= 60 + 30$ Add.

$= 90$ Simplify.

The total cost of the items is $90.

Got It? **Do this problem to find out.**

d. Lance made four phone calls from his cell phone today. The calls lasted 4.7, 9.4, 2.3, and 10.6 minutes. Use mental math to find the total amount of time he spent on the phone.

38+22
30+8+20+2
30+20+10
60

D 4.7+9.4+2.3+10.6
4.7+2.3+9.4+10.6
7 + 20
27 minutes