Explore It!

A shipment of eggs contains some cartons with a dozen eggs and some cartons with a half-dozen eggs.

Lesson 4-2
Generate Equivalent Expressions

Go Online | PearsonRealize.com

I can...
write equivalent expressions for given expressions.

A. How can you represent the total number of eggs in the shipment using diagrams or images? Explain your diagram.

B. How can you represent the total number of eggs in the shipment using expressions? What variables do you use? What do they represent?

Focus on math practices

Construct Arguments How do the two representations compare? How are they different?

195

Essential Question What are equivalent expressions?

EXAMPLE 1 Use Properties of Operations to Write Equivalent Expressions

Scan for Multimedia

The student council has spent $300 on the supplies needed to sponsor a dance concert fundraiser. Three council members wrote the following expressions to represent the total amount raised for t tickets sold. Can they all be correct? Explain.

$6t - 300$ $6(t - 50)$ $-300 + 6t$

Reasoning How can you use the properties of operations to determine whether the expressions are equivalent?

STEP 1 Verify that one of the expressions represents the amount raised for t tickets sold.

$6t - 300$ — The cost of supplies

The amount made selling tickets

STEP 2 Use properties of operations to write equivalent expressions.

$6(t - 50)$
$= 6 \cdot t - 6 \cdot 50$ — Use the Distributive Property.
$= 6t - 300$

$-300 + 6t$
$= 6t + (-300)$ — Use the Commutative Property.
$= 6t - 300$

The council members wrote equivalent expressions. They are all correct.

Try It!

Nancy wrote the expression $3x - 12$ to represent the relationship in a table of values. Use properties of operations to write two equivalent expressions.

$3(x - \square)$
$\square + 3x$

Convince Me! What property can you use to write an equivalent expression for $-5(x - 2)$? Explain.

EXAMPLE 2 Write Equivalent Expressions by Combining Like Terms

Write equivalent expressions by combining like terms.

a. $-5x + 2y + 3x$

$-5x + 3x + 2y$ — Use the Commutative Property.

$(-5 + 3)x + 2y$ — Use the Distributive Property.

$-2x + 2y$

b. $\frac{1}{3}x + \left(\frac{1}{6}x + y\right)$

$\left(\frac{1}{3}x + \frac{1}{6}x\right) + y$ — Use the Associative Property.

$\frac{3}{6}x + y$

Look for Relationships
How can you check whether the expressions are equivalent?

Try It!

Use properties of operations to write two expressions that are equivalent to $\frac{3}{4}n + \left(8 + \frac{1}{2}z\right)$.

EXAMPLE 3 Identify Equivalent Expressions

Which of the expressions below are equivalent to $-\frac{2}{3}x - 2$?

$-\frac{2}{3}x + (-2)$

$= -\frac{2}{3}x - 2$ — Subtract the additive inverse.

The expression is equivalent to $-\frac{2}{3}x - 2$.

$2 - \frac{2}{3}x$

$= -\frac{2}{3}x + 2$ — Use the Commutative Property.

The expression is NOT equivalent to $-\frac{2}{3}x - 2$.

$-x + \left(\frac{1}{3}x + (-2)\right)$

$\left(-x + \frac{1}{3}x\right) + (-2)$ — Use the Associative Property.

$-\frac{2}{3}x + (-2)$

The expression is equivalent to $-\frac{2}{3}x - 2$.

Try It!

Write two expressions that are equivalent to $-\frac{5}{4}x - \frac{3}{4}$.

KEY CONCEPT

You can use properties of operations to write equivalent expressions.

$-\frac{1}{2}(x + 8)$

$= -\frac{1}{2}x + \left(-\frac{1}{2}\right) \cdot 8$ — Use the Distributive Property.

$= -\frac{1}{2}x + (-4)$

$= -4 + \left(-\frac{1}{2}x\right)$ — Use the Commutative Property.

The expressions $-\frac{1}{2}(x + 8)$, $-\frac{1}{2}x + (-4)$, and $-4 + \left(-\frac{1}{2}x\right)$ are equivalent.

Do You Understand?

1. **Essential Question** What are equivalent expressions?

2. **Make Sense and Persevere** For which operations is the Commutative Property true?

3. How can the Associative Property be applied when writing equivalent expressions with variables?

Do You Know How?

4. Write an expression equivalent to $-3 + \frac{2}{3}y - 4 - \frac{1}{3}y$.

5. Complete the tables to determine if the expressions are equivalent. If the expressions are equivalent, name the property or properties that make them equivalent.

$3(x - 5)$

x	Value of Expression
1	
2	
3	

$3x - 15$

x	Value of Expression
1	
2	
3	

6. Use the properties of operations to write an expression equivalent to $4x + \frac{1}{2} + 2x - 3$.

Name: _____

Practice & Problem Solving

Scan for Multimedia

For 7–9, write an equivalent expression.

7. $-3(7+5g)$ see notes

8. $(x+7)+3y$

9. $\frac{2}{9}-\frac{1}{5}\cdot x$

10. Which expression is equivalent to $t+4+3-2t$?

Ⓐ $t+7$

● $-t+7$

Ⓒ $6t$

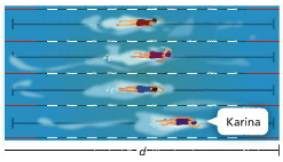
Ⓓ $10t$

$t+4+3-2t$

$(1t+-2t)+(4+3)$

$-1t \quad +7$

11. The distance in feet that Karina swims in a race is represented by $4d-4$, where d is the distance for each lap. What is an expression equivalent to $4d-4$?



12. Use the Associative Property to write an expression equivalent to $(w+9)+3$.

13. Nigel is planning his training schedule for a marathon over a 4-day period. He is uncertain how many miles he will run on two days. One expression for the total miles he will run is $12+y+17+z$.

Use the Commutative Property to write an equivalent expression.

Marathon Training Plan

Day	Miles to Run
1	12
2	y
3	17
4	z

7) $-3\cdot(7+5g)$

$(-3)(7)+(-3)(5g)$

$(-3\cdot5)\cdot g$

$-21+-15g$

~~$-36g$~~

P
E
M ✓
D
A ✓
S

14. Maria said the expression $-4n + 3 + 9n - 4$ is equivalent to $4n$. What error did Maria likely make?

15. Write an expression equivalent to $x - 3y + 4$.

16. Andre wrote the expression $-2 + 4x + 3$ to represent the relationship shown in the table.

Write two other expressions that also represent the relationship shown in the table.

x	Value of Expression
0	−2
6	6
12	14

17. Higher Order Thinking To rent a car for a trip, four friends are combining their money. The group chat shows the amount of money that each puts in. One expression for their total amount of money is 189 plus p plus 224 plus q.

a. Use the Commutative Property to write two equivalent expressions.

b. If they need $500 to rent a car, find at least two different pairs of numbers that p and q could be.

Assessment Practice

18. Which expressions are equivalent to $\frac{3}{5}x + 3$? Select all that apply.

- ☐ $\frac{2}{5}x + 3\frac{1}{5}x$
- ☐ $\frac{4}{5}x - \frac{1}{5}x + 3$
- ☐ $\frac{2}{5}x + 3\frac{3}{5}x - 1$
- ☐ $1 + \frac{3}{5}x + 2$
- ☐ $1 + \frac{x}{5} + 2$
- ☐ $1 + \frac{2}{5}x + 3$