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Lesson 9 Writing Expressions

Focus Lesson

An **expression** is a group of numbers, operations, and symbols that describes the value of something. An **algebraic expression** includes **variables**, symbols or letters that represent unknown values or values that can change. A **numeric expression** is an expression with numbers and operations but no variables.

Words can be translated into expressions, as shown in the examples below.

Words	Expression
Six more than a number	$x + 6$
Six less than a number	$x - 6$
A number less than six	$6 - x$
Six times a number	$6x$
The quotient of a number and 6	$\frac{x}{6}$

Expressions can sometimes be written in different ways to represent the same value. These expressions are called **equivalent expressions**.

7.EE.2

The number of ticket sales reported by a theater this month was 12% fewer than the number of ticket sales reported by the theater last month. If the number of ticket sales reported by the theater last month was x , which of the following expressions could represent the number of ticket sales reported by the theater this month? Select all that apply.

A $0.88x$ **D** $x - 0.12$
B $1.12x$ **E** $x - 0.12x$
C $-0.12x$ **F** $x + 0.12x$

- What operation is indicated by the words 12% fewer? subtraction
- Write an expression to represent 12% of the ticket sales last month. $0.12x$
- How is this expression related to the ticket sales this month?
It is subtracted from last month's ticket sales to find this month's ticket sales.
- What is one expression that could represent the number of ticket sales this month? $x - 0.12x$

From the given expressions, which could represent the number of ticket sales this month?

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OBJECTIVE

To review writing algebraic and numeric expressions based on a written description and to find equivalent expressions

FOCUS LESSON

The Focus Lesson question leads students to select algebraic expressions that describe a real-life situation. Guide students in identifying key words that give clues about operations. Students should also be able to change a percent to a decimal. Once students have written an expression to describe this situation, guide them in identifying equivalent expressions from the answer options.

GUIDED PRACTICE

Students must recognize how to find the perimeter of a figure and use that knowledge to write an expression using the given dimensions of a triangle. Guide students in recognizing how to combine terms in an expression to find equivalent expressions. Students should be able to rewrite the expression they found for the perimeter and the expressions in the table as needed to identify those that are equivalent.

Guided Practice

This diagram shows the lengths, in units, of a triangle.

7.EE.2

In each row of the table below, mark the appropriate box with an X to indicate whether or not the expression is equivalent to the perimeter, in units, of the triangle.

Expression	Equivalent to Perimeter	Not Equivalent to Perimeter
$4x - 9$		X
$4(3x) - 9$	X	
$3(4x - 1 - 2)$	X	
$3(4x) + 3(3 - 6)$		X
$4x + 4x + 4x - 3 - 6$	X	

- Describe in words how to find the perimeter of a triangle.
Add all the side lengths together.
- What is one expression that can be used to represent the perimeter of this triangle? $12x - 9$
- Describe in words at least one way the expression you wrote can be written another way.
A common factor of 3 can be pulled out from each term.

Which expressions in the table are equivalent to the perimeter of the triangle?

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Vocabulary

- Algebraic Expression:** an expression that contains symbols, or letters, and numbers and operations
- Equivalent Expressions:** expressions that represent the same value
- Expression:** a grouping of numbers, symbols, and operations that shows the value of something
- Numeric Expression:** an expression that contains only numbers and operations
- Variable:** a letter or symbol that represents an unknown value or a value that can change

Common Core State Standard

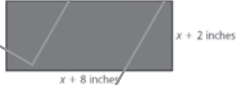
7.EE.2: Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

ANSWER RATIONALE

- Option A reflects only the amount of the height increase, so it is not correct. Option B reflects the height of the original tree (1) plus the amount of increase (0.10), so it is correct. Options C and D incorrectly relate the percent increase to the height of the tree, so they are not correct. Option E reflects the height of the original tree (1) plus the amount of increase (0.1), so it is correct. Option F incorrectly relates the percent increase to the height of the tree, so it is not correct.
- Option A reflects the sum in the parentheses but forgets that it is multiplied by 2, so it is not correct. Option B doubles only the number terms but not the variable terms in parentheses, so it is not correct. Option C doubles all terms inside parentheses, so it is correct. Option D applies the distributive property only to the first term in parentheses instead of all terms in parentheses, so it is not correct. Option E shows the number 2 multiplying the individual sums of the variable terms and the number terms, so it is correct.
- Option A applies the distributive property only to the first term in $2w - 6$ but not the second term, so it is not correct. Option B does not correctly show the product of w and $2w$, so it is not correct. Option C correctly multiplies $2w - 6$ by w , so it is correct. Option D shows the distributive property applied only to the first term in $2w - 6$ but not the second term, so it is not correct. Option E shows the product of w and $2w - 6$, so it is correct. Option F shows the distributive property applied to each term of $2w - 6$, so it is correct.
- Option A is not correct because it reflects the amount of the discount plus the amount of the sales tax on the regular price instead of the discounted price. Option B is not correct because it shows the sales tax on the regular price instead of the discounted price. Options C and E are correct because they show the discounted amount plus the sales tax on the discounted amount. Options D and F are not correct because they show the discounted amount added in each term—once without the sales tax and once with the sales tax.

Independent Practice

Solve the following problems.

- The height of a tree increased by 10% during one year. The height of the tree at the beginning of the year was h feet. Which of the following expressions could represent the height of the tree now? Select all that apply.
 - A $0.10h$
 - B $1.10h$
 - C $h + 10$
 - D $h + 0.10$
 - E $h(1 + 0.1)$
 - F $h(1 + 10)$
- The diagram below shows the dimensions of a rectangle.
 

The expression $2(x + 8 + x + 2)$ represents the perimeter, in inches, of the rectangle. Which of the following expressions is equivalent to this perimeter? Select all that apply.

 - A $2x + 10$
 - B $2x + 20$
 - C $4x + 20$
 - D $2x + 8 + x + 2$
 - E $2(2x) + 2(8 + 2)$

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Independent Practice

- The length of a rectangle is 6 centimeters less than twice the width of the rectangle.
 - The width of the rectangle is w centimeters.
 - The expression $2w + 6$ represents the length, in centimeters, of the rectangle.

Which of the following expressions can be used to represent the area, in square centimeters, of the rectangle? Select all that apply.

 - A $2w^2 - 6$
 - B $2w - 6w$
 - C $2w^2 - 6w$
 - D $w(2w) - 6$
 - E $w(2w - 6)$
 - F $w(2w) - w(6)$
- Ronan bought a baseball glove on sale. The price of the baseball glove was discounted by $\frac{1}{3}$ off the regular price. Ronan paid 5% sales tax on the discounted price. The regular price of the baseball glove was b dollars. Which of the following expressions represents the total price Ronan paid for the baseball glove? Select all that apply.
 - A $\frac{1}{3}b + 0.05b$
 - B $\frac{2}{3}b + 0.05b$
 - C $\frac{2}{3}b + 0.05(\frac{2}{3}b)$
 - D $\frac{2}{3}b + 1.05(\frac{2}{3}b)$
 - E $(1 - \frac{1}{3})b + (0.05)(\frac{2}{3}b)$
 - F $(1 - \frac{1}{3})b + (1 + 0.05)(\frac{2}{3}b)$

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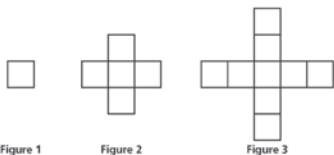
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Independent Practice

5 Figures 1, 2, and 3 shown below were created using square tiles.

7.EE.2
DOK: 2



The expression $4n - 3$ can be used to represent the number of square tiles in a figure, where n represents the figure number.

In each row of the table below, mark the appropriate box with an X to indicate whether or not the expression can be used to find the number of square tiles in Figure n .

Expression	Equivalent to Number of Square Tiles in Figure n	Not Equivalent to Number of Square Tiles in Figure n
$(4 - 1)n$		X
$4(n + 1)$		X
$1 + 4n - 4$	X	
$1 + 4(n - 1)$	X	
$1 + (4 - 1)n$		X

- 5 $(4 - 1)n$ is not equivalent because $(4 - 1)n \neq 4n - 3$.
 $4(n + 1)$ is not equivalent because $4(n + 1) \neq 4n - 3$.
 $1 + 4n - 4$ is equivalent because $1 + 4n - 4 = 4n - 3$.
 $1 + 4(n - 1)$ is equivalent because $1 + 4(n - 1) = 1 + 4n - 4 = 4n - 3$.
 $1 + (4 - 1)n$ is not equivalent because $1 + (4 - 1)n = 1 + 3n \neq 4n - 3$.

Hands-On Extension Activity

Write the following words on a chart or handout: *add, sum, plus, increased by, more than, subtract, difference, minus, decreased by, less than, multiply, product, times, twice, of, divide, divided by, quotient, ratio, per*. Then give each student an algebraic expression with two or more operations.

Ask the student to rewrite the expression using words, in at least two different ways, using the reference chart. Then have the student generate a real-life situation that could be modeled by the expression and identify what the variable stands for.