Mathematics Gymnastics

2

Rewriting Expressions Using the Distributive Property

MATERIALS

None

Lesson Overview

Students rewrite linear expressions using the Distributive Property. First, they plot related algebraic expressions on a number line by reasoning about magnitude. Students realize that rewriting the expressions reveals structural similarities in the expressions, which allows them to more accurately plot the expressions. They then review the Distributive Property. Students expand algebraic expressions using both the area model and symbolic representations, focusing on the symbolic. They then reverse the process to factor linear expressions. Students factor expressions by factoring out the greatest common factor and by factoring out the coefficient of the linear variable. Finally, students rewrite expressions in multiple ways by factoring the same value from each term of the expression.

Grade 6 Expressions, Equations, and Relationships

(6.7) The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to

(D) generate equivalent expressions using the properties of operations: inverse, identity, commutative, associative, and distributive properties

Grade 7 Number and Operations

(7.3) The student applies mathematical process standards to add, subtract, multiply, and divide while solving problems and justifying solutions. The student is expected to

(A) add, subtract, multiply, and divide rational numbers fluently

Grade 7 Expressions, Equations, and Relationships

(7.10) The student applies mathematical process standards to use one-variable equations and inequalities to represent situations. The student is expected to

(A) write one-variable, two-step equations and inequalities to represent constraints or conditions within problems

Grade 7 Expressions, Equations, and Relationships

(7.11) The student applies mathematical process standards to solve one-variable equations and inequalities. The student is expected to

(A) model and solve one-variable, two-step equations and inequalities

ELPS

1.A, 1.D, 1.E, 2.C, 2.D, 2.G, 2.H, 2.I, 3.A, 3.B, 3.C, 3.D, 4.A, 4.B, 4.C, 4.K, 5.E

Essential Ideas

- The Distributive Property provides ways to write numerical and algebraic expressions in equivalent forms.
- The Distributive Property states that if a, b, and c are any real numbers, then $a(b + c) = ab + ac$.
- The Distributive Property is used to expand expressions.
- The Distributive Property is used to factor expressions.
- To factor an expression means to rewrite the expression as a product of factors.
- A coefficient is the number that is multiplied by a variable in an algebraic expression.
- A common factor is a number or an algebraic expression that is a factor of two or more numbers or algebraic expressions.
- The greatest common factor is the largest factor that two or more numbers or terms have in common.
- An expression can be factored in an infinite number of ways.

Lesson Structure and Pacing: 2 Days

Day 1

Engage

Getting Started: Where Are They?

Students plot four related algebraic expressions on an empty number line. They describe their strategy and any assumptions used to plot the expressions. These expressions will be used in Activity 2.1.

Develop

Activity 2.1: Algebraic Expressions on the Number Line

Students analyze strategies for accurately plotting the algebraic expressions from the Getting Started. One strategy involves substituting the same value for the variable and plotting the resulting values (arithmetic). The other strategy requires rewriting each expression as a product of two factors (algebraic). Students review what it means to factor out a coefficient. They plot additional expressions and explain how the expressions are related.

Activity 2.2: Applying the Distributive Property

Students review the Distributive Property by calculating the product of two numbers using the area of rectangles diagram. Students simplify algebraic expressions using both the area model and symbolic representations. They simplify more complicated algebraic expressions using the Distributive Property and then evaluate two expressions using the property.

Day 2

Activity 2.3: Factoring Linear Expressions

Students use the Distributive Property to factor expressions. The greatest common factor is defined and students practice factoring out the GCF. Then students factor out the coefficient of the leading term of an algebraic expression. Students practice factoring and evaluating expressions.

Demonstrate

Talk the Talk: Flexible Expressions

Students use the Distributive Property to rewrite linear expressions in as many equivalent forms as possible.

Getting Started: Where Are They?

ENGAGE

Facilitation Notes

In this activity, students locate algebraic expressions on a number line and discuss their strategy.

Have students work in pairs to complete the empty number line in Questions 1 and 2. Students should use their own strategies to determine the location of each point. Do not worry about students getting precise locations. Focus more on the strategies being used. Have students share their responses, and then have students answer Question 3 in pairs or in groups. Share responses as a class.

Questions to ask

- Did you assume $x + 1$ was to the right of 0? Why or why not?
- Did you assume $x + 1$ was greater than 0? Why or why not?
- Did you assume $x + 1$ was to the left of 0? Why or why not?
- Did you assume $x + 1$ was less than 0? Why or why not?
- What values of x fit your assumption to place the expression where you did on the number line?
- Why did you assume $2x + 2$ was to the right of $x + 1$?
- How many times larger/smaller than $x + 1$ is $2x + 2$? How is that reflected in the placement of $2x + 1$ on your number line?
- Why did you assume $3x + 3$ was to the right of $2x + 2$?
- Why did you assume $4x + 4$ was to the right of $3x + 3$?

As students work, look for

- Placement of $x + 1$ to the right of 0 or to the left of 0.
- Placement of $x + 1$ at 0; if this is the case, $x = -1$ and all other expressions would be placed at 0, too. This is a special case that does not need to be addressed unless students bring it up or you would like to extend the activity; an extension is suggested in the next activity.
- Intervals that are not evenly spaced.

Summary

Related linear expressions have specific locations on a number line.

DEVELOP

Activity 2.1

Algebraic Expressions on the Number Line

Facilitation Notes

In this activity, students review examples of strategies that plot the expressions from the previous activity on a number line. One strategy involves substituting the same value for the variable, and a second strategy involves rewriting each expression as a product of two factors, factoring out a coefficient.

Discuss the examples of correct student work as a class. Have students read and discuss the definitions for *factor* and *coefficient*.

Have students work with a partner or in a group to complete Questions 1 and 2. Share responses as a class.

Questions to ask

- What values did you substitute for the variable?
- How did you determine the values plotted?
- Should the values plotted be multiples of $x + 1$?
- Are the values plotted all multiples of $x + 1$?
- What would the number line look like if $x = 1$?
- What would the number line look like if $x = -2$?
- What would the number line look like if $x = -\frac{1}{2}$?

Have students work with a partner or in a group to complete Questions 3 through 6. Share responses as a class.

Questions to ask

- Can all of the expressions be written as a constant times a sum of two numbers?
- What is the sum of two terms?
- Is $x + 1$ always the sum of two terms?
- What is the coefficient in the term x?
- What is the coefficient in the term $-x$?
- What is a sequence?
- Did Meghan use the Distributive Property when she factored out the coefficient?
- How was the Distributive Property used?

Differentiation strategies

To extend the activity, have students investigate,

- What happens when $x + 1 = 0$.
- The relationship among x, $x + 1$, and the interval size between expressions on the number line.
- How multiples would be generated if the original expression was $x + 5$.

Summary

Factoring out a coefficient using the Distributive Property can reveal the structure of an algebraic expression.

Activity 2.2

Applying the Distributive Property

Facilitation Notes

In this activity, the product of two numbers is shown by the application of the Distributive Property in an area model. Students simplify algebraic expressions using area models, symbolic representations, and the Distributive Property.

Ask a student to read the introduction aloud and analyze the example of student work as a class.

Have students work with a partner or in a group to complete Questions 1 and 2. Share responses as a class.

Questions to ask

- What is an area model?
- Is this an example of an area model?
- What do the numbers in the boxes represent?
- Where did 1400 come from?
- Where did 210 come from?
- Could the rectangle be decomposed differently?
- Could the rectangle be decomposed into 3 smaller rectangles?
- How could the rectangle have been composed differently?
- How are these problems in Question 2 different from the previous problems?
- Why can't you simplify your algebraic expressions in Question 2 by adding the areas?

Have students work with a partner or in a group to complete Questions 3 through 5. Share responses as a class.

Questions to ask

- How did you determine the signs of each term?
- Is the process any different if there are more than two terms in the parentheses?
- How does the distributive process work for the division problems?
- How can a distributive property be used to simplify this expression?

- What is the first step?
- What is the second step?
- Did you use the Distributive Property to simplify this expression? How?
- Is the answer in the simplest form? How do you know?

As students work, look for

- Sign errors, especially when the term in front of the parentheses is negative as well as a subtraction sign inside of the parentheses.
- Distributing errors where students distribute to the first term in the parentheses, but forget to distribute to the second term. Use of the area model helps eliminate this error by having students fill in a rectangle for each term.
- Distributing errors where students distribute to terms following the parentheses that are not in the parentheses.

Misconception

Be sure that students do not overgeneralize the Distributive Property. The numerator can be split as a sum for ease in calculations, but the denominator cannot be split as a sum.

For example: $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

For example: $\frac{c}{a+b} \neq \frac{c}{a} + \frac{c}{b}$

Have students work with a partner or in a group to complete Question 6. Share responses as a class.

Questions to ask

- Was the number distributed correctly?
- Did both terms change as a result of the distribution?
- Are the signs in each term correct?
- Was the sign distributed to each term?
- Was the variable distributed correctly?

Summary

The Distributive Property can be applied in an area model to determine the product of two terms.

Activity 2.3
Factoring Linear Expressions

Facilitation Notes

In this activity, students use the Distributive Property to factor expressions. The greatest common factor is defined and students practice factoring out the GCF. Then students factor out the coefficient of the leading term of an algebraic expression. Students practice factoring and evaluating expressions.

Ask a student to read the introduction aloud and complete Question 1 as a class. Review the key terms together.

Questions to ask

- What is the product of 7(26 + 14) or 7(40)?
- What is the product of 7(26) + 7(14)?
- Which problem was easier to solve?
- What are the types of problems where factoring helps with mental math?
- Is it easier to perform the multiplication and then subtract the products or subtract the numbers in the parentheses and then perform the multiplication? Explain.
- What does it mean to factor an algebraic expression?

Analyze and discuss the worked examples as a class.

Have students work with a partner or in a group to complete Question 2. Share responses as a class.

Differentiation strategies

To support students who struggle with factoring,

- Use the area model to factor expressions; the original expression should be written on top of the rectangle, the GCF should be written to the left of the rectangle, and the expressions inside of the rectangle will be what goes inside of the parentheses.
- Factor out −1 rather than just a negative sign if the GCF is −1.

Questions to ask

- Can the GCF contain variables?
- When should you factor out the negative sign?
- Is the coefficient of the first term in the expression negative or positive?
- Is the coefficient of the first term always the value that you factor out?
- How do you factor out a negative sign if the second term is positive?
- How can you check that you have factored the algebraic expression correctly?

Have students work with a partner or in a group to complete Questions 3 through 5. Note that in Question 3, students are factoring out the coefficient of the variable. They will get fractional constants in some of the problems. Share responses as a class.

Questions to ask

- What coefficient did you factor out of the expression?
- Could a larger coefficient have been factored out of the expression?

- Did you factor out the GCF?
- How can you be sure you factored out the GCF?
- Can you factor a sign out of both terms?
- Are $-24x$ and $16y$ considered like terms? Why or why not?
- Do the terms $-24x$ and $16y$ have a common factor? If so, what is it?
- What is the greatest common factor of the terms $-24x$ and $16y$?
- What is the decimal equivalent for $2\frac{1}{2}$?
- Is it easier to evaluate the expression using $2\frac{1}{2}$ or 2.5? Why?

Summary

The Distributive Property in conjunction with the greatest common factor (GCF) can be used to simplify algebraic expressions.

DEMONSTRATE

Talk the Talk: Flexible Expressions

Facilitation Notes

In this activity, students rewrite algebraic expressions in equivalent forms.

Have students work with a partner or in a group to complete Questions 1 through 4. Share responses as a class. Collect a list of all the different ways students have rewritten each expression.

Differentiation strategy

Ask groups to challenge each other and see who can generate the most unique, or just the most equivalent expressions.

Summary

Algebraic expressions can be rewritten by factoring out a GCF, factoring out the coefficient of the variable or factoring out any value.

Mathematics Gymnastics 2

Rewriting Expressions Using the Distributive Property

WARM UP

Write a numeric expression for the opposite of each given expression.

1. −7 − 2
2. 3 − 9
3. −3 + 2
4. 3 − (−7)

LEARNING GOALS

- Write and use the Distributive Property.
- Apply the Distributive Property to expand expressions with rational coefficients.
- Apply the Distributive Property to factor linear expressions with rational coefficients.

KEY TERMS

- factor
- coefficient
- common factor
- greatest common factor (GCF)

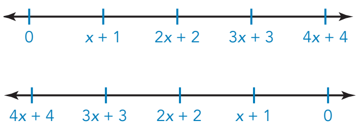
You have used the Distributive Property to expand and factor algebraic expressions with positive numbers. How can you apply the property to all rational numbers?

Warm Up Answers

1. 7 + 2
2. −3 + 9
3. 3 − 2
4. −3 − 7

Answers

1. Answers will vary.



2. Answers will vary.
   Students should discuss magnitude and evenly-spaced intervals.
3. Answers will vary.
   Some students may assume that $x + 1 > 0$. Others may assume that $x + 1 < 0$.

Getting Started

Where Are They?

Consider the list of linear expressions.

$x + 1$ $2x + 2$ $3x + 3$ $4x + 4$

1. **On the empty number line, plot each algebraic expression by estimating its location.**

2. **Explain your strategy. How did you decide where to plot each expression?**

3. **What assumptions did you make to plot the expressions? Does everyone's number line look the same? Why or why not?**

ACTIVITY 2.1

Algebraic Expressions on the Number Line

Consider the four expressions plotted in the previous activity. How can you prove that you are correct?

To **factor** an expression means to rewrite the expression as a product of factors.

Graham

I can use an example by evaluating all four expressions at the same value of x and plot the values.

Let $x = 4$.

$x + 1 = 4 + 1 = 5$

$2x + 2 = 2(4) + 2 = 10$

$3x + 3 = 3(4) + 3 = 15$

$4x + 4 = 4(4) + 4 = 20$

I can plot the expressions at 5, 10, 15, and 20.

Meaghan

The expressions look similar. I can factor out the coefficient of each expression.

$x + 1$

$2x + 2 = 2(x + 1)$

$3x + 3 = 3(x + 1)$

$4x + 4 = 4(x + 1)$

So, I can plot $x + 1$ and use that expression to plot the other expressions.

1. **Use Graham's strategy with a different positive value for x to accurately plot the four expressions.**

A **coefficient** is a number that is multiplied by a variable in an algebraic expression.

2. **Use Graham's strategy with a negative value for x to accurately plot the four expressions. How is your number line different from the number line in Question 1?**

Answers

1. Answers will vary.
   The values plotted should be multiples of $x + 1$.
2. Answers will vary.
   The values plotted should be multiples of $x + 1$.
   If $x = -1$, all expressions are 0.
   If $-1 < x < 0$, the expressions are plotted to the right of 0 in this order: $x + 1$, $2x + 2$, $3x + 3$, $4x + 4$.
   If $x < -1$ the values are plotted to the left of 0 in this order: $x + 1$, $2x + 2$, $3x + 3$, $4x + 4$.

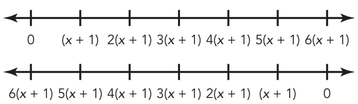
Answers

3.

$x + 1$	1	$x + 1$
$2x + 2$	2	$x + 1$
$3x + 3$	3	$x + 1$
$4x + 4$	4	$x + 1$

All of the expressions can be rewritten as a constant times $(x + 1)$.

4. Students should plot one of the following number lines. The distance between any two consecutive expressions should be the same as the distance from 0 to $x + 1$.



5. The next two terms are $5(x + 1)$ and $6(x + 1)$. They should be plotted on the number line in Question 4. $5(x + 1)$ is a distance of $x + 1$ from $4(x + 1)$, and $6(x + 1)$ is a distance of $x + 1$ from $5(x + 1)$.

6. Meaghan used the Distributive Property.

Often, writing an expression in a different form reveals the structure of the expression. Meaghan saw that each expression could be rewritten as a product of two factors.

Meaghan's expressions
$x + 1$
$2x + 2 = 2(x + 1)$
$3x + 3 = 3(x + 1)$
$4x + 4 = 4(x + 1)$

3. What are the two factors in each of Meaghan's expressions? What is common about the factors of each expression?

4. Use Meaghan's work to accurately plot the four expressions. Explain your strategy.

If a variable has no coefficient, the understood coefficient is 1.

5. Meaghan noticed that the expressions formed a sequence. Write and plot the next two terms in the sequence. Explain your strategy.

6. What property did Meaghan use when she factored out the coefficient of the expressions?

ACTIVITY 2.2

Applying the Distributive Property

NOTES

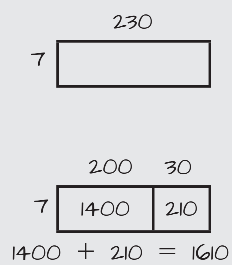
Recall that the Distributive Property states that if *a*, *b*, and *c* are any real numbers, then $a(b + c) = ab + ac$. The property also holds if addition is replaced with subtraction, then $a(b - c) = ab - ac$.

Dominique remembers that the Distributive Property can be modeled with a rectangle. She illustrates with this numeric example.

Dominique

Calculating 230 × 7 is the same as determining the area of a rectangle by multiplying the length by the width.

But I can also decompose the rectangle into two smaller rectangles and calculate the area of each. I can then add the two areas to get the total.



So, 7(230) = 1610.

1. Write Dominique's problem in terms of the Distributive Property.

Answers

1. $7(230) = 7(200 + 30)$
   $= 7(200) + 7(30)$
   $= 1400 + 210 = 1610$

Answers

2a.

	x	9
6	$6x$	54

$6x + 54$

2b.

	$2b$	-5
7	$14b$	-35

$14b - 35$

2c.

	$4a$	1
-2	$-8a$	-2

$-8a - 2$

2d.

	x	15
$\frac{1}{5}$	$\frac{1}{5}x$	3

$\frac{x}{5} + 3$

3a. $12y + 6$

3b. $12x + 36$

3c. $-12ab + 20a$

3d. $-14y + 21x - 63$

3e. $-3m - 6$

3f. $11 - 2x$

4a. $-18x + 24y$

4b. $12x - 2$

You can also use area models with algebraic expressions.

2. Draw a model for each expression, and then rewrite the expression with no parentheses.

a. $6(x + 9)$

b. $7(2b - 5)$

c. $-2(4a + 1)$

d. $\frac{x + 15}{5}$

3. Use the Distributive Property to rewrite each expression in an equivalent form.

a. $3(4y + 2)$

b. $12(x + 3)$

c. $-4a(3b - 5)$

d. $-7(2y - 3x + 9)$

e. $\frac{6m + 12}{-2}$

f. $\frac{22 - 4x}{2}$

4 Simplify each expression. Show your work.

a. $-6(3x + (-4y))$

b. $-4(-3x - 8) - 34$

c. $\frac{-7.2 - 6.4x}{-0.8}$

d. $\left(-2\frac{1}{2}\right)\left(3\frac{1}{4}\right) + \left(-2\frac{1}{2}\right)\left(-2\frac{1}{4}\right)$

e. $\frac{\left(-7\frac{1}{2}\right) + 5y}{2\frac{1}{2}}$

5. Evaluate each expression for the given value.
Then, use properties to simplify the original expression.
Finally, evaluate the simplified expression.

a. $2x(-3x + 7)$ for $x = -1\frac{2}{3}$

b. $\frac{4.2x - 7}{1.4}$ for $x = 1.26$

c. Which form—simplified or not simplified—did you prefer to evaluate? Why?

Answers

4c. $9 + 8x$

4d. $-2\frac{1}{2}$

4e. $-3 + 2y$

5a. $2x(-3x + 7) = 2\left(-1\frac{2}{3}\right)\left[-3\left(-1\frac{2}{3}\right) + 7\right] = -40$

$2x(-3x + 7) = -6x^2 + 14x$
$= -6\left(-1\frac{2}{3}\right)^2 + 14\left(-1\frac{2}{3}\right)$
$= -40$

5b. $\frac{4.2x - 7}{1.4} = \frac{4.2(1.26) - 7}{1.4}$
$= -1.22$

$\frac{4.2x - 7}{1.4} = 3x - 5$
$= 3(1.26) - 5 = -1.22$

5c. Answers will vary.

Answers

6a. √

6b. X $6x - 12$

6c. X $-12xy + 30x$

6d. X $15x^2 + 10xy$

6e. √

6f. X $2x - 1$

6g. X $4(3x + 1)$

6h. √

6. A student submitted the following quiz. Grade the paper by marking each correct item with a √ or incorrect item with an X. Correct any mistakes.

Name Alicia Smith

Distributive Property Quiz

a. $2(x + 5) = 2x + 10$

b. $2(3x - 6) = 6x - 6$

c. $-3x(4y - 10) = -12xy + 30$

d. $5x(3x + 2y) = 15x + 10xy$

e. $\frac{15x + 10}{5} = 3x + 2$

f. $\frac{8x - 4}{4} = 2x + 1$

g. $12x + 4 = 3(4x + 1)$

h. $-2x + 8 = -2(x - 4)$

8 • TOPIC 2: Algebraic Expressions

ACTIVITY 2.3

Factoring Linear Expressions

You can use the Distributive Property to expand expressions, as you did in the previous activity, and to factor linear expressions, as Meaghan did. Consider the expression:

$$7(26) + 7(14)$$

Since both 26 and 14 are being multiplied by the same number, 7, the Distributive Property says you can add 26 and 14 together first, and then multiply their sum by 7 just once.

$$7(26) + 7(14) = 7(26 + 14)$$

You have factored the original expression.

The number 7 is a *common factor* of both 7(26) and 7(14).

A **common factor** is a number or an algebraic expression that is a factor of two or more numbers or algebraic expressions.

1. Factor each expression using the Distributive Property.

a. 4(33) − 4(28) **b. 16(17) + 16(13)**

The Distributive Property can also be used to factor algebraic expressions. For example, the expression $3x + 15$ can be written as $3(x) + 3(5)$, or $3(x + 5)$. The factor, 3, is the *greatest common factor* to both terms.

The **greatest common factor (GCF)** is the largest factor that two or more numbers or terms have in common.

When factoring algebraic expressions, you can factor out the greatest common factor from all the terms.

WORKED EXAMPLE

Consider the expression $12x + 42$.

The greatest common factor of $12x$ and 42 is 6. Therefore, you can rewrite the expression as $6(2x + 7)$.

Answers

1a. 4(33 − 28)

1b. 16(17 + 13)

Answers

2a. $7(x + 2)$
2b. $9(x - 3)$
2c. $5(2y - 5)$
2d. $4(2n + 7)$
2e. $-3(x + 9)$
2f. $-6(x - 5)$
3a. $10\left(x - \frac{9}{2}\right)$
3b. $-2\left(x - \frac{3}{2}\right)$
3c. $-1(x - 4)$
3d. $-1(x + 19)$

It is important to pay attention to negative numbers. When factoring an expression that contains a negative leading coefficient it is preferred to factor out the negative sign.

WORKED EXAMPLE

Consider the expression $-2x + 8$. You can think about the greatest common factor as being the coefficient of -2.

$$\begin{aligned} -2x + 8 &= (-2)x + (-2)(-4) \\ &= -2(x - 4) \end{aligned}$$

2. Rewrite each expression by factoring out the greatest common factor.

a. $7x + 14$ **b.** $9x - 27$

c. $10y - 25$ **d.** $8n + 28$

e. $-3x - 27$ **f.** $-6x + 30$

Often, especially in future math courses, you will need to factor out the coefficient of the variable, so that the variable has a coefficient of 1.

3. Rewrite each expression by factoring out the coefficient of the variable.

a. $10x - 45$ **b.** $-2x + 3$

c. $-x + 4$ **d.** $-x - 19$

4. Rewrite each expression by factoring out the GCF.

a. $-24x + 16y$

b. $-4.4 - 1.21z$

c. $-27x - 33$

d. $-2x - 9y$

e. $4x + (-5xy) - 3x$

NOTES

5. Evaluate each expression for the given value. Then factor the expression and evaluate the factored expression for the given value.

a. $-4x + 16$ for $x = 2\frac{1}{2}$

b. $30x - 140$ for $x = 5.63$

c. Which form—simplified or not simplified—did you prefer to evaluate? Why?

Answers

4a. $-8(3x - 2y)$

4b. $-1.1(4 + 1.1z)$

4c. $-3(9x + 11)$

4d. $-1(2x + 9y) = -(2x + 9y)$

4e. $x(1 - 5y)$

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

$-4x + 16 = -4(x - 4) = -4\left(2\frac{1}{2} - 4\right) = 6$

5b. $30x - 140 = 30(5.63) - 140 = 28.9$

$10(3x - 14) = 10[3(5.63) - 14] = 28.9$

5c. Answers will vary.

Answers

Answers will vary. Sample responses are provided for each expression.

1. $4(x - 3)$, $-4(-x + 3)$, $2(2x - 6)$, $-2(-2x + 6)$, $\frac{1}{4}(16x - 48)$
2. $-3(x - 5)$, $3(-x + 5)$, $\frac{1}{2}(-6x + 30)$, $-\frac{1}{2}(6x - 30)$
3. $10(1 - 2y)$, $-10(-1 + 2y)$, $5(2 - 4y)$, $-5(-2 + 4y)$
4. $-8\left(y - \frac{9}{8}\right)$, $8\left(-y + \frac{9}{8}\right)$, $9\left(-\frac{8}{9}y + 1\right)$, $-9\left(\frac{8}{9}y - 1\right)$

NOTES

TALK the TALK

Flexible Expressions

As you have seen, you can rewrite expressions by factoring out a GCF or by factoring out the coefficient of the variable. You can also rewrite expressions by factoring out any value. For example, some of the ways $6x + 8$ can be rewritten are provided.

$2(3x + 4)$	$6\left(x + \frac{4}{3}\right)$	$-2(-3x - 4)$
$-6\left(-x - \frac{4}{3}\right)$	$\frac{1}{2}(12x + 16)$	$-\frac{1}{2}(-12x - 16)$

Rewrite each expression in as many ways as you can by factoring the same value from each term.

1. $4x - 12$

2. $-3x + 15$

3. $10 - 20y$

4. $-8y + 9$