ENGAGE + DEVELOP + TEACH

ENGAGE at the **Module** level

DEVELOP at the **Topic** level

TEACH: Read the facilitation notes and **plan learning experiences**.

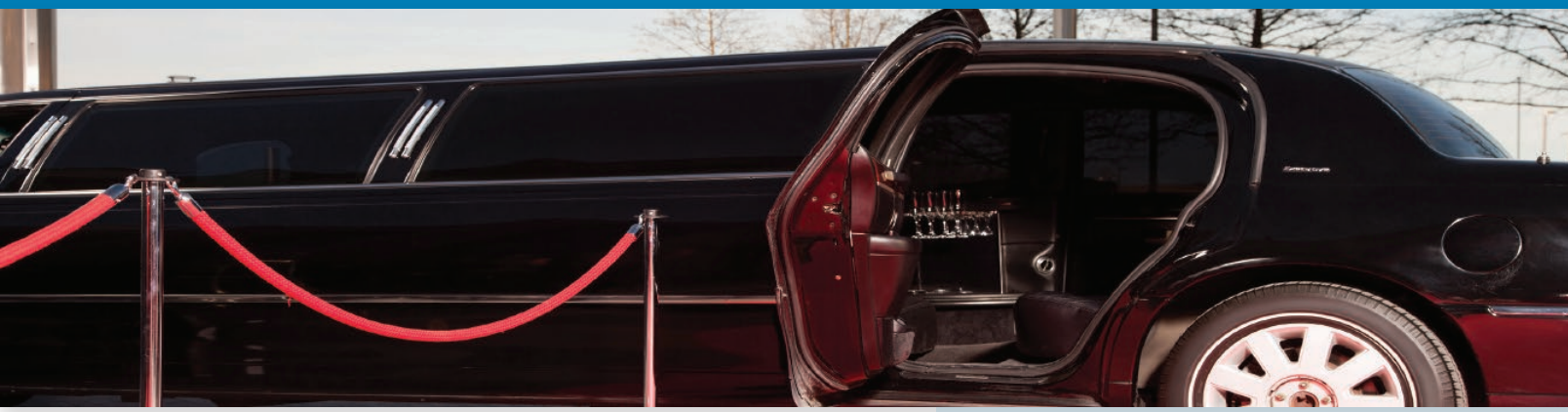
Where are we?

TOPIC 1 Two-Step Equations and Inequalities	LESSON 1 No Substitute for Hard Work	LESSON 2 Picture Algebra	LESSON 3 Expressions That Play Together . . .	LESSON 4 Formally Yours	LESSON 5 Put It on the Plane
Pacing	**1 Session**	2 Sessions	1 Session	3 Sessions	2 Sessions

OVERVIEW: LESSON 1

No Substitute for Hard Work

Evaluating Algebraic Expressions



ENGAGE

- Students plot one-term variable expressions with different coefficients of x.

DEVELOP

- Students compare the same one-term variable expressions when $x < 0$ and $x > 0$.
- They differentiate between linear and nonlinear algebraic expressions.
- They combine like terms with rational coefficients.
- They rewrite expressions representing costs with sales tax, discounts, and tips.
- They substitute values into expressions to verify the accuracy of their work.

DEMONSTRATE

- Students write an expression and substitute values into the expression to solve problems.

GRADE 7 STANDARDS

Expressions and Equations

Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multistep real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals) using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

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LESSON STRUCTURE AND PACING GUIDE 1 SESSION

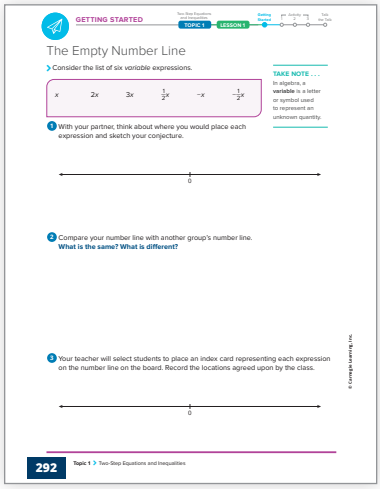
This activity highlights a key term or concept that is essential to the learning goals of the lesson.

Session 1

INSTRUCTIONAL SEQUENCE

ENGAGE	DEVELOP	DEVELOP
Establish a situation	Worked Example Peer analysis	Worked Example Mathematical problem solving

GETTING STARTED
The Empty Number Line


GETTING STARTED

The Empty Number Line

Consider the list of six *variable* expressions.

x $2x$ $3x$ $\frac{1}{2}x$ $-x$ $-\frac{1}{2}x$

TAKE NOTE . . .
In algebra, a **variable** is a letter or symbol used to represent an unknown quantity.

1. With your partner, think about where you would place each expression and sketch your conjecture.

2. Compare your number line with another group's number line. **What is the same? What is different?**

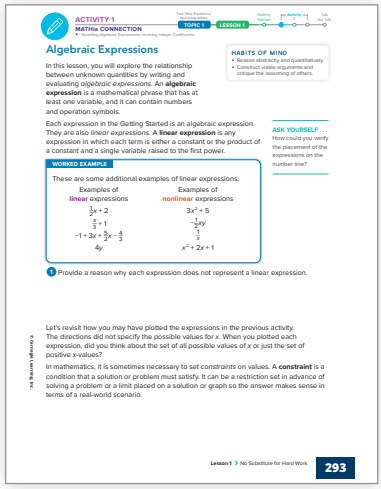
3. Your teacher will select students to place an index card representing each expression on the number line on the board. Record the locations agreed upon by the class.

292 Topic 1 > Two-Step Equations and Inequalities

Students plot one-term variable expressions with different coefficients of *x*.

- They consider the meaning of the negative coefficients in relation to previously plotted variable expressions.

ACTIVITY 1
Algebraic Expressions


ACTIVITY 1
MATHia CONNECTION

Algebraic Expressions

In this lesson, you will explore the relationship between unknown quantities by writing and evaluating *algebraic expressions*. An **algebraic expression** is a mathematical phrase that has at least one variable, and it can contain numbers and operation symbols.

HABITS OF MIND
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.

Each expression in the Getting Started is an algebraic expression. They are also *linear expressions*. A **linear expression** is any expression in which each term is either a constant or the product of a constant and a single variable raised to the first power.

ASK YOURSELF . . .
How could you verify the placement of the expressions on the number line?

WORKED EXAMPLE

These are some additional examples of linear expressions:

Examples of linear expressions	Examples of nonlinear expressions
$\frac{1}{2}x + 2$	$3x^2 + 5$
$\frac{2}{3} + 1$	$-\frac{1}{2}xy$
$-1 + 3x + \frac{5}{2}x - \frac{4}{3}$	$\frac{1}{x}$
$4y$	$x^2 + 2x + 1$

1. Provide a reason why each expression does not represent a linear expression.

Let's revisit how you may have plotted the expressions in the previous activity. The directions did not specify the possible values for x. When you plotted each expression, did you think about the set of all possible values of x or just the set of positive x-values?

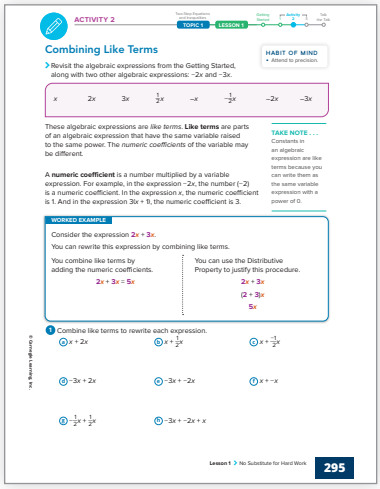
In mathematics, it is sometimes necessary to set constraints on values. A **constraint** is a condition that a solution or problem must satisfy. It can be a restriction set in advance of solving a problem or a limit placed on a solution or graph so the answer makes sense in terms of a real-world scenario.

Lesson 1 > No Substitute for Hard Work 293

Students differentiate between linear and nonlinear algebraic expressions.

- They compare the same one-term variable expressions when $x < 0$ and $x > 0$.
- They use substitution to verify the accuracy of the plotted expressions.

ACTIVITY 2
Combining Like Terms


ACTIVITY 2

Combining Like Terms

HABIT OF MIND
- Attend to precision.

Revisit the algebraic expressions from the Getting Started, along with two other algebraic expressions: $-2x$ and $-3x$.

x $2x$ $3x$ $\frac{1}{2}x$ $-x$ $-\frac{1}{2}x$ $-2x$ $-3x$

These algebraic expressions are *like terms*. **Like terms** are parts of an algebraic expression that have the same variable raised to the same power. The *numeric coefficients* of the variable may be different.

A **numeric coefficient** is a number multiplied by a variable expression. For example, in the expression $-2x$, the number (-2) is a numeric coefficient. In the expression x, the numeric coefficient is 1. And in the expression $3lx + 9l$, the numeric coefficient is 3.

TAKE NOTE . . .
Constants in an algebraic expression are like terms because you can write them as the same variable expression with a power of 0.

WORKED EXAMPLE

Consider the expression $2x + 3x$.

You can rewrite this expression by combining like terms.

You combine like terms by adding the numeric coefficients.	You can use the Distributive Property to justify this procedure.
$2x + 3x = 5x$	$2x + 3x$ $(2 + 3)x$ $5x$

1. Combine like terms to rewrite each expression.
   a. $x + 2x$
   b. $x + \frac{1}{2}x$
   c. $x + \frac{-1}{2}x$
   d. $-3x + 2x$
   e. $-3x + -2x$
   f. $x + -x$
   g. $-\frac{1}{2}x + \frac{1}{2}x$
   h. $-3x + -2x + x$

Lesson 1 > No Substitute for Hard Work 295

Students combine like terms with rational coefficients.

- They substitute values into the original expression and the expression with combined terms to verify their equivalency.
- They use substitution to evaluate expressions with rational coefficients.

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NOTES

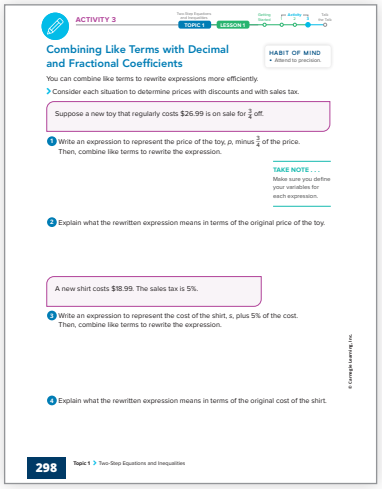
TOPIC 1

INSTRUCTIONAL SEQUENCE

DEVELOP
Real-world problem solving

DEMONSTRATE
Exit ticket application

ACTIVITY 3
Combining Like Terms with Decimal and Fractional Coefficients


ACTIVITY 3

Combining Like Terms with Decimal and Fractional Coefficients

HABIT OF MIND
• Attend to precision.

You can combine like terms to rewrite expressions more efficiently.

› Consider each situation to determine prices with discounts and with sales tax.

Suppose a new toy that regularly costs $26.99 is on sale for $\frac{3}{4}$ off.

1. Write an expression to represent the price of the toy, p, minus $\frac{3}{4}$ of the price. Then, combine like terms to rewrite the expression.

TAKE NOTE . . .
Make sure you define your variables for each expression.

2. Explain what the rewritten expression means in terms of the original price of the toy.

A new shirt costs $18.99. The sales tax is 5%.

3. Write an expression to represent the cost of the shirt, s, plus 5% of the cost. Then, combine like terms to rewrite the expression.

4. Explain what the rewritten expression means in terms of the original cost of the shirt.

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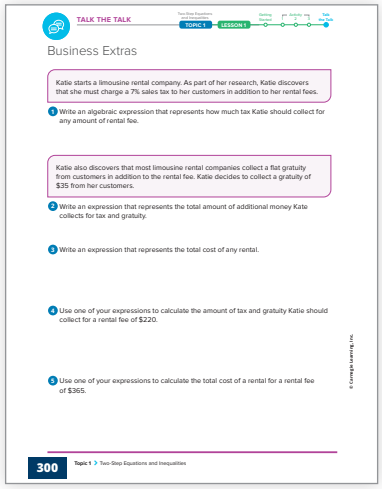
298 Topic 1 › Two-Step Equations and Inequalities

Students write expressions representing costs with sales tax, discounts, and tips.

- They combine like terms to rewrite expressions.
- They interpret the meaning of the expression in terms of the original cost.

TALK THE TALK
Business Extras


TALK THE TALK

Business Extras

Katie starts a limousine rental company. As part of her research, Katie discovers that she must charge a 7% sales tax to her customers in addition to her rental fees.

1. Write an algebraic expression that represents how much tax Katie should collect for any amount of rental fee.

Katie also discovers that most limousine rental companies collect a flat gratuity from customers in addition to the rental fee. Katie decides to collect a gratuity of $35 from her customers.

2. Write an expression that represents the total amount of additional money Kate collects for tax and gratuity.

3. Write an expression that represents the total cost of any rental.

4. Use one of your expressions to calculate the amount of tax and gratuity Katie should collect for a rental fee of $220.

5. Use one of your expressions to calculate the total cost of a rental for a rental fee of $365.

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300 Topic 1 › Two-Step Equations and Inequalities

Students write a two-step expression to represent a situation.

- They substitute values into the expression to solve problems.

Log in to MyCL for:
- Editable templates
- Additional planning support

Now that you have read the Module, Topic, and Lesson Overviews, you are ready to plan.

Do the Math

› Tear out the lesson planning template (page 291O) and jot down thoughts as you work through this lesson and read the Facilitation Notes.

- Anticipate student responses.
- Track your time so you can estimate how much time to spend on any activity.
- Decide which differentiation and collaboration strategies you may use and how that may impact pacing.

Connect the Learning

MATHbook + MATHia

The table shows a portion of the self-paced MATHia sequence for the *Two-Step Expressions and Equations* topic.

Median student completion time for the entire topic: ~275–290 minutes

› As you implement this lesson, consider different connections for students who are on pace and those who have not yet completed the workspaces aligned to this lesson.

STUDENTS WHO ARE NOT HERE YET

Students will practice rewriting algebraic expressions.

TYPE	WORKSPACE NAME
	Rewriting Algebraic Expressions Involving Integer Exponents
	Using Picture Algebra with Equations
	Identifying Attributes of Linear Relationships

STUDENTS WHO ARE ON PACE

After you complete Activity 2, ask these students to share strategies they used to rewrite algebraic expressions.

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No Substitute for Hard Work

Evaluating Algebraic Expressions

Session 1

GETTING STARTED The Empty Number Line ✪

Pacing (minutes)	
My Time	Class Time

KEY TERM
variable

ACTIVITY 1 Algebraic Expressions ✪

Pacing (minutes)	
My Time	Class Time

KEY TERMS
algebraic expression
linear expression
constraint

ACTIVITY 2 Combining Like Terms ✪

Pacing (minutes)	
My Time	Class Time

KEY TERMS
like terms
numeric coefficient
evaluate an algebraic expression

ACTIVITY 3 Combining Like Terms with Decimal and Fractional Coefficients ✪

Pacing (minutes)	
My Time	Class Time

TALK THE TALK Business Extras ✪

Pacing (minutes)	
My Time	Class Time

✪ This activity highlights a key term or concept that is essential to the learning goals of the lesson.

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Log in to MyCL for:

- Editable templates
- Additional planning support

Reflect on Your Lesson

› Consider the effectiveness of your lesson on student learning.

What went well?	What did not go as planned?

› Anticipate how you would change the lesson next time you teach it.

How will you capitalize on the things that went well?	How will you improve things that did not go as planned?

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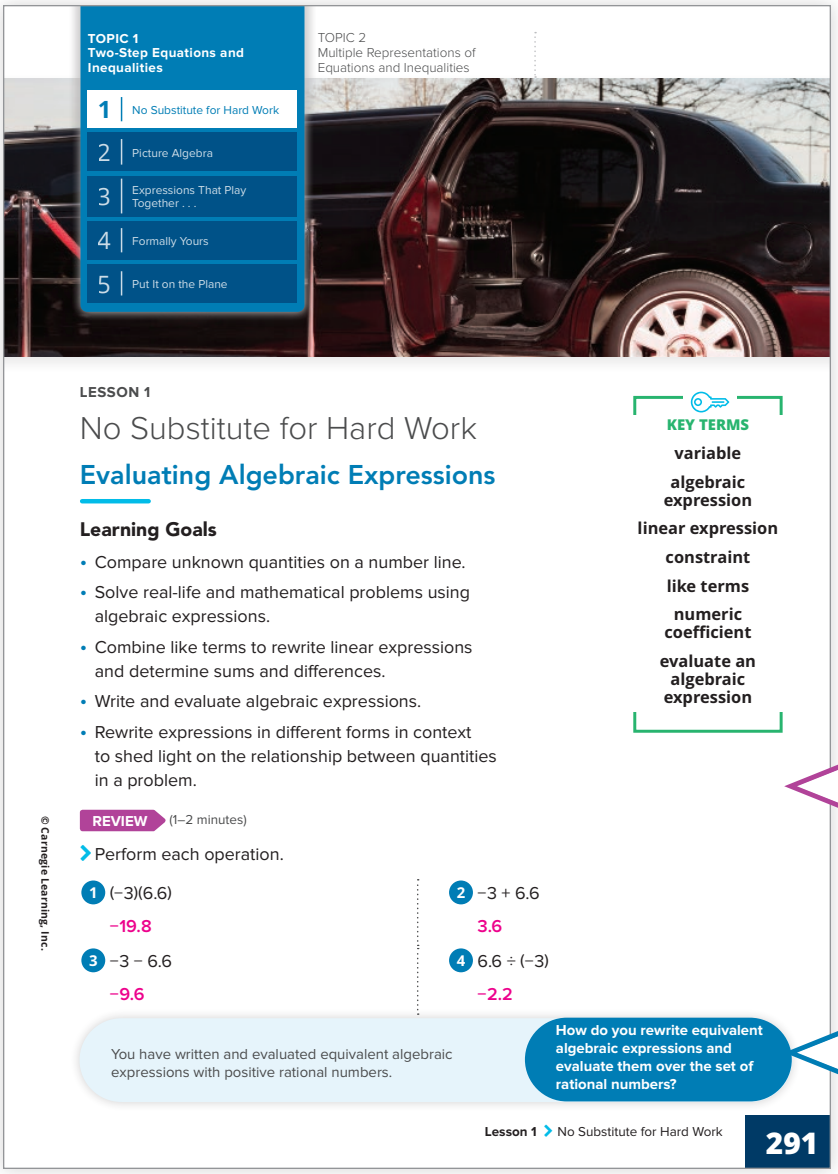
MATERIALS

- Index cards
- Tape

Setting the Stage

- **Assign Review (optional, 1–2 minutes)**
- **Communicate the learning goals and key terms to look for**
- **Tap into your students' prior learning by reading the narrative statement**
- **Provide a sense of direction by reading the question**

TOPIC 1



TOPIC 1
Two-Step Equations and Inequalities

1 No Substitute for Hard Work
2 Picture Algebra
3 Expressions That Play Together . . .
4 Formally Yours
5 Put It on the Plane

TOPIC 2
Multiple Representations of Equations and Inequalities

LESSON 1

No Substitute for Hard Work

Evaluating Algebraic Expressions

Learning Goals

- Compare unknown quantities on a number line.
- Solve real-life and mathematical problems using algebraic expressions.
- Combine like terms to rewrite linear expressions and determine sums and differences.
- Write and evaluate algebraic expressions.
- Rewrite expressions in different forms in context to shed light on the relationship between quantities in a problem.

KEY TERMS

- variable
- algebraic expression
- linear expression
- constraint
- like terms
- numeric coefficient
- evaluate an algebraic expression

REVIEW (1–2 minutes)

Perform each operation.

1. (−3)(6.6) → −19.8
2. −3 + 6.6 → 3.6
3. −3 − 6.6 → −9.6
4. 6.6 ÷ (−3) → −2.2

You have written and evaluated equivalent algebraic expressions with positive rational numbers.

How do you rewrite equivalent algebraic expressions and evaluate them over the set of rational numbers?

Lesson 1 › No Substitute for Hard Work 291

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IN THIS REVIEW
Students evaluate numeric expressions. They will use this skill in **ACTIVITY 2 Combining Like Terms**.

You can combine like terms to rewrite algebraic expressions.

You can evaluate an algebraic expression by substituting a value for the variable and then performing all possible mathematical operations.

Essential Ideas

- The algebraic expression $-x$ means the opposite of x. It does not imply that the value is always negative.
- Like terms are parts of an algebraic expression that have the same variable raised to the same power. The coefficients of the variable may be different.
- Combining like terms is a strategy to solve problems with like terms more efficiently.
- To evaluate an algebraic expression, substitute each variable in the expression with a number or numeric expression and then perform all possible mathematical operations.

SUMMARY **A variable represents an unknown quantity. You can model the relationship between variable expressions with the same variable on a number line.**

Chunking the Activity

- **Read and discuss the introduction**
- **Group students to complete 1 and 2**
- **Check in and share**
- **Complete 3 as a class**
- **Share and summarize**

NOTE: Before class, write these expressions on index cards: x, $2x$, $3x$, $\frac{1}{2}x$, $-x$, $-\frac{1}{2}x$. Create an empty number line either on the floor or on the board.

When implementing Question 3, you may want to have students add their expressions on the number line in this order: x, $2x$, $3x$, $\frac{1}{2}x$, $-\frac{1}{2}x$, $-x$.

Student Look-Fors

- Placement of x to the left of the 0

  Students will consider this in Activity 1.
- Uneven intervals between $-x$, x, $2x$, and $3x$ as well as between $-x$, $-\frac{1}{2}x$, 0, $\frac{1}{2}x$, and x
- The expression $\frac{1}{2}x$ miswritten as $\frac{1}{2x}$

The Empty Number Line

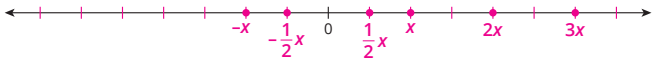
Consider the list of six *variable* expressions.

x	$2x$	$3x$	$\frac{1}{2}x$	$-x$	$-\frac{1}{2}x$

TAKE NOTE . . .
In algebra, a **variable** is a letter or symbol used to represent an unknown quantity.

1. With your partner, think about where you would place each expression and sketch your conjecture.

   Sample answer based on $x > 0$:



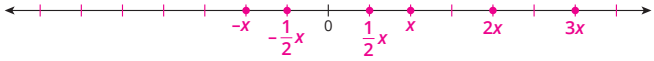
2. Compare your number line with another group's number line.
   What is the same? What is different?

   Sample answer:
   The expression $2x$ is always twice the distance from 0 as x, and the expression $3x$ is always three times the distance from 0 as x.
   The expression $-x$ is always the same distance from 0 in the opposite direction as x.
   The expression $\frac{1}{2}x$ is always halfway between 0 and x, and the expression $-\frac{1}{2}x$ is halfway between 0 and $-x$.

   The expression x may be plotted in different places on the number line, which affects the placement of the other expressions.

3. Your teacher will select students to place an index card representing each expression on the number line on the board. Record the locations agreed upon by the class.

   Sample answer based on $x > 0$:



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Questions to Support Discourse

		TYPE
1	• What is the same about each expression? • How did you decide where to place x? • How do you read each expression?	Probing
2	• Why is it acceptable that everyone didn't place x in the same location?	Probing
3	• How did you use the location of x to plot the other expressions? • How did you know where to place $-x$? • Compare the locations of $\frac{1}{2}x$ and $-\frac{1}{2}x$. • What is the distance between each pair of points? What pairs of points are the same distance apart?	Seeing structure

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ACTIVITY 1

SUMMARY **The algebraic expression –*x* means the opposite of *x*. It does not imply that the value of *x* is negative.**

Algebraic Expressions

HABITS OF MIND
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.

In this lesson, you will explore the relationship between unknown quantities by writing and evaluating *algebraic expressions*. An **algebraic expression** is a mathematical phrase that has at least one variable, and it can contain numbers and operation symbols.

Each expression in the Getting Started is an algebraic expression. They are also *linear expressions*. A **linear expression** is any expression in which each term is either a constant or the product of a constant and a single variable raised to the first power.

ASK YOURSELF . . .
How could you verify the placement of the expressions on the number line?

WORKED EXAMPLE

These are some additional examples of linear expressions:

Examples of **linear** expressions	Examples of **nonlinear** expressions
$\frac{1}{2}x + 2$	$3x^2 + 5$
$\frac{x}{3} + 1$	$-\frac{1}{2}xy$
$-1 + 3x + \frac{5}{2}x - \frac{4}{3}$	$\frac{1}{x}$
$4y$	$x^2 + 2x + 1$

1 Provide a reason why each expression does not represent a linear expression.

The expression $3x^2 + 5$ contains a variable raised to the second power rather than the first power.

The expression $-\frac{1}{2}xy$ contains two variables rather than a single variable.

Let's revisit how you may have plotted the expressions in the previous activity. The directions did not specify the possible values for *x*. When you plotted each expression, did you think about the set of all possible values of *x* or just the set of positive *x*-values?

In mathematics, it is sometimes necessary to set *constraints* on values. A **constraint** is a condition that a solution or problem must satisfy. It can be a restriction set in advance of solving a problem or a limit placed on a solution or graph so the answer makes sense in terms of a real-world scenario.

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Questions to Support Discourse

		TYPE
Intro	• What is a *constant*? • What is an example of a variable raised to the first power?	Gathering
Worked Example	• How many terms are in each expression? • Which operation(s) can you use between terms? • Identify the numeric coefficients for each term.	Gathering
	• Create an example of another linear expression.	Seeing structure

Chunking the Activity

TOPIC 1

- **Read and discuss the introduction and the Worked Example**
- **Complete 1 as a class**
- **Read and discuss the text and definition**
- **Group students to complete 2**
- **Share and summarize**

Student Look-Fors

Whether students are annotating the students strategy

Remind students to ask themselves:

- Why is this method correct?
- Have I used this method before?

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NOTES

DIFFERENTIATION STRATEGY

See page 302A to assist all students with 2.

COMMON MISCONCEPTION

See page 302A for misconceptions related to 2.

ACTIVITY 1 Continued

› Analyze the number lines created by Bella and Tito using the expressions from the Getting Started.

Bella

Tito

2 Compare and contrast each representation.

(a) Identify the set of *x*-values that make each number line true. **Write each constraint as an inequality.**

For Bella's representation: $x > 0$

For Tito's representation: $x < 0$

(b) Select a value for *x* from your set of possible values and substitute that value for *x* into each expression to verify the plotted locations are correct.

Sample answer:

For $x = 1$, Bella correctly labeled expressions at -1, $-\frac{1}{2}$, $\frac{1}{2}$, 1, 2, and 3.

For $x = -1$, Tito correctly labeled expressions at -3, -2, -1, $-\frac{1}{2}$, $\frac{1}{2}$, and 1.

(c) Compare your values from part (b) with your classmates. **Do you have the same values? If not, what does that mean?**

Answers will vary, but students likely used different values for *x*. As long as a group consistently used the same value for the unknown, *x*, each group is correct because *x* is an unknown quantity.

THINK ABOUT . . .

One strategy to verify your placement of the cards is to substitute values for the variable *x* into each expression.

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Questions to Support Discourse

		TYPE
2	• Did you think you had to use a positive value for *x* because the sign in front of *x* is positive?	Gathering
	• How did Bella and Tito think through this problem differently? • Can *x* represent a negative number? Explain your thinking. • What does the expression $-x$ mean? • If $x = -1$, what is the value of $-x$? • Did you use a positive or negative value for *x*? Why? • Did anyone use a negative value for *x*? • How many values for *x* are possible? • What is an example where $-x$ is larger than *x*?	Probing

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ACTIVITY 2

SUMMARY **Combining like terms is a strategy to rewrite algebraic expressions and evaluate for a value of the variable more efficiently.**

Combining Like Terms

HABIT OF MIND
- Attend to precision.

Revisit the algebraic expressions from the Getting Started, along with two other algebraic expressions: $-2x$ and $-3x$.

x $\quad 2x$ $\quad 3x$ $\quad \frac{1}{2}x$ $\quad -x$ $\quad -\frac{1}{2}x$ $\quad -2x$ $\quad -3x$

These algebraic expressions are *like terms*. **Like terms** are parts of an algebraic expression that have the same variable raised to the same power. The *numeric coefficients* of the variable may be different.

A **numeric coefficient** is a number multiplied by a variable expression. For example, in the expression $-2x$, the number (-2) is a numeric coefficient. In the expression x, the numeric coefficient is 1. And in the expression $3(x + 1)$, the numeric coefficient is 3.

TAKE NOTE . . .
Constants in an algebraic expression are like terms because you can write them as the same variable expression with a power of 0.

WORKED EXAMPLE

Consider the expression $2x + 3x$.

You can rewrite this expression by combining like terms.

You combine like terms by adding the numeric coefficients.

$2x + 3x = 5x$

You can use the Distributive Property to justify this procedure.

$2x + 3x$

$(2 + 3)x$

$5x$

1 Combine like terms to rewrite each expression.

(a) $x + 2x$
$(1 + 2)x = 3x$

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

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

(d) $-3x + 2x$
$(-3 + 2)x = -x$

(e) $-3x + -2x$
$(-3 + -2)x = -5x$

(f) $x + -x$
$(1 + -1)x = 0$

(g) $-\frac{1}{2}x + \frac{1}{2}x$
$\left(-\frac{1}{2} + \frac{1}{2}\right)x = 0$

(h) $-3x + -2x + x$
$(-3 + -2 + 1)x = -4x$

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Questions to Support Discourse

		TYPE
1	• What does it mean to combine like terms?	Gathering
	• When you combine the terms, how do you know whether to add or subtract the coefficients?	Probing
	• How can you use the Distributive Property to verify each rewrite? • How is combining like terms similar to combining numbers? How is it different?	Seeing structure

Chunking the Activity

TOPIC 1

- Read and discuss the introduction
- Group students to complete 1 and 2
- Check in and share
- Group students to complete 3
- Share and summarize

DIFFERENTIATION STRATEGY

See page 302A to group students to complete 1 and 2.

Student Look-Fors

Whether students are demonstrating proficiencies related to this Habit of Mind:

- Attend to precision.

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NOTES

Student Look-Fors

Whether students are annotating the Worked Example and making connections between the steps

ACTIVITY 2 Continued

To **evaluate an algebraic expression**, you substitute each variable in the expression with a number or numeric expression and then perform all possible mathematical operations.

WORKED EXAMPLE

You can evaluate expressions to verify their equivalence. Select any value for x, substitute that value into each expression, and evaluate.

Verify that $2x + 3x = 5x$.

Suppose $x = 4$.	Suppose $x = -4$.
$2(4) + 3(4) \stackrel{?}{=} 5(4)$	$2(-4) + 3(-4) \stackrel{?}{=} 5(-4)$
$8 + 12 \stackrel{?}{=} 20$	$-8 + -12 \stackrel{?}{=} -20$
$20 = 20$	$-20 = -20$

2 Use $x = 4$ and $x = -4$ to evaluate each algebraic expression in Question 1 and verify your answers.

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

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

$2 = 2$ $\quad -2 = -2$

(b) $-3x + -2x = -5x$

$-3(4) + -2(4) = -5(4)$ $\quad -3(-4) + -2(-4) = -5(-4)$

$-20 = -20$ $\quad 20 = 20$

(c) $x + -x = 0$

$4 + -4 = 0$ $\quad -4 + -(-4) = 0$

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Questions to Support Discourse

		TYPE
2	• Is it easier to substitute values into the original expression or the combined expression? Explain your thinking.	Probing

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ACTIVITY 2 Continued

3 Evaluate each expression for the given values.

(a)

h	$-2h-7$
2	$-2(2)-7$ $-4-7$ -11
-1	$-2(-1)-7$ $2-7$ -5
8	$-2(8)-7$ $-16-7$ -23
-7	$-2(-7)-7$ $14-7$ 7

TAKE NOTE . . .
Use parentheses to show multiplication, like $-2(-1)-7$.

(b)

a	-12	-10	-4	0
$\frac{1}{4}a+6$	$\frac{1}{4}(-12)+6$ $-3+6$ 3	$\frac{1}{4}(-10)+6$ $-\frac{5}{2}+6$ 3.5	$\frac{1}{4}(-4)+6$ $-1+6$ 5	$\frac{1}{4}(0)+6$ $0+6$ 6

(c) Evaluate the expression $-\frac{1}{5}y+3\frac{2}{5}$ using the set $\{-5,-1,0,15\}$. Write the results as a set of numbers.

$-\frac{1}{5}(-5)+3\frac{2}{5}$ → $1+3\frac{2}{5}$ → $4\frac{2}{5}$

$-\frac{1}{5}(-1)+3\frac{2}{5}$ → $\frac{1}{5}+3\frac{2}{5}$ → $3\frac{3}{5}$

$-\frac{1}{5}(0)+3\frac{2}{5}$ → $0+3\frac{2}{5}$ → $3\frac{2}{5}$

$-\frac{1}{5}(15)+3\frac{2}{5}$ → $-3+3\frac{2}{5}$ → $\frac{2}{5}$

$\{4\frac{2}{5}, 3\frac{3}{5}, 3\frac{2}{5}, \frac{2}{5}\}$

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Questions to Support Discourse

		TYPE
3	• What strategy did you use to evaluate each expression?	Probing

NOTES

TOPIC 1

DIFFERENTIATION STRATEGY

See page 302B to support students who struggle with 3.

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ACTIVITY 3

Session 1 of 1

SUMMARY **You can combine like terms to interpret real-world problems and solve them more efficiently.**

Chunking the Activity

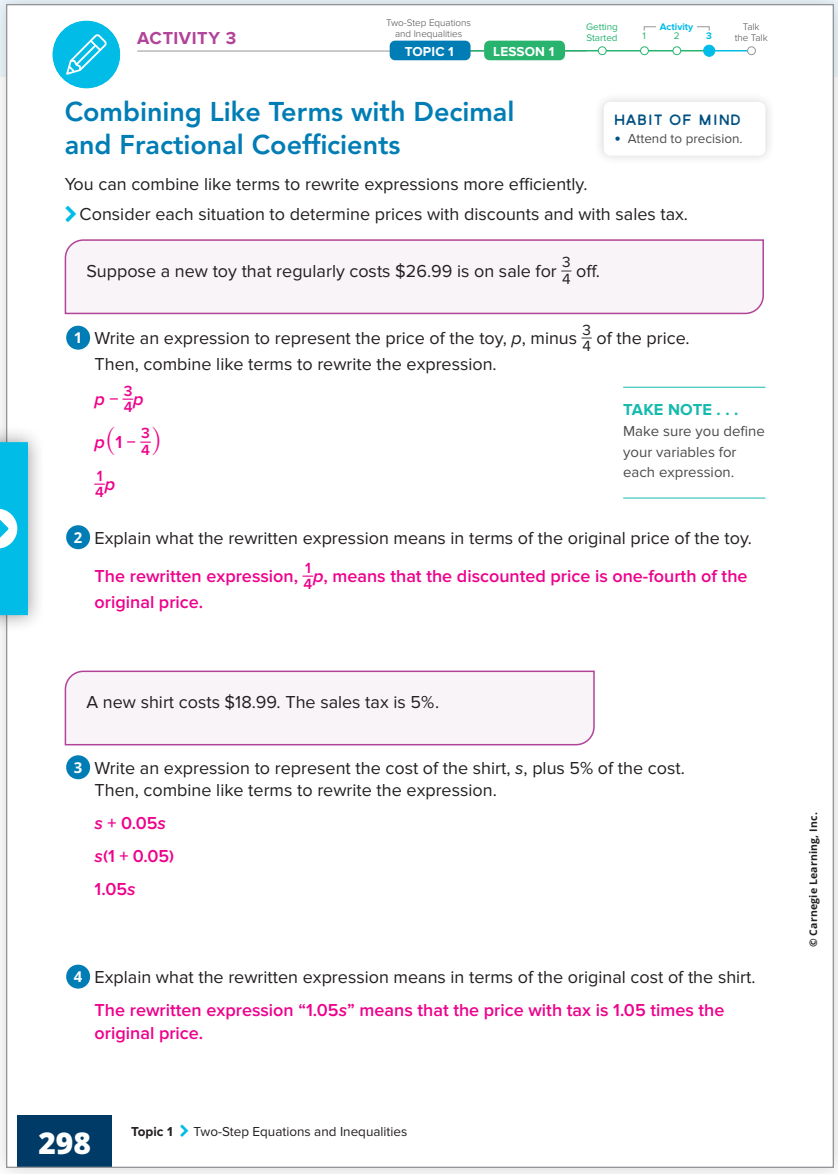
- Read and discuss the introduction
- Complete 1 as a class
- Group students to complete 2–5
- Share and summarize

DIFFERENTIATION STRATEGY

See page 302B to assist all students with 1.

Student Look-Fors

Using self-motivation and self-discipline to persevere in problem solving



ACTIVITY 3

Two-Step Equations and Inequalities: TOPIC 1 — LESSON 1 — Getting Started — Activity 1 2 3 — Talk the Talk

Combining Like Terms with Decimal and Fractional Coefficients

HABIT OF MIND
- Attend to precision.

You can combine like terms to rewrite expressions more efficiently.

Consider each situation to determine prices with discounts and with sales tax.

Suppose a new toy that regularly costs $26.99 is on sale for $\frac{3}{4}$ off.

1. Write an expression to represent the price of the toy, p, minus $\frac{3}{4}$ of the price. Then, combine like terms to rewrite the expression.

$p - \frac{3}{4}p$

$p\left(1 - \frac{3}{4}\right)$

$\frac{1}{4}p$

TAKE NOTE . . .
Make sure you define your variables for each expression.

2. Explain what the rewritten expression means in terms of the original price of the toy.

The rewritten expression, $\frac{1}{4}p$, means that the discounted price is one-fourth of the original price.

A new shirt costs $18.99. The sales tax is 5%.

3. Write an expression to represent the cost of the shirt, s, plus 5% of the cost. Then, combine like terms to rewrite the expression.

$s + 0.05s$

$s(1 + 0.05)$

$1.05s$

4. Explain what the rewritten expression means in terms of the original cost of the shirt.

The rewritten expression "1.05s" means that the price with tax is 1.05 times the original price.

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Questions to Support Discourse

		TYPE
2	• How can the store rephrase the $\frac{3}{4}$ off sale to indicate how much you have to pay? • How could you envision using this strategy while shopping?	Probing
	• What does the numeric coefficient $\frac{1}{4}$ represent?	Seeing structure
3	• What does the numeric coefficient 1.05 represent?	Seeing structure

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ACTIVITY 3 Continued

5 Write an algebraic expression with the fewest terms to represent each situation.

(a) You give an 18% tip for a meal. What expression represents the total cost with tip?

Let m = the cost of the meal.

$m + 0.18m$

$m(1 + 0.18)$

Total cost = $1.18m$

(b) A pair of shoes sells for $\frac{1}{4}$ off. What expression represents the total cost after the discount?

Let s = the original cost of the shoes.

$s - \frac{1}{4}s$

$s\left(1 - \frac{1}{4}\right)$

Total cost after discount = $\frac{3}{4}s$

(c) A store discounts a new bike by 35%. What expression represents the total cost?

Let b = the original price of the bike.

$b - 0.35b$

$b(1 - 0.35)$

Total cost = $0.65b$

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Questions to Support Discourse

		TYPE
5	• How did you know whether to add or subtract?	Probing
	• What does the numeric coefficient 1.18 represent? $\frac{3}{4}$? 0.65?	Seeing structure

NOTES

TOPIC 1

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TALK THE TALK

Session 1 of 1

SUMMARY **You can write an algebraic expression as a rule to represent a situation. Then, evaluate the expressions for a value of the variable to solve a problem.**

Chunking the Activity

- **Read and discuss the directions**
- **Group students to complete the activity**
- **Share and summarize**

DIFFERENTIATION STRATEGY

See page 302B to support students who struggle with 4 and 5.

TALK THE TALK

Two-Step Equations and Inequalities | TOPIC 1 | LESSON 1 | Getting Started | Activity 1 2 3 | Talk the Talk

Business Extras

Katie starts a limousine rental company. As part of her research, Katie discovers that she must charge a 7% sales tax to her customers in addition to her rental fees.

1. Write an algebraic expression that represents how much tax Katie should collect for any amount of rental fee.

   Let r = the rental fee.

   $0.07r$

Katie also discovers that most limousine rental companies collect a flat gratuity from customers in addition to the rental fee. Katie decides to collect a gratuity of $35 from her customers.

2. Write an expression that represents the total amount of additional money Katie collects for tax and gratuity.

   $0.07r + 35$

3. Write an expression that represents the total cost of any rental.

   $r + 0.07r + 35$

   $r(1 + 0.07) + 35$

   $1.07r + 35$

4. Use one of your expressions to calculate the amount of tax and gratuity Katie should collect for a rental fee of $220.

   $0.07(220) + 35$

   $15.40 + 35$

   Katie should collect $50.40.

5. Use one of your expressions to calculate the total cost of a rental for a rental fee of $365.

   $1.07(365) + 35$

   $390.55 + 35$

   The total cost is $425.55.

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Questions to Support Discourse

		TYPE
3	• How did you modify your expression in Question 2 to determine the total cost? • What does the numeric coefficient in your expression represent? The constant?	Probing
4	• Explain how you used substitution and the Order of Operations to calculate the total cost. • What is another way to solve this problem?	Probing

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LESSON 1 ASSIGNMENT

› Use a separate piece of paper for your Journal entry.

JOURNAL

Explain the difference between a linear expression and an algebraic expression.

REMEMBER

You can combine like terms to rewrite algebraic expressions.

You can evaluate an algebraic expression by substituting a value for the variable and then performing all possible mathematical operations.

PRACTICE

› Rewrite each expression by combining like terms, if possible.

1. $6x + 4x$

   $10x$

2. $-5y + 2y$

   $-3y$

3. $9m - 7m + 13$

   $2m + 13$

4. $4a + 8b$

   $4a + 8b$

› Evaluate each algebraic expression for the given quantity.

5. $-6.2x + 1.4x, x = -9.3$

   $-6.2(-9.3) + 1.4(-9.3)$

   $57.66 + (-13.02)$

   44.64

6. $3\frac{1}{2}x - 5\frac{1}{3}x, x = \frac{2}{5}$

   $3\frac{1}{2}\left(\frac{2}{5}\right) - 5\frac{1}{3}\left(\frac{2}{5}\right)$

   $\frac{21}{15} - \frac{32}{15}$

   $-\frac{11}{15}$

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Go to LiveHint.com for help on the PRACTICE questions.

Encourage students to use LiveHint.com for help with the **PRACTICE** questions of this assignment.

Chunking the Assignment

TOPIC 1

- Journal
- Practice 1–9
- Stretch (advanced learners) 1 and 2
- Mixed Practice (page 351) 1

JOURNAL

A linear expression is any algebraic expression in which each term is either a constant or the product of a constant and a single variable raised to the first power.

An algebraic expression is a mathematical phrase with at least one variable and can contain numbers and operation symbols.

Linear expressions are specific types of algebraic expressions.

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NOTES

STRETCH

1. 137.73, 25.59, −67.02
2. −71.2, 8, −42.05

› Write an algebraic expression with the fewest terms to represent each situation.

7 Tim lives $\frac{2}{3}$ as far from school as Felipe. Felipe walks to school and then walks to Tim's house after school. What expression represents the total distance Felipe walked?

Let d = the distance Felipe walks to school.

$d + \frac{2}{3}d$

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

Total distance Felipe walked = $\frac{5}{3}d$

8 A store marks up the price of an item by 20%. What expression represents the cost a customer pays for the item?

Let p = the original cost of the item.

$p + 0.2p$

$p(1 + 0.2)$

Cost customer pays for the item = $1.2p$

9 The area of Circle A is $\frac{1}{4}$ the area of Circle B. What expression represents the difference between the areas of Circle A and Circle B?

Let b = the area of Circle B.

$b - \frac{1}{4}b$

$b\left(1 - \frac{1}{4}\right)$

Difference between the areas of Circle A and Circle B = $\frac{3}{4}b$

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STRETCH Optional

› Evaluate each algebraic expression for the given values.

1 $-3(2.1x - 7.9)$ for $x = -18.1, -0.3, 14.4$

2 $-9.8t^2 + 20t + 8$ for $t = -2, 0, 3.5$

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No Substitute for Hard Work

This resource details additional facilitation notes to fully assist you as you plan each lesson to support all students, students who struggle, and advanced learners. It provides differentiation strategies, common student misconceptions, and suggestions to extend certain activities.

ACTIVITY 1

Session 1 of 1

Algebraic Expressions

Students differentiate between linear and nonlinear algebraic expressions. They compare the same one-term variable expressions when $x < 0$ and $x > 0$ and use substitution to verify the accuracy of the plotted expressions.

CHUNK	AUDIENCE	ADDITIONAL SUPPORTS
As students work on 2	All students	**DIFFERENTIATION STRATEGY** Make the distinction between comparing $\frac{1}{2}$ and $\left(-\frac{1}{2}\right)$ versus comparing $\frac{1}{2}x$ and $-\frac{1}{2}x$. It is correct to say $\frac{1}{2} > -\frac{1}{2}$, but for the variable comparison, the correct inequality symbol depends on the value of x.
As students work on 2	All students	**COMMON MISCONCEPTION** Students often think the expression $-x$ always represents a negative number and x always represents a positive number. Remind students that $-x$ means *the opposite of x*. The negative sign is not an indication that x is a negative value. Provide an example: when $x = -3$, then $-x = 3$.

ACTIVITY 2

Session 1 of 1

Combining Like Terms

Students combine like terms with rational coefficients. They substitute values into the original expression and the expression with combined terms to verify their equivalency. Students also use substitution to complete tables with expressions with rational coefficients.

CHUNK	AUDIENCE	ADDITIONAL SUPPORTS
As an alternate grouping strategy for 1 and 2	All students	**DIFFERENTIATION STRATEGY** • Have students work in pairs. • Assign each pair a different part of the question. For example, pair 1 starts with part (a) and pair 2 with part (b). • Have each pair choose three other parts to complete.

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CHUNK	AUDIENCE	ADDITIONAL SUPPORTS
As students work on 3	Students who struggle	**DIFFERENTIATION STRATEGY** Suggest that students add extra columns or rows to the tables to show their substitution and evaluation steps.

ACTIVITY 3

Session 1 of 1

Combining Like Terms with Decimal and Fractional Coefficients

Students rewrite expressions representing costs with sales tax, discounts, and tips. They combine like terms to rewrite the expression and interpret the meaning in terms of the original cost.

CHUNK	AUDIENCE	ADDITIONAL SUPPORTS
As students work on 1	All students	**DIFFERENTIATION STRATEGY** Have students solve the problem in two different ways to demonstrate how combining like terms is a more efficient strategy. $27\left(\frac{3}{4}\right) = 20.25$ $27\left(\frac{1}{4}\right) = 6.75$ $27 - 20.5 = 6.75$

TALK THE TALK

Session 1 of 1

Business Extras

Students write a two-step expression to represent a situation. They substitute values into the expression to solve problems.

CHUNK	AUDIENCE	ADDITIONAL SUPPORTS
As students work on 4 and 5	Students who struggle	**DIFFERENTIATION STRATEGY** Suggest that students organize their work in table form to respond to these questions.

Rental Fee	Expression Substitution $1.07r + 35$	Evaluation	Total Cost
$220			
$365			

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Practice the Learning

MATHbook + Skills Practice

The table shows the targeted practice of the skills and mathematical concepts for the *Two-Step Expressions and Equations* topic. The highlighted **Problem Sets** align with **No Substitute for Hard Work**.

PROBLEM SET	
1	**Evaluating Algebraic Expressions**
2	**Rewriting Algebraic Expressions**
3	Modeling Two-Step Expressions and Equations
4	Solving Equations with Double Number Lines
5	Solving Two-Step Equations
6	Graphs of Equations

ANYTIME AFTER ACTIVITY 3

Facilitate students as they work individually on **Problem Sets 1** and **2**.

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NOTES

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