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| **GRADE: 8th** |
| **Unit Title: Solving Linear Equations****Lesson Title:** Simplifying Algebraic Expressions**Estimated Duration: 4 Days** | **Real-World Purpose:** **Some calculations, such as finding the cost of several items, involve more than one variable. Simplifying variable expressions first can make calculations easier.** Example: For her birthday, Sara received a ticket to go to the ballet to see The Nutcracker. Sara needs to figure out the cost for the tickets for her friends, but she isn’t sure exactly how many of her friends will be going, it could be three or four. The cost for one ticket is $35.00, and there is a $2.00 one-time fee for the ticket purchase. Sara needs to know the price if she buys three tickets and also if she buys four tickets. If Sara could write a variable **expression** to model her problem, how could she use it to figure out the cost of the tickets? |
| ***I Can:*****Standard(s):\_** 8.EE.7, 8. EE.7bSolve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b. Solve linear equations and inequalities with rational number coefficients, including those whose solutions require expanding expressions using the distributive property and collecting like terms. |
| **Performance Objective: (Evidence of Learning)****The student will be able to combine like terms and to simplify algebraic expressions by completing the exit tickets with at least 65% accuracy.** |
| **Prerequisite Skills:*** The product of a number and its multiplicative inverse is 1: $\frac{a}{b}$ $∙ \frac{b}{a}$= 1, where a ≠ 0 and b ≠ 0
* The coefficient is the numerical factor of a term that contains a variable.
* An equation is a sentence stating that two quantities are equal.
* An inequality is a statement that two quantities are not equal. The symbols >, and < are used to express inequalities.
* The solution of an equation or inequality is the value of a variable that makes the equation or inequality true.
* Addition property of equality.
* Subtraction property of equality
* Multiplication property of equality.
* Division property of equality.
* Properties of inequality
* How to solve simple one-step equations and inequalities.
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| **Materials/Resources:** IXL Online LearningInfinite Pre-Algebra SoftwarePearson textbook and online resourcesMimioElmo document cameraChromebooksComputersEtc. | **Key Vocabulary:** *
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Simplify, Algebraic Expression, Like terms, Distributive Property, Isolate, Constant, Variable, Inverse, Operation, Equation, Algebra |
| **Elements of Rigor:*** **Conceptual understanding of key concepts**
* **Procedural skill and fluency**
* **Rigorous application of mathematics in real-world contexts**
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| **Lesson Introduction** |
| **How will you introduce the lesson?** **Starter: Accessing prior knowledge**1. Which of these representations does not tell us to multiply?
	1. 3(4)
	2. 2m
	3. $\frac{r}{5}$
	4. 6 • 7
	5. 8 x 10
2. Use Mental Math to compute. (hint: use properties to make it easier)
	1. 3 + (17 + 138)
	2. 1( ½ + 4 + ½ )
	3. 5 x 26 x 2
	4. 2(13) + 2(7)
	5. 5(3 + 10)
	6. 231 • 8 • 0
3. Compute using the correct order for operations: 3 + 5²[9 – 3(-1 + 4)]

When correcting number 2 and 3 on the starter, have students explain their thinking. As they do, review the commutative, associative, identity, 0, and distributive properties. Have them get out and review their properties foldable form. Sing the Properties Song to review.Properties Song (to “Macnamara’s Band” or to any song) The Commutative Properties Are like an order game Whether first is last or last is first, The answer will be the same. So one plus two is two plus one, And either sum is three. And, five times eight is eight times five. Commutative Property! Chorus Oh with these properties computing can be fun, Making operations easier to be done! The Identity Property Makes numbers stay the same. How can you add or multiply And not change the number’s name? When adding, add a zero, Multiplying, times by one. The answer will be identical to The number where you’ve begun. Chorus Oh with these properties computing can be fun, Making operations easier to be done! The Associative Properties Say grouping can be fun! And, the little parentheses Show how the grouping’s done. Often, answers can be found More quick or easily by Moving parentheses around. Associative Property! Chorus Oh, with these properties computing can be fun Making operations easier to be done! Now the Distributive Property Says factors should be shared, All numbers in parentheses, With the same factor paired. So 5 times 2 plus five times one Is the same as five times three. Multiplying will be easier with Distributive Property! Chorus Oh, with these properties computing can be fun Making operations easier to be done!**Student Exploration Activity*** Concept Attainment: (Compare and contrast examples that contain the attributes of the

concept with examples that do not contain those attributes.)* **(Please See Attachment After Lesson Plan)**  The teacher needs to cut these up into cards before this activity. Each group of students needs a set of these cards. The teacher also needs a set for instruction.

Teacher will create a two-column chart visible to all students. There is a “yes” column and a “no” column. As the teacher places several cards onto the chart, the students observe the characteristics, make comparisons and draw conclusions. (The first column includes only constant terms and the second column includes only variable terms).Students will then look for patterns/similarities on the chart and describe them using correct vocabulary terms: constant terms and variable term. * Teacher now asks different students to bring up a card and place it in the correct column on the chart.

Variations to the concept attainment: 1. Opposite Sides: Teacher will place the examples on opposite walls in the room. Students will move to the side in which their example corresponds.
2. Technology (Interactive Board): Use the container feature to drag and drop the examples into the correct column.
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| **Lesson Activities** |
| Sequence of Activities 1. Starter Activity – Introduction
2. Student Exploration Activity – (see above and attachment)
3. Lecture – Simplifying, transforming, solving
4. Think-Pair-Share (Power Point See Attachment)
5. Homework – simplifying, transforming, solving
6. Quiz – simplifying, transforming, solving
7. Closure
* This lesson plan is over the course of 4 days. I would probably do steps 1 & 2 on the first day. I would plan the pacing of steps 2 and 3 on the second day. On the third day, I would probably do steps 4 and 5. Lastly, on the last day, I would do steps 6 and 7.
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| **Lesson Closure** |
| Day 1. Exit ticket: On an index card, answer “What is the difference between the two steps involved in solving a two-step equation?”Day 2. Exit ticket: When can you combine like terms?Day 3. Write a term on the board such as 12z. One half of the class will take turns writing like terms under it. The other half of the class will write unlike terms in a different place on the board.Day 4. Before moving to multi-step equations, have students to complete the following Formative Assessment: Checkpoint Quiz (Chapter 2: Sections 1-2): Textbook page 58 # 1-17 | **Essential Questions:*** How do you know when an algebraic expression is in simplest form?
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| **Standards for Mathematical Practice** (select all that apply) |
| * Make sense of problems and persevere in solving them.
* Reason abstractly and quantitatively.
* Construct viable arguments and critique the reasoning of others.
* Model with mathematics.
* Use appropriate tools strategically.
* Attend to precision.
* Look for and make use of structure.
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* Look for and express regularity in repeated reasoning.
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| **Supplemental Activities** |
| **Intervention**Before simplifying, have students use a colored pencil or pen to circle the like terms in each expression.Visual Learners: Have students draw one arrow from the scalar to each term in the parentheses.Review the rules for multiplying signed numbers, especially the product of two negatives.Tactile Learners: Model Expressions using Algebra Tiles<https://www.mathgames.com/skill/6.14-simplify-variable-expressions>**This website will give students an opportunity to gain more experience with simplifying algebraic expressions.**  | **Enrichment*** Have students solve equations by dividing first. Then have students to write an equation that might be easier to solve by dividing first.

  * Use two different colored counters to model the addition of like terms. After students understand the physical model, help them see how the abstract properties represent what they did with the counters.

 * Pose the question: “When is it possible to find a single value for the expression 3x + 4y?”
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| **Performance Based Assessment Task**  |
| **Math Task**Performance Based Assessment: Translating and Evaluating Cell Phone Plans 1. You want to get a cell phone plan including unlimited data, texting, and calls for your first phone you are going to purchase this summer from Best Buy. Go to the Best Buy website and find a cell phone you would want to buy and record the price and type. All of the plans at Best Buy have a base service charge of $45 per month plus the cost of the phone. Write an expression to represent the service charge. 2. There are three unlimited plans Best Buy offers and each plan incorporates the service charge. Translate each plan into an algebraic expression using the service charge expression from the above question. Plan 1: $10 less than twice the amount of the service charge. Plan 2: The quotient of the service charge and 2 increased by a fee of $60 per month. Plan 3: The sum of half the number of months cubed and a third of the service charge. 3. Which plan would be most cost effective for a 2-year contract? Show all calculations that led to your results. Explain your results comparing the 3 plans. 4. Best Buy is having a special promotion by challenging customers to create their own plan. Customers must write a verbal expression that must include the service charge and at least two operations. The operations to choose from are listed below. If the plan is within $10 per month of one of the original 3 plans then the customer could choose that plan. Create a 4th plan and show all calculations that led to your results. Operations: product, more than, less than, double, sum, divided by, square | **Rubric/ Plausible Student Response(s)**Benchmark Performance Based Assessment: Translating and Evaluating Cell Phone Plans 1. You want to get a cell phone plan including unlimited data, texting, and calls for your first phone that you are going to purchase this summer from Best Buy. Go to the Best Buy website and find a cell phone you would want to buy and record the price and type. Round the cost to the nearest dollar. All of the plans at Best Buy have a base service charge of $45 per month plus the cost of the phone. Write an expression to represent the service charge. Cell phone type: Samsung Galaxy Express 3 4G LTE Cost: $80 Setup fee: 45m + 80 2. There are three unlimited plans that Best Buy offers and each plan incorporates the service charge. Translate each plan into an algebraic expression using the service charge expression from the above question. Plan 1: $10 less than twice the amount of the service charge. 2(45m+80) – 10 Plan 2: The quotient of the service charge and 2 increased by fee of $60 per month. (45m + 80)/2 + 60m Plan 3: The sum of half the number of months cubed and a third of the service charge. ( 1 2 𝑚)3 + 1 3 (45𝑚 + 80) 3. Which plan would be most cost effective for a 2-year contract? Show all calculations that led to your results. Explain your results comparing the 3 plans. Plan 1: 2(45 \* 24+80) – 10 = $2310 Plan 2: (45 \* 24 + 80)/2 + 60(24) = $2020 Plan 3: ( 1 2 𝑚)3 + 1 3 (45𝑚 + 80) = $2,114.67 Plan 2 would be the most cost effective plan because it is the one that costs the least for two years. 4. Best Buy is having a special promotion by challenging customers to create their own plan. Customers must write a verbal expression that must include the service charge and at least two operations. The operations to choose from are listed below. If the plan is within $10 per month of one of the original 3 plans then the customer could choose that plan. Create a 4th plan and show all calculations that led to your results. Operations: product, more than, less than, double, sum, divided by, square The product of 5 and the setup fee divided by 3. 5(45m + 80)/3 5(45\*24 + 80) /3 = $1933.33 Plan 2: $2020/24 = $84.17 per month Plan 4: $1933.33/24 = $80.56 per month**Rubric (see Attachment)** |

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| 2 | 0.5x | 3y |
| $$\frac{1}{2}$$ | -3x | -4y |
| -3 | $\frac{1}{2}$ x | $\frac{1}{2}$ y |
| 6 | 4a | 6y |
| 1 | 2x | -2b |
| $$-\frac{1}{3}$$ | -6x | -5b |

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| --- | --- | --- |
| 8 | -0.4a | -0.3b |
| -2.5 | $\frac{1}{3}$a | $-\frac{1}{2}$ y |
| .25 | $\frac{1}{6}$x | 0.3b |
| 1.2 | 0.8a | -5y |
| 24 | 6x | 8b |

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| --- | --- | --- |
| 2 | 5x | 3y |
| $$\frac{1}{2}$$ | -3x | -4y |
| -3 | $\frac{1}{2}$ x | $\frac{1}{2}$ y |
| 6 | 8x | 6y |
| 1 | 2x | -2y |
| $$-\frac{1}{3}$$ | -6x | -5y |

|  |  |  |
| --- | --- | --- |
| 8 | -0.4x | -0.3y |
| -2.5 | $\frac{1}{3}$x | $-\frac{1}{2}$ y |
| .25 | $\frac{1}{6}$x | 0.3y |
| 1.2 | 0.8x | -5y |
| 24 | 6x | 8y |