**Lesson Plan: 7.EE.A.1 Factor, Expand and Combine Like Terms**

*(This lesson should be adapted, including instructional time, to meet the needs of your students.)*

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| **Background Information** |
| **Content/Grade Level** | Expressions and Equations/ Grade 7 |
| **Unit/Cluster** | Use properties of operations to generate equivalent expressions. |
| **Lesson Topic** | Factor, Expand and Combine Like Terms in Linear Expressions with Rational Coefficients. |
| **Essential Questions/Enduring Understandings Addressed in the Lesson** | How can applying properties of operations as strategies help us simplify linear expressions?Expressions are simplified using a predetermined order of operations. Expressions are used to model relationships between quantities in real-world situations.  |
| **FOCUS** | **7.EE.A.1:** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. **(Major Standard)** It is critical that the Standards for Mathematical Practices are incorporated in ALL lesson activities throughout the unit as appropriate. It is not the expectation that all eight Mathematical Practices will be evident in every lesson. The Standards for Mathematical Practices make an excellent framework on which to plan your instruction. Look for the infusion of the Mathematical Practices throughout this unit. |
| **COHERENCE** | **Across-Grade Coherence: Content Knowledge from Earlier Grades****6.EE.A.3:**  Apply the properties of operations to generate equivalent expressions.**6.EE.A.2:**  Write, Read, and Evaluate expressions in which letters stand for numbers.**6.NS.B.4:**  Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. **Within-Grade Coherence: Content from Other Standards in the Same Grades that Provide Reinforcement****7.EE.A.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.**7.EE.B.4:**  Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.**7.NS.A.1:**  Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers**7.NS.A.2:**  Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. |
| **RIGOR** | **Procedural Skill**Students have the opportunity to practice solving equations for the solutions of one answer, many answers, or no answers. They apply their knowledge from prior lessons to make inferences about the equations as they work. **Conceptual Understanding*** Students have the opportunity to develop for themselves the meaning of solving equations that have one solution, many solutions, or no solutions.

**Modeling/Application**Students have the opportunity to work with models (equations) as they complete their work with equations. |
| **Student Outcomes** | Students will be able to simplify linear expressions with rational coefficients. |
| **Learning Experience** |
| ***Component*** | ***Details*** |
|  **Method for determining student readiness for the lesson****Warm Up/Motivation** | * Concept Attainment: (Compare and contrast examples that contain the attributes of the

concept with examples that do not contain those attributes.)* **Attachment #1** 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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| **Learning Experience** |
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| ***Component*** | ***Details*** | ***Which Standards for Mathematical Practice(s) does this address? How is the Practice used to help students develop proficiency?*** |
| ***Activity 1*** UDL Components* Multiple Means of Representation
* Multiple Means for Action and Expression
* Multiple Means for Engagement

Key QuestionsFormative AssessmentSummary | UDL Components:Principle I: Representation is present in the activity. Students use prior knowledge as they sort variable terms. Principle II: Expression is present in the activity. Students physically interact with instructional materials by placing the card into the appropriate column.Principle III: Engagement is present in the activity. The small group think-time and whole group share time allows for active participation, personal response, evaluation and reflection.Vocabulary Builder:* At this point students should have an understanding of constant terms and variable terms. As the activity progresses more specific vocabulary should be developed.
* **(Attachment #1)** At this point students need to realize that variable terms are not all like terms. Now the teacher will display a three-column chart with the first column completed (constant terms) and guide students in completing the last two columns (x-variable and y-variable)
* Teacher displays a few examples, and then asks students to bring up a card and place it where it belongs. (constant and variables).
* Teachers can facilitate questions between groups focusing on new vocabulary terms: like terms, unlike terms, coefficient.

(SMP #1,3,6)Group Discussion Questions/Statements/Summary:* What do you notice about the values in the constant column? How are they similar? How are they different?
* Within your group explain the unique attributes of the terms: 8, 8x, and 8y. Have students share their responses.
 | Students relate current concepts of simplifying algebraic expressions to the previously learned numerical expressions and connect mathematical ideas to one another. (SMP# 1)Students will compare the two columns and draw conclusions about their similarities and differences and justify their reasoning using examples and counter-examples. (SMP# 3)Students will communicate precisely with others and try to use clear mathematical language when discussing their reasoning for what goes in each column in the comparison charts. (SMP# 6) |
| ***Activity 2***UDL Components* Multiple Means of Representation
* Multiple Means for Action and Expression
* Multiple Means for Engagement

Key QuestionsFormative AssessmentSummary | UDL Components:Principle I: Representation is present in the activity. Students have the opportunity to use a work mat to organize their thought. Principle II: Expression is present in the activity. Students physically interact with instructional materials by placing the cards into the work mat to identify like terms and simplify the expression.Principle III: Engagement is present in the activity. The small groups think time and whole group share time allows for active participation, personal response, evaluation and reflection.* Simplifying Expressions (adding and subtracting) with Work mat **(Attachment #3.)**
* Teacher will display 2 apples and 3 apples and ask what she will get when she adds these? Then she should display 2 books and 3 books and ask what she will get when she adds these. Finally teacher will display 2 apples and 3 books and ask what she will get when she adds these. Explain that in mathematics (as in apples and books) it is only possible to add terms that are like.

 * In small groups students will be given an envelope with new cards **(Attachment #2)** and addition/subtraction work mat **(Attachment #3)**.
* Teacher will randomly draw cards and display under the document camera or using the interactive board. Students will find the same cards in their stack and place them as the teacher did in the appropriate position on the mat. (Students can record in notebook, math journal, etc)
* Groups of students identify the like terms and simplify the expression. Teacher will monitor and provide feedback and ask guiding questions as needed.
* Groups will continue to select cards and create algebraic expressions and simplify.
* One group will share their work and model identifying and simplifying the expression for the class.

(SMP # 1,6,7)* Group discussion questions/statements:
* What operations must you perform to simplify?
* How can we simplify this expression?
* Create an example of an expression that cannot be simplified.
* Create an expression that simplifies to one term.
* When like terms contain fractions and decimals, how do you simplify them? (example: $\frac{1}{3}a+0.8a$)
* Formative Assessment: Exit Card

**(Attachment #4)**- Simplifying two algebraic expressions using addition and subtraction.Summary: (sample provided)* The most important thing about simplifying algebraic expressions is *to identify the like terms first*.

I have to remember to… *follow order of operations, apply the operations to the term that follows, and be precise in my calculations.* But the most important thing about simplifying algebraic expressions is *to identify the like terms first.* | Students relate current concepts of simplifying expressions to those previously learned and connect mathematical ideas to one another. (SMP# 1)Students will calculate accurately and efficiently when simplifying expressions that include rational numbers.(SMP# 6)Students will see complicated things as single objects or as being composed of several objects, for example: $2x+5$ is composed of$6+ -3x+5x-1$. (SMP# 7) |
| ***Activity 3***UDL Components* Multiple Means of Representation
* Multiple Means for Action and Expression
* Multiple Means for Engagement

Key QuestionsFormative AssessmentSummary | UDL Components:Principle I: Representation is present in the activity. Students use prior knowledge as they identify equivalent expressions. Principle II: Expression is present in the activity. Use the model in Attachment 6 to help the students learn the concept of distributive property.Principle III: Engagement is present in the activity. The individual think time and whole group discourse allows for active participation, personal response, evaluation and reflection.Directions:* Use cards from **(Attachment #2**) to fill in spaces in **(Attachment # 6**) to review distributive property with constant terms and variables.)
* Three’s a Crowd: **(Attachment # 5)**

Instructional Strategy: Think-Pair-ShareTeacher will present a set of three expressions and students need to determine which expressions are equivalent and which expression does not belong. Students will use their knowledge of simplifying expressions, greatest common factor (factoring), and multiplication (distributive property) to justify their reasoning.(SMP #1,3,6)Formative Assessment:* Ask student pairs to create their own “Three’s a Crowd Expressions.” Then have groups trade their products and work on each other’s problems.
 | Students relate current concepts to those previously learned and connect mathematical ideas to one another. (SMP# 1)Students will construct arguments that support equivalent expressions and refute non-equivalent expressions.(SMP# 3)Students will calculate accurately and efficiently when simplifying expressions that include rational numbers.(SMP# 6) |
| ***Closure*** | **3-2-1:**Write **three** terms.Use correct math vocabulary to describe **two** of the terms.Using the three terms, write **one** expression and simplify if possible. (Combine similar terms, if any.)  |  |

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| **Supporting Information** |
| Interventions/Enrichments* Students with Disabilities/Struggling Learners
* ELL
* Gifted and Talented
 | Students with Disabilities/Struggling Learners: * Teacher creates an expression with all like terms to simplify and then allows students to create other expressions. When the student has mastered this concept, teacher will add non-like terms and have students simplify these expressions.

Gifted and Talented students: * Students create their own expressions and use the extension work mat for activity #2 (simplify using the distributive property).

ELL students: * Teacher will create a Word Wall of terms with examples.
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| Materials | Whiteboards (markers and erasers) or paper for students to show work as needed. |
| Technology | SmartboardDocument Camera |
| Resources | *Teaching Student-Centered Mathematics, Grades 5-8*, John A. Van de Walle  |

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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 |

 **7.EE.1 Concept Attainment CARDS Warm-up/Attachment #1**

**7.EE.1 Concept Attainment CARDS Warm-up/Attachment #1**

|  |  |  |
| --- | --- | --- |
| 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 |

**Attachment #2 7.EE.1 Simplify Expressions Work mat Cards Activity #2**

|  |  |  |
| --- | --- | --- |
| 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 |

**Attachment #2 7.EE.1 Simplify Expressions Work mat Cards Activity #2**

|  |  |  |
| --- | --- | --- |
| 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 |

**Attachment #3**  **7.EE.1 Simplify Expressions Work mat Activity #2**

**Attachment # 4 7.EE.1 Simplify Expressions EXIT CARD Activity #2**

**7.EE.1 Simplify Expressions EXIT CARD NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***Simplify.***

$3x+ -0.4n+\frac{1}{2}x+\frac{1}{5}n$ $4b+ -5a-\frac{1}{3}b+ 6a$

**7.EE.1 Simplify Expressions EXIT CARD NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***Simplify.***

$3x+ -0.4n+\frac{1}{2}x+\frac{1}{5}n$ $4b+ -5a-\frac{1}{3}b+ 6a$

**Attachment # 5** **7.EE.1 Simplify Expressions Activity #3**

***Three’s a Crowd Expressions***

**SET 1:** $3(x+2)$$3x+6$$3(2x)$

**SET 2:** $\frac{1}{2}(-4x)$$\frac{1}{2}(2x- 6)$$x- 3$

**SET 3:** $24x+8y$$2(12x+4y)$$8(3x+y)$

***Three’s a Crowd Expressions KEY***

**SET 1:** $3(x+2)$$3x+6$$3(2x)$

**SET 2:** $\frac{1}{2}(-4x)$$\frac{1}{2}(2x- 6)$$x- 3$

**SET 3:** $24x+8y$$2(12x+4y)\*\* $$8(3x+y)$

**All three are mathematically equivalent, but the 2nd expression is not factored completely.**

**Attachment # 6 7.EE.1 Simplify Expressions Work Mat Activity #3**

**Constant term only**