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| **GRADE:** | |
| **Unit Title:** Solving Linear Equations  **Lesson Title:** Solving Multi-Step Equations  **Estimated Duration:** 4 days | **Real World Purpose:**   * **Real-World Application: Profit 🡪 sample teacher explanation🡪 *A growers’ cooperative has a farmer’s market in the town center every Saturday. They sell what they have grown and split the money into several categories. 8.5% of all the money taken in is set aside for sales tax. $150 goes to pay the rent on the space they occupy. What remains is split evenly between the seven growers. How much total money is taken in if each grower receives a $175 share?*** * **Real-World Application: sample teacher explanation🡪 *Calculating distance, speed and/or time. The speed of a body is the distance it travels per unit of time. That means that we can also find out how far an object moves in a certain amount of time if we know its speed: we use the equation “distance= speed × time.”*** * **Finding costs of multiple items** |
| ***I Can:***  **Standard(s):** 8.EE.7, 8. EE.7b  Solve 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 solve and check multi-step equations by completing a teacher handout with at least 65% accuracy. | |
| **Prerequisite Skills:**   * The product of a number and its multiplicative inverse is 1: = 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. | |
| **Materials/Resources:**   * Elmo document camera * Chromebooks * Computers * Candy Equations handout | **Key Vocabulary:**   * Infinite Pre-Algebra Software * 2.3 *Do Now* handout * Balance Beam handout * Equations assignment sheet * Simplify * Distributive property * Like terms * Solution * Inverse operations * Isolate * Constant * Variable * Inverse * Operation |
| **Elements of Rigor:**   * **Conceptual understanding of key concepts** * **Procedural skill and fluency** * **Rigorous application of mathematics in real-world contexts** | |
| **Lesson Introduction** | |
| **How will you introduce the lesson?**  **Student Exploration Activity**  The purpose of this activity is to encourage students to check their work when solving an equation. Students will complete the 2.3 Multi-Step Do Now (attachment) in 4 minutes. We will then review the answers as a whole group. I will say aloud the equation and solution, and students will silently respond with a thumbs up if they agree and a thumbs down if they disagree. I will call on volunteers to justify a new solution for each response that was labeled incorrect, "(e) ten divided by two plus added to five is equal to fifteen, so the solution for letter e has to be x = 2)"  Next, a student will read the objective to the class: The student will be able to solve and check multi-step equations with at least 65% accuracy. I will ask students to reflect on the entire journey our class has taken up to this (translating, combining like terms, one-step equations, two-step equations, distributive property) and to make a prediction about how all the pieces will connect in order for us to complete today's objective. | |
| **Lesson Activities** | |
| 1. Students will work in groups of two (homogeneous ability levels). Each pair will need about 30 gummy bears (2 groups of 15 in a single color) and about 30 M&M candies (2 groups of 15 in a single color). This activity will run more smoothly, if the candy is sorted into 4 Dixie cups prior to the beginning of class.   Each student will need the balance beam sheet, and the Candy Equations handout to complete this activity. I will explain to the class that we will use the candy to represent the variables and constants that are in a multi-step equation, in order to give our equations a physical model. I have the students create a key on the top of the equation handout by placing a piece of candy next to the corresponding item.  I tell students that we are going to balance our equations, and that our goal is to ensure that each gummy bear receives an equal distribution of M&M's as the other gummy bears in the equation. The only rule that students must abide by is to make their actions balanced; whatever is removed from one side of the balance beam has to be identically removed from the other side. In this video (candy lab) a student gives a thorough explanation on how to solve a multistep equation using candy.   1. – Display PowerPoint. <https://www.youtube.com/watch?v=AVsvletw4W0&t=15s>   The group activity is a great supplement to the guided notes and practice section of the lesson. During each example, I do not deviate from the order: "Distributive property 🡪 Combine like terms on the same side 🡪 Move Variables to the opposite side 🡪 Undo addition and subtraction 🡪 Undo multiplication and division". This is done to get students into a solid routine. Even if a particular example does not require using the distributive property or combining like terms, I still will include it in my explanation so that students get used to following this sequence every time.   1. Complete the Solving Equations Assignment Sheet. 2. For additional assistance, have students label each side of the equation with the acronym: “Don’t call me after midnight”. I will still refer to this acronym as we solve equations and use it to guide students to mastery:  * If we only want constants on this side of the equation, which term doesn't belong? * How can I undo a positive four? * If I move a constant to the other side of the equation, what is the only term on the other side of the equation that I can combine it with? Why? * Why do you think I am stressing the word "same" during the second part of the equation process? Aren't inverse operations and combining like terms the same thing? Why or why not? * How does solving equations on paper relate to the equations that we solved with candy? | |
| **Lesson Closure** | |
| 1. Review key concepts & make connections to the objective. 2. Exit ticket: Students will then complete an Exit Card (focuses on algebraic problem solving).  * The exit cards may be used as a formative assessment after class for the teacher to make further adjustments, if necessary. The students may even be grouped by the percentage of correct for a remediation group during the next lesson. | **Essential Questions:**   * How do we express a relationship mathematically? * How do we determine the value of an unknown quantity? |
| **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.   * Look for and express regularity in repeated reasoning. | |
| **Supplemental Activities** | |
| **Intervention**   * Students needing remediation may use interactive Algebra Tiles which is an interactive website that reviews solving two-step equations using algebra tiles.   How to access: Click on the link (<http://www.classzone.com/cz/index.htm>) 🡪 select middle school math and Alabama🡪 and then the green go button🡪 Select *McDougal Littell Math Course 3*🡪 Animations🡪 and then Chapter 3: Solving 2-step equations.  or  Direct Link: <https://goo.gl/wfAm88>  The website will give them an opportunity to manipulate algebra tiles while solving two-step equations.   * Students that have difficulty taking notes may be provided a copy of the slide presentation. They should be encouraged to follow the presentation and add additional notes when applicable.  This will also allow you to have time for some individual instruction while the other students are copying notes. | **Enrichment**   * Students needing enrichment may extend their knowledge of multi-step equations by finding consecutive integers. They will watch a video clip to review the concept of consecutive integers. Then, they will apply their knowledge of this concept by participating in an online interactive session on [www.quizizz.com](http://www.quizizz.com).      * “How to” Video link: <https://www.youtube.com/watch?v=Qx3gfzlJ6PY>      * Quizizz.com🡪 After the teacher launches the site, the students will visit: [www.join.quizizz.com](http://www.join.quizizz.com) . 🡪 The teacher will then give them a 6-digit game code to enter in order to play.   Name of game: “Consecutive Integer Word Problems” |
| **Performance Based Assessment Task** | |
| **Math Task**   * Performance Task: “Writing For a Math Website”   (see .pdf attachment from teacher’s manual and student worksheet) | **Rubric/ Plausible Student Response(s)**     * Above is a sample student response. Performance Task: “Writing For a Math Website”   (see .pdf attachment) |