

Do Everything Twice?

Co-teacher Method

One Teaching, One Helping

Grade Level & Content Area

9th grade algebra

Main Concept/Big Idea

The anticipatory set in this lesson engages students in a story that portrays a real-life scenario with a fictional twist. The story leads logically into the lesson where students discover the addition and subtraction properties of equality and develop a procedure for solving equations with them.

Objectives

1. Students will be able to correctly use the addition and subtraction properties of equality and additive inverse operations to solve one-variable equations 8 out of 10 times given the equations. (this will show understanding of the properties and procedure)
2. Students will be able to correctly recite the addition and subtraction properties of equality verbally or in writing.

Standards

Standard 2.1.A1.F: Extend the concept and use of inverse operations to determine unknown quantities in linear and polynomial equations.

Materials

20 copies of guided notes (This will be printed two-sided on 11 x 17 paper, folded, and 3-hole punched)

20 copies of graphic organizer

20 copies Problem of the Day Instructions

20 copies of lunch menu manipulatives, cut out

1 copy of large lunch menu manipulatives

10 copies of the exit tickets, cut in half

1 SMART™ Board with computer and projector to show ppt

Adaptations for Special Needs

The **slide presentation** will engage students visually as it provides a record of the critical points of the lesson. The students who struggle with listening or who tire from listening (e.g. ELL) will be able to connect with the lesson by both hearing and seeing the lesson's main points. The students who struggle with maintaining attention and focus will be engaged and drawn into the lesson because each segment of the class has one or more slides to go with it. The slide presentation will also serve to engage and motivate unmotivated students.

The **guided notes** will provide a record of the lesson so students can refer to critical concepts later as they work in class and at home. Students who struggle with writing will benefit from having to write only critical words and phrases. This will help them focus on the "big picture" rather than on writing every word down. The Concept Corner box will assist students who need support learning the new terms by providing space for them to write the term in their own words (or own language) and to illustrate the new term in their own way to help them remember it. This section will also help the students who struggle with writing as they will be able to draw a picture of the concept to help them remember what it means. Having a record of this lesson will assist the students who struggle with attention and focus by allowing them to refer back to any part of the lesson at any time.

The **graphic organizer** will help all students organize the steps involved in solving equations with addition and subtraction and to move from concrete to representational to abstract thought. Specifically, this will aid students who are weak in organization skills and/or who struggle with abstract thinking. The graphic organizer will be filled in during a group activity and collaboration among students will help support those who struggle with listening, speaking, writing, or performing mathematical calculations.

The **group work** enables students to discuss and solve problems together. Students can explore different methods for solving the problems and discuss which methods work and which methods lead to false solutions and why. This will benefit students who are weak in communication or social skills or who need to work with a peer who is stronger in the subject matter.

The **feedback** provides guidance for all students to make sure they are understanding the point of the lesson and making adequate progress toward the lesson objectives. This is a critical component for students who need teachers to check their progress frequently. Teachers will migrate around the room to check on students and their progress during group interactions. After the groupwork, teachers will provide feedback as they lead a discussion about the solution to the problem and the methods for solving it.

The overall **lesson structure and pacing** will benefit all students because the lesson activates prior knowledge and introduces new concepts. The students have all of the information they need to solve the problems in this lesson. The structure of this lesson will be particularly helpful for those students who have gaps in their knowledge. The lesson moves quickly between teacher-directed, semi-directed, peer-

directed, and non-directed lecture and activities so students who struggle with attention and focus will be adequately stimulated throughout the lesson.

Use of Technology

The SMART Board will be used to engage students during the direct teaching portion of the lesson. The SMART Board enables the teacher and the students to work out solutions together. The PowerPoint presentation will be posted on the class website with automated animations and voice recordings to allow students receiving learning support, ELL, and/or disability services to review the lesson at home.

Procedure

***Note:** Red words indicate where blanks appear on the student guided notes. Students will fill in the information during the lesson.*

*The guided notes includes a "Recall from yesterday..." section where students can complete two important definitions, i.e. **equation** and **solution to the equation**, that they learned the previous day and need to recall for this lesson. The notes also include a "Recall from pre-algebra..." section where students can complete the definition of **additive inverse** and fill in an Inverse Operations table for addition and subtraction. Students will complete these sections in their groups prior to solving the Problem of the Day.*

Anticipatory Set (3 min, 3 min)

Lead teacher (narrator) and two students act out the math story called "Do Everything Twice?"

Students will volunteer to help with this and will practice with the teacher during lunch or after school the previous day. If no students volunteer, both teachers will present the story.

This story appears on page 4 of guided notes for students to reference later - they do not read it now.

******Teacher-Direct******

Amelia's Lunch (3 min, 6 min)

Amelia now understands that she does not need to repeat everything she says and does. But, what did Monica mean when she said their math teacher told them to do everything twice when solving linear equations? That is the question we will answer today. But, before we talk about this, we need to know two new properties. Let's explore how Amelia spends her money to prepare us for this.

Amelia has \$3 to spend on lunch everyday. Obviously, she cannot buy items that cost more than what she has. But Amelia has trouble keeping her money in her pocket. She always has to spend every last cent. So, we will select a lunch for Amelia that equals exactly three dollars.

Slide 3

School Lunch Menu

Burrito	\$1.10
Chicken Nuggets	\$0.75
Fruit	\$0.35
Chips	\$0.60

Milk	\$0.90
Water	\$1.00
Cookie	\$0.25
Miniature candy	\$0.05

*Teacher tapes images of lunch items on white board (not SMART board) as students select the lunch.
Write numbers in to indicate multiple items, e.g. 3 (picture of dollar) indicates 3 dollars.*

Slide 4

$$\$3 = (\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad})$$

This equation states that the quantities (3) and ($\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$) are **equal**, which means they are the **same**.

I need a volunteer to write the prices for each lunch item on the SMART board. We do not need to fill in every space. We reached \$3.00 with only [three ... four] items, so we'll just cross off the other spaces.

You will find space to write this down on page 2 of your notes so go ahead and copy it in as we go. What is Amelia's first item?

On the SMART board, a student writes the number sentence that represents what Amelia selects.

We talked yesterday about equations and equality so this is review.

This equation states that the quantities (3) and ($\underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$) are equal, which means what?

Answer: They are the same.

Maintaining Equality, Part 1 (3 min, 9 min)

Now that we have a number sentence to work with, we are going to explore what happens when you increase or decrease one of the expressions. What are the operations that we use to increase or decrease the value of something?

Answer: addition, subtraction, multiplication, division

There is more space on page 2 of your notes to work out the following scenarios:

Slide 5

$$\$3.50 = \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad} + \underline{\quad}$$

Let's look at the original problem again and suppose another one of Amelia's friends repays Amelia the \$0.50 that she borrowed the other day. Now Amelia has \$3.50 to spend on lunch.

What do you think you have to do to maintain equality if you add \$0.50 to the left-hand side of the original equation?

Answer: add \$0.50 worth of food to the right-hand side

Let's go ahead and adjust Amelia's order.

The Addition Property of Equality (2 min, 11 min)

All of this now leads us to two very important properties. Refer to page 3 of your notes as we discuss these new terms. On your own time, you can add more information in the "Concept Corner" section if it will help you.

Slide 6

You can add **the same number** to **both** sides of an equation, and the statement will still be **true**.

Repeat after me: You can add the same number to both sides of an equation, and the statement will still be true.

Slide 7

$$3=3$$

$$3+2=3+2$$

$$5=5$$

$$a=b$$

$$a+c=b+c$$

You can see that this property is true when I use the number 3 and add 2. Three equals three and five equals five. The important thing to remember is that this property is true for any numbers. We can then represent 'any' numbers with variables a and b. If $a=b$ then any number c added to a on the left and b on the right will yield two new expressions that are also equal.

Maintaining Equality, Part 2 (3 min, 14 min)

Slide 8

$$\$2 = ______ + ______ + ______ + ______ + ______$$

Amelia finds out that her friend Monica does not have enough money to buy her lunch. Amelia generously gives Monica \$1.00 to supplement what Monica does have.

What do you think you have to do to maintain equality if you subtract \$1.00 from the left-hand side of the equation?

Answer: subtract \$1.00 worth of food from the right-hand side

Adjust Amelia's order.

The Subtraction Property of Equality (2 min, 16 min)

Slide 9

You can subtract **the same number** from **both** sides of an equation, and the statement will still be **true**.

Repeat after me: You can subtract the same number from both sides of an equation, and the statement will still be true.

Slide 10

$$7=7$$

$$7-3=7-3$$

$$4=4$$

$$a=b$$

$$a-c = b-c$$

The subtraction property is the same except we are subtracting 'any' number. We can represent 'any' numbers with variables a and b, and if $a=b$ then any number c subtracted from a on the left and b on the right will yield two new expressions that are also equal.

Now, we are going to introduce a problem with an unknown item. Ice cream was added as a lunch option at the last minute, and the price does not appear on the menu.

How do you find the value of an unknown?

Remember, when you have an unknown value within an expression, you have to isolate the variable to determine its value.

What does isolate mean?

To isolate a variable means to separate it from everything else so it is by itself.

Students will use the lunch menu manipulatives to work through the lunch scenarios while the lead teacher demonstrates with the large copies of lunch items at the white board.

The Main Idea (1 min, 17 min)

Slide 11

Whatever you do to **one side** of the equation, you have to do to the **other side**. Do everything twice!

You will use the concepts that we reviewed today and the new information to isolate the variable.

Whatever you do to one side of the equation, you have to do to the other side. Do everything twice!

Student groups were predetermined based on individual student strengths and weaknesses. Students who are weak in certain areas are included in groups with students who are strong in those areas.

Before we work on the problem, work in your groups to make sure you have everything in your notes so you can refer to them. There is a review from yesterday on the top of page 2 of your notes that you can fill in first. On page 4, there are two hints that you can look at as you try to solve this problem.

*****Semi-Direct*****

Problem of the Day: "Unknown Cost"

Group Activity (8 min, 25 min)

Slide 12

Amelia buys chicken nuggets, chips, fruit, milk, and ice cream. If her lunch costs \$3.00, how much does the ice cream cost?

The instructions and graphic organizer for this activity are included with your guided notes. Get started! Teachers walk around the room and offer support, if needed, without explicitly telling the procedure. Teachers also make sure students understand the directions on how to fill out the worksheet. Students are familiar with the terms "representational" and "abstract" from previous activities.

*****Peer-Direct*****

Procedures and Solutions (8 min, 33 min)

Slide 13

Selected students lead a discussion of how to solve the problem.

Let's talk about how you went about solving this problem.

Teachers call on students to work through the problem, and share how they solved the problem, at the board. Teachers engage students in thinking about the concrete, representational, and abstract methods.

Steps to Solving Equations with Addition and Subtraction (7 min, 40 min)

Slide 14

1. Simplify each side of the equation by distributing to remove parentheses and combining like terms.
2. Isolate the variable by performing inverse operations. Use the Addition and Subtraction Properties. Do everything twice!
3. Simplify each side of the equation again by combining like terms.
4. Check your answer by substituting the result into the original equation.

On the first page of your notes, you will see space for you to write down the basic, general steps for solving the kinds of equations we worked with today. Take a few minutes in your groups to write down what you need to remember to solve equations with addition and subtraction.

Teacher shows slide 14 after students write notes in their own words. If the teacher feels students would benefit from having the steps shared sooner, she may do so.

*****Non-Direct*****

Individual Practice - Assignment (5 min, 45 min)

For the next 5 minutes, work to solve the problems on pages 80 and 81 of your book. [Assignment.pdf](#)

Teacher points to the SMART board where the following assignment is listed.

Slide 15

Page 80: Odd problems 21 to 47

Page 81: Problems 58 and 61

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Your assignment this evening is to finish what you do not complete in class.

Closure (5 min, 50)

Exit Ticket

Using at least five lines, describe how to solve equations with addition and subtraction.

Student Evaluation

Teachers will evaluate student performance formatively throughout the group activity and during the peer-direct activity when groups share their solutions and how they arrived at them. Teachers will observe each student's participation in the group and make sure each student is contributing. Teachers will ask questions of individual students if their work does not show understanding. The homework assignment will also be a formative assessment to determine individual student understanding. A summative assessment will be administered the following class period after teachers and students review the assignment and address questions and concerns. The summative assessment will be a short quiz consisting of two problems.

Assignment

Students will have problems from the textbook for homework. These problems will reinforce the lesson concepts through practice.