Journey of the Isolated Variable, Part 3

Literal Equations

Amber Stokes, Matthew McDonald
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Grade Level	9th Grade	**Time Frame**	2-3 class period(s)
Subject	Mathematics	**Duration**	120 minutes
Course	Algebra 1		

Essential Question

How do I rearrange a multi-variable equation to isolate a specific variable?

Summary

This lesson is Part 3 of "Journey of the Isolated Variable," a four-part lesson series on solving different types of equations. In this lesson, students will build on the equation-solving knowledge they gained in Parts 1 and 2 in order to solve literal equations.

Snapshot

Engage

Students contribute to a class-created word cloud about equations.

Explore

Students solve equations they already know how to solve and then compare them with literal equations.

Explain

Students follow a flowchart to solve literal equations.

Extend

Students work with peers to complete a collaborative handout.

Evaluate

Students respond to a Muddiest Point prompt to identify any remaining questions or confusion about literal equations.

Standards

Oklahoma Academic Standards for Mathematics (Grades 9, 10, 11, 12)

A1.A.3.1: Solve equations involving several variables for one variable in terms of the others.

Attachments

- Extend-Journey-of-the-Isolated-Variable-Part-3 - Spanish.docx
- Extend-Journey-of-the-Isolated-Variable-Part-3 - Spanish.pdf
- Extend-Journey-of-the-Isolated-Variable-Part-3.docx
- Extend-Journey-of-the-Isolated-Variable-Part-3.pdf
- Flowchart—Journey of the Isolated Variable, Part 2 - Spanish.pdf
- Flowchart—Journey of the Isolated Variable, Part 2.pdf
- Lesson-Slides-Journey-of-the-Isolated-Variable-Part-3.pptx
- Literal-Equations-Exploration-Journey-of-the-Isolated-Variable-Part-3 - Spanish.docx
- Literal-Equations-Exploration-Journey-of-the-Isolated-Variable-Part-3 - Spanish.pdf
- Literal-Equations-Exploration-Journey-of-the-Isolated-Variable-Part-3.docx
- Literal-Equations-Exploration-Journey-of-the-Isolated-Variable-Part-3.pdf
- Muddiest-Point-Journey-of-the-Isolated-Variable-Part-3 - Spanish.docx
- Muddiest-Point-Journey-of-the-Isolated-Variable-Part-3 - Spanish.pdf
- Muddiest-Point-Journey-of-the-Isolated-Variable-Part-3.docx
- Muddiest-Point-Journey-of-the-Isolated-Variable-Part-3.pdf

Materials

- Lesson Slides (attached)
- Literal Equations Exploration handout (attached; one per student)
- Extend handout (attached; one per student)
- Flowchart (attached; one per student)
- Muddiest Point handout (attached; one half-sheet per student)
- Chromebooks or student devices with internet access

Engage

Introduce the lesson using the attached **Lesson Slides.** Display **slide 3** to share the lesson's essential question: *How do I rearrange a multi-variable equation to isolate a specific variable?* Display **slide 4** to go over the lesson's learning objective. Review these slides with students to the extent you feel necessary.

Teacher's Note: Preparation

Before beginning the lesson, create a Mentimeter word cloud for students to interact with. Mentimeter has a free option that includes a limited number of interactive components. When you sign up, click on the "?" in the upper-right corner of your homepage to watch videos that show you how to create a word cloud to share with students. For quick accessibility, include the generated code on slide 5 for students to type in on their devices.

Go to **slide 5**. Students will complete a Collaborative Word Cloud using Mentimeter. Students will go to menti.com, enter your generated code, and answer the following prompt: *What are words you associate with equations?* As students enter their words, display the word cloud for students to see how the words grow when other students enter the same word.

Teacher's Note: Word Cloud Display

Through Mentimeter, you have the ability to display the word cloud as students answer the prompt. This allows students to see specific words grow in importance. Use this display to guide the discussion.

Go to **slide 6**. Have a class discussion on what students notice about the word cloud.

Explore

Display **slide 7**. Pass out the attached **Literal Equations Exploration** handout to each student.

Have students work in pairs to complete the handout. Students will solve multi-step equations with one variable and literal equations with four variables, using the same operations to see how they compare. In each equation, students will solve for x by explaining the steps they will take to isolate x, which terms they can simplify (if any), and their final solution in terms of $x =$ __.

Teacher's Note: Purpose

Students might be intimidated by equations with multiple variables at first, but the point of this activity is to show them that literal equations aren't all that different from the equations they know how to solve already.

Go to **slide 8**. Have a class discussion on what students noticed about the pairs of equations.

Sample Student Responses

Possible student responses include:

- "I noticed the operations were the same on both equations."
- "I noticed that if I plugged in the numbers for a, b, and c, the second and fourth equations matched the first and third equations."
- "I tried using the same steps in the second and fourth equations as I did in the first and third equations to get x by itself."

Explain

Teacher's Note: Flowchart

If you completed the previous lesson in this series, "Journey of the Isolated Variable, Part 2," students will use the same flowchart from that lesson. This will help establish the connection between solving multi-step equations with one variable and solving literal equations, as they follow the same steps. However, you will need to print out the attached Flowchart handout for students if you have not completed the Part 2 lesson with them.

Display **slide 9**. Pass out the attached **Flowchart** to each student if they do not already have a copy.

Ask students what they notice about the flowchart. Students should realize the steps for solving a one-variable equation are the same as they are for solving a multi-variable equation. Explain to students that, because solving literal equations follows the same steps as solving one-variable equations, they can use the same flowchart they used in the Part 2 lesson.

Display **slide 10**. Using the equation on the slide and the flowchart steps, teach students how to follow the steps to solve a literal equation. The first example will be easier for them.

Go to **slide 11** for another example of a literal equation. As students begin to comprehend the steps of solving literal equations while using the flowchart as a guide, introduce harder problems such as the examples provided on **slides 12–14**. Feel free to add, delete, or modify the equations to best fit students' needs.

Display **slide 15**. This slide provides a word problem example that uses a specific formula. Students will solve the formula for a specific variable in the first part of the problem. Then, they will use their new formula to obtain an answer to the second question.

Extend

Display **slide 16**. Pass out the attached **Extend** handout to each student. Instruct students to walk around the room to find someone who can solve each problem on their handout.

Make sure students understand that they *must* get their problems solved in order from 1–10. This will allow students to solve a variety of problems on their peers' handouts—e.g., once a student has solved Problem 1 on a classmate's handout, they can't solve the same problem for anyone else. After a student solves a problem, have them write or sign their name in the box to claim that problem as theirs.

Evaluate

Teacher's Note: Preparation

The attached Muddiest Point handout is meant to be cut in half, providing each student with a half-sheet card. If you'd prefer, you may have students respond to the prompt on their own sheets of paper. If you have a digital platform for your classroom, such as Google Classroom or Canvas, you may have students respond to the prompt on a discussion board instead.

Display **slide 17**. Pass out a half-sheet card from the attached **Muddiest Point** handout to each student. Have students use the Muddiest Point strategy to answer the following questions: *What are you still confused about? In other words, what remains the "muddiest point" about literal equations for you?*

Students will respond on their cards with what they think was the most confusing point of the lesson. Their responses will give you a frame of reference for discussing remaining misconceptions and moving forward.

Resources

- K20 Center. (n.d.). Collaborative Word Clouds. Strategies. https://learn.k20center.ou.edu/strategy/103
- K20 Center. (n.d.). Mentimeter. Tech Tools. https://learn.k20center.ou.edu/tech-tool/645
- K20 Center. (n.d.). Muddiest Point. Strategies. https://learn.k20center.ou.edu/strategy/109