

# 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 focuses on solving literal equations by building on the equation-solving knowledge students developed in Parts 1 and 2 of the Journey of the Isolated Variable series. Students will deepen their understanding of rearranging multi-variable equations to isolate a specific variable. By the end of the lesson, students will solve literal equations using algebraic properties and operations while making connections to real-world problem-solving scenarios.

## 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

*ACT College and Career Readiness Standards - Mathematics (6-12)*

**AF502:** Build functions and write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions)

*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

- Flowchart—Journey of the Isolated Variable, Part 3 - Spanish.pdf
- Flowchart—Journey of the Isolated Variable, Part 3.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
- Literal Equations Practice - Journey of the Isolated Variable, Part 3 - Spanish.docx
- Literal Equations Practice - Journey of the Isolated Variable, Part 3 - Spanish.pdf
- Literal Equations Practice - Journey of the Isolated Variable, Part 3.docx
- Literal Equations Practice - 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)
- Literal Equations Practice handout (attached; one per student; print 2-sided)
- Flowchart (attached; one per student)
- Muddiest Point handout (attached; one half-sheet per student)
- Chromebooks or student devices with internet access

5 minutes

# Engage

**Teacher's Note: Preparation**

Before beginning the lesson, create a Mentimeter word cloud for students to interact with. Mentimeter offers a free option that includes a limited number of interactive components. To get started, sign up for an account and click on the "?" in the upper-right corner of your homepage to access tutorial videos on creating a word cloud.

When your word cloud is ready, generate a code for students to use. For quick accessibility, include this code on **slide 5** of the lesson slides so students can easily type it into their devices.

Introduce the lesson using the attached **Lesson Slides**. Display **slide 3** to share the lesson's essential question. Display **slide 4** to go over the lesson's learning objective. Review these slides with students to the extent you feel necessary.

Go to **slide 5**. Students will complete a Collaborative Word Cloud using Mentimeter (See Teacher's Note above). Students will go to menti.com, enter your generated code, and answer the prompt. 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** and facilitate a class discussion about the word cloud. Encourage students to reflect on how their contributions connect to the lesson topic and emphasize the importance of the terms presented in the word cloud.

20 minutes

# Explore

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

Instruct students to work in pairs to complete the handout. Each pair will solve both multi-step equations with one variable and literal equations with four variables, using the same operations to observe and compare the processes. For each equation, students will:

1. Explain the steps they will take to isolate *x*.
2. Identify which terms (if any) can be simplified.
3. Write their final solution in terms of *x* =__.

### Teacher's Note: Purpose

Students may initially feel intimidated by equations with multiple variables, but this activity demonstrates that solving literal equations is similar to solving equations they are already familiar with. Emphasize that the same operations apply, regardless of the number of variables.

Display **slide 8** and lead a class discussion on students' observations about the pairs of equations. Encourage students to refer to what they wrote at the end of the handout to support their insights.

### 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."

20 minutes

# 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** and pass out the **Flowchart** handout to each student if needed.

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.

Move to **slide 10** and use the equation on the slide to demonstrate how to follow the flowchart steps to solve a literal equation. Walk students through each step, emphasizing how the flowchart guides their decision-making. This example is intentionally simpler to help students build confidence before tackling more complex problems.

Display **slide 11** and introduce another example of a literal equation. As students grow more comfortable with the process, proceed to harder problems provided on **slides 12–14.** Adjust the examples as needed to meet the skill levels and needs of your students.

Finally, display **slide 15**, which features a word problem involving a specific formula. Have students solve the formula for a designated variable in the first part of the problem. Then, guide them to use their new formula to find the solution to the second question.

Encourage students to apply the flowchart at each step and discuss how it aids their problem-solving process.

35 minutes

# Extend

Display **slide 16** and pass out the attached **Literal Equations Practice** handout to each student.

Explain the activity as a collaborative walk-and-solve exercise. Instruct students to move around the classroom and find classmates who can solve the problems on their handouts.

**Activity Guidelines**:

1. Students must solve the problems in sequential order from 1 to 10.
2. Once a student solves a problem on a classmate's handout, they must write or sign their name in the corresponding box to claim that problem as theirs.
3. A student can only solve each problem once, so they must work on different problems on different classmates' handouts.

10 minutes

# Evaluate

**Teacher's Note: Preparation**

The attached **Muddiest Point** handout is designed to be cut in half, providing each student with a half-sheet card. Alternatively, students can respond to the prompt on their own sheets of paper. If your classroom uses a digital platform, such as Google Classroom or Canvas, consider having students submit their responses on a discussion board for easier review.

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 on the slide and/or handout about what is now clear to them about literal equations and what is still "muddy" for them.

Collect their cards and review the responses. 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