

UNDERSTANDING THE TARGET TO CREATE A PATHWAY TO EXCELLENCE
Ensuring each student is a thinker, problem solver, and communicator

UNWRAP A STANDARD: *WHAT DO STUDENTS HAVE TO KNOW AND BE ABLE TO DO?*

Reporting Category: Equations and Inequalities
Reporting Category Weight: 38% of SOL assessment items

Standard: A.EI.1 The student will represent, solve, explain, and interpret the solution to multistep linear equations and inequalities in one variable and literal equations for a specified variable.

Required Knowledge and Skills

Emerging	Developing	Proficient	Distinguished
<p>I can solve a single step equation in one variable.</p> <p>I can solve a single step inequality in one variable.</p> <p>I can write a linear equation or inequality in one variable to represent a contextual situation.</p>	<p>I can solve multistep linear equations in one variable by applying the properties of real numbers and/or properties of equality.</p> <p>I can solve multistep linear inequalities in one variable algebraically and graph the solution set on a number line, including those in contextual situations, by applying the properties of real numbers.</p>	<p>I can rearrange a formula or literal equation to solve for a specified variable by applying the properties of equality.</p> <p>I can determine if a linear equation in one variable has one solution, no solution, or an infinite number of solutions.</p>	<p>I can verify possible solution(s) to multistep linear equations and inequalities in one variable algebraically, graphically, and with technology to justify the reasonableness of the answer(s).</p> <p>I can explain the solution method and interpret solutions for problems given in context.</p>

Building Background Knowledge: FLASHBACK STANDARD

SOL 8.PFA.4 The student will write and solve multistep linear equations in one variable, including problems in context that require the solution of a multistep linear equation in one variable.

SOL 8.PFA.4 The student will write and solve multistep linear inequalities in one variable, including problems in context that require the solution of a multistep linear inequality in one variable.

Where will students use these knowledge and skills: PREVIEW STANDARD

SOL 8.PFA.4 The student represent, solve, and interpret the solution to quadratic equations in one variable over the set of complex numbers and solve quadratic inequalities in one variable.

UNDERSTANDING THE TARGET TO CREATE A PATHWAY TO EXCELLENCE
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UNWRAP A STANDARD: WHAT DO STUDENTS HAVE TO KNOW AND BE ABLE TO DO?

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Required Knowledge and Skills

Emerging	Developing	Proficient	Distinguished
<p>I can solve a <u>single step equation</u> in one variable.</p> <p>I can solve a <u>single step inequality</u> in one variable.</p> <p>I can write a <u>linear equation or inequality</u> in one variable to represent a <u>contextual situation</u>.</p>	<p>I can solve <u>multistep linear equations</u> in one variable by applying the properties of real numbers and/or properties of equality.</p> <p>I can solve <u>multistep linear inequalities</u> in one variable <u>algebraically</u> and graph the <u>solution set on a number line</u>, including those in <u>contextual situations</u>, by applying the properties of real numbers.</p>	<p>I can rearrange a <u>formula or literal equation to solve</u> for a <u>specified variable</u> by applying the properties of equality.</p> <p>I can determine if a linear equation in one variable has <u>one solution, no solution, or an infinite number of solutions</u>.</p>	<p>I can verify <u>possible solution(s) to multistep linear equations and inequalities</u> in one variable <u>algebraically, graphically, and with technology</u> to justify the <u>reasonableness of the answer(s)</u>.</p> <p>I can explain the <u>solution method</u> and interpret <u>solutions</u> for problems given in context.</p>

Building Background Knowledge: FLASHBACK STANDARD

SOL 8.PFA.4 The student will write and solve multistep linear equations in one variable, including problems in context that require the solution of a multistep linear equation in one variable.

SOL 8.PFA.5 The student will write and solve multistep linear inequalities in one variable, including problems in context that require the solution of a multistep linear inequality in one variable.

Where will students use these knowledge and skills: PREVIEW STANDARD

SOL A2.EI.4 The student will represent, solve, and interpret the solution to quadratic equations in one variable over the set of complex numbers and solve quadratic inequalities in one variable.

Standard Analysis

What do students need to know? What do they need to be able to do?

<p>ESSENTIAL KNOWLEDGE/CONCEPTS <i>What Do Students Need to Know/Understand?</i> List the underlined nouns.</p> <p>Linear Equation Linear Inequality Contextual Situation Literal Equation Multistep (equation and Inequality) No Solution Infinite Solution One Solution</p>	<p>ESSENTIAL SKILLS <i>What Do Students Need to Be Able to Do?</i> List the circled (or italicized) verbs.</p> <p>Solve Write Represent determine Justify Interpret Explain Graph Verify</p> <hr/> <p>DOK LEVEL Level of content complexity rather than content difficulty.</p> <p style="text-align: center;">DOK 1 DOK 2 DOK 3</p>
<p>WONDER QUESTIONS <i>How can we capture student wonder?</i> *Including open-ended and 'second' questions</p> <p>How does the setting shape the character in a story or drama? How might a different setting change the outcome or the story? Critique the effectiveness of the author's use of setting in our story? Create a new story or drama and design the setting to have a specific impact on the characters and plot.</p>	<p>ESSENTIAL VOCABULARY <i>What Do Students Need to Comprehend?</i> List all key vocabulary</p> <p>Linear Equation Linear Inequality Contextual Situation Literal Equation Multistep (equation and Inequality) Solution (Infinite, None, One)</p>

LEARNING TARGETS ALIGNED TO THE STANDARD

How will we engage students in determining what they have to know and be able to do?

What are the lesson-sized, student friendly learning targets that describe what students are learning about or learning to do? "I am learning about...(concept)" or "I am learning to do...(skill)"

Learning Targets					
I am learning to write a linear equation or inequality with one variable that represents a real-world situation.	I am learning to solve multistep linear equations with one variable, including equations that come from real-world situations.	I am learning to solve multistep linear inequalities, graph the solution on a number line, and interpret the solution in context.	I am learning to rearrange a formula to solve for a specific variable.	I am learning to determine whether a linear equation has one solution, no solution, or infinitely many solutions.	I am learning to verify solutions to linear equations and inequalities using algebra, graphs, and technology, and explain whether my answers make sense.

SUCCESS CRITERIA ALIGNED TO THE LEARNING TARGETS

How will students demonstrate success toward the Learning Targets? What will they say or do to demonstrate success? These success criteria should be scaffolded, actionable, student-friendly, and aligned to the learning target,

<p>I can identify the unknown quantity and choose a variable for it.</p> <p>I can translate words like total, more than, at least, less than, or per into math symbols.</p> <p>I can write an equation or inequality that correctly matches the situation.</p> <p>I can explain what my equation or inequality means in the context of the problem.</p>	<p>I can use the properties of equality to keep both sides balanced.</p> <p>I can correctly simplify expressions (combine like terms and use distributive property).</p> <p>I can isolate the variable step by step.</p> <p>I can check my solution by substituting it back into the original equation.</p> <p>I can explain what the solution means in the context of the problem.</p>	<p>I can apply the properties of inequality correctly, including reversing the inequality when multiplying or dividing by a negative number.</p> <p>I can simplify and solve the inequality step by step.</p> <p>I can graph the solution accurately using open or closed circles and arrows.</p> <p>I can write the solution using words, symbols, and a graph.</p> <p>I can explain what the solution means in the real-world situation.</p>	<p>I can identify the variable I need to solve for.</p> <p>I can use the properties of equality to isolate that variable.</p> <p>I can perform inverse operations correctly and logically.</p> <p>I can check my rearranged formula by substitution values.</p> <p>I can explain the steps I used and why they work.</p>	<p>I can simplify both sides of an equation correctly.</p> <p>I can recognize when variables cancel out or when a false statement appears.</p> <p>I can identify:</p> <ul style="list-style-type: none"> • One solution when a variable equals a number. • No solution when the equation is never true. • Infinite solutions when the equation is always true. <p>I can justify my answer using algebraic reasoning.</p>	<p>I can check solutions algebraically by substitution.</p> <p>I can verify solutions graphically using a number line or coordinate graph.</p> <p>I can use technology (such as a graphing calculator or Desmos) to confirm my solution.</p> <p>I can explain my solution method clearly using correct math language.</p>
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EVIDENCE OF STUDENT UNDERSTANDING?

How will we know when they know it? How will we encourage each student to try?

- Exit Ticket (daily check for understanding)
- Diagnostic Formative Assessment (DFA) (check for understanding of a standard)
- Common Formative Assessment (CFA)

Possible EXIT Tickets (daily check for understanding)

LI1: A movie theater charges a one-time membership fee of \$5 and then \$8 for each movie ticket you buy.

Let x represent the number of movie tickets purchased.

1. Write a linear equation that represents the total cost y .
2. If you have no more than \$45 to spend, write a linear inequality that shows how many movie tickets you can buy.

LI2: Solve the equation below. Show each step and explain how to keep both sides of the equation balanced.

$$4x + 7 = 27$$

1. What operation do you perform first, and why?
2. What operation did you perform next?
3. How do you know the equation stays balanced after each step?

LI3: A streaming service charges a monthly fee of \$12 plus \$3 for each movie rented. You have at most \$45 to spend in one month.

1. Let x represent the number of movies rented. Write a linear inequality that models this situation.
2. Solve the inequality, showing all steps.
3. Graph the solution on a number line.
4. Interpret the solution in context: What does your answer tell you about how many movies you can rent?

LI4: A car travels at a constant speed. The formula for speed is

$$s = \frac{d}{t}$$

If a car travels at a speed of 60 miles per hour for 3 hours, rearrange the formula to solve for **distance (d)** and then find the distance traveled.

LI5: Solve the inequality for x . Show each step used to arrive at a solution.

$$2(3x - 4) - 5 < 4(x - 1) + x$$

Select a number from the solution set for x and show it is true using substitution.

LI6: Solve the inequality:

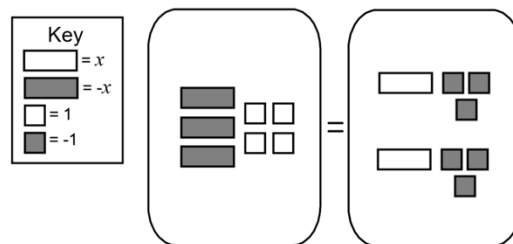
$$3x - 4 \leq 11$$

1. **Algebra:** Solve the inequality and check your work using substitution with a test value.
2. **Graph:** Graph the solution on a number line and explain what the graph shows.
3. **Technology:** Use a calculator or graphing tool to confirm the solution set.
4. **Reasoning:** Explain whether your answer makes sense in context and how you know it is correct.

EVIDENCE OF STUDENT MASTERY? *How will we know when they know it?*

Aligned to SOL A.El.1.0 (flashback Item SOL 8.PFA.4)

1. Find the value of x in the model.



Aligned to SOL A.El.1.1

2. Solve the equation algebraically. Show your work/thinking.

$$6x - 12 = -24$$

Aligned to SOL A.EI.1.2

3. A movie theater charges a membership fee of \$8 plus \$6 for each movie ticket. You have **no more than \$50** to spend.
- Write a linear inequality that represents the situation.
 - Solve the inequality algebraically, showing each step and applying the properties of real numbers.
 - Graph the solution set on a number line.
 - Explain what the solution means in the context of the problem.

Aligned to SOL A.EI.1.3

4. The formula for the total cost C of renting a bike is given by

$$C = \frac{3h+12}{4}$$

where h represents the number of hours the bike is rented.

- Rearrange the formula to solve for h .
- Clearly show each step.
- Use your rearranged formula to determine how many hours the bike was rented if the total cost was \$15.
- Explain why each step maintains equality.

Aligned to SOL A.EI.1.3

5. Determine whether the following equation has **one solution**, **no solution**, or **infinitely many solutions**. Justify your answer.

$$4(2x - 3) + 5 = 8x - 7$$

- Simplify both sides of the equation.
- Show each step as you solve.
- State how you know whether the equation has one solution, no solution, or infinitely many solutions.
- If there is a solution, find it.

Aligned to SOL A.EI.1.4

6. A student claims that $x = 4$ is a solution to the equation and inequality below.

$$\text{Equation: } 3(2x - 5) + 4 = 2x + 6 \quad \text{Inequality: } 5x - 7 \leq 2(3x + 1)$$

a. **Algebraic Verification**

Substitute $x = 4$ into each expression to determine whether it is a solution to the equation and the inequality. Show all steps.

b. **Graphical Verification**

Graph both sides of the equation and the inequality on the same coordinate plane or number line. Use the graphs to verify whether $x = 4$ satisfies each statement.

c. **Technology Verification**

Use a graphing calculator or online graphing tool (such as Desmos) to check your results. Include a screenshot or written explanation of what you observe.

d. **Reasonableness**

Explain whether the student's claim is reasonable based on all three methods. If $x = 4$ is not a solution, state the correct solution set and justify it.

*What will we do for students who do not know it?
What will we do for students who already know it?*

Guided Group Lesson

Standard:

Date:

	Beginning	Developing	Proficient	Distinguished
Group Members				

Warm-Up:

Vocabulary

Beginning	Developing	Proficient	Distinguished
<p>Lesson focus:</p> <p>Escape Room Challenge: Beat the Clock!</p> <p>Your class is playing a school math escape room game. Each team pays a \$6 entry fee plus \$3 per puzzle they attempt. Your</p>	<p>Lesson focus:</p> <p>Mystery Math Case: The Vanishing Solution</p> <p>Your team is investigating a math mystery. Three suspects left behind three equations. Only one tells the truth!</p> <p>For each equation below, determine whether it</p>	<p>Lesson focus:</p> <p>Concert Countdown Challenge!</p> <p>A music festival has two different ticket rules. A student claims $x = 5$ works for both situations.</p> <p>Situation A (Equation): $2x + 3 = 13$</p>	<p>Lesson focus:</p> <p>Boss Battle: Can the Solution Survive?</p> <p>Your team is facing the Final Math Boss. A player claims that $x = 3$ defeats <i>both</i> challenges below.</p>

<p>team has at most \$30 to spend. Let p represent the number of puzzles your team can attempt.</p> <ol style="list-style-type: none"> Write a multistep linear inequality that represents the situation. Solve the inequality algebraically, showing each step and applying the properties of real numbers. Graph the solution set on a number line. Interpret the solution: What does your answer mean for your team in the game? Team Talk 🗨️: Is it possible to attempt a negative number of puzzles? How does that affect your graph? 	<p>has one solution, no solution, or infinitely many solutions. Show your work and explain your reasoning to your team.</p> <p>Suspect A: $3(2x - 4) = 6x - 12$</p> <p>Suspect B: $5x + 7 = 5x - 1$</p> <p>Suspect C: $4(x + 2) + 2x = 6x + 8$</p> <hr/> <p>Team Tasks:</p> <ol style="list-style-type: none"> Simplify both sides of each equation. Decide whether the result leads to: <ul style="list-style-type: none"> a true statement (infinitely many solutions), a false statement (no solution), or a single value for x (one solution). Be ready to defend your conclusion to the class! 	<p>Situation B (Inequality): $x - 2 \leq 4$</p> <p>Team Mission:</p> <ol style="list-style-type: none"> Solve each equation and inequality algebraically. Graph each solution: <ul style="list-style-type: none"> Use a coordinate graph for the equation. Use a number line for the inequality. Verify graphically whether $x = 5$ is a solution for each situation. Team Discussion 🗨️ <ul style="list-style-type: none"> How does the graph help confirm or reject the solution? Which graph makes verification easier—and why? 	<p>Challenge 1: Equation $4(2x - 1) - 5 = 3x + 6$</p> <p>Challenge 2 Inequality $2(3x + 4) \geq 5x + 7$</p> <p>Team Tasks:</p> <ol style="list-style-type: none"> Solve each problem algebraically to find the actual solution(s). Use technology (Desmos, a graphing calculator, or similar) to: <ul style="list-style-type: none"> Graph both sides of the equation. Graph the inequality on a number line or coordinate graph. Verify whether $x = 3$ is a valid solution for each challenge. Justify the reasonableness of your conclusions using what you see on the graphs. Team Explanation 🗨️ Be ready to explain how the technology confirms (or disproves) the player's claim
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Observations:
What you notice about your students during small group instruction.

Next Steps:
What will you do with these students next?
Change groups, repeat, etc.