

### Core Content

<b>Cluster Title: Understand solving equations as a process of reasoning and explain the reasoning.</b>
<b>Standard A.REI.1:</b> Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
<b>Concepts and Skills to Master</b>
<ul style="list-style-type: none"> <li>Understand, apply, and explain the results of using inverse operations.</li> <li>Justify the steps in solving equations by applying and explaining the properties of equality, inverse and identity.</li> <li>Use the names of the properties and common sense explanations to explain the steps in solving an equation.</li> </ul>

### Supports for Teachers

<b>Critical Background Knowledge</b>															
<ul style="list-style-type: none"> <li>Use order of operations</li> <li>Simplify expressions using properties of algebra</li> </ul>															
<b>Academic Vocabulary</b>															
Constant , coefficient , properties of operations and properties of equalities, like terms, variable, evaluate, justify, viable															
<b>Suggested Instructional Strategies</b>	<b>Resources</b>														
<ul style="list-style-type: none"> <li>Have students share different ways of solving equations that lead to the same answer.</li> <li>Find and analyzemistakes in student work samples.</li> <li>Partner problems: One student solves, the other writes reasons why steps work.</li> <li>Introduce a two-column proof as a way of organizing justifications.</li> </ul>	<i>Making it Happen</i> (NCTM)														
<b>Sample Formative Assessment Tasks</b>															
<b>Skill-based Task</b> Justify the equation solution by writing the property or reason why each solution step works. <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td><math>3x + 7 = 12</math></td><td></td></tr> <tr><td><math>3x + 7 - 7 = 12 - 7</math></td><td></td></tr> <tr><td><math>3x + 0 = 5</math></td><td></td></tr> <tr><td><math>3x = 5</math></td><td></td></tr> <tr><td><math>(3x)(1/3) = (5)(1/3)</math></td><td></td></tr> <tr><td><math>1x = 5/3</math></td><td></td></tr> <tr><td><math>x = 5/3</math></td><td></td></tr> </table>	$3x + 7 = 12$		$3x + 7 - 7 = 12 - 7$		$3x + 0 = 5$		$3x = 5$		$(3x)(1/3) = (5)(1/3)$		$1x = 5/3$		$x = 5/3$		<b>Problem Task</b> When Sally picks any number between 1 and 20, doubles it, adds 6, divides by 2 and subtracts 3, she always gets the number she started with. Why? Evaluate and use algebraic evidence to support your conclusion.
$3x + 7 = 12$															
$3x + 7 - 7 = 12 - 7$															
$3x + 0 = 5$															
$3x = 5$															
$(3x)(1/3) = (5)(1/3)$															
$1x = 5/3$															
$x = 5/3$															

## Core Content

<b>Cluster Title: Solve equations and inequalities in one variable.</b>
<b>Standard A.REI.3:</b> Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
<b>Concepts and Skills to Master</b>
<ul style="list-style-type: none"> <li>• Write equations in equivalent forms to solve problems.</li> <li>• Analyze and solve literal equations for a specified variable.</li> <li>• Understand and apply the properties of Inequalities.</li> <li>• Verify that a given number or variable is a solution to the equation or inequality.</li> <li>• Interpret the solution of an inequality in real terms.</li> </ul>

## Supports for Teachers

<b>Critical Background Knowledge</b>	
<ul style="list-style-type: none"> <li>• Solving linear equations</li> </ul>	
<b>Academic Vocabulary</b>	
Properties of Inequalities as interpreted in table 5 of the CCSS glossary page 90	
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
<ul style="list-style-type: none"> <li>• Solve specified variables, using common formulas used in science, economics, or other disciplines.</li> <li>• Examine and prove why dividing or multiplying by a negative reverses the inequality sign.</li> <li>• Use applications from a variety of disciplines to motivate solving linear equations and inequalities.</li> </ul>	USU Library of Virtual Manipulatives
<b>Sample Formative Assessment Tasks</b>	
<b>Skill-based Task</b>	<b>Problem Task</b>
Solve $2(x+4) - 3 \geq 4x - 2$ .	The perimeter of a rectangle is given by $P = 2W + 2L$ . Solve for $W$ and restate in words the meaning of this new formula in terms of the meaning of the other variables.

## Core Content

<b>Cluster Title: Solve systems of equations.</b>
<b>Standard A.REI.5:</b> Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
<b>Concepts and Skills to Master</b>
<ul style="list-style-type: none"> <li>• Explain the use of the multiplication property of equality to solve a system of equations.</li> <li>• Explain why the sum of two equations is justifiable in the solving of a system of equations (property of equality).</li> <li>• Relate the process of linear combinations with the process of substitution for solving a system of linear equations.</li> </ul>

## Supports for Teachers

<b>Critical Background Knowledge</b>	
<ul style="list-style-type: none"> <li>• Graph a line</li> <li>• Solve systems of equations.</li> </ul>	
<b>Academic Vocabulary</b>	
Elimination by multiplication and addition, substitution	
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
<ul style="list-style-type: none"> <li>• Modeling with a balance scale –to make the point of the multiple of an equation for purposes of elimination in a system.</li> </ul>	<i>Making it Happen</i> (NCTM)
<b>Sample Formative Assessment Tasks</b>	
<p><b>Skill-based Task</b></p> <p>Verify that (-4,13) is the solution to the system.</p> $\begin{cases} 2x + y = 5 \\ -5x - 2y = -6 \end{cases}$ <p>Justify that the following is an equivalent system.</p> $\begin{cases} -3x - y = -1 \\ -5x - 2y = -6 \end{cases}$ <p>Verify that (-4,13) is the solution to this new system.</p>	<p><b>Problem Task</b></p> <p>Create a new system using both the addition and multiplication properties of equality. Then verify that the new system has the same solution as the original.</p> $\begin{cases} 2x + y = 5 \\ -5x - 2y = -6 \end{cases}$

## Core Content

<b>Cluster Title: Solve systems of equations.</b>	
<b>Standard A.REI.6:</b> Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.	
<b>Concepts and Skills to Master</b>	
<ul style="list-style-type: none"> <li>• Solve a system of equations exactly (with algebra) and approximately (with graphs).</li> <li>• Test a solution to the system in both original equations (both graphically and algebraically).</li> <li>• Analyze a system of equations using slope to predict one, infinitely many or no solutions.</li> </ul>	
<b>Supports for Teachers</b>	
<b>Critical Background Knowledge</b>	
<ul style="list-style-type: none"> <li>• Graph a line</li> <li>• Find the slope of a line</li> <li>• Solve systems of equations</li> </ul>	
<b>Academic Vocabulary</b>	
System of equations, consistent and inconsistent systems, dependent and independent systems, solution set	
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
<ul style="list-style-type: none"> <li>• Solve contextual problems using systems of equations.</li> <li>• Have students generate scenarios which might yield one, many, no solutions.</li> <li>• Have students create systems of equations to model various contextual situations such as cell phone costs.</li> <li>• Use graphing calculators to estimate solutions to systems.</li> </ul>	<a href="http://www.illuminations.NCTM.org">www.illuminations.NCTM.org</a> Everything Balances Out in the End
<b>Sample Formative Assessment Tasks</b>	
<b>Skill-based Task</b>	<b>Problem Task</b>
Approximate the solution to the system of equations graphically. Then verify the solution algebraically.  $3x - 5y = -15$ $2x - y = 2$	The high school is putting on the musical <i>Footloose</i> . The auditorium has 300 seats. Student tickets are \$3 and adult tickets are \$5. The royalty for the musical is \$1300. What combination of student and adult tickets do you need to fill the house and pay the royalty? How could you change the price of tickets so more students can go?