

# Algebra 2 CP Unit 2: Systems of Equations

<b>Unit #:</b>	APSDO-00018093	<b>Duration:</b>	4.0 Week(s)	<b>Date(s):</b>	
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**Grades:**  
 10, 11

**Subjects:**  
 Mathematics

## Unit Focus

In this unit, students will solve and graph systems of equations and inequalities, and write and solve systems of equations in order to solve real world problems, Students will use linear programming and optimization to make and explain decisions represented by constraints. In addition, students will perform matrix operations and use matrices to solve systems. Summative assessments may include projects, labs and test.

## Stage 1: Desired Results - Key Understandings

Established Goals	Transfer		
<p><b>Common Core</b>  <i>Mathematics: 10</i></p> <ul style="list-style-type: none"> <li>Explain why the x-coordinates of the points where the graphs of the equations <math>y = f(x)</math> and <math>y = g(x)</math> intersect are the solutions of the equation <math>f(x) = g(x)</math>; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where <math>f(x)</math> and/or <math>g(x)</math> are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*  <i>CCSS.MATH.CONTENT.HSA.REI.D.11</i></li> <li>Multiply a vector (regarded as a matrix</li> </ul>	<p><b>T1</b> (T50) Based on an understanding of any problem, initiate a plan, execute it and evaluate the reasonableness of the solution.</p> <p><b>T2</b> (T53) Articulate how mathematical concepts relate to one another in the context of a problem or in the theoretical sense.</p> <p><b>T3</b> (T51) Examine alternate methods to accurately and efficiently solve problems.</p> <p><b>T4</b> (T52) Use appropriate tools strategically to deepen understanding of mathematical concepts.</p> <p><b>T5</b> (T22) Describe and/or solve problems using algebraic expressions, equations, inequalities, and functions.</p> <p><b>T6</b> (T23) Use functions or equations to model relationships among quantities.</p>		
	Meaning		
	Understandings	Essential Questions	
	<p><b>U1</b> (U501) Effective problem solvers identify</p>	<p><b>Q1</b> (Q502) What is important here? What is</p>	

<p>with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors. <i>CCSS.MATH.CONTENT.HSN.VM.C.11</i></p> <ul style="list-style-type: none"> <li>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. <i>CCSS.MATH.CONTENT.HSN.Q.A.1</i></li> <li>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. <i>CCSS.MATH.CONTENT.HSA.CED.A.2</i></li> <li>Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. <i>CCSS.MATH.CONTENT.HSA.REI.D.12</i></li> </ul>	<p>relevant information. <b>U2</b> (U502) Effective problem solvers identify and apply an appropriate model, tool, or strategy. <b>U3</b> (U530) Every problem belongs to a category of problems that has a similar structure and set of characteristics; which means it can be solved using a similar model. <b>U4</b> (U541) The accuracy of a solution depends upon the proper selection and effective use of a mathematical tool. <b>U5</b> (U203) Certain mathematical manipulations preserve the relationship in an expression or equation, even though they change the representation. <b>U6</b> (U205) Expressions, equations, inequalities, and functions use symbols to represent quantities, operations, and their relationships. <b>U7</b> (U206) A function can represent how quantities in the real world relate to one another.</p>	<p>not important? <b>Q2</b> (Q505) Is my answer correct? OR Does my solution make sense? <b>Q3</b> (Q531) What values, numbers, quantities, and/or symbols can be used to solve a problem? <b>Q4</b> (Q532) Which model best represents this problem? <b>Q5</b> (Q541) How do I use tools to solve problems? <b>Q6</b> (Q205) How can I represent this relationship as a function or equation? (Gr. 6-12) <b>Q7</b> (Q206) How do I evaluate this function or solve the equation? (Gr. 6-12)</p>
<b>Acquisition of Knowledge and Skill</b>		
<b>Knowledge</b>		<b>Skills</b>
	<p><b>S1</b> Write and solve a system of linear equations with two unknowns graphically, algebraically, and with graphing device and three unknowns with a graphing device</p> <p><b>S2</b> Solve a system of equations including a combination of linear, absolute value, exponentials (algebraic and graphical device where appropriate)</p> <p><b>S3</b></p>	

<p>payoffs or incidence relationships in a network.  <i>CCSS.MATH.CONTENT.HSN.VM.C.6</i></p> <ul style="list-style-type: none"> <li>• Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.  <i>CCSS.MATH.CONTENT.HSN.VM.C.7</i></li> <li>• Add, subtract, and multiply matrices of appropriate dimensions.  <i>CCSS.MATH.CONTENT.HSN.VM.C.8</i></li> <li>• Represent a system of linear equations as a single matrix equation in a vector variable.  <i>CCSS.MATH.CONTENT.HSA.REI.C.8</i></li> <li>• Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension <math>3 \times 3</math> or greater).  <i>CCSS.MATH.CONTENT.HSA.REI.C.9</i></li> <li>• Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.  <i>CCSS.MATH.CONTENT.HSN.VM.C.9</i></li> <li>• Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).  <i>CCSS.MATH.CONTENT.HSA.REI.D.10</i></li> <li>• Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.  <i>CCSS.MATH.CONTENT.HSN.VM.C.10</i></li> <li>• Make sense of problems and persevere in solving them. <i>CCSS.MATH.MP.1</i></li> <li>• Model with mathematics.</li> </ul>		<p>Write and solve a system of linear inequalities and identify appropriate constraints, feasible region, vertices</p> <p><b>S4</b></p> <p>Applying linear systems to real world problems</p> <p><b>S5</b></p> <p>Round answers to remain in the feasible region</p> <p><b>S6</b></p> <p>Understand the appropriate units as applied to the graph and solution</p> <p><b>S7</b></p> <p>Understand the meaning of a solution to a real world application (optimization)</p> <p><b>S8</b></p> <p>Multiply matrices by a scalar</p> <p><b>S9</b></p> <p>Add, subtract, multiply matrices</p> <p><b>S10</b></p> <p>Calculate the determinant of a <math>2 \times 2</math> matrix</p> <p><b>S11</b></p> <p>Use the inverse of a matrix if it exists to solve linear systems of equations</p> <p><b>S12</b></p> <p>Understand the commutative property does not apply to matrices</p>
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<p><i>CCSS.MATH.MP.4</i></p> <ul style="list-style-type: none"> <li>• Use appropriate tools strategically.</li> </ul> <p><i>CCSS.MATH.MP.5</i></p>		<p><b>S13</b></p> <p>Understand the zero and identity matrices</p> <p><b>S14</b></p> <p>Understand the application of determinant</p>
<b>Stage 3: Learning Plan</b>		
<b>Coding</b>	<b>Code</b>	<b>Description of Learning Activity</b>