

# ACC Systems of Equations and Inequalities

Content Area: **Mathematics**  
Course(s): **Algebra**  
Time Period: **March**  
Length: **15 Days**  
Status: **Published**

## Unit Summary

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The goal of this unit is to extend solving equations to understanding solving systems of equations, which is defined as a set of two or more linear equations that contain the same two variables. Students start their exploration of this topic by recognizing that a point of intersection (P.O.I.) on a graphical representation of a system is the solution or ordered pair that makes both equations true. This is done by graphing by hand as well as using graphing calculators. The use of graphing technology and the concept of solving systems of equations is extended to rewriting complex non-linear equations as systems.

Problems are structured so that students also experience equations that represent parallel lines (no P.O.I./no solution) and equations that are equivalent (the lines are coincident and there are an infinite number of P.O.I./solutions). Besides finding solutions graphically, students will solve systems algebraically using substitution, equal value, and elimination algorithms.

The concepts and graphing techniques are also applied to non-linear systems of equations as well as systems of inequalities where the solution set is described as an area with an infinite number of solutions if a solution exists.

Students will explore many problems with real-world context for which they must write and solve pairs of linear equations. Emphasis is on defining the unknown values, setting up the system, solving the system, and clearly interpreting and communicating the solution.

## Standards

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MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.8.EE.C	Analyze and solve linear equations and pairs of simultaneous linear equations.
MA.8.EE.C.8	Analyze and solve pairs of simultaneous linear equations.
MA.8.EE.C.8a	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
MA.8.EE.C.8b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
MA.8.EE.C.8c	Solve real-world and mathematical problems leading to two linear equations in two variables.
MA.A-REI.C	Solve systems of equations

MA.A-REI.C.5	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.
MA.A-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
MA.A-REI.D	Represent and solve equations and inequalities graphically
MA.A-REI.D.11	Explain why the $x$ -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
MA.A-REI.D.12	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.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.

## Student Learning Objectives

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- Students will learn to approximate solutions to linear systems by graphing and inspection.
- Students will learn to solve linear systems using substitution or linear combination.
- Students will learn to identify linear systems that have either no solutions or an infinite number of solutions.
- Students will learn to solve real-world and mathematical problems leading to 2 linear equations/inequalities in 2 variables.
- Students will learn to determine whether the lines through 2 pairs of points intersect.
- Students will learn to graph systems of linear inequalities.
- Students will learn to solve complex equations in one variable by creating and solving a system of equations.

## Essential Questions

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- How do you communicate choice?
- What are some factors that go into selecting one solution over another?
- When do real-world problems have many answers?

## Enduring Understandings

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- Students will understand that the best solution to any complex problem requires negotiation of multiple considerations.

## Application

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- Students will be able to independently use their learning to interpret graphs of systems of equations.
- Students will be able to independently use their learning to recognize when systems have one, more than one, or no solutions.
- Students will be able to independently use their learning to solve word problems by writing a system of equations and then solving it.
- Students will be able to independently use their learning to determine when to use a system of inequalities to analyze and situation instead of a system of equations.

## Skills

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Students will be skilled at:

- Solving a system of equations through substitution.
- Solving a system of equations through linear combination.
- Identifying the best method to solve a system of equations.