Unit 2: Systems of Equations Linear and Inequalities

Content Area: **Mathematics**
Course(s): **Algebra 3CP**
Time Period: **Semester 1**
Length: **5 weeks**
Status: **Published**

Unit Description

The unit develops students' conceptual and procedural understanding of systems of linear equations and inequalities through multiple solution methods, including graphing, substitution, and elimination. Students learn to identify and interpret systems with one solution, no solution, or infinitely many solutions while examining the advantages and limitations of various solving techniques. The unit extends to systems of linear inequalities and systems involving three variables, emphasizing real-world applications and mathematical reasoning. Instruction is designed to support diverse learners through visual representations, structured problem-solving strategies, and meaningful connections between algebraic procedures and graphical interpretations. Students will build confidence in selecting efficient methods, verifying solutions, and communicating mathematical thinking using appropriate mathematical language.

Standards

MA.A-REI	Reasoning with Equations and Inequalities
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.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
MA.A-REI.D	Represent and solve equations and inequalities graphically
MA.A-REI.D.10	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).
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.

Enduring Understantdings

Students will understand that:

- Systems of equations model situations involving multiple relationships and constraints.
- Different solution methods can be used to solve the same system efficiently.

- The intersection of graphs represents common solutions that satisfy all equations in a system.
- Some systems have one solution, no solution, or infinitely many solutions based on the relationships between the equations.
- Linear inequalities represent regions of possible solutions rather than single points.
- Choosing an appropriate solving method improves efficiency and accuracy.
- Systems in three variables extend the concepts of solving systems in two variables.
- Mathematical models help analyze and solve real-world problems involving multiple conditions.

Essential Questions

What does it mean for a point to be a solution to a system?

How can graphs help us visualize solutions to systems?

Why do some systems have one solution, no solution, or infinitely many solutions?

When is substitution the most efficient solving method?

When is elimination the most efficient solving method?

How can we determine the best strategy for solving a system?

How are systems of inequalities different from systems of equations?

How can systems of equations and inequalities be used to model real-life situations?

How do the concepts of systems extend to three variables?

Knowledge and Skills

Students will be able to:

- Define a system of linear equations.
- Define a system of linear inequalities.
- Explain the meaning of a solution within a system.
- Distinguish between one solution, no solution, and infinitely many solutions.
- Interpret graphical representations of systems.
- Analyze the relationship between algebraic and graphical solutions.
- Recognize equivalent systems of equations.

Transfer Goals

Students will independently use their learning to analyze situations involving multiple relationships and constraints, select appropriate mathematical strategies, and solve complex problems accurately and efficiently. They will transfer their understanding of systems of equations and inequalities to academic, workplace, and real-world contexts by interpreting data, making decisions based on multiple conditions, evaluating possible solutions, and communicating their reasoning with clarity and precision. Students will recognize that different mathematical approaches can lead to the same solution and will develop confidence in choosing methods that best fit the structure of a problem.