Unit 6: Systems of Equations and Inequalities

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 24**
Length: **4 Weeks**
Status: **Published**

Unit Overview

In this unit, students learn various methods for solving systems of equations: by graphing and finding the point where the lines intersect (graphing method), by solving one equation for one of the variables and substituting it into the other equation (substitution method), and by combining the equations to eliminate one of the variables (elimination method). Students also examine special cases where a system has no solution or infinitely many solutions. Students will also solve systems of linear inequalities through graphing.

Standards

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-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
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.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.

Essential Questions

- How can we model a real-life situation using a system of equations?
- How can we construct equations in order to solve a real-world problem?
- What types of real-world problems can be solved using a system of linear equations?

Application of Knowledge and Skills...

Students will know that...

- 1) a system of linear equations consists of two or more linear equations in the same variables
- 2) the point of intersection on a graph is the solution to a system
- 3) the substitution method is useful when a coefficient is one or negative one
- 4) the elimination method is useful when all coefficients are different from one
- 5) a system of parallel lines has no solution
- 6) a system of the same line has infinitely many solutions
- 7) the graph of a system of linear inequalities is the intersection of the half-planes of each inequality in the system

Students will be able to...

- a) Check solutions to systems algebraically
- b) Solve systems by graphing
- c) Solve systems by substitution
- d) Solve systems by elimination
- e) Solve systems by arranging like terms and by multiplying first
- f) Solve special types of linear systems
- g) Write and solve linear systems from word problems
- h) Solve systems of linear inequalities

Assessments

- Communicator Practice Diagnostic: Other written assessments Students will solve practice problems on communicators to receive immediate feedback

- Daily Do Now Problems Diagnostic: Other written assessments Students will complete daily Do Now problems to assess readiness
- Homework Formative: Narrative Writing Assignment Students will complete daily homework assignments to reinforce concepts and skills used in class
- Systems of Equations Quiz Formative: Written Test Students will take a quiz to assess their understanding of solving systems using three methods - graphing, substitution, and elimination
- Systems of Equations Test Summative: Written Test Topics will include: solving systems by graphing, substitution, and elimination including those that are special cases; solving word problems using systems; solving systems of inequalities
- Tickets to Leave Formative: Other written assessments Students will complete one or two problems to assess knowledge and skills learned during the class period
- Unit Project Summative: Other written assessments Students will demonstrate their understanding of linear systems by creating their own short story that incorporates a system of linear equations. They will create their problem and solve it using all three methods: graphing, substitution, and elimination

Activities

Linear Systems Investigation Activity

Students will be introduced to systems of linear equations and their solutions using a table.

Amusement Park Activity

Students work to interpret the best admission and ride package by graphing a system of linear equations.

Solve Systems using Substitution Activity

Students are introduced to the substitution method using real-life context.

Math Sprints

Students will work in pairs to solve sets of systems and race their classmates to complete all sets.

System Partner Practice

Students will complete a two-columned worksheet whose parallel problems yield the same answers and self-check their work.

Word Problem Box Activity

Students will solve a word problem by writing a system of equations and using all three methods to solve it.

Battleship Review

Students will work in pairs to solve systems by playing a game of battleship.

Communicator Practice

Students will solve differentiated practice problems on SmartPal response boards.

- Math Sprints
- Word Problem Box Activity
- Battleship Review
- Substitution Activity

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
  - Modifications & accommodations as listed in the student's IEP
  - Assign a peer to help keep student on task
  - Modified or reduced assignments
  - Reduce length of assignment for different mode of delivery
  - Increase one-to-one time
  - Working contract between you and student at risk
  - Position student near helping peer or have quick access to teacher
  - Break tests down in smaller increments

- **Content specific modifications may include:**
  - Provide personal handout for integer rules
  - Provide graphic organizer for remembering angle relationships
  - Provide completed examples for practice work and homework.
  - Provide calculator to assist with calculations.
  - Provide students with a formula sheet with one type of problem for each formula worked out for them already.

Differentiation for ELL's:

- General modifications may include:
  - Strategy groups
  - Teacher conferences
  - Graphic organizers

- Modification plan

- **Content specific vocabulary important for ELL students to understand include:** graphing, substitution, elimination, like terms, linear systems, linear inequalities

Differentiation to extend learning for gifted students may include:

- Challenge and enrichment homework, worksheets, and activity
- Optional weekly challenge problems
- Appropriately leveled problems for students to solve when participating in communicator practice will be provided.

Integrated/Cross-Disciplinary Instruction

Language Arts Literacy - Students will use writing skills when creating their story for their word problems for the System of Equations Unit Project.

Resources

McDougal-Littell Algebra 1 textbook and resource materials

Kuta software

SmartExchange resources

McDougal Littell Algebra 1
SMART Exchange

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace

	with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.