

07-Systems of Equations & Inequalities

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **2-3 weeks (7-10 blocks)**
Status: **Published**

General Overview, Course Description or Course Philosophy

In this unit, students will understand that solutions to equations are points that make the equation true, while solutions to systems make all equations (or inequalities) true. They will learn how to solve linear systems using graphing, substitution, and elimination methods and identify when each method is most efficient. Students will then use these methods to investigate systems of linear and quadratic functions.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students will understand that:

- Graphs of systems can be used to represent a real-world situation, solve a problem, or predict an outcome
- Rules of arithmetic and algebra can be used together with equivalence to transform systems of equations so solutions can be found to problems

Essential Questions:

- How can you identify whether a system has one, none, or infinitely many solutions from a graph? Using substitution? Using elimination?
- How can you identify a real-world situation that can be represented using a system of equations or inequalities?
- What are the advantages and disadvantages to the methods of solving systems of equations and inequalities?

CONTENT AREA STANDARDS

A.CED

A. Create equations that describe numbers or relationships

A.REI

A. Understand solving equations as a process of reasoning and explain the reasoning

B. Solve equations and inequalities in one variable

C. Solve systems of equations

D. Represent and solve equations and inequalities graphically

A.SSE

A. Interpret the structure of expressions

B. Write expressions in equivalent forms to solve problems

MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
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.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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.8.PB.3: Explain how to create budget that aligns with financial goals.

LA.K-12.NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
CS.K-12.4.c	Create modules and develop points of interaction that can apply to multiple situations and reduce complexity.
CS.K-12.4.d	Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Systems of equations can be used to model real-world problems
- The solution to a system of equations is where the graphs of the functions intersect
- The solution to a system of inequalities is where the shaded regions of the functions overlap
- There are three methods to solve systems of equations and inequalities: graphing, substitution, and linear combination (elimination)

Procedural Knowledge

Students will be able to:

- Categorize systems as having one, none, or infinitely many solutions
- Solve a system of equations in two-variables by graphing, substitution, and elimination
- Create and solve systems of equations and inequalities based on word problems
- Determine the most efficient method to solve a system and justify the reasoning

EVIDENCE OF LEARNING

Benchmark Assessments

Benchmark Assessments conducted three times per year, using Pear Assessment (Standards Based Assessments)

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

- Class Discussion/Exit Cards
- Homework/practice problems (assigned from textbook or various web resources, such as Khan Academy, Albert, Quizizz, or Desmos)

Summative Assessments

- Lesson quizzes
- Teacher-generated unit test
- Performance tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Resources

- *Algebra 1: Common Core*, Chapter 6 and section 9-8

Supplemental Instructional Resources

- [Illustrative Math Tasks](#)
- [Arlington Algebra Project \(Systems\)](#)
- Desmos Activities:
 - [Solutions to Systems of Linear Equations](#)
 - [Solutions to Systems of Linear Inequalities](#)
 - [Polygraph: Systems of Linear Inequalities](#)
 - [Turtle Time Trials](#)

INTERDISCIPLINARY CONNECTIONS

Systems of equations and inequalities can be used in a variety of real-world situations, such as investigating constraints and linear programming.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.