Unit 07 - Systems of Equations and Inequalities

Content Area: **Mathematics**
Course(s): **Algebra I**
Time Period: **March**
Length: **16 days**
Status: **Published**

Enduring Understandings

- A linear inequality in two variables has an infinite number of solutions. These solutions can be represented in the coordinate plane as a set of all points on one side of a boundary line. The solutions of a system of linear inequalities can be represented by the region where the graphs of the individual inequalities overlap.
- Solutions to a linear inequality in two variables can be represented in the coordinate plane as a set of all points on one side of a boundary line. The solutions of a system of linear inequalities can be represented by the region where the graphs of the individual inequalities overlap.
- Some problems can be modeled by systems of linear equations.
- Systems of linear equations can be used to model problems. System of equations can be solved by graphing, substitution, or eliminating a variable.

Essential Questions

- Can systems of equations model real-life situations?
- How can you find the solutions to a system of equations?
- How can you solve a system of equations or inequalities?

Lesson Titles

- Application of Linear Systems
- Linear Inequalities
- Solving Systems by Elimination
- Solving Systems by Graphing
- Solving Systems by Substitution
- Systems of Linear Inequalities

Standards/Indicators

CCSS.Math.Practice.MP1	Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the

	problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
CCSS.Math.Practice.MP2	Reason abstractly and quantitatively. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize-to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents-and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
CCSS.Math.Practice.MP3	Construct viable arguments and critique the reasoning of others. Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and-if there is a flaw in an argument-explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
CCSS.Math.Practice.MP4	Model with mathematics. Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
CCSS.Math.Practice.MP6	Attend to precision.
CCSS.Math.Content.HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
CCSS.Math.Content.HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting

	quantities. Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
CCSS.Math.Practice.MP7	Look for and make use of structure. Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
CCSS.Math.Practice.MP8	Look for and express regularity in repeated reasoning. Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.
CCSS.Math.Content.HSA-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
CCSS.Math.Content.HSA-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.
CCSS.Math.Content.HSA-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
CCSS.Math.Content.HSA-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.
CCSS.Math.Content.HSA-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.

Inter-Disciplinary Connections

- Business
- Chemistry
- Computers
- Engineering
- English
- Geography
- History
- Physics

Warm-Up

- PARCC type of question
- SAT question of the day
- Skill needed to do lesson
- Use What You Know - type of question

Anticipatory Set

- 5 Minute Activity Based
- connecting previous lessons
- connecting vocabulary with roots words
- Discussion including vocab review/recall
- Video Clip

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

- Introduction, notes, and examples on solving systems of inequalities by graphing
- Solve systems of linear equations and explain your solution and the method used.
- students will work as a team and explain their work
- #1- Blooms Knowledge - Remember previously learned information
- #2 - Blooms Comprehension - Demonstrate an understanding of facts
- #3 - Blooms Application - Apply Knowledge to actual situations
- #4 - Blooms Analysis - Break down objects or ideas into simpler parts and find evidence to support generalizations
- #5 - Blooms Synthesis - Compile component ideas into a new whole or propose alternative solutions
- #6 - Blooms Evaluation - Make and defend judgments based on internal evidence or external criteria
- Compare the methods of solving systems of equations and determine which will work best for the given problem.
- Create graphs to find the shaded area of intersection when solving systems of inequalities.

- Introduction, notes, and examples on solving systems of equations by using the multiplication method.
- Introduction, notes, and examples on solving systems of linear equations by graphing.
- Introduction, notes, and examples on solving systems of linear equations by substitution.
- Introduction, notes, and examples on solving systems of linear equations by the elimination and addition method.
- review homework if need - answers posted on Edmodo
- review warm up
- students will work individually

Closure

- evaluate your understanding of the lesson
- Pass out of class
- turn to your partner and discuss

Formative Assessment

- Edmodo assignments
- Guided Review
- homework/classwork
- Mathxlforschool
- Partner Board Presentation
- Pass Out of Class
- Socrative
- teacher observation
- think-pair-share
- Warm up Review
- White Boards

Summative Assessment

- quiz
- unit test
- warm up quiz

Resources & Technology

- Algebra 1 Book
- class dojo.com

- color pencils
- desmos.com
- Edmodo
- edpuzzle.com
- Google Forms
- graphing calculator
- Learn Zillion
- mathway.com
- mathxlforschool.com
- quizlet.com
- Remind
- smartboard
- socrative
- student whiteboards
- Teacher Generated Worksheets
- video clips