07 Systems of Linear Equations

Content Area: **Mathematics**
Course(s):
Time Period: **Week1**
Length: **5 Weeks**
Status: **Published**

Stage 1: Desired Results

Unit Overview/ Rationale

Students use systems of linear equations to represent, analyze and solve a variety of problems. Students will write systems of linear equations and inequalities and examine constraints placed on real-world situations. Students strategically choose and efficiently implement procedures to solve systems by graphing, substitution and elimination and verify that solutions satisfy both equations in a system.

A linear inequality has an infinite number of solutions that can be represented in the coordinate plane as the set of all points within a boundary. The solutions to a system of linear inequalities can be represented by the region wherethe graphs of the individual inequalities overlap.

Standards & Indicators

MA.9-12.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.9-12.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
MA.9-12.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.9-12.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.9-12.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.9-12.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.
MA.9-12.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.

Big Ideas - Students will understand that...

-Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of change.

-Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea.

-The value of a particular representation depends on its purpose.

-A variety of families of functions can be used to model and solve real world situations.

-Graphing, substitution, elimination, and matrices are equivalent ways for solving a system of equations.

Essential Questions - What provocative questions will foster inquiry and transfer of learning

-What is the most suitable method to use when solving a system of equations?

-How are systems of equations or inequalities used to make product decisions?

Content - Students will know...

Key Vocabulary:

Linear system, solution of a linear system, consistent, inconsistent, dependent, independent, intersection, substitution, elimination, linear combination, system of linear inequalities, solution of a system of linear inequalities, graph of a system of linear inequalities

Skills - Students will be able to...

-Solve systems by graphing, substitution, and elimination

-Use a graphing calculator to solve systems by graphing and matrices

-Solve a system of inequalities graphically

-Systems of equations may include intersecting, parallel or coincident lines, some of which may be equations of horizontal or vertical lines

-Recognize, express and solve problems that can be modeled using one- or two-variable inequalities; or two-variable systems of linear equations. Interpret their solutions in terms of the context of the problem

-For items where a student is required to graph the equation or function, axes and scales should be labeled. If the item is written in a context, the labels and scales must be appropriate within the context of the item, including units (e.g., dollars, seconds, etc).

Stage 2: Assessment Evidence

Assessment

Stage 3: Learning Plan

Learning Activities

Learning Activities

Introduce the Authentic Learning Experience (1 day)

Activity - Solve Linear Systems by graphing (2-3 days)

Students will solve consistent, inconsistent, and independent systems.

For items where a student is required to graph the equation or function, axes and scales should be labeled. If the item is written in a context, the labels and scales must be appropriate within the context of the item, including units (e.g., dollars, seconds, etc).

For applications, this includes using and interpreting appropriate units of measurement, estimation and the

appropriate level of precision.

Closure/Exit Slip:

 Students are asked to finish a partially completed graphing problem and state the solution, no solution, or infinitely many solutions.

Closure/Exit Slip:

Students explain in 3-6 lines how to solve systems of equations by graphing.

Graphing Calculator Activity:

Students use a graphing calculator to solve systems of equations *(handout)*

Suggested Activity:

Graph two equations written in slope-intercept form and also not written in slope-intercept form, word problems with the equation given, use graphing calculator to estimate solutions

Activity - Solve Linear Systems by Substitution (2 days)

Students will solve consistent, inconsistent, and independent systems.

Example: Quick Trip rental car agency charges a flat weekly rate of $193.00 and $0.19 per mile. Drive Easy rental car agency charges a flat weekly rate of $219.00 and $0.15 per mile for an identical car. For a one-week rental, how many miles does the car need to be driven so that the charges for a rental at Quick Trip are the same as a rental at Drive Easy?

Closure/Exit Slip:

Students will be given a system and will be asked to complete the first substitution step. Students should describe in 3-5 lines which equation was chosen to solve for a variable and substitute and why.

Closure/Exit Slip:

Students will be given a completely worked system and will describe and correct the error in solving the linear system.

Suggested Activity:

Sample: -x + 8y = 27, x = -3

Sample: 2x + 8y = 24, y = 2x

Sample: y = -3x + 5, 2x − y = 10

Students will solve systems word problems with the equation specified.

Quiz 1 (1/2 day)

–Solving systems using graphing and substitution

Students will be required to solve systems by hand and using the calculator. Word problems will be included.

Activity - Solve Linear Equations by Elimination (2 days)

Closure/Exit Slip:

Students will be given a system and will be asked to complete the first elimination step. Students should describe in 3-5 lines which variable was chosen to be eliminated and why.

Closure/Exit Slip:

Students will be given a completely worked system and will describe and correct the error in solving the linear system.

Suggested Activity:

Students will solve systems where one or both equations will be multiplied by a constant.

Students will solve systems word problems with the equation specified.

Activity - Combining methods (1 - 2 days)

Closure/Exit Slip:

Students will be given 3 systems and asked to determine which technique would be the most efficient method. Students will justify their response.

Suggested Activity:

Students will solve systems word problems with the equation specified.

Activity - Solving word problems using systems (2 days)

Closure/Exit Slip:

Given a word problem, students will underline 3-4 key words or phrases that will be used to write the system of equations.

Closure/Exit Slip:

Students will be given a multiple choice word problem and will select the correct set of equations.

Suggested Activity:

Example: One angle of an acute triangle is twice the first angle while the third angle is 40º more than the first angle. Determine the degree measure of each of the three angles.

Example: Carol is five times as old as her brother. She will be three times as old as her brother in two years. How old is

Carol now?

Activity - Solve Systems of Linear Inequalities (2 - 3 days)

Closure/Exit Slip:

 Students will be given a multiple choice inequality question and will pick the appropriate graph.

Closure/Exit Slip:

Students will be given a completely graphed system and will describe and correct the error in graphing the linear system.

Suggested Activity:

Students will solve a system of linear equations and determine if an ordered pair is a solution of the system.

Students will solve inequality system word problems with the inequality specified.

Resources

Pearson Algebra 1 c. 2012

Chapter 6: Systems of Equations and Inequalities