Unit #10 System of Equations

Content Area: **Math**
Course(s):
Time Period:
Length: **5 weeks**
Status: **Published**

State Mandated Topics Addressed in this Unit

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N/A	N/A

System of Equations

Learning Objectives

- Objective 1 - Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

- Objective 10 - Interpret expressions that represent a quantity in terms of its context.   Interpret complicated expressions by viewing one or more of their parts as a single entity.

- Objective 11 - Use the structure of an expression to identify ways to rewrite it. For example, see $x4 – y4$ as $(x2) 2 – (y2) 2$, thus recognizing it as a difference of squares that can be factored as $(x2 – y2)(x2 + y2)$.

- Objective 12 - Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

- Objective 13 - Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

- Objective 14 - For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★

- Objective 15 - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.★

- Objective 16 - Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

- Objective 17 - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ Graph linear and quadratic functions

and show intercepts, maxima, and minima.

- Objective 18 - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

- Objective 19 - Distinguish between situations that can be modeled with linear functions and with exponential functions. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

- Objective 2 - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

- Objective 20 - Interpret the parameters in a linear or exponential function in terms of a context.

- Objective 21 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

- Objective 22 - Define appropriate quantities for the purpose of descriptive modeling.

- Objective 28 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

- Objective 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. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

- Objective 4 - Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R.

- Objective 5 - Solve systems of linear equations algebraically (include using elimination method) and graphically, focusing on pairs of linear equations in two variables.

- Objective 6 - 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).

- Objective 7 - 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.★

- Objective 8 - 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.

- Objective 9 - Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.

Essential Skills

- Essential Skill 1 - Understand polynomials are closed under addition, subtraction, and multiplication.

- Essential Skill 10 - Explain why the solution of $f(x)=g(x)$ is the x coordinate of their intersection.

- Essential Skill 11 - Find the solutions approximately using technology to graph the function or create a table of values.

- Essential Skill 12 - *Include $f(x)$ & $g(x)$ that are linear, polynomial, rational, absolute value, exponential, and logarithmic*.

- Essential Skill 13 - Solve a system of inequalities in two variables by graphing.

- Essential Skill 14 - Interpret parts of expressions including terms, factors, and coefficients.

- Essential Skill 15 - Interpret expressions in terms of context.

- Essential Skill 16 - Factor expressions.

- Essential Skill 17 - Identify structure to rewrite expressions.

- Essential Skill 18 - Rewrite using difference of squares.

- Essential Skill 19 - Rewrite expressions using difference of cubes.

- Essential Skill 2 - Create an equation that represents relationships between quantities.

- Essential Skill 20 - Rewrite expressions using sum of cubes.

- Essential Skill 21 - Understand that a function has one member of the domain assigned to exactly one element of the range.

- Essential Skill 22 - F(x) denotes the output of f corresponding to the input of x.

- Essential Skill 23 - The graph of f is the graph of y=f(x).

- Essential Skill 24 - Use function notation to evaluation functions for inputs in their domain.

- Essential Skill 25 - Interpret statements that use function notations in terms of context.

- Essential Skill 26 - Sketch a graph using the key features of a function.

- Essential Skill 27 - Interpret key features from a graph or a table of values

- Essential Skill 28 - Relate the domain of a function its graph.

- Essential Skill 29 - Relate the domain of a function to the quantitative relationship that it describes.

- Essential Skill 3 - Graph equations on axes with labels and scales.

- Essential Skill 30 - Calculate the average rate of change of a function from a graph or a function on an interval.

- Essential Skill 31 - Interpret the average rate of change.

- Essential Skill 32 - Estimate the average rate of change from a graph.

- Essential Skill 33 - Graph linear and quadratic functions showing key features including intercepts, maxima and minima.

- Essential Skill 34 - Compare properties of two functions represented differently (algebraically, graphically, numerically, verbally).

- Essential Skill 35 - Example: given a graph of a quadratic and algebraic expression, say which has the larger maximum.

- Essential Skill 36 - Distinguish between situations that can be modeled with linear functions and with exponential functions.

- Essential Skill 37 - Recognize situations where one quantity changes at a constant rate relative to another.

- Essential Skill 38 - Interpret the parameters of a linear or exponential functions in context.

- Essential Skill 39 - Apply scales to graphs, origin of graph and data displays.

- Essential Skill 4 - Represent solutions of equations, inequalities, and systems to real-world applications.

- Essential Skill 40 - Use units to make sense of solutions.

- Essential Skill 41 - Apply scales to multi-step problems and formulas.

- Essential Skill 42 - Interpret units in formulas.

- Essential Skill 43 - Choose units in formulas.

- Essential Skill 44 - Define quantities for descriptive modeling problems. (Incorporate appropriate units).

- Essential Skill 45 - Choose limits on measurements when reporting quantities.

- Essential Skill 46 - Choose the level of accuracy.

- Essential Skill 5 - Interpret solutions as viable based on the constraints of the application.

- Essential Skill 6 - Rearrange formulas to highlight a quantity of interest.

- Essential Skill 7 - Solve system of linear equations with two variables

- Essential Skill 8 - Understand that the graph of an equation in two variables is the set of all of its solutions plotted in the coordinate plane.

- Essential Skill 9 - Understand that the solution set to an equation in two variables often forms a curve (which could be a line).

Standards

MATH.9-12.A.APR.A.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
MATH.9-12.N.Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MATH.9-12.N.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MATH.9-12.N.Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
MATH.9-12.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.
MATH.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.
MATH.9-12.A.CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
MATH.9-12.F.IF.A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
MATH.9-12.F.IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
MATH.9-12.F.IF.B.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
MATH.9-12.F.IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MATH.9-12.F.IF.B.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
MATH.9-12.F.IF.C.7.a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MATH.9-12.A.REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
MATH.9-12.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).
MATH.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.
MATH.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.
MATH.9-12.F.IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MATH.9-12.A.SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
MATH.9-12.A.SSE.A.1.b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MATH.9-12.A.SSE.A.2	Use the structure of an expression to identify ways to rewrite it.
MATH.9-12.F.LE.A.1.b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
MATH.9-12.F.LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.

Instructional Tasks/Activities

- Basketball activity
- Bingo
- Cooperative group activities
- Ladder Activity
- Think-pair-share
- Zombie Grudge Match

Assessment Procedure

- Classroom Total Participation Technique
- Classwork
- DBQ
- Essay
- Exit Ticket/Entrance Ticket/Do Now
- Identify the error problems
- Journal / Student Reflection
- Kahoot
- Other named in lesson
- Peer Review
- Performance
- Problem Correction
- Project
- Quiz

- Rubric
- Teacher Collected Data
- Test
- Worksheet

Recommended Technology Activities

- Appropriate Content Specific Online Resource
- Appropriate Content Specific Online Resource
- Gimkit
- GoGuardian
- Google Classroom
- Google Docs
- Google Slides
- Google Slides
- Kahoot
- MagicSchool AI
- Other- Specified in Lesson
- Quiziz
- Screencastify

Accommodations & Modifications & Differentiation

Accommodations and Modifications should be used to meet individual needs. Their IEP and 504 plans should be used in addition to the following suggestions.

Gifted and Talented

- Compare & Contrast
- Conferencing
- Debates
- Jigsaw
- Peer Partner Learning
- Problem Solving
- Structured Controversy
- Think, Pair, Share
- Tutorial Groups

Instruction/Materials

- alter format of materials (type/highlight, etc.)
- color code materials
- eliminate answers
- extended time
- extended time
- large print
- modified quiz
- modified test
- Modify Assignments as Needed
- Modify/Repeat/Model directions
- necessary assignments only
- Other (specify in plans)
- other- named in lesson
- provide assistance and cues for transitions
- provide daily assignment list
- read class materials orally
- reduce work load
- shorten assignments
- study guide/outline
- utilize multi-sensory modes to reinforce instruction

Environment

- alter physical room environment
- assign peer tutors/work buddies/note takers
- assign preferential seating
- individualized instruction/small group
- modify student schedule (Describe)
- other- please specify in plans
- provide desktop list/formula

Honors Modifications

Resources

- https://deltamath.com/
- https://education.ti.com/en/timathnspired/us/algebra-1
- www.Khanacademy.com
- www.mathforum.com

Special Education Pull Out Essential Skills

- 1)   The artist will be able to understand that the solution to any system of equations can be found at the point of intersection.
- 2)   The artist will be able to solve systems of equations algebraically