Unit 04: Systems of Linear Equations

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **8 weeks**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

MA.8.EE	Expressions and Equations
MA.8.EE.C	Analyze and solve linear equations and pairs of simultaneous linear equations.
MA.8.EE.C.7	Solve linear equations in one variable.
MA.8.EE.C.7a	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
MA.8.EE.C.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
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.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.

CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

CS.6-8.8.1.8.AP.2	Create clearly named variables that represent different data types and perform operations on their values.
CS.6-8.8.1.8.CS.3	Justify design decisions and explain potential system trade-offs.
CS.6-8.8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

Capacities of the Literate Individual
Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

ELA.SL.PE.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
ELA.SL.PE.8.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
ELA.SL.PE.8.1.B	Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
ELA.SL.PE.8.1.C	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
ELA.SL.PE.8.1.D	Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale
Unit Rationale The purpose of this unit… **The purpose of this unit is to analyze and solve pairs of simultaneous linear equations to solve real-world problems.**

Meaning

Essential Questions

Essential Questions

-Why is finding the number of solutions to a system of equations important for helping us to understand and solve real-world problems?

-How do various representations of systems of linear equations help us to understand two-variable relationships?

-How does finding the intersection of two linear equations help us to solve real-world problems?

Enduring Understanding/Indicators of Understanding

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-Understand that a system of linear equations has either one, none, or infinitely many solutions

-Understand that systems can be represented and solved both graphically and algebraically

-Understand that the point of intersection of the graphs of two linear equations represents the solution of the system because that point satisfies both equations simultaneously

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

-Definition of a system of linear equations

-A system of linear equations has either one, none, or infinitely many solutions

-A system of linear equations that intersect have one solution

-A system of linear equations that results in parallel lines has no solution

-A system of linear equations that results in two identical equations/lines results in infinitely many solutions

-The point of intersection of two linear equations on a graph represents the solution of the system

-Systems of equations can be represented and solved both graphically and algebraically

-Recognize algebraically that a system either has no solution or infinitely many solutions once both equations have been simplified

Skills

Skills

Student will be skilled at …

-Write systems of linear equations in slope-intercept form

-Graph systems of linear equations

-Identify the intersection of two lines on a graph as the solution to the system

-Solve systems of linear equations algebraically using both substitution and elimination

-Manipulate linear equations to ease solving them algebraically including solving both equations for one variable and multiplying entire equations by a certain value

-Translate real-world situations into systems of linear equations and use them to solve problems

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Unit 4 activities.docx
Unit 4- Cycle 1 graphing activity wartime battle.doc
Unit 4- Cycle 2-3 activity supply and demand (systems).doc
Unit 4- Cycle 2-3 systems of equations substitution memory.doc
Unit 4-Cycle 2-3 word problems -with work organizer.doc
Unit 4 - Cycle 4-5 word problems.docx
Unit 4- Cycle 4-5 frayer map- types of solutions.doc
Unit 4-4-5 Systems of Equations Lesson Plan STEM.docx
Unit 4-Cycle 4-5 scavenger hunt answer sheet.docx
Unit 4-Cycle 4-5 scavenger hunt teacher instructions.docx
Unit 4 - PARCC practice.docx

Formative Assessment Strategies

Formative Assessment Strategies

- ixl.com scores
- tenmarks.com scores
- teacher center observation
- STEM projects

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Systems of Linear Equations: Approximately 5 Cycles

Cycle 1: Topics Covered

- Solving a System by Graphing

- Activities/Centers
    - IXL.com centers
        - Y.1 Is (x, y) a solution to the system of equations?
        - Y.2 Solve a system of equations by graphing
        - Y.3 Solve a system of equations by graphing: word problems
        - Y.4 Find the number of solutions to a system of equations by graphing
    - Tenmarks centers
        - 8.EE.8a Solving Systems of Linear Equations Graphically
    - Hands-On/Creative Centers
        - Battleship activity*
    - Online games
        - https://www.quia.com/cz/43456.html
    - Xtramath: review flashcards
    - Teacher Directed Stations
        - Bellringers: Week 27—page 67-68
        - Bellringers: Week 27—page 65-66
        - Teacher created problems on white boards: solving a system by graphing
- STEM activity: Group activity (each group will complete)

http://www.fredonia.edu/org/projectprime/resources/lessons/wheredowemeet.pdf

Cycle 2/3: Topics Covered

- Solving a system using substitution

- Activities/Centers
    - IXL.com centers
        - Y.8 Solve a system of equations using substitution
        - Y.9 Solve a system of equations using substitution: word problems
    - Tenmarks centers
        - 8.EE.8b Investigating Systems of Equations Graphically and Algebraically
        - 8.EE.8c Solving Word Problems Involving Systems of Equations
    - Hands-On/Creative Centers
        - Substitution memory*

        - Partner work word problems*
    - Online games
        - http://www.mathgames.com/skill/8.67-solve-a-system-of-equations-using-substitution
    - Xtramath: review flashcards
    - Teacher Directed Stations
        - Bellringers: Week 26—page 63-64
        - Bellringers: Week 26—page 61-62
        - Bellringers: Week 26—page 59-60
        - Bellringers: Week 26—page 57-58
        - Teacher created problems on white boards: solving by substitution
- STEM activity: Supply and demand activity*

Cycle 4/5: Topics Covered

- Solving a system using elimination

- Activities/Centers
    - IXL.com centers
        - Y.10 Solve a system of equations using elimination
        - Y.11 Solve a system of equations using elimination: word problems
    - Tenmarks centers
        - 8.EE.8b Investigating Systems of Equations Graphically and Algebraically
        - 8.EE.8c Solving Word Problems Involving Systems of Equations
    - Hands-On/Creative Centers
        - Scavenger hunt*
        - Partner work word problems*
        - Type of solutions graphic organizer*
    - Online games
        - http://www.mathgames.com/skill/8.54-solve-a-system-of-equations-using-elimination
    - Xtramath: review flashcards
    - Teacher Directed Stations
        - Bellringers: Week 25—page 55-56
        - Bellringers: Week 25—page 53-54
        - Bellringers: Week 25—page 51-52
        - Bellringers: Week 25—page 49-50
        - Teacher created problems on white boards: solving with elimination
- STEM activity: real-world activities solved by a system*

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing

or sight issues need to be close to the instruction which often means near the front.