Unit 2: Systems of Linear and NonLinear Systems and Inequalities

Content Area: **Mathematics**
Course(s): **Pre-Calculus Honors**
Time Period: **February**
Length: **4 Weeks**
Status: **Published**

Unit Overview

During this unit, students will…

- Create and solve systems of linear equations.
- Create and solve systems of linear inequalities through graphing.
- Create and solve systems of non-linear equations.
- Build systems that model a relationship between quantities.
- Build system of functions that model real world phenomena.

BLITZER- SECTION Chapter 7

Transfer

Students will be able to independently use their learning to...

- Write systems of equations that model situations found in the real-world.
- Determine solutions for systems of inequalities graphically.
- Distinguish which solution methods are more efficient for individual systems.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- Linear Systems can be created in more than two variables.
- Linear systems can be solved graphically or algebraically.
- The solution to a linear system in three variables is an ordered triple.
- Sustitution and addition methods are used to solve systems and word problems.

Essential Questions

Students will keep considering...

- How can mathematical models be used as tools to describe and help explain real-life situations?
- How are linear and non-linear systems related and used to solve real-life applications?
- How do you determine when a situation calls for the use of an equation or inequality?
- How can sketching accurate graphs of functions be helpful in solving systems?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How do systems of equations and inequalities be solved both effectively and efficiently?

Application of Knowledge and Skill

Students will know...

Students will know...

- Real-life applications can be modeled using systems of linear equations and inequalities
- Real-life applications can be modeled using nonlinear systems of equations.

Students will be skilled at...

Students will be skilled at...

- Sketching graphs of inequalities in two variables to solve systems.
- Modeling real-life applications using systems of equations and inequalities.

Academic Vocabulary

ordered pair

linear system

substitution method

addition method

linear equation

quadratic equation

consistant system

inconsistant system

dependent

solution set

non-linear system

inequality

half-plane

Learning Goal 2.1

SWBAT model real-life phenomena using sytems of linear and non-linear equations and inequalities.

Target 2.1.1 (Systems of Equations)

SWBAT:

- Solve Linear systems in two variables using substitution and addition(elimination) methods. **(DOK 2)**
- Recognize and Solve non-linear systems in two variables using substituation, addition, and algebraic methods such as foiling and factoring. **(DOK 2)**
- Solve and verify solutions to systems of linear equations in three variables. **(DOK 2)**

Chapter 7.1-7.2, 7.4

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
MA.A-SSE.B	Write expressions in equivalent forms to solve problems
MA.K-12.5	Use appropriate tools strategically.
MA.A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
MA.K-12.6	Attend to precision.
MA.K-12.8	Look for and express regularity in repeated reasoning.
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	Solve systems of equations
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.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

Target 2.1.2 (Real-Life Applications)

SWBAT...

- Model word problems with sketches and drawings. **(DOK 3)**
- Create systems of equations (either linear or non-linear) in either two or three variables that represents word problems. **(DOK 3)**
- Use linear systems to solve application word problems. **(DOK 2)**

Chapter 7.4

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.A-SSE.B	Write expressions in equivalent forms to solve problems
MA.A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
MA.K-12.6	Attend to precision.
MA.F-BF.A.1c	Compose functions.
MA.A-REI	Reasoning with Equations and Inequalities

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.

Target 2.1.3 (Partial Fraction Decomposition)

SWBAT:

- Perform partial fraction decomposition of a rational expression with a denominator that is a product of distinct linear factors. **(DOK 2)**
- Perform partial fraction decomposition of a rational expression with a denominator that has prime quadratic factors, none of which are repeated. **(DOK 2)**

Section 7.3

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MA.A-SSE.B	Write expressions in equivalent forms to solve problems
MA.A-SSE.B.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.A-APR	Arithmetic with Polynomials and Rational Expressions

Target 2.1.4 (Linear & Non-Linear Inequalities)

SWBAT:

- Graph linear inequalities in two variables. **(DOK 2)**
- Graph non-linear inequalities. **(DOK 2)**
- Graph a system of inequalities (linear and non-linear) modeling data and determine its solution set. **(DOK 2)**

Section 7.5

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	Reasoning with Equations and Inequalities
MA.A-REI.B	Solve equations and inequalities in one variable

MA.A-REI.D	Represent and solve equations and inequalities graphically
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.

Formative Assessment and Performance Opportunities

- academic games
- Class discussions
- Classwork
- Do nows
- Exit tickets
- Homework
- Problem based learning
- student interviews
- Teacher observation
- whiteboard/communicator opportunities

Summative Assessment

- Link-It Exam
- Projects
- Quizzes
- student interviews
- Tests
- Unit Exam

21st Century Life and Careers

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
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.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
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.
CAEP.9.2.12.C	Career Preparation

CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.

Technology

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.2.12.A.CS2	The core concepts of technology.

Accommodations and Modifications

- 504 Accommodations
- Academic Games of Review Packet for each section
- centers/stations
- challenge questions
- IEP Modifications
- Individual vs. Large Group Wipeboard Q & A
- manipulatives (Highlighting, underlining, starring critical information)
- Provide YouTube Videos
- scaffolding questions
- small group instruction (opportunity to work with teacher 1-on-1)
- use of technology such as google classroom to provide answer keys and supplemental materials

Unit Resources

- Google Classroom
- Kuta software
- NCTM website

- online textbook materials
- Text
- You Tube & Internet Videos

Interdisciplinary Connections

Real world applications involving rate of change and systems of equations helps students compare/contrast to help make educated financial decisions. (MA.9-12.ACED.A.3)

Students can create their own word problems in small discussion groups involving two or three variables. Once created, students will answer other groups word problems.

PFL.9.1.12.E.2	Analyze and apply multiple sources of financial information when prioritizing financial decisions.