Unit #4: Equations

Content Area: **Mathematics**
Course(s):
Time Period: **March**
Length: **1**
Status: **Published**

Unit Overview

Unit rates are addressed formally in graphical representations, algebraic equations, and geometry through similar triangles. By using coordinate grids and various sets of three similar triangles, students prove that the slopes of the corresponding sides are equal, thus making the unit rate of change equal.

Students learn that proportional relationships are part of a broader group of linear functions, and they are able to identify whether a relationship is linear. Nonlinear functions are included for comparison.

Students graph a system of two linear equations, recognizing that the ordered pair for the point of intersection is the x-value that will generate the given y-value for both equations. Students recognize that graphed lines with one point of intersection (different slopes) will have one solution, parallel lines (same slope, different -intercepts) have no solutions, and lines that are the same (same slope, same y-intercept) will have infinitely many solutions)

Enduring Understandings

- Patterns and relationships can be represented graphically, numerically, symbolically, or verbally.
- Some systems of equations have no solutions (parallel lines) and others have infinite solutions (be the same line).
- The solution to a system of two linear equations in two variables is an ordered pair that satisfies both equations.
- Unit rates can be explained in graphical representation, algebraic equations, and in geometry through similar triangles.

Student Learning Objectives (SLOs)

- Construct a function to model the linear relationship between two variables and determine the rate of change and initial value of the real world data it represents from either graphs or tabulated values
- Derive the equation of a line (y = mx for a line through the origin and the equation y = mx +b for a line intercepting the vertical axis at b) and use similar triangles to explain why the slope (m) is the same between any two points on a non-vertical line in the coordinate plane
- Graph and analyze the different representations of proportional relationships and interpret the unit rate as the slope of the graph which indicates the rate of change.
- Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function.
- Solve linear equations in one variable with rational number coefficients that might require expanding

expressions using the distributive property and/or combining like terms, including examples with one solution, infinite solutions, or no solution.

- Solve systems of linear equations in two variables by inspection, algebraically, and/or graphically (estimate solutions) to demonstrate solutions correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

Essential Questions

- How does the context of the problem affect the reasonableness of a solution?
- How is it determined if multiple solutions to an equation are valid?
- What makes a solution strategy both efficient and effective?
- Why can two equations be added together to get another true equation?
- Why is one variable dependent upon the other in relationships?

Standards/Indicators

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.8.EE	Expressions and Equations
MA.K-12.4	Model with mathematics.
MA.8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
MA.8.EE.C	Analyze and solve linear equations and pairs of simultaneous linear equations.
MA.8.EE.C.8	Analyze and solve pairs of simultaneous linear equations.

Lesson Titles

- Determine the equation of a line in multiple ways
- Exploring Patterns with Lines
- Finding the point of intersection
- Solving Linear Equations
- Solving Systems of Equations
- Special Linear Equations

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate

	effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections

- Consumer Science
- LAL - Vocabulary

LA.L.8.4	Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.
PFL.9.1.8.A	Income and Careers
PFL.9.1.8.B	Money Management

Anticipatory Set

- Current Events
- Mathematics History
- Relate to prior knowledge
- Video clips

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

- SWBAT compare graphs, tables, and equations of proportional relationships.
- SWBAT construct a model for a linear function.
- SWBAT derive the equation

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=mx+b for a line through the origin.

- SWBAT describe the qualities of a function using a graph (e.g., where the function is increasing or decreasing).
- SWBAT determine if a system has one solution, no solutions, or many solutions.
- SWBAT determine whether a relationship is linear.
- SWBAT estimate solutions by graphing equations
- SWBAT graph proportional relationships and interpret the unit rate as the slope.
- SWBAT identify and contextualize the rate of change and the initial value from tables, graphs, equations, or verbal descriptions.
- SWBAT interpret the solution to a system of equations in context.
- SWBAT sketch a graph when given a verbal description of a situation.
- SWBAT solve systems by graphing, substitution, or elimination (combination).
- SWBAT use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane

Modifications

ELL Modifications

Content specific:

vocabulary important for ELL students to understand include: Numerical expression, variable, algebraic expression, exponent, term, coefficient, constant, like terms, associative property, commutative property, identity property, distributive property, simplify, evaluate, inverse operation, solution, function, sequence, inequality

- Collaboration with ELL Teacher
- Frontload information in native language
- Graphic organizers
- Modification plan
- Strategy groups
- Teacher conferences
- Using videos, illustrations, pictures, and drawings to explain or clarification

IEP & 504 Modifications

- Break tests down in smaller increments
- Increase one-to-one time
- Modifications & accommodations as listed in the student's IEP
- Modified or reduced assignments
- Position student near helping peer or have quick access to teacher
- Prioritize tasks
- Provide guided notes and step-by-step instructions on solving equations
- Provide worked out examples on classwork and homework that students can use as a guide when working independently
- Reduce length of assignment for different mode of delivery
- Think in concrete terms and provide hands-on-tasks
- Use a balance to show how equations are solved
- Use algebra tiles to provide more hands on and visual representation of variables and expressions

G&T Modifications

- Evaluating algebraic expressions with more than one variable

- Finding function rules that are two step
- Simplifying algebraic expressions with multiple terms and variables
- Simplifying numerical expressions with more than 4 operations involved
- Writing algebraic expressions with more than one operation
- Writing and solving multi step equations
- Writing, solving, and graphing two step inequalities

Formative Assessment

- Exit Question - Finding Slope
- Exit Question - Slope Intercept Form
- Exit Tickets
- Graphic Organizer
- Group Work
- Guided Practice
- Hand Signals
- Independent Practice
- Observation
- Oral Questioning
- PARCC Questions - Linear Relationships
- Senteo
- Slope Puzzle - Matching Slope in various forms
- Think-Pair-Share
- Written Work

Summative Assessment

- Project - Line Design
- Marking Period Assessment
- Project - Stained Glass Window
- Project Based Assessment
- Quiz - Graphing Lines
- Quiz - Slope
- Quiz - Systems of Equations
- Quiz - Tables, Graphs, Equations
- Self-Assessment
- Test - Graphing Lines from multiple forms
- Test - Table, Graphs, Equations

Alternative Assessments

Performance tasks
Project-based assignments
Problem-based assignments
Presentations

Benchmark Assessments

Skills-based assessment- math practice

Resources and Materials

- Connected Math - Moving Straight Ahead
- Glencoe Pre Algebra - Chapter 8
- Graph Paper
- PMI - Systems of Equations

Technology

- Calculator
- Chromebook
- desmos.com
- Equation of a Line from Table https://www.youtube.com/watch?v=swydB4hltzQ
- Equation of a Line https://www.youtube.com/watch?v=mmWf_oLTNSQ
- Graphing Calculator
- Graphing Using Slope and Y-Intercept https://www.youtube.com/watch?v=BzO8LQ2vcUM
- Smartboard
- You Tube "All I Do Is Solve" video

TECH.8.1.8	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.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.