

Unit 4: Linear Equations & Systems of Linear Equations

Algebra Prep Honors

17 meetings
Revised April 2024

Essential Questions

- What kinds of relationships can proportions represent in real-world situations?
- What is the difference between a proportional and non-proportional relationship?

Enduring Understandings with Unit Goals

EU 1: Unit Rate, the Constant of Proportionality, Rate of Change are all associated with slope

- Determine the Rate of Change from a table or graph
- Apply the slope formula to points in a real-world scenario

EU 2: A graph can be used to represent a scenario

- Graph real-world scenario using slope-intercept form
- Write the equation of a line, $y=mx$ or $y=mx+b$

EU 3: A system of equations consists of two or more linear equations which intersect in various ways

- Solve a system of equations through graphing
- Isolate the variable y in an equation and determine the number of solutions to a system
- Apply the substitution method to solve a system of equations

Standards

Common Core State Standards/College and Career Readiness Anchor Standards:

- **8.EE.B.5:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
- **8.EE.B.6:** 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; derive the equation $y=mx$ for a line through the origin and the equation $y=mx+b$ for a line intercepting the vertical axis at b .
- **8.EE.C.8. A:** 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.
- **8.EE.C.8. B:** Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection.
- **8.EE.C.8.C:** Solve real-world and mathematical problems leading to two linear equations in two variables.

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ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.

Competency 2: Speak to diverse audiences in an accountable manner.

Competency 3: Develop the behaviors needed to interact and contribute with others on a team.

Competency 4: Analyze and solve problems independently and collaboratively.

Competency 5: Be responsible, creative, and empathetic members of the community.

Unit Content Overview

1. Proportional Relationships and Rate of Change in Tables and Graphs

- Determine Proportionality in a Table or Graph
- Calculate/Find Constant of Proportionality (k) using a Table or Graph
- Calculate Slope as $\Delta x/\Delta y$
- Slope vs. Constant of Proportionality ($y=kx$ vs. $y=mx+b$)
- Vocabulary: coefficient, constant of proportionality, cross-canceling, cross-multiplication, cross-product, cross-product property, equivalent, graph, linear equation, lowest common multiple (lcm), means and extremes, place value, proportion, proportional relationship, rate, rate of change, slope, table of values, unit rate, variable

2. Slope-Intercept Form

- Graph equations in slope-intercept form
- Write a linear equation given a graph or real-world scenario
- Vocabulary: coefficient, constant of proportionality, cross-canceling, cross-multiplication, cross-product, cross-product property, equivalent, graph, linear equation, place value, proportion, proportional relationship, rate, rate of change, slope, table of values, unit rate, variable

3. Slope-Intercept Form

- Solve systems of equations through graphing
- Determine the number of solutions to a system of equation by isolating y and comparing the rate of change and y -intercepts
- Use the substitution method to solve a system of equations
- Vocabulary: system, linear equation, slope, y -intercept, substitution, rate of change, unit rate, variable

Interdisciplinary Connection:

- Language Arts - Word Problems
- Science – Word Problems

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Daily Learning Objectives with TWPS Activities

Students will be able to...

- Determine if a graph shows a proportional relationship and find the slope/constant of proportionality of a line given the graph
 - TWPS – *What error did the student make when determining the slope of the line? Explain using mathematical reasoning.*
- Calculate the slope/constant of proportionality between two points using the slope-formula
 - TWPS – *Explain using mathematical reasoning how you could use the slope-formula to determine the slope of a graphed line.*
- Determine the rate of change given a linear equation in a variety of representations
 - TWPS – *Do all graphs have to count by 1's? If not, how does this change the way we calculate the slope? Explain using mathematical reasoning.*
- Graph a linear equation in slope-intercept form
 - TWPS – *Which of the four linear equations does not belong with the rest? Explain using mathematical reasoning.*
- Write a linear equation in slope-intercept form given a graph
 - TWPS – *How could you write instructions for writing a linear equation in slope-intercept form given a graph? Explain using mathematical reasoning.*
- Create an equation in slope-intercept form from a real-world scenario
 - TWPS – *What is the difference between a rate of change and an initial value? How can you tell which number is which? Explain using mathematical reasoning.*
- Compare rates of change and initial values to determine the number of solutions in a system of linear equations
 - TWPS – *Explain using mathematical reasoning how you can graph a linear equation in a real-world scenario.*
- Solve a system of equations through graphing
 - TWPS – *Explain using mathematical reasoning the difference between the three graphed systems of linear equations.*
- Determine the number of solutions of a system of equations by isolating y
 - TWPS – *How is solving an equation with two variables different from solving an equation with one variable? Explain using mathematical reasoning.*
- Find the solution to the system of equations using substitution**
 - TWPS – *What do the numbers 3 and 4 represent in the solution to the system of equations? Explain using mathematical reasoning.*
 - *How can you determine if a point is the correct solution to the system of equations? Explain using mathematical reasoning.*

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Instructional Strategies/Differentiated Instruction

- TWPS
- Whole-group instruction
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Guided notes
- Student-led instruction
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Cumulative Homework
- Visuals to support instruction
- Small group instruction
- Pre-teaching and reteaching
- Multiplication charts
- Number lines
- Explicit instruction
- Color-coding
- Small group check in
- Differentiated homework assignments
- Differentiated assessments

EL DIFFERENTIATED INSTRUCTION:

- Word Walls with visuals
- TWPS (Think, Write, Pair, Share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit Modeling
- Key Vocabulary
- Graphic Organizers
- Strategic Grouping
- Non-verbal Assessments

Assessments

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FORMATIVE ASSESSMENTS:

- Accountable Talk Discussions
- Daily Think-Write-Pair Share (TWPS)
- Daily Do Now
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Student-led instruction
- Cumulative Homework
- Performance Task – Family Reunion of Linear Equations
 - Problem Solving Rubric

SUMMATIVE ASSESSMENTS:

- Edulastic Quiz 1 – EU 1
- Edulastic Quiz 2 – EU 2
- Unit 4 Test – EU 1, EU 2, and EU 3
- Performance Task – Family Reunion of Linear Equations

Unit Task

Unit Task Name: Family Reunion of Linear Equations

Description: Students are provided with two catering options for a family reunion they will be hosting. They will need to create a table of values, a linear equation, and a graph for each option (EU 1, EU 2). Students will then analyze their results to determine which catering company provides a better deal for a certain number of attendees and explain their work (EU 3). Students will be utilizing the skills learned in this unit to create and solve this system of linear equations.

Evaluation: Problem Solving Rubric

Unit Resources

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- Worksheets
- Calculator
- Laptops
- SBAC Prep Online
- Edulastic
- Kahn Academy
- Gimkit
- Quizizz
- Individual Whiteboards
- 2 Truths & One Lie
- State Common Core Standards Transition Tasks
- Online resources