Instructional Focus Document
Grade 8 Mathematics

TITLE : Unit 04: Developing an Understanding of Slope and Y-Intercept **SUGGESTED DURATION :** 8 days

UNIT OVERVIEW

Introduction

This unit bundles student expectations that address using tables and graphs to develop the understanding of slope and *y*-intercept. According to the Texas Education Agency, mathematical process standards including application, a problem-solving model, tools and techniques, communication, representations, relationships, and justifications should be integrated (when applicable) with content knowledge and skills so that students are prepared to use mathematics in everyday life, society, and the workplace. The introduction to the grade level standards state, "While the use of all types of technology is important, the emphasis on algebra readiness skills necessitates the implementation of graphing technology." Additionally, the availability of graphing technology is required during STAAR testing.

Prior to this Unit

In Grade 7, students represented constant rates of change in mathematical and real-world problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations. Students determined the constant of proportionality within mathematical and real-world problems. Additionally, students represented linear relationships using verbal descriptions, tables, graphs, and equations that simplify to the form $y = mx + b$. Although students were formally introduced to the slope intercept form of $y = mx + b$, students did not explicitly study slope or *y*-intercept.

During this Unit

Students use similar right triangles to develop an understanding of slope. This approach lends itself to the development of the formula for slope by determining the ratio of the change in *y*-values compared to the change in *x*-values is the same for any two points on the same line. Students use data from a table or graph to determine the rate of change or slope and the *y*-intercept.

Other considerations: Reference the Mathematics COVID-19 Gap Implementation Tool Grade 8

After this Unit

In Unit 06, students will further examine slope and *y*-intercept through the lens of proportional and non-proportional situations. Students will interpret the unit rate as the slope of the line that models a proportional relationship. In Algebra I students will determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$. Students will also calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems. Additionally, they will graph linear functions on the coordinate plane and identify key features, including *x*-intercept, *y*-intercept, zeros, and slope, in mathematical and real-world problems.

Additional Notes

In Grade 8, using similar right triangles to develop an understanding that slope, *m*, given as the rate comparing the change in *y*-values to the change in *x*-values, is the same for any two points (x_1, y_1) and (x_2, y_2) on the same line is STAAR Supporting Standard 8.4A. STAAR Readiness Standard 8.4C is identified as using data from a table or graph to determine the rate of change or slope and *y*-intercept in mathematical and real-world problems. Both of these standards are subsumed under the Grade 8 STAAR Reporting Category 2: Computations and Algebraic Relationships and the Grade 8 *Texas Response to Curriculum Focal Points* (TxRCFP): Representing, Applying and Analyzing

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Proportional Relationships. This unit is supporting the development of the *Texas College and Career Readiness Standards* (TxCCRS): I. Numeric Reasoning B1; II. Algebraic Reasoning D1, D2; III. Geometric and Spatial Reasoning B2, C1; V. Statistical Reasoning A1, C2; VI. Functions B1, C2; VII. Problem Solving and Reasoning A1, A2, A3, A4, A5, B1, C1, D1, D2; VIII. Communication and Representation A1, A2, A3, B1, B2, C1, C2, C3; IX. Connections A1, A2, B1, B2, B3.

Research

According to the National Mathematics Advisory Panel (2008), "Middle grade experience with similar triangles is most directly relevant for the study of Algebra. Sound treatments of the slope of a straight line and of linear functions depend logically on the properties of similar triangles" (p. 18). The National Council of Teachers of Mathematics (2010) states that "To develop a deep understanding of linear equations and linear functions, it is important for students to understand how different mathematical relationships between two quantities are reflected in the graph of the line that represents those relationships" (p. 18). Van de Walle and Lovin (2006) remark that "Representing functions in different ways can lead to analysis and understanding of that change. Students in the middle grades should develop an understanding of the multiple methods of expressing real-world functional relationships (words, graphs, equations, and tables). Working with these different representations of functions will allow students to develop a fuller understanding of this important concept" (p. 284).

National Council of Teachers of Mathematics. (2010). *Focus in grade 8 teaching with curriculum focal points*. Reston, VA: National Council of Teachers of Mathematics, Inc
National Mathematics Advisory Panel. (2008). *Foundations for success: The final report of the national mathematics advisory panel*. Washington, DC: U.S. Department of Education.
Texas Education Agency & Texas Higher Education Coordinating Board. (2009). *Texas college and career readiness standards.* Retrieved from http://www.thecb.state.tx.us/institutional-resources-programs/public-community-technical-state-colleges/texas-college-and-career-readiness-standards/
Texas Education Agency. (2013). *Texas response to curriculum focal points for kindergarten through grade 8 mathematics.* Retrieved from https://www.texasgateway.org/resource/txrcfp-texas-response-curriculum-focal-points-k-8-mathematics-revised-2013
Van de Walle, J., & Lovin, L. (2006). *Teaching student-centered mathematics grades 5 – 8*. Boston, MA: Pearson Education, Inc.

OVERARCHING UNDERSTANDINGS AND QUESTIONS

Quantitative relationships model problem situations efficiently and can be used to make generalizations, predictions, and critical judgements in everyday life.

- What patterns exist within different types of quantitative relationships and where are they found in everyday life?
- Why is the ability to model quantitative relationships in a variety of ways essential to solving problems in everyday life?

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)

Understanding how two quantities vary together (covariation) and can be reasoned up and down in situations involving invariant (constant) relationships builds flexible algebraic reasoning in order to make predictions and critical judgements about the relationship.
• Proportional and non-proportional linear relationships are represented by two attributes, the constant rate of change in *y*-values compared to the change in *x*-values, modeled using similar triangles to explain slope, and *y*-intercept.
  • How can similar triangles be created from a line representing a linear situation?
  • What relationship exists between similar triangles and the slope, *m*, of a line?
  • How can similar triangles be used to generalize the formula for slope as the ratio of the change in the *y*-values to the change in the *x*-values?
  • What relationship exists among the similar triangles?
  • What relationship exists between the *y*-intercept and proportional and non-proportional problem situations?
  • What is the process of determining the …
	Proportionality
	• Attributes of Linear Relations
	  • Slope
	  • *y*-intercept
	• Ratios and Rates
	  • Slope
	• Relationships and Generalizations
	  • Equivalence
	  • Linear proportional
	  • Linear non-proportional
	  • Geometric similarity
	• Representations
	
	<u>Associated Mathematical Processes</u>
	• Application
	• Problem Solving Model
	• Tools and Techniques
	• Communication
	• Representations
	• Relationships
	• Justification
		Mathematics Grade 8 Unit 04 PA 01
		Click on the PA title to view related rubric.
		
		Analyze the problem situation(s) described below. Organize and record your work for each of the following tasks. Using precise mathematical language, justify and explain each solution process.
		
		1. Bennett noticed a beetle crawling towards him. The table shows the distance in centimeters the beetle was from Bennett in relation to time in seconds.
		
		Distance in Relation to Time
		Time (seconds) / Distance (cm)
		0 / 39.55
		3 / 35.47
		5 / 32.75
		8 / 28.67
		13 / 21.87
		
		a. Use the data in the table to graph the relationship between the number of seconds and distance traveled.

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
◦ *y*-intercept ◦ rate or change or slope … of a set of data represented in a … ◦ table? ◦ graph?		b. Use the table of data or graph to determine the rate of change, or slope, and *y*-intercept and explain what each of them represents in the context of the problem situation. c. Write an equation to represent the problem situation where *x* represents the time in seconds and *y* represents the distance the beetle is from Bennett. d. Use the graph to describe how similar right triangles can be used to justify how the slope of the line representing the problem situation is the same for any two points on the line. Standard(s): 8.1A, 8.1B, 8.1C, 8.1D, 8.1E, 8.1F, 8.1G, 8.4A, 8.4C, ELPS.c.1A, ELPS.c.2C, ELPS.c.2D, ELPS.c.2E, ELPS.c.3C, ELPS.c.3D, ELPS.c.3H, ELPS.c.4C, ELPS.c.4D, ELPS.c.4H, ELPS.c.4J, ELPS.c.5B, ELPS.c.5F, ELPS.c.5G

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MISCONCEPTIONS / UNDERDEVELOPED CONCEPTS

Misconceptions:

- Some students may think that the slope in a linear relationship is $m = \frac{\text{change in } x\text{-values}}{\text{change in } y\text{-values}}$, since the *x* coordinate (horizontal) always comes before the *y* coordinate (vertical) in an ordered pair. Instead the correct representation of slope in a linear relationship is $m = \frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$.
- Some students may think that the intercept coordinate is the zero term instead of the non-zero term, since intercepts are associated with zeros. In other words, students may think (0, 4) would be the *x*-intercept because the 0 is in the *x* coordinate.

Underdeveloped Concepts:

- Some students may confuse corresponding sides of similar triangles.

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UNIT VOCABULARY

- **Similar shapes** – shapes whose angles are congruent and side lengths are proportional (equal scale factor)
- **Slope** – the steepness of a line; rate of change in *y* (vertical) compared to change in *x* (horizontal), $\frac{\text{rise}}{\text{run}}$ or $\frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$ or $\frac{(y_2 - y_1)}{(x_2 - x_1)}$, denoted as *m* in $y = mx + b$
- ***y*-intercept** – *y* coordinate of a point at which the relationship crosses the *y*-axis meaning the *x* coordinate is equal to zero, denoted as *b* in $y = mx + b$ and the ordered pair (0, *b*)

Related Vocabulary:

- Congruent
- Constant of proportionality
- Corresponding angles
- Corresponding sides
- Horizontal
- Input
- Linear
- Negative
- Non-proportional
- Origin
- Output
- Positive
- Proportional
- Rate of change
- Ratio
- Right angle
- Right triangle
- Rise
- Run
- Scale factor
- Similarity
- Undefined
- Vertical
- *x*-axis
- *x* coordinate
- *x*-value
- *y*-axis
- *y* coordinate
- *y*-value

UNIT ASSESSMENT ITEMS	SYSTEM RESOURCES	OTHER RESOURCES
Unit Assessment Items that have been published by your district may be accessed through **Search All Components** in the District Resources tab. Assessment items may also be found using the Assessment Center if your district has granted access to that tool.	**Mathematics Concepts Charts** **Mathematics COVID-19 Gap Implementation Tool Grade 8** **Mathematics COVID-19 Gap Implementation Tool Instructions**	Texas Higher Education Coordinating Board – **Texas College and Career Readiness Standards** Texas Education Agency – **Texas Response to Curriculum Focal Points for K-8 Mathematics Revised 2013**

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	Mathematics Grade 8 Backward Design Document **Mathematics Grade 8 Enhanced TEKS Clarification** **Mathematics Grade 8 Focal Points with Aligned Standards and TEKS Introduction** **Mathematics Grade 8 STAAR Analysis Resources** **Mathematics Grade 8 STAAR Blueprint and Item Percentages** **Mathematics Grade 8 STAAR Enhanced Blueprint** **Mathematics Grade 8 Vertical Alignment** **Mathematics Grade 8_Unit 04_TEKS Resource System STAAR Analysis** **Mathematics K-HS Overarching Understandings and Questions** **Mathematics Long Term Transfer Goals** **Mathematics Suggested Basic Manipulatives by Grade Level** **Mathematics Suggested Engaging Literature** **Mathematics Texas Education Agency Grade 8 TEKS Supporting Information (with TEKS**	Texas Education Agency – **Mathematics Curriculum** Texas Education Agency – **STAAR Mathematics Resources** Texas Education Agency Texas Gateway – **Revised Mathematics TEKS: Vertical Alignment Charts** Texas Education Agency Texas Gateway – **Mathematics TEKS: Supporting Information** Texas Education Agency Texas Gateway – **Interactive Mathematics Glossary** Texas Education Agency Texas Gateway – **Resources Aligned to Grade 8 Mathematics TEKS** Texas Instruments – **Graphing Calculator Tutorials**

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	Resource System Comments) Mathematics Vertical Quick Guide	

TAUGHT DIRECTLY TEKS

TEKS INTENDED TO BE EXPLICITLY TAUGHT IN THIS UNIT.

TEKS/SE Legend:

- ***Knowledge and Skills Statements (TEKS) identified by TEA are in italicized, bolded, black text.***
- **Student Expectations (TEKS) identified by TEA are in bolded, black text.**
- ***Student Expectations (TEKS) are labeled Readiness as identified by TEA of the assessed curriculum.***
- ***Student Expectations (TEKS) are labeled Supporting as identified by TEA of the assessed curriculum.***
- ***Student Expectations (TEKS) are labeled Process standards as identified by TEA of the assessed curriculum.***
- Portions of the Student Expectations (TEKS) that are not included in this unit but are taught in previous or future units are indicated by a ~~strike-through~~.

Specificity Legend:

- Supporting information / clarifications (specificity) written by TEKS Resource System are in blue text.
- *Unit-specific clarifications are in italicized, blue text.*
- Information from Texas Education Agency (TEA), Texas College and Career Readiness Standards (TxCCRS), Texas Response to Curriculum Focal Points (TxRCFP) is labeled.
- A Partial Specificity label indicates that a portion of the specificity not aligned to this unit has been removed.

TEKS# / SE#	TEKS	SPECIFICITY
8.1	***Mathematical process standards. The student uses***	

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	mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:	

8.1A	**Apply mathematics to problems arising in everyday life, society, and the workplace.** ***Process Standard***	Apply
		
		MATHEMATICS TO PROBLEMS ARISING IN EVERYDAY LIFE, SOCIETY, AND THE WORKPLACE
		
		Including, but not limited to:
		
		• Mathematical problem situations within and between disciplines
		  ◦ Everyday life
		  ◦ Society
		  ◦ Workplace
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Representing, applying, and analyzing proportional relationships
		  ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem
		  ◦ Making inferences from data
		• TxCCRS:
		  ◦ VII.D. Problem Solving and Reasoning – Real-world problem solving
		  • VII.D.1. Interpret results of the mathematical problem in terms of the original real-world situation.
		  ◦ IX.A. Connections – Connections among the strands of mathematics
		  • IX.A.1. Connect and use multiple key concepts of mathematics in situations and problems.

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TEKS# / SE#	TEKS	SPECIFICITY
		• IX.A.2. Connect mathematics to the study of other disciplines. ◦ IX.B. Connections – Connections of mathematics to nature, real-world situations, and everyday life • IX.B.1. Use multiple representations to demonstrate links between mathematical and real-world situations. • IX.B.2. Understand and use appropriate mathematical models in the natural, physical, and social sciences. • IX.B.3. Know and understand the use of mathematics in a variety of careers and professions.
8.1B	**Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution.** ***Process Standard***	Use A PROBLEM-SOLVING MODEL THAT INCORPORATES ANALYZING GIVEN INFORMATION, FORMULATING A PLAN OR STRATEGY, DETERMINING A SOLUTION, JUSTIFYING THE SOLUTION, AND EVALUATING THE PROBLEM-SOLVING PROCESS AND THE REASONABLENESS OF THE SOLUTION Including, but not limited to: • Problem-solving model ◦ Analyze given information ◦ Formulate a plan or strategy ◦ Determine a solution ◦ Justify the solution ◦ Evaluate the problem-solving process and the reasonableness of the solution Note(s): • The mathematical process standards may be applied to all content standards as appropriate.

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		• TxRCFP: ◦ Representing, applying, and analyzing proportional relationships ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem ◦ Making inferences from data • TxCCRS: ◦ I.B. Numeric Reasoning – Number sense and number concepts • I.B.1. Use estimation to check for errors and reasonableness of solutions. ◦ V.A. Statistical Reasoning – Design a study • V.A.1. Formulate a statistical question, plan an investigation, and collect data. ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.1. Analyze given information. • VII.A.2. Formulate a plan or strategy. • VII.A.3. Determine a solution. • VII.A.4. Justify the solution. • VII.A.5. Evaluate the problem-solving process. ◦ VII.D. Problem Solving and Reasoning – Real-world problem solving • VII.D.2. Evaluate the problem-solving process.
8.1C	**Select tools, including ~~real objects,~~ ~~manipulatives,~~ paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.** ***Process Standard***	Partial Specificity Select TOOLS, INCLUDING PAPER AND PENCIL AND TECHNOLOGY AS APPROPRIATE, AND TECHNIQUES, INCLUDING MENTAL MATH, ESTIMATION, AND NUMBER SENSE AS APPROPRIATE, TO SOLVE PROBLEMS Including, but not limited to: • Appropriate selection of tool(s) and techniques to apply in order to solve problems ◦ Tools

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		• Paper and pencil • Technology ◦ Techniques • Mental math • Estimation • Number sense Note(s): • The mathematical process standards may be applied to all content standards as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem ◦ Making inferences from data • TxCCRS: ◦ I.B. Numeric Reasoning – Number sense and number concepts • I.B.1. Use estimation to check for errors and reasonableness of solutions. ◦ V.C. Statistical Reasoning – Analyze, interpret, and draw conclusions from data • V.C.2. Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software.
8.1D	**Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.** ***Process Standard***	Communicate MATHEMATICAL IDEAS, REASONING, AND THEIR IMPLICATIONS USING MULTIPLE REPRESENTATIONS, INCLUDING SYMBOLS, DIAGRAMS, GRAPHS, AND LANGUAGE AS APPROPRIATE Including, but not limited to:

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		• Mathematical ideas, reasoning, and their implications
		  ◦ Multiple representations, as appropriate
		  • Symbols
		  • Diagrams
		  • Graphs
		  • Language
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Representing, applying, and analyzing proportional relationships
		  ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem
		  ◦ Making inferences from data
		• TxCCRS:
		  ◦ II.D. Algebraic Reasoning – Representing relationships
		  • II.D.1. Interpret multiple representations of equations, inequalities, and relationships.
		  • II.D.2. Convert among multiple representations of equations, inequalities, and relationships.
		  ◦ VIII.A. Communication and Representation – Language, terms, and symbols of mathematics
		  • VIII.A.1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem.
		  • VIII.A.2. Use mathematical language to represent and communicate the mathematical concepts in a problem.
		  • VIII.A.3. Use mathematical language for reasoning, problem solving, making connections, and generalizing.

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		◦ VIII.B. Communication and Representation – Interpretation of mathematical work • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations. • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context. ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words. • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas. • VIII.C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications. ◦ IX.B. Connections – Connections of mathematics to nature, real-world situations, and everyday life • IX.B.1. Use multiple representations to demonstrate links between mathematical and real-world situations.
8.1E	**Create and use representations to organize, record, and communicate mathematical ideas.** ***Process Standard***	Create, Use REPRESENTATIONS TO ORGANIZE, RECORD, AND COMMUNICATE MATHEMATICAL IDEAS Including, but not limited to: • Representations of mathematical ideas ◦ Organize ◦ Record ◦ Communicate • Evaluation of the effectiveness of representations to ensure clarity of mathematical ideas being

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		communicated
		• Appropriate mathematical vocabulary and phrasing when communicating mathematical ideas
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Representing, applying, and analyzing proportional relationships
		  ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem
		  ◦ Making inferences from data
		• TxCCRS:
		  ◦ VIII.B. Communication and Representation – Interpretation of mathematical work
		  • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations.
		  • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context.
		  ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work
		  • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words.
		  • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas.

8.1F	**Analyze mathematical relationships to connect and communicate mathematical ideas.** ***Process Standard***	Analyze MATHEMATICAL RELATIONSHIPS TO CONNECT AND COMMUNICATE MATHEMATICAL IDEAS Including, but not limited to:

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		• Mathematical relationships
		  ◦ Connect and communicate mathematical ideas
		  • Conjectures and generalizations from sets of examples and non-examples, patterns, etc.
		  • Current knowledge to new learning
		
		Note(s):
		
		• The mathematical process standards may be applied to all content standards as appropriate.
		• TxRCFP:
		  ◦ Representing, applying, and analyzing proportional relationships
		  ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem
		  ◦ Making inferences from data
		• TxCCRS:
		  ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving
		  • VII.A.1. Analyze given information.
		  ◦ VIII.A. Communication and Representation – Language, terms, and symbols of mathematics
		  • VIII.A.1. Use mathematical symbols, terminology, and notation to represent given and unknown information in a problem.
		  • VIII.A.2. Use mathematical language to represent and communicate the mathematical concepts in a problem.
		  • VIII.A.3. Use mathematical language for reasoning, problem solving, making connections, and generalizing.
		  ◦ VIII.B. Communication and Representation – Interpretation of mathematical work
		  • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations.
		  ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work

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		• VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words. • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas. • VIII.C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications. ◦ IX.A. Connections – Connections among the strands of mathematics • IX.A.1. Connect and use multiple key concepts of mathematics in situations and problems. • IX.A.2. Connect mathematics to the study of other disciplines.
8.1G	**Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.** ***Process Standard***	Display, Explain, Justify MATHEMATICAL IDEAS AND ARGUMENTS USING PRECISE MATHEMATICAL LANGUAGE IN WRITTEN OR ORAL COMMUNICATION Including, but not limited to: • Mathematical ideas and arguments ◦ Validation of conclusions • Displays to make work visible to others ◦ Diagrams, visual aids, written work, etc. • Explanations and justifications ◦ Precise mathematical language in written or oral communication Note(s): • The mathematical process standards may be applied to all content standards as appropriate. • TxRCFP:

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		◦ Representing, applying, and analyzing proportional relationships ◦ Using expressions and equations to describe relationships, including the Pythagorean Theorem ◦ Making inferences from data • TxCCRS: ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.4. Justify the solution. ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations. ◦ VII.C. Problem Solving and Reasoning – Logical reasoning • VII.C.1. Develop and evaluate convincing arguments. ◦ VIII.A. Communication and Representation – Language, terms, and symbols of mathematics • VIII.A.3. Use mathematical language for reasoning, problem solving, making connections, and generalizing. ◦ VIII.B. Communication and Representation – Interpretation of mathematical work • VIII.B.1. Model and interpret mathematical ideas and concepts using multiple representations. • VIII.B.2. Summarize and interpret mathematical information provided orally, visually, or in written form within the given context. ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work • VIII.C.3. Explain, display, or justify mathematical ideas and arguments using precise mathematical language in written or oral communications.
8.4	***Proportionality. The student applies mathematical process standards to explain proportional and non-***	

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	proportional relationships involving slope. The student is expected to:	
8.4A	**Use similar right triangles to develop an understanding that slope, *m*, given as the rate comparing the change in *y*-values to the change in *x*-values, $(y_2 - y_1)/(x_2 - x_1)$, is the same for any two points (x_1, y_1) and (x_2, y_2) on the same line.** ***Supporting Standard***	Use SIMILAR RIGHT TRIANGLES TO DEVELOP AN UNDERSTANDING THAT SLOPE, *m*, GIVEN AS THE RATE COMPARING THE CHANGE IN *y*-VALUES TO THE CHANGE IN *x*-VALUES, $\frac{(y_2 - y_1)}{(x_2 - x_1)}$, IS THE SAME FOR ANY TWO POINTS (x_1, y_1) AND (x_2, y_2) ON THE SAME LINE Including, but not limited to: • Similar shapes – shapes whose angles are congruent and side lengths are proportional (equal scale factor) ◦ The order of the letters determines corresponding side lengths and angles. • Notation for similar shapes ◦ Symbol for similarity (~) read as “similar to” • Attributes of similar right triangles when the longest sides of the triangles (sides opposite the right angles) lie on the same line ◦ Corresponding sides are proportional. ◦ Corresponding angles are congruent. ◦ Rate comparing the change in *y*-values to the change in *x*-values is the same for any two points on the same line. • Slope – the steepness of a line; rate of change in *y* (vertical) compared to change in *x* (horizontal), $\frac{\text{rise}}{\text{run}}$ or $\frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$ or $\frac{(y_2 - y_1)}{(x_2 - x_1)}$, denoted as *m* in $y = mx + b$ ◦ Slope is either positive, negative, zero, or undefined. • Connections between similar right triangles and slope ◦ A right triangle can be formed from any two points on a line by drawing a vertical line

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		from one point and a horizontal line from the other point until the lines intersect. ◦ Slope of the line containing the longest side (side opposite the right angle) of a right triangle is determined between the two vertices not forming the right angle. ◦ Reversal of the order of the points $\frac{(y_2 - y_1)}{(x_2 - x_1)}$ or $\frac{(y_1 - y_2)}{(x_1 - x_2)}$, yields the same slope. ◦ Not all longest sides (sides opposite the right angles) of similar right triangles have the same slope when placed on a coordinate plane. ◦ To have the same slope, similar right triangles must be placed on a coordinate plane having two points of their longest sides (sides opposite the right angles) that lie on the same line. Note(s): • Grade Level(s): ◦ Algebra I will determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships • TxCCRS: ◦ III.B. Geometric and Spatial Reasoning – Transformations and symmetry • III.B.2. Use transformations to investigate congruence, similarity, and symmetries of figures. ◦ III.C. Geometric and Spatial Reasoning – Connections between geometry and other mathematical content strands • III.C.1. Make connections between geometry and algebraic equations. ◦ VI.B. Functions – Analysis of functions • VI.B.1. Understand and analyze features of functions.

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		◦ VII.B. Problem Solving and Reasoning – Proportional reasoning • VII.B.1. Use proportional reasoning to solve problems that require fractions, ratios, percentages, decimals, and proportions in a variety of contexts using multiple representations.
8.4C	**Use data from a table or graph to determine the rate of change or slope and *y*-intercept in mathematical and real-world problems.** ***Readiness Standard***	Use DATA FROM A TABLE OR GRAPH TO DETERMINE THE RATE OF CHANGE OR SLOPE AND *y*-INTERCEPT IN MATHEMATICAL AND REAL-WORLD PROBLEMS Including, but not limited to: • Slope – the steepness of a line; rate of change in *y* (vertical) compared to change in *x* (horizontal), $\frac{\text{rise}}{\text{run}}$ or $\frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$ or $\frac{(y_2 - y_1)}{(x_2 - x_1)}$, denoted as *m* in $y = mx + b$ • Determining rate of change or slope from various representations ◦ Table (horizontal/vertical) ◦ Graph • Connections between unit rate, rate of change, and slope in mathematical and real-world problems • *y*-intercept – *y* coordinate of a point at which the relationship crosses the *y*-axis meaning the *x* coordinate is equal to zero, denoted as *b* in $y = mx + b$ and the ordered pair $(0, b)$ • Determining *y*-intercept from various representations ◦ Table (horizontal/vertical) ◦ Graph • Connections between the “starting point” (the output value when the input value is 0) and *y*-intercept in mathematical and real-world problem situations • Linear proportional relationship ◦ Linear

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		◦ Passes through the origin (0, 0) ◦ Represented by $y = kx$ ◦ Constant of proportionality represented as $k = \frac{y}{x}$ • When $b = 0$ in $y = mx + b$, then k = the slope, m • Linear non-proportional relationship ◦ Linear ◦ Does not pass through the origin (0, 0) ◦ Represented by $y = mx + b$, where $b \neq 0$ ◦ Constant slope represented as $m = \frac{\text{rise}}{\text{run}}$ or $m = \frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$ or $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$ Note(s): • Grade Level(s): ◦ Algebra I will calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems. ◦ Algebra I will graph linear functions on the coordinate plane and identify key features, including x-intercept, y-intercept, zeros, and slope, in mathematical and real-world problems. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships • TxCCRS: ◦ VI.B. Functions – Analysis of functions • VI.B.1. Understand and analyze features of functions. ◦ VI.C. Functions – Model real-world situations with functions • VI.C.2. Develop a function to model a situation. ◦ IX.B. Connections – Connections of mathematics to nature, real-world situations, and

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		everyday life • IX.B.1. Use multiple representations to demonstrate links between mathematical and real-world situations.

ELPS#	SUBSECTION C: CROSS-CURRICULAR SECOND LANGUAGE ACQUISITION ESSENTIAL KNOWLEDGE AND SKILLS.
The English Language Proficiency Standards (ELPS), as required by 19 Texas Administrative Code, Chapter 74, Subchapter A, §74.4, outline English language proficiency level descriptors and student expectations for English language learners (ELLs). School districts are required to implement ELPS as an integral part of each subject in the required curriculum.	
School districts shall provide instruction in the knowledge and skills of the foundation and enrichment curriculum in a manner that is linguistically accommodated commensurate with the student's levels of English language proficiency to ensure that the student learns the knowledge and skills in the required curriculum. School districts shall provide content-based instruction including the cross-curricular second language acquisition essential knowledge and skills in subsection (c) of the ELPS in a manner that is linguistically accommodated to help the student acquire English language proficiency. http://ritter.tea.state.tx.us/rules/tac/chapter074/ch074a.html#74.4 **Choose appropriate ELPS to support instruction.**	
ELPS.c.1	***The ELL uses language learning strategies to develop an awareness of his or her own learning processes in all content areas. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:***
ELPS.c.1A	**use prior knowledge and experiences to understand meanings in English**
ELPS.c.1B	**monitor oral and written language production and employ self-corrective techniques or other resources**
ELPS.c.1C	**use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary**

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ELPS#	SUBSECTION C: CROSS-CURRICULAR SECOND LANGUAGE ACQUISITION ESSENTIAL KNOWLEDGE AND SKILLS.
ELPS.c.1D	**speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known)**
ELPS.c.1E	**internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment**
ELPS.c.1F	**use accessible language and learn new and essential language in the process**
ELPS.c.1G	**demonstrate an increasing ability to distinguish between formal and informal English and an increasing knowledge of when to use each one commensurate with grade-level learning expectations**
ELPS.c.1H	**develop and expand repertoire of learning strategies such as reasoning inductively or deductively, looking for patterns in language, and analyzing sayings and expressions commensurate with grade-level learning expectations.**
ELPS.c.2	***The ELL listens to a variety of speakers including teachers, peers, and electronic media to gain an increasing level of comprehension of newly acquired language in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in listening. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:***
ELPS.c.2A	**distinguish sounds and intonation patterns of English with increasing ease**
ELPS.c.2B	**recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters**
ELPS.c.2C	**learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions**
ELPS.c.2D	**monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed**
ELPS.c.2E	**use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language**
ELPS.c.2F	**listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD ROM to build and reinforce concept and language attainment**
ELPS.c.2G	**understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and**

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	contexts are familiar to unfamiliar
ELPS.c.2H	**understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations**
ELPS.c.2I	**demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs.**
ELPS.c.3	***The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:***
ELPS.c.3A	**practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible**
ELPS.c.3B	**expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, and objects, by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication**
ELPS.c.3C	**speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired**
ELPS.c.3D	**speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency**
ELPS.c.3E	**share information in cooperative learning interactions**
ELPS.c.3F	**ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments**
ELPS.c.3G	**express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics**
ELPS.c.3H	**narrate, describe, and explain with increasing specificity and detail as more English is acquired**

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ELPS.c.3I	**adapt spoken language appropriately for formal and informal purposes**
ELPS.c.3J	**respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment.**
ELPS.c.4	***The ELL reads a variety of texts for a variety of purposes with an increasing level of comprehension in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in reading. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations apply to text read aloud for students not yet at the stage of decoding written text. The student is expected to:***
ELPS.c.4A	**learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words**
ELPS.c.4B	**recognize directionality of English reading such as left to right and top to bottom**
ELPS.c.4C	**develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials**
ELPS.c.4D	**use prereading supports such as graphic organizers, illustrations, and pretaught topic-related vocabulary and other prereading activities to enhance comprehension of written text**
ELPS.c.4E	**read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned**
ELPS.c.4F	**use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language**
ELPS.c.4G	**demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs**
ELPS.c.4H	**read silently with increasing ease and comprehension for longer periods**
ELPS.c.4I	**demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of**

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ELPS#	SUBSECTION C: CROSS-CURRICULAR SECOND LANGUAGE ACQUISITION ESSENTIAL KNOWLEDGE AND SKILLS.
	supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs
ELPS.c.4J	**demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs**
ELPS.c.4K	**demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade-level needs.**
ELPS.c.5	***The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:***
ELPS.c.5A	**learn relationships between sounds and letters of the English language to represent sounds when writing in English**
ELPS.c.5B	**write using newly acquired basic vocabulary and content-based grade-level vocabulary**
ELPS.c.5C	**spell familiar English words with increasing accuracy, and employ English spelling patterns and rules with increasing accuracy as more English is acquired**
ELPS.c.5D	**edit writing for standard grammar and usage, including subject-verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade-level expectations as more English is acquired**
ELPS.c.5E	**employ increasingly complex grammatical structures in content area writing commensurate with grade-level expectations, such as:**
ELPS.c.5F	**write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired**
ELPS.c.5G	**narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.**

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