Instructional Focus Document
Grade 8 Mathematics

TITLE : Unit 06: Statistics with Bivariate Data **SUGGESTED DURATION :** 10 days

UNIT OVERVIEW

Introduction

This unit bundles student expectations that address representing bivariate sets of data with scatterplots and representations of linear situations. 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 5, students represented discrete paired data on a scatterplot. In Grade 8 Unit 04, students used similar right triangles to develop an understanding of slope. Students used data from a table or graph to determine the rate of change or slope and the *y*-intercept. In Unit 05, students distinguished between proportional and non-proportional linear situations and solved problems involving direct variation. Students also represented linear proportional and non-proportional situations with tables, graphs, and equations.

During this Unit

Students continue to examine characteristics of linear relationships through the lens of trend lines that approximate the relationship between bivariate sets of data. Students contrast graphical representations of bivariate sets of data that suggest linear relationships with bivariate sets of data that do not suggest a linear relationship. Scatterplots are constructed from bivariate sets of data and used to describe the observed data. Observations include questions of association such as linear (positive or negative trend), non-linear, or no association. Students extend previous work with linear proportional and linear non-proportional situations to trend lines as they continue to represent situations with tables, graphs, and equations in the form $y = kx$ or $y = mx + b$, where $b \neq 0$, respectively. Within a scatterplot that represents a linear relationship, students use the trend line to make predictions and interpret the slope of the line that models the relationship as the unit rate of the scenario.

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

After this Unit

In Algebra I, students will write linear equations in two variables in various forms and when given a table of values, a graph, and a verbal description. Students will write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points. In addition, students will write and solve equations involving direct variation and calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in the context of mathematical and real-world problems. Students will calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association.

Additional Notes

In Grade 8, graphing proportional relationships, interpreting the unit rate as the slope of the line that models the relationship and writing an equation in the form $y = mx + b$ to model a linear relationship between two quantities using verbal, numerical, tabular, and graphical representations are identified as STAAR Readiness Standards 8.4B and 8.5I.

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Representing linear proportional situations with tables, graphs, and equations in the form of $y = kx$ and representing linear non-proportional situations with tables, graphs, and equations in the form of $y = mx + b$, where $b \neq 0$ are identified as STAAR Supporting Standards 8.5A and 8.5B. All of these standards are subsumed under the Grade 8 Reporting Category: Computations and Algebraic Relationships. Contrasting bivariate sets of data that suggest a linear relationship with bivariate sets of data that do not suggest a linear relationship from a graphical representation is STAAR Supporting Standard 8.5C. Using a trend line that approximates the linear relationship between bivariate sets of data to make predictions is identified as STAAR Readiness Standard 8.5D. Both of these standards are part of the Grade 8 STAAR Reporting Category: Data Analysis and Personal Financial Literacy. All of these standards are subsumed under the Grade 8 *Texas Response to Curriculum Focal Points* (TxRCFP): Representing, applying and analyzing proportional relationships. Constructing a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data is STAAR Supporting Standard 8.11A, part of the Grade 8 STAAR Reporting Category: Data Analysis and Personal Financial Literacy, and identified within the Grade 8 Focal Point: Making inferences from data (TxRCFP). 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 C2; V. Statistical Reasoning A1, B2, B4, C1, C2; VI. Functions A2, B1, C1, 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 *Developing Essential Understanding of Statistics Grades 6 – 8* (2013) from the National Council of Teachers of Mathematics (NCTM), “The analysis of bivariate data focuses on identifying and describing patterns in the covariability in the data. For a collection of bivariate data on two quantitative variables, a scatterplot is a useful graphical display for illustrating the covariability and for identifying the general direction and form of a relationship” (p. 66). As students study scatterplots, NCTM (2010) suggests that “Teachers should point out that a trend line represents a set of biviariate data just as a measure of center or spread represent a set of univariate data…During their study of bivariate data, students should have the opportunity to analyze scatterplots and trend lines. Teachers should

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 Council of Teachers of Mathematics. (2013). *Developing essential understanding of statistics grades 6 – 8*. Reston, VA: National Council of Teachers of Mathematics, Inc.
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

OVERARCHING UNDERSTANDINGS AND QUESTIONS

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Grade 8 Mathematics

TITLE : Unit 06: Statistics with Bivariate Data **SUGGESTED DURATION :** 10 days

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?

Statistical displays often reveal patterns within data that can be analyzed to interpret information, inform understanding, make predictions, influence decisions, and solve problems in everyday life with degrees of confidence.

- How does society use or make sense of the enormous amount of data in our world available at our fingertips?
- How can data and data displays be purposeful and powerful?
- Why is it important to be aware of factors that may influence conclusions, predictions, and/or decisions derived from data?

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

Understanding how two quantities vary together (covariation) in situations involving invariant (constant) relationships builds flexible functional reasoning in order to make predictions and critical judgements about the relationship.
• Proportional and non-proportional relationships can be presented using multiple representations, and those representations can be examined to distinguish between linear and non-linear proportional situations
	Proportionality
	• Statistics
	  • Predictions and inferences
	  • Data
	  • Statistical representations
	• Relationships and Generalizations
	  • Linear
	  • Non-linear
	• Representations
		Mathematics Grade 8 Unit 06 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. A minimum wage is the lowest hourly, daily, or monthly amount that employers must legally pay to workers. The

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

and identify attributes of linear relationships.

- What is bivariate data?
- What patterns are exhibited by the covariability in bivariate sets of data?
- What are the characteristics of bivariate data that shows a …
  - linear
  - non-linear

  … relationship in a graphical representation?
- How can a trend line be used to …
  - make predictions?
  - describe a situation?
- What are the characteristics of a trend line that represents a …
  - positive trend?
  - negative trend?
  - no trend?

Data can be described in order to communicate and reason statically about the entire data set.

- What are the characteristics of a scatterplot?
- How does bivariate data that represents associations such as linear, non-linear, or no association appear in a graph?

Measurement and Data

- Coordinate Plane
- Graphical Representations
  - Scatterplots

<u>Associated Mathematical Processes</u>

- Application
- Problem Solving Model
- Tools and Techniques
- Communication
- Representations
- Relationships
- Justification

United States Department of Labor introduced the Fair Labor Standards Act in 1938. Today the minimum wage is at the same hourly rate as it was in 2009. The table below shows the minimum wage rate and its respective year.

Date	Amount
1956	$1.00
1961	$1.15
1963	$1.25
1964	$1.40
1965	$1.60
1974	$2.00
1975	$2.10
1976	$2.30
1978	$2.65
1979	$2.90

Date	Amount
1980	$3.10
1981	$3.35
1990	$3.80
1991	$4.25
1996	$4.75
1997	$5.15
2007	$5.85
2008	$6.55
2009	$7.25
2013	$7.25

a. Construct a scatterplot that accurately represents the minimum wage data and the year.

b. Describe the association of the observed data as linear, non-linear, or no association.

c. Draw a trend line that approximates the relationship between the year and minimum wage.

d. Describe the trend of the graph as positive,

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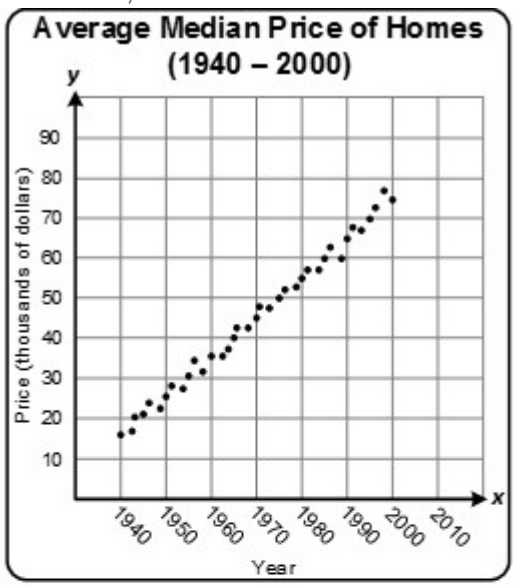
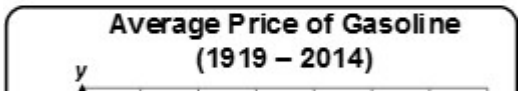
UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
		negative, or no trend. e. Use the trend line to predict the minimum wage in the year 2020. 2. As the minimum wage increased, the price of certain items increased as well. a. Compare and contrast the relationships with the sets of data displayed in the graphs below and describe the associations in the graphs as linear, non-linear, or no association.  

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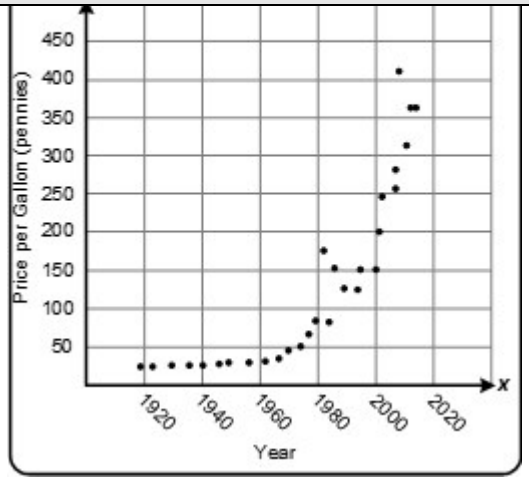
UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
		 Standard(s): 8.1A, 8.1B, 8.1C, 8.1D, 8.1E, 8.1F, 8.1G, 8.5C, 8.5D, 8.11A, ELPS.c.1A, ELPS.c.2C, ELPS.c.2D, ELPS.c.2E, ELPS.c.3C, ELPS.c.3D, ELPS.c.3H, ELPS.c.4C, ELPS.c.4D, ELPS.c.4F, ELPS.c.4H, ELPS.c.5B, ELPS.c.5F, ELPS.c.5G

OVERARCHING UNDERSTANDINGS AND QUESTIONS

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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?

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

Understanding how two quantities vary together (covariation) in situations involving invariant (constant) relationships builds flexible proportional reasoning in order to make predictions and critical judgements about the relationship.
• The unit rate can be determined from the graph of a proportional relationship and used to describe the constant rate of change, the slope of the line.
  • How can a graph of a proportional relationship be
	Proportionality
	• Statistics
	  • Predictions and inferences
	  • Data
	  • Statistical representations
	• Ratios and Rates
	  • Unit rates
	  • Slope
	• Relationships and Generalizations
		Mathematics Grade 8 Unit 06 PA 02
		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. Audie constructed a scatterplot to display the amount she spent on gasoline for the past 6 months.

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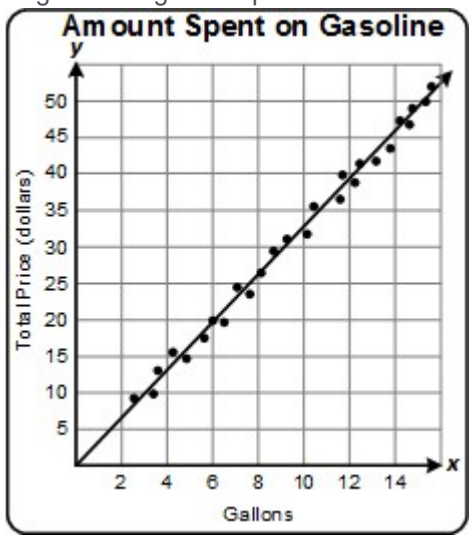
UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
used to interpret the slope of a line and the unit rate? • What are the characteristics of a linear proportional situation in a(n) … ◦ table? ◦ graph? ◦ equation in the form of $y = kx$? • What is the relationship between the slope of a line, the constant of proportionality, and the unit rate of a situation that represents a linear proportional relationship? • How can the equation of a linear proportional situation be manipulated to prove that the constant of proportionality exists within the relationship? • Proportional and non-proportional relationships can be presented using multiple representations, and those representations can be examined to distinguish between linear and non-linear proportional situations and identify attributes of linear relationships. • What are the key characteristics of a linear proportional and non-proportional situations? • What are the similarities and differences between the … ◦ graphs ◦ tables ◦ equations … of a linear proportional and linear non-proportional	• Equivalence • Constant of proportionality • Independent and dependent quantities • Linear • Linear proportional • Linear non-proportional • Representations <u>Associated Mathematical Processes</u> • Application • Problem Solving Model • Tools and Techniques • Communication • Representations • Relationships • Justification	Sometimes she would put a few gallons of gas in her car, and sometimes she would fill her tank completely. Audie drew a trend line to approximate the relationship between the total price spent on gasoline and the number of gallons of gas she put in her car.  a. Describe the trend of the graph as positive, negative, or no trend. b. Use the graph and trend line to write an equation in the form $y = mx + b$ to represent the linear relationship between total price spent on gasoline and the number of gallons of gas Audie put in her car.

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
situations? • What is the process for representing a linear relationship … ◦ verbally? ◦ with a table? ◦ with a graph? ◦ with an equation that simplifies to the form of $y = mx + b$? • How are independent and dependent quantities related in a linear problem situation? • What is the meaning of each of the variables in the equation $y = mx + b$? • How are the table and graph of a linear problem		c. Describe the meaning of the slope of the trend line in terms of a unit rate that represents the relationship between the total price spent on gasoline and the number of gallons of gas Audie put in her car. d. Use the trend line to predict the amount Audie would pay for 3 gallons of gas, 12 gallons of gas, and 16 gallons of gas. 2. Audie used her credit card to pay for her gasoline and other purchases. She usually makes bimonthly payments large enough to pay off any recent charges and still decrease her overall credit card balance. Her credit card company provided her with a scatterplot

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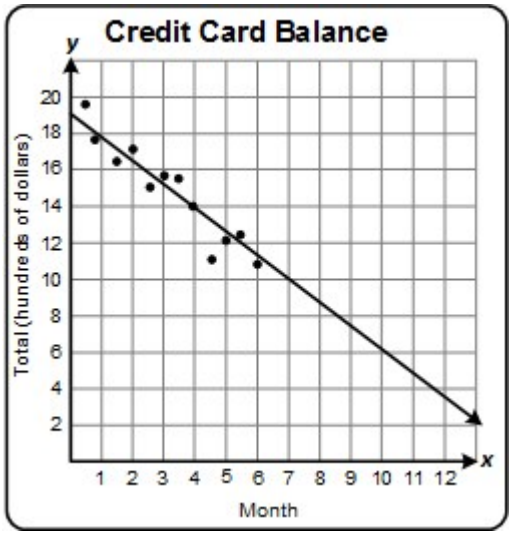
UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
situation related to an equation that simplifies to the form of $y = mx + b$? • How can a trend line be used to … ◦ make predictions? ◦ describe a situation? • What are the characteristics of a trend line that represents a … ◦ positive trend? ◦ negative trend? ◦ no trend?		displaying her monthly balance for January (month 1) through June. Audie added a trend line to the graph to approximate the relationship between her monthly credit card balance and the month.  a. Describe the trend of the graph as positive, negative, or no trend. b. Use the graph and trend line to write an equation in the form $y = mx + b$ to represent the linear relationship between Audie's monthly credit card balance and the month. c. Use the trend line to predict Audie's credit card balance in July, September, and the following

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UNIT UNDERSTANDINGS AND QUESTIONS	OVERARCHING CONCEPTS AND UNIT CONCEPTS	PERFORMANCE ASSESSMENT(S)
		January assuming she continues her spending and payment habits. Standard(s): 8.1A, 8.1B, 8.1C, 8.1D, 8.1E, 8.1F, 8.1G, 8.4B, 8.5A, 8.5B, 8.5D, 8.5I, 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.4F, ELPS.c.4H, ELPS.c.5B, ELPS.c.5F, ELPS.c.5G

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MISCONCEPTIONS / UNDERDEVELOPED CONCEPTS

Misconceptions:

- Students may think that the trend line has to begin at the origin rather than understanding that a trend line is not always proportional.
- Students may think that if both numbers in the data set are decreasing, then it represents a negative trend.
- Students may confuse a positive trend with a negative trend.
- Some students may attempt to connect the dots of a scatterplot rather than realizing the data is discrete and not continuous.

Underdeveloped Concepts:

- 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 $m = \frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}}$.
- Students may use (y, x) as the ordered pair instead of (x, y)
- Some students may not associate the unit rate of a problem situation to the slope of the line that represents the problem situation.
- Some students may not relate the constant rate of change or unit rate to m in the equation $y = mx + b$.
- Some students may not relate the constant of proportionality or unit rate as k in the equation $y = kx$ or m in the equation $y = mx + b$, when $b = 0$.
- Some students may think that a constant rate of change always means the situation is proportional.

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UNIT VOCABULARY

- **Bivariate data** – data relating two quantitative variables that can be represented by a scatterplot
- **Data** – information that is collected about people, events, or objects
- **Discrete paired data** – data that involves only distinct values that are finite or countable
- **Graph –** a visual representation of the relationships between data collected
- **Linear relationship** – a relationship with a constant rate of change represented by a graph that forms a straight line
- **Scatterplot** – a graphical representation used to display the relationship between discrete data pairs
- **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 $y = mx + b$
- **Trend line** – the line that best fits the data points of a scatterplot
- **Unit rate** – a ratio between two different units where one of the terms is 1
- ***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:

- Association
- Constant
- Constant rate of change
- Correlation
- Dependent
- Independent
- Linear association
- Negative trend
- No association
- No trend
- Non-linear association
- Non-linear relationship
- Non-proportional relationship
- Ordered pair
- Origin
- Positive trend
- Prediction
- Proportional relationship
- Rate of change
- Scale factor
- *x*-axis
- *y*-axis

UNIT ASSESSMENT ITEMS	SYSTEM RESOURCES	OTHER RESOURCES
Unit Assessment Items that have been published by your district may be accessed through Search All	Mathematics Concepts Charts	Texas Higher Education Coordinating Board – Texas College and Career Readiness Standards

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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 COVID-19 Gap Implementation Tool Grade 8 Mathematics COVID-19 Gap Implementation Tool Instructions 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 06_TEKS Resource System STAAR Analysis Mathematics K-HS Overarching Understandings and Questions Mathematics Long Term Transfer Goals Mathematics Suggested Basic Manipulatives by Grade Level	Texas Education Agency – Texas Response to Curriculum Focal Points for K-8 Mathematics Revised 2013 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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	Mathematics Suggested Engaging Literature Mathematics Texas Education Agency Grade 8 TEKS Supporting Information (with TEKS 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.

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

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TEKS# / SE#	TEKS	SPECIFICITY
		problems. • 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):

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TEKS# / SE#	TEKS	SPECIFICITY

		• 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.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

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		◦ Tools • 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

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		Including, but not limited to:
		• 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

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		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.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

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		• Evaluation of the effectiveness of representations to ensure clarity of mathematical ideas being 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

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		Including, but not limited to:
		• 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.

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		◦ 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.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):

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		• 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.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.

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8.4	***Proportionality. The student applies mathematical process standards to explain proportional and non-proportional relationships involving slope. The student is expected to:***	

8.4B	**Graph proportional relationships, interpreting the unit rate as the slope of the line that models the relationship.** ***Readiness Standard***	Graph
		
		PROPORTIONAL RELATIONSHIPS, INTERPRETING THE UNIT RATE AS THE SLOPE OF THE LINE THAT MODELS THE RELATIONSHIP
		
		Including, but not limited to:
		
		• Unit rate – a ratio between two different units where one of the terms is 1
		• 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 $y = mx + b$
		• Linear proportional relationship
		  ◦ Linear
		  ◦ 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
		• Graphing unit rate from various representations
		  ◦ Verbal
		  ◦ Numeric
		  ◦ Tabular(horizontal/vertical)
		  ◦ Symbolic/algebraic
		• Connections between unit rate in proportional relationships to the slope of a line

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		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. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships • TxCCRS: ◦ VI.C. Functions – Model real-world situations with functions • VI.C.2. Develop a function to model a situation. ◦ 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. ◦ 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. ◦ 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.
8.5	***Proportionality. The student applies mathematical process standards to use proportional and non-proportional relationships to develop foundational concepts of functions. The student is expected to:***	

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8.5A	**Represent linear proportional situations with tables, graphs, and equations in the form of *y* = *kx*.** ***Supporting Standard***	Represent LINEAR PROPORTIONAL SITUATIONS WITH TABLES, GRAPHS, AND EQUATIONS IN THE FORM OF $y = kx$ 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 $y = mx + b$ • *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*) • Linear relationship – a relationship with a constant rate of change represented by a graph that forms a straight line ◦ One quantity is dependent on the other ◦ Two quantities may be directly proportional to each other ◦ Can be classified as a positive or negative relationship ◦ Can be expressed as a pair of values that can be graphed as ordered pairs ◦ Graph of the ordered pairs matching the relationship will form a line ◦ Linear proportional problem situations • Linear • 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*. ◦ Multiple representations of linear proportional problem situations • Verbal • Table (horizontal/vertical)

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		• Graph
		• Algebraic
		  ◦ Both $y = kx$ and $kx = y$ forms
		  ◦ Association of k as multiplication by a given constant factor (including unit rate)
		  ◦ Rational number coefficients and constants
		  ◦ Manipulation of equations
		
		Note(s):
		
		• Grade Level(s):
		  ◦ Grade 7 represented constant rates of change in mathematical and real-world problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations, including $d = rt$.
		  ◦ Grade 7 converted between measurement systems, including the use of proportions and the use of unit rates.
		  ◦ Algebra I will write and solve equations involving direct variation.
		  ◦ Algebra I will use, translate, and make connections among algebraic, tabular, graphical, or verbal descriptions of linear functions.
		  ◦ Algebra I will write linear equations with two variables given a table of values, a graph, and a verbal description.
		  ◦ Various mathematical process standards will be applied to this student expectation as appropriate.
		• TxRCFP:
		  ◦ Representing, applying, and analyzing proportional relationships
		• TxCCRS:
		  ◦ II.D. Algebraic Reasoning – Representing relationships
		  • II.D.2. Convert among multiple representations of equations, inequalities, and relationships.
		  ◦ VII.B. Problem Solving and Reasoning – Proportional reasoning

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		• 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. ◦ 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 • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words.
8.5B	**Represent linear non-proportional situations with tables, graphs, and equations in the form of $y = mx + b$, where $b \neq 0$.** ***Supporting Standard***	Represent LINEAR NON-PROPORTIONAL SITUATIONS WITH TABLES, GRAPHS, AND EQUATIONS IN THE FORM OF $y = mx + b$, WHERE $b \neq 0$ 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 $y = mx + b$ • 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 $(0, b)$ • Linear relationship – a relationship with a constant rate of change represented by a graph that forms a straight line ◦ One quantity is dependent on the other ◦ Two quantities may be directly proportional to each other ◦ Can be classified as a positive or negative relationship ◦ Can be expressed as a pair of values that can be graphed as ordered pairs

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- Graph of the ordered pairs matching the relationship will form a line
- Linear non-proportional problem situations
  - 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 $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$
- Multiple representations of linear non-proportional problem situations
  - Verbal
  - Table (horizontal/vertical)
  - Graph
  - Algebraic
    - Both $y = mx + b$ and $mx + b = y$ forms
    - Rational number coefficients and constants
    - Manipulation of equations

Note(s):

- Grade Level(s):
  - Grade 7 represented linear relationships using verbal descriptions, tables, graphs, and equations that simplify to the form $y = mx + b$.
  - Algebra I will write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points.
  - Algebra I will use, translate, and make connections among algebraic, tabular, graphical, or verbal descriptions of linear functions.
  - Algebra I will write linear equations with two variables given a table of values, a graph, and a verbal description.

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		◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships • TxCCRS: ◦ II.D. Algebraic Reasoning – Representing relationships • II.D.2. Convert among multiple representations of equations, inequalities, and relationships. ◦ 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 • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words.
8.5C	**Contrast bivariate sets of data that suggest a linear relationship with bivariate sets of data that do not suggest a linear relationship from a graphical representation.** ***Supporting Standard***	Contrast BIVARIATE SETS OF DATA THAT SUGGEST A LINEAR RELATIONSHIP WITH BIVARIATE SETS OF DATA THAT DO NOT SUGGEST A LINEAR RELATIONSHIP FROM A GRAPHICAL REPRESENTATION Including, but not limited to: • Data – information that is collected about people, events, or objects • Bivariate data – data relating two quantitative variables that can be represented by a scatterplot • Discrete paired data – data that involves only distinct values that are finite or countable • Scatterplot – a graphical representation used to display the relationship between discrete data pairs

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		◦ Characteristics of a scatterplot • Title clarifies the meaning of the data represented. • Subtitles clarify the meaning of data represented on each axis. • Numerical data represented with labels may be whole numbers, fractions, or decimals. • Points are not connected by a line. • Scale of the axes may be intervals of one or more, and scale intervals are proportionally displayed. ◦ The scales of the axes are number lines. • Linear relationship – a relationship with a constant rate of change represented by a graph that forms a straight line ◦ One quantity is dependent on the other ◦ Two quantities may be directly proportional to each other ◦ Can be classified as a positive or negative relationship ◦ Can be expressed as a pair of values that can be graphed as ordered pairs ◦ Graph of the ordered pairs matching the relationship will form a line • Characteristics of bivariate data that suggests a linear relationship ◦ Linear proportional relationship • Linear • 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

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		$m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$ • Characteristics of bivariate data that does not suggest a linear relationship ◦ Not linear ◦ Not represented by $y = kx$ or $y = mx + b$ ◦ No constant slope ◦ May or may not cross the origin (0, 0) Note(s): • Grade Level(s): ◦ Grade 8 introduces contrasting bivariate sets of data that suggest a linear relationship with bivariate sets of data that do not suggest a linear relationship from a graphical representation. ◦ Algebra I will calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships • TxCCRS: ◦ V.B. Statistical Reasoning – Describe data • V.B.4. Describe patterns and departure from patterns in the study of data. ◦ 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. ◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.1. Analyze given information.

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8.5D	**Use a trend line that approximates the linear relationship between bivariate sets of data to make predictions.** ***Readiness Standard***	Use A TREND LINE THAT APPROXIMATES THE LINEAR RELATIONSHIP BETWEEN BIVARIATE SETS OF DATA TO MAKE PREDICTIONS Including, but not limited to: • Bivariate data – data relating two quantitative variables that can be represented by a scatterplot • Characteristics of bivariate data that suggests a linear relationship ◦ Linear proportional relationship • Linear • 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 $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$ • Graph of data suggests a constant rate of change between the independent and dependent values ◦ Trend line – the line that best fits the data points of a scatterplot • A tool for making predictions by approximating the linear relationship between bivariate sets of data

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		• A trend line contains most of the data points and/or is situated so that the data points are evenly distributed above and below the line.
		• Given or collected data
		• Analysis of parts of data representation
		  ◦ Title
		  ◦ Labels
		  ◦ Scales
		  ◦ Graphed data
		• Predictions of independent value when given a dependent value using a trend line that approximates the linear relationship
		• Predictions of dependent value when given an independent value using a trend line that approximates the linear relationship
		
		Note(s):
		
		• Grade Level(s):
		  ◦ Grade 8 introduces using a trend line that approximates the linear relationship between bivariate sets of data to make predictions.
		  ◦ Algebra I will calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association.
		  ◦ Various mathematical process standards will be applied to this student expectation as appropriate.
		• TxRCFP:
		  ◦ Representing, applying, and analyzing proportional relationships
		• TxCCRS:
		  ◦ V.B. Statistical Reasoning – Describe data
		  • V.B.4. Describe patterns and departure from patterns in the study of data.
		  ◦ VI.C. Functions – Model real-world situations with functions
		  • VI.C.1. Apply known functions to model real-world situations.

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		◦ VII.A. Problem Solving and Reasoning – Mathematical problem solving • VII.A.1. Analyze given information. ◦ 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. ◦ 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.
8.5I	**Write an equation in the form *y* = *mx* + *b* to model a linear relationship between two quantities using verbal, numerical, tabular, and graphical representations.** ***Readiness Standard***	Write AN EQUATION IN THE FORM *y* = *mx* + *b* TO MODEL A LINEAR RELATIONSHIP BETWEEN TWO QUANTITIES USING VERBAL, NUMERICAL, TABULAR, AND GRAPHICAL REPRESENTATIONS 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* • *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*) • Linear relationship – a relationship with a constant rate of change represented by a graph that forms a straight line ◦ One quantity is dependent on the other ◦ Two quantities may be directly proportional to each other ◦ Can be classified as a positive or negative relationship ◦ Can be expressed as a pair of values that can be graphed as ordered pairs

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		◦ Graph of the ordered pairs matching the relationship will form a line ◦ 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 $m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$ • Equations in the form $y = mx + b$ to represent relationships between two quantities ◦ Rational number coefficients and constants ◦ Various representations • Verbal • Numerical • Tabular (horizontal/vertical) • Graphical Note(s): • Grade Level(s): ◦ Grade 7 represented linear relationships using verbal descriptions, tables, graphs, and equations that simplify to the form $y = mx + b$. ◦ Algebra I will write linear equations in two variables given a table of values, a graph, and a verbal description. ◦ Algebra I will use, translate, and make connections among algebraic, tabular, graphical, or verbal descriptions of linear functions. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Representing, applying, and analyzing proportional relationships

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TEKS# / SE#	TEKS	SPECIFICITY
		• TxCCRS: ◦ II.D. Algebraic Reasoning – Representing relationships • II.D.2. Convert among multiple representations of equations, inequalities, and relationships. ◦ 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 • VIII.C.1. Communicate mathematical ideas, reasoning, and their implications using symbols, diagrams, models, graphs, and words.
8.11	***Measurement and data. The student applies mathematical process standards to use statistical procedures to describe data. The student is expected to:***	
8.11A	**Construct a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data.** ***Supporting Standard***	Construct A SCATTERPLOT Including, but not limited to: • Graph – a visual representation of the relationships between data collected ◦ Organization of data used to describe and summarize data • Data – information that is collected about people, events, or objects ◦ Discrete paired data – data that involves only distinct values that are finite or countable • Limitations ◦ Various forms of positive and negative rational numbers within related data pairs

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		• Integers • Decimals • Fractions • Data representation ◦ Scatterplot – a graphical representation used to display the relationship between discrete data pairs • Characteristics of a scatterplot ◦ Titles and subtitles • Title represents the purpose of collected data • Subtitles clarify the meaning of the data represented on each axis ◦ First quadrant of coordinate plane • Number lines form *x*-axis and *y*-axis • Proportional increments • Intervals of one or more • Break between 0 and the first marked interval indicated in one or both axes to accommodate large numbers if necessary ◦ Ordered pairs • Pairs of data form each ordered pair • Points not connected by a line • Data pairs analyzed to find possible relationships between two sets of data ◦ Pairs of numbers collected to determine if a relationship exists between the two sets of data • Relationship between each data pair is discrete although the data itself could be either continuous or discrete in nature • Given or collected data • Bivariate data – data relating two quantitative variables that can be represented by a scatterplot Describe THE OBSERVED DATA ON A SCATTERPLOT TO ADDRESS QUESTIONS OF ASSOCIATION SUCH

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		AS LINEAR, NON-LINEAR, AND NO ASSOCIATION BETWEEN BIVARIATE DATA
		
		Including, but not limited to:
		
		• Discrete paired data – data that involves only distinct values that are finite or countable
		• Limitations
		  ◦ Various forms of positive and negative rational numbers within related data pairs
		  • Integers
		  • Decimals
		  • Fractions
		• Data representation
		  ◦ Scatterplot – a graphical representation used to display the relationship between discrete data pairs
		• Data pairs analyzed to find possible relationships between two sets of data
		  ◦ Pairs of numbers collected to determine if a relationship exists between the two sets of data
		• Relationship between each data pair is discrete although the data itself could be either continuous or discrete in nature
		• Given or collected data
		• Bivariate data – data relating two quantitative variables that can be represented by a scatterplot
		• Association within a scatterplot
		  ◦ Linear trend
		  • Positive trend
		  • Negative trend
		  ◦ Non-linear trend
		  ◦ No trend or no association
		
		Note(s):
		
		• Grade Level(s):

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		◦ Grade 5 represented discrete paired data on a scatterplot. ◦ Various mathematical process standards will be applied to this student expectation as appropriate. • TxRCFP: ◦ Making inferences from data • TxCCRS: ◦ III.C. Geometric and Spatial Reasoning – Connections between geometry and other mathematical content strands • III.C.2. Make connections between geometry, statistics, and probability. ◦ V.B. Statistical Reasoning – Describe data • V.B.2. Construct appropriate visual representations of data. • V.B.4. Describe patterns and departure from patterns in the study of data. ◦ V.C. Statistical Reasoning – Analyze, interpret, and draw conclusions from data • V.C.1. Analyze data sets using graphs and summary statistics. • V.C.2. Analyze relationships between paired data using spreadsheets, graphing calculators, or statistical software. ◦ VI.A. Functions – Recognition and representation of functions • VI.A.2. Recognize and distinguish between different types of functions. ◦ VI.B. Functions – Analysis of functions • VI.B.1. Understand and analyze features of functions. ◦ VIII.C. Communication and Representation – Presentation and representation of mathematical work • VIII.C.2. Create and use representations to organize, record, and communicate mathematical ideas. ◦ 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,

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		physical, and social sciences.

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.

Last Updated 08/01/2018