These student expectations will not be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.

5.1(A) apply mathematics to problems arising in everyday life, society, and the workplace;

5.1 (B) 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:

5.1 (C) 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;

5.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

5.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

5.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

5.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Reporting Category 1 Numerical Representations and Relationships 6 Questions

The student will demonstrate an understanding of how to represent and manipulate numbers and expressions.

(5.2) Number and operations. The student applies mathematical process standards to represent, compare, and order positive rational numbers and understand relationships as related to place value. The student is expected to

- (A) represent the value of the digit in decimals through the thousandths using expanded notation and numerals; Supporting Standard
- (B) compare and order two decimals to thousandths and represent comparisons using the symbols >, <, or =; and Readiness Standard
- (C) round decimals to tenths or hundredths. *Supporting*Standard

(5.4) Algebraic reasoning

The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:

- (A) identify prime and composite numbers; Supporting Standard
- (E) describe the meaning of parentheses and brackets in a numeric expression; and Supporting Standard
- (F) simplify numerical expressions that do not involve exponents, including up to two levels of grouping. Readiness Standard

Reporting Category 2
Computations and Algebraic Relationships
17 Questions

The student will demonstrate an understanding of how to perform operations and represent algebraic relationships.

- **(5.3) Number and operations.** The student applies mathematical process standards to develop and use strategies and methods for positive rational number computations in order to solve problems with efficiency and accuracy. The student is expected to:
- (A) estimate to determine solutions to mathematical and real-world problems involving addition, subtraction, multiplication, or division; *Supporting Standard*
- (B) multiply with fluency a three-digit number by a two-digit number using the standard algorithm; **Supporting Standard**
- (C) solve with proficiency for quotients of up to a four-digit dividend by a two-digit divisor using strategies and the standard algorithm; **Supporting Standard**
- (D) represent multiplication of decimals with products to the hundredths using objects and pictorial models, including area models; **Supporting Standard**
- (E) solve for products of decimals to the hundredths, including situations involving money, using strategies based on place-value understandings, properties of operations, and the relationship to the multiplication of whole numbers; Readiness Standard
- (F) represent quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using objects and pictorial models, including area models; Supporting Standard
- (G) solve for quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using strategies and algorithms, including the standard algorithm; Readiness Standard
- (H) represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations; Supporting Standard
- (I) represent and solve multiplication of a whole number and a fraction that refers to the same whole using objects and pictorial models, including area models; Supporting Standard
- (J) represent division of a unit fraction by a whole number and the division of a whole number by a unit fraction such as 1/3 ÷ 7 and 7 ÷ 1/3 using objects and pictorial models, including area models; Supporting Standard
- (K) add and subtract positive rational numbers fluently; and Readiness Standard
- (L) divide whole numbers by unit fractions and unit fractions by whole numbers. Readiness Standard
- **(5.4) Algebraic reasoning.** The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:
- **(B)** represent and solve multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity; **Readiness Standard**
- (C) generate a numerical pattern when given a rule in the form y = ax or y = x + a and graph; and **Readiness Standard**
- **(D)** recognize the difference between additive and multiplicative numerical patterns given in a table or graph. **Supporting Standard**

Reporting Category 3
Geometry and Measurement
9 Questions

The student will demonstrate an understanding of how to represent and apply geometry and measurement concepts.

- **(5.4) Algebraic reasoning.** The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:
- (H) represent and solve problems related to perimeter and/or area and related to volume.
 Readiness Standard
- **(5.5) Geometry and measurement.** The student applies mathematical process standards to classify two-dimensional figures by attributes and properties. The student is expected to:
- (A) classify two-dimensional figures in a hierarchy of sets and subsets using graphic organizers based on their attributes and properties. *Readiness Standard*
- **(5.6) Geometry and measurement.** The student applies mathematical process standards to understand, recognize, and quantify volume. The student is expected to:
- (A) recognize a cube with side length of one unit as a unit cube having one cubic unit of volume and the volume of a three-dimensional figure as the number of unit cubes (n cubic units) needed to fill it with no gaps or overlaps if possible; and Supporting Standard
- (B) determine the volume of a rectangular prism with whole number side lengths in problems related to the number of layers times the number of unit cubes in the area of the base. *Supporting Standard*
- **(5.7) Geometry and measurement.** The student applies mathematical process standards to select appropriate units, strategies, and tools to solve problems involving measurement. The student is expected to:
- (A) solve problems by calculating conversions within a measurement system, customary or metric. *Supporting Standard*
- **(5.8) Geometry and measurement.** The student applies mathematical process standards to identify locations on a coordinate plane. The student is expected to:
- (A) describe the key attributes of the coordinate plane, including perpendicular number lines (axes) where the intersection (origin) of the two lines coincides with zero on each number line and the given point (0, 0); the x-coordinate, the first number in an ordered pair, indicates movement parallel to the x-axis starting at the origin; and the y-coordinate, the second number, indicates movement parallel to the y-axis starting at the origin; **Supporting Standard**
- (B) describe the process for graphing ordered pairs of numbers in the first quadrant of the coordinate plane; and *Supporting Standard*
- (C) graph in the first quadrant of the coordinate plane ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table. *Readiness Standard*

Reporting Category 4
Data Analysis and Personal
Financial Literacy
4 Questions

The student will demonstrate an understanding of how to represent and analyze data and how to describe and apply personal financial concepts.

- **(5.9) Data analysis.** The student applies mathematical process standards to solve problems by collecting, organizing, displaying, and interpreting data. The student is expected to:
- (A) represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-and-leaf plots; Supporting Standard
- (B) represent discrete paired data on a scatterplot; and
- Supporting Standard

 (C) solve one- and two-step problems using data from a frequency table, dot plot, bar graph, stem-and-leaf plot, or scatterplot. Readiness
 Standard

(5.10) Personal financial literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:

- (A) define income tax, payroll tax, sales tax, and property tax; Supporting Standard
- (B) explain the difference between gross income and net income; Supporting Standard
- (E) describe actions that might be taken to balance a budget when expenses exceed income; and Supporting Standard
- (F) balance a simple budget. Supporting Standard



§111.7 Grade 5, Adopted 2012.

(a) Introduction.

- (1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.
- (2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will 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. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and pencil, and technology and techniques such as mental math, estimation, number sense, and generalization and abstraction to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical language in written or oral communication.
- (3) For students to become fluent in mathematics, students must develop a robust sense of number. The National Research Council's report, "Adding It Up," defines procedural fluency as "skill in carrying out procedures flexibly, accurately, efficiently, and appropriately." As students develop procedural fluency, they must also realize that true problem solving may take time, effort, and perseverance. Students in Grade 5 are expected to perform their work without the use of calculators.
- (4) The primary focal areas in Grade 5 are solving problems involving all four operations with positive rational numbers, determining and generating formulas and solutions to expressions, and extending measurement to area and volume. These focal areas are supported throughout the mathematical strands of number and operations, algebraic reasoning, geometry and measurement, and data analysis. In Grades 3-5, the number set is limited to positive rational numbers. In number and operations, students will apply place value and identify part-to-whole relationships and equivalence. In algebraic reasoning, students will represent and solve problems with expressions and equations of functions through patterning, identify prime and composite numbers, and use the order of operations. In geometry and measurement, students will classify two-dimensional figures, connect geometric attributes to the measures of three-dimensional figures, use units of measure, and represent location using a coordinate plane. In data analysis, students will represent and interpret data.
- (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and skills

Mathematical Process Standards

(5.1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

5.1(A) apply mathematics to problems rising in everyday life, society, and the workplace;

5.1 (B) 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;

5.1 (C) 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:

5.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

5.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

5.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

5.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Personal Financial Geometry and Measurement Numbers and Operations Algebraic Reasoning Data Anavsis Literacy (5.7) Geometry (5.2) Number and (5.3) Number and operations. The student applies mathematical process standards to (5.4) Algebraic reasoning. The student (5.5) Geometry (5.6) Geometry and (5.8) Geometry and 5.9) Data analysis (5.10) Personal measurement. The operations. The develop and use strategies and methods for positive rational number computations in applies mathematical process standards to measurement. The student The student financial literacy. The student applies order to solve problems with efficiency and accuracy. The student is expected to: develop concepts of expressions and measurement. student applies measurement applies mathematical applies student applies mathematical process equations. The student is expected to: The student mathematical The student process standards to identify mathematical mathematical process (A) estimate to determine solutions to mathematical and real-world problems involving standards to process standards to locations on a coordinate process standards standards to manage one's applies applies represent, compare, addition, subtraction, multiplication, or division; **Supporting Standard** (A) identify prime and composite mathematical understand, mathematica plane. The student is to solve problems financial resources and order positive numbers; Supporting Standard process standards recognize, and process expected to: by collecting, effectively for lifetime rational numbers and (B) multiply with fluency a three-digit number by a two-digit number using the standard to classify twoquantify volume. The standards to organizing, financial security. The understand algorithm: Supporting Standard (B) represent and solve multi-step dimensional student is expected (A) describe the key attributes student is expected to: select displaying, and problems involving the four of the coordinate plane. relationships as related figures by appropriate interpreting data to place value. The (C) solve with proficiency for quotients of up to a four-digit dividend by a two-digit divisor operations with whole numbers using attributes and including perpendicular The student is (A) define income tax, units, using strategies and the standard algorithm; Supporting Standard equations with a letter standing for A) recognize a cube number lines (axes) where payroll tax, sales tax, student is expected to properties. The strategies, and expected to: the unknown quantity; Readiness with side length of tools to solve the intersection (origin) of and property tax; student is (A) represent the (D) represent multiplication of decimals with products to the hundredths using objects the two lines coincides with Standard expected to one unit as a unit problems (A) represent Supporting value of the digit and pictorial models, including area models; Supporting Standard classify twocube having one involving zero on each number line categorical data Standard (C) generate a numerical pattern when cubic unit of and the given point (0, 0); in decimals dimensional measurement. with bar graphs or given a rule in the form y = ax or ythrough the (E) solve for products of decimals to the hundredths, including situations involving figures in a volume and the The student is the x-coordinate, the first frequency tables B) explain the difference x + a and graph; Readiness thousandths using money, using strategies based on place-value understandings, properties of hierarchy of sets volume of a threeexpected to number in an ordered pair. and numerical between gross income data, including expanded notation operations, and the relationship to the multiplication of whole numbers: **Readiness** Standard and subsets using dimensional figure solve problems indicates movement parallel and net income: and numerals: Standard graphic organizers as the number of by calculating to the x-axis starting at the data sets of Supporting Supporting (D) recognize the difference between based on their unit cubes (n cubic conversions origin; and the y-coordinate measurements in Standard Standard F) represent quotients of decimals to the hundredths, up to four-digit dividends and twoadditive and multiplicative numerical attributes and units) needed to fill within a the second number, fractions or patterns given in a table or graph; indicates movement parallel decimals, with dot (C) identify the digit whole number divisors, using objects and pictorial models, including area it with no gaps or measurement properties. (B) compare and models; Supporting Standard Supporting Standard Readiness overlaps if possible system, to the y-axis starting at the plots or stem-andadvantages and order two decimal Standard and Supporting customary or origin; Supporting disadvantages of leaf plots: to thousandths (G) solve for quotients of decimals to the hundredths, up to four-digit dividends and two-(E) describe the meaning of parentheses Standard Standard Supporting different methods of metric. digit whole number divisors, using strategies and algorithms, including the standard and brackets in a numeric Supporting Standard payment, including and represent expression; Supporting Standard (B) determine the (B) describe the process for comparisons using algorithm: Readiness Standard Standard check, credit card, the symbols volume of a graphing ordered pairs of (B) represent discrete debit card, and (H) represent and solve addition and subtraction of fractions with unequal denominators (F) simplify numerical expressions that rectangular prism paired data on a electronic payments; >, <, or =; and numbers in the first Readiness referring to the same whole using objects and pictorial models and properties of do not involve exponents, including with whole number quadrant of the coordinate scatterplot; and up to two levels of grouping; plane; and Supporting operations; Supporting Standard side lengths in Supporting (D) develop a system for Standard Readiness Standard problems related to Standard Standard keeping and using (C) round decimals to (I) represent and solve multiplication of a whole number and a fraction that refers to the the number of layers financial records; tenths or same whole using objects and pictorial models, including area models; Supporting (G) use concrete objects and pictorial times the number of **(C)** graph in the first quadrant (C) solve one- and hundredths (E) describe actions that models to develop the formulas for unit cubes in the of the coordinate plane two-step problems might be taken to Supporting the volume of a rectangular prism. area of the base. ordered pairs of numbers using data from a arising from mathematical Standard (J) represent division of a unit fraction by a whole number and the division of a whole including the special form for a cube Supporting frequency table, balance a budget number by a unit fraction such as $1/3 \div 7$ and $7 \div 1/3$ using objects and pictorial and real-world problems, $(V=I \times W \times h, V=s \times s \times s, and$ Standard dot plot, bar when expenses models, including area models; Supporting Standard V=Bh); and including those generated by exceed income; and graph, stem-and number patterns or found in Supportina leaf plot, or (K) add and subtract positive rational numbers fluently; and Readiness Standard (H) represent and solve problems related an input-output table scatterplot. Standard to perimeter and/or area and related Readiness Standard Readiness (L) divide whole numbers by unit fractions and unit fractions by whole numbers. to volume. Readiness Standard Standard (F) balance a simple budget. **Supporting** Readiness Standard Standard



These student expectations will not be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.

6.1(A) apply mathematics to problems arising in everyday life, society, and the workplace;

6.1 (B) 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;

6.1 (C) 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;

6.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

6.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

6.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

6.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Reporting Category 1 Numerical Representations and Relationships 10 Questions

The student will demonstrate an understanding of how to represent and manipulate numbers and expressions.

- **(6.2) Number and operations.** The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:
- (A) classify whole numbers, integers, and rational numbers using a visual representation such as a Venn diagram to describe relationships between sets of numbers; Supporting Standard
- (B) identify a number, its opposite, and its absolute value; Supporting Standard
- (C) locate, compare, and order integers and rational numbers using a number line; *Supporting Standard*
- (D) order a set of rational numbers arising from mathematical and real-world contexts; and *Readiness* Standard
- E) extend representations for division to include fraction notation such as a/b represents the same number as a ÷ b where b ≠ 0. Supporting Standard
- **(6.4) Proportionality.** The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:
- (C) give examples of ratios as multiplicative comparisons of two quantities describing the same attribute;
- Supporting Standard

 (D) give examples of rates as the comparison by division of
- two quantities having different attributes, including rates as quotients; **Supporting Standard**
- (E) represent ratios and percents with concrete models, fractions, and decimals; *Supporting Standard*
- (F) represent benchmark fractions and percents such as 1%, 10%, 25%, 33 1/3%, and multiples of these values using 10 by 10 grids, strip diagrams, number lines, and numbers; and Supporting Standard
- (G) generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that money. Readiness Standard
- **(6.5) Proportionality.** The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to
- (C) use equivalent fractions, decimals, and percents to show equal parts of the same whole. **Supporting Standard**
- **(6.7) Expressions, equations, and relationships.** The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:
- (A) generate equivalent numerical expressions using order of operations, including whole n umber exponents, and prime factorization; *Readiness Standard*
- (B) distinguish between expressions and equations verbally, numerically, and algebraically; **Supporting Standard**
- (C) determine if two expressions are equivalent using concrete models, pictorial models, and algebraic representations; and *Supporting Standard*
- (D) generate equivalent expressions using the properties of operations: inverse, identity, commutative, associative, and distributive properties. Readiness Standard

Reporting Category 2 Computations and Algebraic Relationships 15 Questions

The student will demonstrate an understanding of how to perform operations and represent algebraic relationships.

- **(6.3) Number and operations.** The student applies mathematical process standards to represent addition, subtraction, multiplication, and division while solving problems and <u>justifying solutions</u>. The student is expected to:
- (A) recognize that dividing by a rational number and multiplying by its reciprocal result in equivalent values; Supporting Standard
- (B) determine, with and without computation, whether a quantity is increased or decreased when multiplied by a fraction, including values greater than or less than one; Supporting Standard
- (C) represent integer operations with concrete models and connect the actions with the models to standardized algorithms; Supporting Standard
- (D) add, subtract, multiply, and divide integers fluently; and *Readiness Standard*
- (E) multiply and divide positive rational numbers fluently. Readiness Standard
- **(6.4) Proportionality.** The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:
- (A) compare two rules verbally, numerically, graphically, and symbolically in the form of y = ax or y = x + a in order to differentiate between additive and multiplicative relationships; and **Supporting Standard**
- (B) apply qualitative and quantitative reasoning to solve prediction and comparison of realworld problems involving ratios and rates. Readiness Standard
- **(6.5) Proportionality.** The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to:
- (A) represent mathematical and real-world problems involving ratios and rates using scale factors, tables, graphs, and proportions; and **Supporting Standard**
- (B) solve real-world problems to find the whole given a part and the percent, to find the part given the whole and the percent, and to find the percent given the part and the whole, including the use of concrete and pictorial models. **Readiness Standard**
- **(6.6) Expressions, equations, and relationships.** The student applies mathematical process standards to use multiple representations to describe algebraic relationships. The student is expected to:
- (A) identify independent and dependent quantities from tables and graphs; Supporting Standard
- (B) write an equation that represents the relationship between independent and dependent quantities from a table; and Supporting Standard
- (C) represent a given situation using verbal descriptions, tables, graphs, and equations in the form y = kx or y = x + b. **Readiness Standard**
- **(6.9) Expressions, equations, and relationships.** The student applies mathematical process standards to use equations and inequalities to represent situations. The student is expected to:
- (A) write one-variable, one-step equations and inequalities to represent constraints or conditions within problems; *Supporting Standard*
- (B) represent solutions for one-variable, one-step equations and inequalities on number lines; and Supporting Standard
- (C) write corresponding real-world problems given one-variable, one-step equations or inequalities. Supporting Standard
- **(6.10) Expressions, equations, and relationships.** The student applies mathematical process standards to use equations and inequalities to solve problems. The student is expected to
- (A) model and solve one-variable, one-step equations and inequalities that represent problems, including geometric concepts; and *Readiness Standard*
- **(B)** determine if the given value(s) make(s) one-variable, one-step equations or inequalities true. **Supporting Standard**

Reporting Category 3
Geometry and Measurement
6 Questions

The student will demonstrate an understanding of how to represent and apply geometry and measurement concepts.

- (6.4) Proportionality. The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:
- (H) convert units within a measurement system, including the use of proportions and unit rates. **Readiness Standard**
- (6.8) Expressions, equations, and relationships. The student applies mathematical process standards to use geometry to represent relationships and solve problems. The student is expected to:
- (A) extend previous knowledge of triangles and their properties to include the sum of angles of a triangle, the relationship between the lengths of sides and measures of angles in a triangle, and determining when three lengths form a triangle;

 Supporting Standard
- (B) model area formulas for parallelograms, trapezoids, and triangles by decomposing and rearranging parts of these shapes; Supporting Standard
- (C) write equations that represent problems related to the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers; and *Supporting*Standard
- (D) determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers.

 Readiness Standard

(6.11) Measurement and data. The student applies mathematical process standards to use coordinate geometry to identify locations on a plane. The student is expected to:

(A) graph points in all four quadrants using ordered pairs of rational numbers. **Readiness Standard**

Reporting Category 4
Data Analysis and Personal Financial Literacy
7 Questions

The student will demonstrate an understanding of how to represent and analyze data and how to describe and apply personal financial concepts.

- **(6.12) Measurement and data.** The student applies mathematical process standards to use numerical or graphical representations to analyze problems. The student is expected to:
- (A) represent numeric data graphically, including dot plots, stemand-leaf plots, histograms, and box plots; **Supporting**
- (B) use the graphical representation of numeric data to describe the center, spread, and shape of the data distribution; Supporting Standard
- (C) summarize numeric data with numerical summaries, including the mean and median (measures of center) and the range and interquartile range (IQR) (measures of spread), and use these summaries to describe the center, spread, and shape of the data distribution; and **Readiness Standard**
- (D) summarize categorical data with numerical and graphical summaries, including the m ode, the percent of values in each category (relative frequency table), and the percent bar graph, and use these summaries to describe the data distribution. Readiness Standard

(6.13) Measurement and data. The student applies mathematical process standards to use numerical or graphical representations to solve problems. The student is expected to:

- (A) interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots; and Readiness Standard
- (B) distinguish between situations that yield data with and without variability. **Supporting Standard**
- **(6.14) Personal financial literacy.** The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:
- (A) compare the features and costs of a checking account and a debit card offered by different local financial institutions; **Supporting Standard**
- (B) distinguish between debit cards and credit cards; **Supporting Standard**
- (C) balance a check register that includes deposits, withdrawals, and transfers; Supporting Standard
 (E) describe the information in a credit report and how long it is
- retained; **Supporting Standard**(F) describe the value of credit reports to borrowers and to
- lenders; **Supporting Standard**(G) explain various methods to pay for college, including thr
- (G) explain various methods to pay for college, including through savings, grants, scholarships, student loans, and work-study; and Supporting Standard
- (H) compare the annual salary of several occupations requiring various levels of post-secondary education or vocational training and calculate the effects of the different annual salaries on lifetime income. *Supporting Standard*

§111.26. Grade 6, Adopted 2012.

(a) Introduction.

- (1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.
- (2) The process standards describe ways in which students are expected to engage in the content. The placement of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and technology are the technolo mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- (3) The primary focal areas in Grade 6 are number and operations; proportionality; expressions, equations, and relationships; and measurement and data. Students use concepts, algorithms, and properties of rational numbers to explore mathematical relationships and to describe increasingly complex situations. Students use concepts of proportionality to explore, develop, and communicate mathematical relationships to describe how a change in one quantity in a relationship results in a change in the other. Students connect verbal, numeric, graphic, and symbolic representations of relationships, including equations and inequalities. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, and reasoning to draw conclusions, evaluate arguments, and make recommendations. While the use of all types of technology is important, the emphasis on algebra readiness skills necessitates the implementation of graphing technology.
- (4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and Skills.

Mathematical Process Standards (6.1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

applies

involvina

6.1(A) apply mathematics to problems arising in everyday life, society, and the workplace:

6.1 (B) 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:

6.1 (C) 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

(6.6) The

process

multiple

to describe

relationships

The student is

expected to:

(A) identify

the

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tables,

equations in

the form

y = kx or

v = x + b.

Readiness

Standard

situation

independent

dependent

quantities

from tables

algebraic

student applies

standards to use

representations

mathematical

6.1 (D) communicate mathematical ideas. reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate:

6.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

(6.9) The

process

student applies

standards to use

equations and

inequalities to

situations. The

expected to:

(A) write one

and

variable.

one-ster

equations

inequalities

to represent

constraints

conditions

problems

Standard

represent

variable,

one-step

and

(C) write

equations

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Supporting

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mathematical

6.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas: and

6.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Numbers and Operations applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to: (A) classify whole numbers, integers, and rational numbers using a visual representation such as a Venn diagram to describe relationships

numbers: Supporting Standard

B) identify a number, its opposite, and its absolute value: Supporting Standard (C) locate, compare, and

between sets of

order integers and rational numbers using a number line: Supporting Standard

(D) order a set of rational numbers arising from mathematical and real-world contexts: and **Readiness** Standard

) extend representations for division to include fraction notation such as a/b represents the same number as a ÷ b where $b \neq 0$. Supporting Standard

(6.3) The student applies mathematical process standards to represent addition. subtraction, multiplication, and division while solving problems and justifying

solutions. The student is

expected to: (A) recognize that dividing by a rational number and multiplying by its reciprocal result in equivalent values: Supporting

Standard determine, with and without computation whether a quantity is increased or decreased when multiplied by a fraction, including values greater than

or less than one: Supporting Standard

(C) represent integer operations with concrete models and connect the actions with the models to standardized algorithms: Supporting

Standard **D)** add, subtract. multiply, and divide integers fluently; and **Readiness** Standard

(E) multiply and divide positive rational numbers fluently Readiness Standard

(6.4) The student applies nathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected

(A) compare two rules verbally, numerically, graphically, and symbolically in the form of v ax or y = x + a in order todifferentiate between additive and multiplicative relationships: Supporting Standard

(B) apply qualitative and quantitative reasoning to solve prediction and comparison of real-world problems involving ratios and rates; Readiness Standard

give examples of ratios as multiplicative comparisons of two quantities describing the same attribute: Supporting Standard

(D) give examples of rates as the comparison by division of two quantities having different attributes, including rates as quotients; Supporting Standard

(E) represent ratios and percents with concrete models, fractions and decimals; Supporting Standard

represent benchmark fractions and percents such as 1%, 10% 25%, 33 1/3%, and multiples of these values using 10 by 10 grids, strip diagrams, number lines, and numbers:

Supporting Standard **G)** generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money; and Readiness Standard

H) convert units within a measurement system, including the use of proportions and unit rates. Readiness Standard

(6.5) The student mathematical process standards to solve problems proportional relationships. The

> represent mathematical and real-world problems involving ratios and rates using scale factors. tables, graphs, and proportions;

Supporting

Standard

student is expected

B) solve real-world problems to find the whole given a part and the percent, to find the part given the whole and the percent. and to find the percent given the part and th whole, including the use of concrete and pictorial

models: and Readiness Standard use equivalent fractions. decimals, and percents to show equal parts of the same whole Supporting

Standard

(6.7) The student lies mathematical process standards to develop concepts of expressions and equations. The student is expected

(A) generate equivalent numerical expressions using order of operations including whole number exponents and factorization: Readiness

and graphs Standard Supporting (B) distinguish Standard hetween write an expressions and equation equations verhally represents numerically and relationship algebraically; Readiness between Standard independent (C) determine if two

expressions are dependent equivalent auantities using concrete models table: and pictorial Supporting models, and Standard algebraic (C) represent a representations; Supporting Standard using verba (D) generate descriptions, equivalent graphs, and

expressions using the properties of operations: identity, commutative. associative, an distributive properties.

Expressions, Equations, and Relationships (6.8) The student applies hematical process standards to use geometry to represent relationships and solve problems. The student is expected to: (A) extend previous

knowledge of triangles and their properties to include the sum of angles of a triangle, the relationship between the lengths of sides and measures of angles in a triangle. and determining when three lengths form a triangle; Supporting Standard

model area formulas for parallelograms, trapezoids, and triangles by decomposing and rearranging parts of these shapes: Supporting Standard (C) write equations that

represent problems related to the area of rectangles. parallelograms trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers: and Supporting

Standard (D) determine solutions for problems involving the area of rectangles parallelograms trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rationa numbers. Readiness Standard

(6.10) The student applies mathematical process standards to use equations and inequalities to solve problems. The student is

(6.11) The

mathematica

standards to

use coordinate

geometry to

locations on a

plane. The

student is

n all four

quadrants

pairs of

rational

numbers

Readiness

Standard

expected to

graph points

using ordered

student

applies

process

identify

expected to: (A) model and solve onevariable. one-step equations and inequalities that represent problems including aeometric concepts;

Readiness Standard (B) determine if the given value(s) make(s) onevariable. one-step equations inequalities

true.

Supporting

(6.12) The student applies mathematical process standards to use numerical or graphical representations to analyze problems. The student is expected to A) represent numeric data graphically, including

Measurement and Data

dot plots, stem-andleaf plots, histograms, and box plots: Supporting Standard use the graphical representation of numeric data to describe the center. spread, and shape of the data distribution;

(C) summarize numeric data with numerical summaries, including the mean and median (measures of center) and the range and interquartile range (IQR) (measures of spread), and use these summaries to describe the center, spread, and shape of the data distribution; and Readiness Standard

Supporting Standard

summarize categorica data with numerical and graphical summaries, including the mode, the percent of values in each category (relative frequency table), and the percent bar graph and use these

summaries to describe

Readiness Standard

the data distribution

(6.13) The student applies mathematical process standards to use numerical or graphical representations to solve problems. The student is

expected to: (A) interpret numeric summarized in dot plots stem-andleaf plots, histograms, and box plots: and Readiness Standard

distinguish

between situations that yield data with and without variability. Supporting Standard

(6.14) The student applies nathematical process standards to develop an economic way of thinking and problem solving useful in one life as a knowledgeable consumer and investor. The student is expected to: (A) compare the features and

Personal Financial Literacy

costs of a checking account and a debit card offered by different local financial institutions Supporting Standard

(B) distinguish between debit cards and credit cards: Supporting Standard

(C) balance a check register that includes deposits, withdrawals, and transfers; Supporting Standard

(D) explain why it is important to establish a positive credit history; (E) describe the information in a credit report and

how long it is retained: Supporting Standard (F) describe the value of credit reports to borrowers and to lenders; Supporting

(G) explain various methods to pay for college. including through savings, grants scholarships, student loans, and work-study: and Supporting Standard

Standard

(H) compare the annual salary of several occupations requiring various levels of post-secondary education or vocational training and calculate the effects of the different annual salaries on lifetime income Supporting Standard



These student expectations will not be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.

7.1(A) apply mathematics to problems arising in everyday life, society, and the workplace;

7.1 (B) 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:

7.1 (C) 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;

7.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

7.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

7.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

7.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Reporting Category 1 Probability and Numerical Representations 6 Questions

The student will demonstrate an understanding of how to represent probabilities and numbers.

- **(7.2) Number and Operations.** The student applies mathematical process standards to represent and use rational numbers in a variety of forms.
 - (A) The student is expected to extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of rational numbers. **Supporting Standard.**
- **(7.6) Proportionality.** The student applies mathematical process standards to use probability and statistics to describe or solve problems involving proportional relationships. The student is expected to:
 - (A) represent sample spaces for simple and compound events using lists and tree diagrams. **Supporting Standard**
 - (C) make predictions and determine solutions using experimental data for simple and compound events. **Supporting Standard**
 - (D) make predictions and determine solutions using theoretical probability for simple and compound events. **Supporting Standard**
 - (E) find the probabilities of a simple event and its complement and describe the relationship between the two. **Supporting Standard**
 - (H) solve problems using qualitative and quantitative predictions and comparisons from simple experiments. Readiness Standard
 - (I) determine experimental and theoretical probabilities related to simple and compound events using data and sample spaces. **Readiness Standard**

Reporting Category 2 Computations and Algebraic Relationships 15 Questions

The student will demonstrate an understanding of how to perform operations and represent algebraic relationships.

- **(7.3) Number and Operations.** The student applies mathematical process standards to add, subtract, multiply, and divide while solving problems and justifying solutions. The student is expected to:
 - (A) add, subtract, multiply, and divide rational numbers fluently; and Supporting Standard
 - (B) apply and extend previous understandings of operations to solve problems using addition, subtraction, multiplication, and division of rational numbers. *Readiness Standard*
- **(7.4) Proportionality.** The student applies mathematical process standards to represent and solve problems involving proportional relationships. The student is expected to:
 - (A) represent constant rates of change in mathematical and real-world problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations, including d = rt; *Readiness Standard*
 - **(B)** calculate unit rates from rates in mathematical and real-world problems; **Supporting Standard**
 - (C) determine the constant of proportionality (k = y/x) within mathematical and real-world problems; and **Supporting Standard**
 - (D) solve problems involving ratios, rates, and percents, including multistep problems involving percent increase and percent decrease, and financial literacy problems. **Readiness Standard**
- **(7.7) Expressions, equations, and relationships.** The student applies mathematical process standards to represent linear relationships using multiple representations. The student is expected to:
 - (A) represent linear relationships using verbal descriptions, tables, graphs, and equations that simplify to the form y = mx + b.

 Readiness Standard
- **(7.10) Expressions, equations, and relationships.** The student applies mathematical process standards to use one-variable equations and inequalities to represent situations. The student is expected to:
 - (A) write one-variable, two-step equations and inequalities to represent constraints or conditions within problems; Supporting Standard
 - **(B)** represent solutions for one-variable, two-step equations and inequalities on number lines; and **Supporting Standard**
 - (C) write a corresponding real-world problem given a one-variable, two-step equation or inequality. **Supporting Standard**
- **(7.11) Expressions, equations, and relationships.** The student applies mathematical process standards to solve one-variable equations and inequalities. The student is expected to:
 - (A) model and solve one-variable, two-step equations and inequalities; and *Readiness Standard*
 - **(B)** determine if the given value(s) make(s) one-variable, two-step equations and inequalities true. **Supporting Standard**

Reporting Category 3
Geometry and Measurement
12 Questions

The student will demonstrate an understanding of how to represent and apply geometry and measurement concepts.

- **(7.4) Proportionality.** The student applies mathematical process standards to represent and solve problems involving proportional relationships. The student is expected to:
 - **(E)** convert between measurement systems, including the use of proportions and the use of unit rates. **Supporting Standard**
- **(7.5) Proportionality.** The student applies mathematical process standards to use geometry to describe or solve problems involving proportional relationships. The student is expected to:
 - (A) generalize the critical attributes of similarity, including ratios within and between similar shapes; Supporting Standard
 - (B) describe π as the ratio of the circumference of a circle to its diameter; and **Supporting Standard**
 - (C) solve mathematical and real-world problems involving similar shape and scale drawings. Readiness Standard
- **(7.9) Expressions, equations, and relationships.** The student applies mathematical process standards to solve geometric problems. The student is expected to:
 - (A) solve problems involving the volume of rectangular prisms, triangular prisms, rectangular pyramids, and triangular pyramids. **Readiness Standard**
 - **(B)** determine the circumference and area of circles. *Readiness Standard*
 - (C) determine the area of composite figures containing combinations of rectangles, squares, parallelograms, trapezoids, triangles, semicircles, and quarter circles. *Readiness Standard*
 - (D) solve problems involving the lateral and total surface area of a rectangular prism, rectangular pyramid, triangular prism, and triangular pyramid by determining the area of the shape's net.

 Supporting Standard
- **(7.11) Expressions, equations, and relationships.** The student applies mathematical process standards to solve one-variable equations and inequalities. The student is expected to:
 - (C) write and solve equations using geometry concepts, including the sum of the angles in a triangle, and angle relationships. Supporting Standard

Reporting Category 4
Data Analysis and Personal Financial Literacy
7 Questions

The student will demonstrate an understanding of how to represent and analyze data and how to describe and apply personal financial concepts.

- **(7.6) Proportionality.** The student applies mathematical process standards to use probability and statistics to describe or solve problems involving proportional relationships. The student is expected to:
- (G) solve problems using data represented in bar graphs, dot plots, and circle graphs, including part-to- whole and part-to-part comparisons and equivalents.

 Readiness Standard
- (7.12) Measurement and data. The student applies mathematical process standards to use statistical representations to analyze data. The student is expected to:
 - (A) compare two groups of numeric data using comparative dot plots or box plots by comparing their shapes, centers, and spreads; *Readiness Standard*
 - **(B)** use data from a random sample to make inferences about a population; and **Supporting Standard**
 - (C) compare two populations based on data in random samples from these populations, including informal comparative inferences about differences between the two populations. **Supporting Standard**
- **(7.13) Personal financial literacy.** The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:
- (A) calculate the sales tax for a given purchase and calculate income tax for earned wages; **Supporting Standard**
- (B) identify the components of a personal budget, including income; planned savings for college, retirement, and emergencies; taxes; and fixed and variable expenses, and calculate what percentage each category comprises of the total budget;

 Supporting Standard
- (C) create and organize a financial assets and liabilities record and construct a net worth statement; Supporting Standard
- (D) use a family budget estimator to determine the minimum household budget and average hourly wage needed for a family to meet its basic needs in the student's city or another large city nearby;

 Supporting Standard
- **(E)** calculate and compare simple interest and compound interest earnings; and **Supporting Standard**
- (F) analyze and compare monetary incentives, including sales, rebates, and coupons. Supporting Standard

§111.27. Grade 7, Adopted 2012.

(a) Introduction.

- (1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.
- (2) The process standards describe ways in which students are expected to engage in the content. The placement of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and technology are technology and technology and technology are technology are technology and technology are technology and technology are technology ar mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- (3) The primary focal areas in Grade 7 are number and operations; proportionality; expressions, equations, and relationships; and measurement and data. Students use concepts, algorithms, and properties of rational numbers to explore mathematical relationships and to describe increasingly complex situations. Students use concepts of proportionality to explore, develop, and communicate mathematical relationships, including number, geometry and measurement, and statistics and probability. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a change in the other. Students connect verbal, numeric, graphic, and symbolic representations of relationships, including equations and inequalities. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, and reasoning to draw conclusions, evaluate arguments, and make recommendations. While the use of all types of technology is important, the emphasis on algebra readiness skills necessitates the implementation of graphing technology.
- (4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and Skills

Mathematical Process Standards

(7.1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

7.1(A) apply mathematics to problems arising in everyday life, society, and the workplace;

7.1 (B) 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

7.1 (C) select tools, including real objects, nanipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve

7.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

mathematical

standards to

relationships

using multiple

representations

The student is

represent linear

expected to

relationships

using verbal

descriptions,

tables, graphs

and equations

that simplify to

 $\prime = mx + b$

Readiness

Standard

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process

7.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

7.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

7.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Number and Operations (7.2) The student applies mathematical process standards to represent and use rational numbers in variety of forms. The student is expected to extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of rational numbers.

Supporting

Standard.

(**7.3**) The student applies mathematical process standards to add, subtract, multiply, and divide while solving problems and justifying solutions. The student is (A) add, and

expected to: subtract, multiply, and divide numbers fluently; Supporting Standard (B) apply and extend previous understandi ngs of operations to solve problems using addition, subtraction multiplicati on and division of rational numbers.

Readiness

Standard

- (7.4) The student applies mathematical process standards to represent and solve problems involving proportional relationships. The student is expected to: (A) represent constant rates
 - of change in mathematical and realworld problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations, including d = rt;
- Readiness Standard B) calculate unit rates from rates in mathematical and real-world problems; Supporting Standard
- (C) determine the constant of proportionality (k = y/x) within mathematical and realworld problems; and Supporting Standard
- **D)** solve problems involving ratios, rates, and percents, including multi-step problems involving percent increase and percent decrease, and financial literacy problems.
- Readiness Standard convert between measurement systems, including the use of proportions and the use of unit rates. Supporting Standard

(7.5) The student applies mathematical process standards to use geometry to describe or solve problems involving proportional relationships. The student is expected

Proportionality

- (A) generalize the critical attributes of similarity, including ratios within and between similar shapes; Supporting
- (B) describe π as the ratio of the circumference of a circle to its diameter; and Supporting Standard

Standard

(C) solve mathematical and real-world problems involving similar shape and scale drawings. Readiness Standard

- (7.6) The student applies mathematical process standards to use probability and statistics to describe or solve problems involving proportional relationships. The student is expected to:
- (A) represent sample spaces for simple and compound events using lists and tree diagrams
- Supporting Standard
- (B) select and use different simulations to represent simple and compound events with and without technology
- (C) make predictions and determine solutions using experimental data for simple and compound events.

Supporting Standard

- (D) make predictions and determine solutions using theoretical probability for simple and compound events.
- Supporting Standard
- (E) find the probabilities of a simple event and its complement and describe the relationship between the two. **Supporting Standard**
- (F) use data from a random sample to make inferences about a population. Supporting Standard
- (G) solve problems using data represented in bar graphs, dot plots, and circle graphs, including part-towhole and part-to-part comparisons

and equivalents. Readiness Standard

- (H) solve problems using qualitative and quantitative predictions and comparisons from simple experiments. Readiness Standard
- determine experimental and theoretical probabilities related to simple and compound events using data and sample spaces. Readiness Standard

(7.8) The student (7.7) The student applies applies

- mathematical process standards to develop geometric relationships with volume. The student is expected to:
- (A) model the relationship between the volume of a rectangular prism and a rectangular pyramid having both congruent bases and heights and connect that relationship to
- the formulas: (B) explain verbally symbolically the relationship between the volume of a triangular prism and a triangular pyramid having both congruent hases and heights and connect that relationship to the formulas;
- **(C)** use models to determine the approximate formulas for the circumference and area of a circle and connect the models to the actual formulas

(7.9) The student applies mathematical process standards to solve geometric problems. The student is expected to:

Expressions, Equations, and Relationships

student applies

process standards

to use one-variable

mathematical

equations and

inequalities to

situations. The

(A) write one-

student is expected

variable, two-

step equations

inequalities to

represent

- (A) solve problems involving the volume of rectangular prisms, triangular prisms rectangular pyramids, and triangular pyramids. Readiness
- Standard represent (B) determine the constraints or circumference and conditions area of circles. within problems Standard Supporting (C) determine the area Standard of composite (B) represent
- solutions for figures containing combinations of one-variable, rectangles, two-step squares, equations and inequalities on parallelograms, trapezoids, number lines; triangles, Supporting semicircles, and quarter circles. Standard Readiness (C) write a Standard (D) solve problems

net. **Supporting**

Standard

corresponding real-world involving the latera problem given and total surface a onevariable, tworectangular prism, step equation rectangular or inequality. pyramid, triangular Supporting prism, and Standard triangular pyramid by determining the area of the shape's

(7.11) The student mathematical process standards to solve onevariable equations and inequalities. The student is expected to:

make(s) one-

variable, two-

step equations

inequalities

Supportina

Standard

write and

- (A) model and solve one-(A) compare two variable, two groups of step equations numeric data using inequalities: comparative dot plots or box Readiness plots by Standard comparing their determine if shapes, centers the given and spreads;
 - Standard B) use data from a random sample to make inferences about a population; and **Supporting** Standard (C) compare two
 - populations based on data in equations usina random samples geometry from these concepts, populations, including the including sum of the informal angles in a comparative triangle, and inferences about angle differences relationships between the two Supporting populations Standard Supporting Standard

(7.13) Personal financial Measurement and literacy. The student applies data. The student mathematical process standards applies mathematica to develop an economic way of process standards to thinking and problem solving use statistical useful in one's life as a representations to knowledgeable consumer and analyze data. The investor. The student is expected student is expected

Measurement

and Data

(A) calculate the sales tax for a given purchase and calculate income tax for earned wages; Supporting Standard (B) identify the components of a

Personal Financial

- personal budget, including income; planned savings for college, retirement, and emergencies; taxes; and fixed and variable expenses percentage each category comprises of the total budget; **Supporting** Standard
- (C) create and organize a financial assets and liabilities record and construct a net worth statement Supporting Standard
- (D) use a family budget estimator to determine the minimum household budget and average hourly wage needed for a family to meet its basic needs in the student's city or another large city nearby; Supporting Standard
- (E) calculate and compare simple interest and compound interest earnings; and Supporting Standard
- (F) analyze and compare monetary incentives, including sales, rebates, and coupons. Supporting Standard



These student expectations will not be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.

8.1(A) apply mathematics to problems arising in everyday life, society, and the workplace;

8.1 (B) 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;

8.1 (C) 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;

8.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

8.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

8.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

8.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Reporting Category 1 Numerical Representations and Relationships 4 Questions

The student will demonstrate an understanding of how to represent and manipulate numbers and expressions.

- **(8.2) Number and operations.** The student
 applies mathematical process
 standards to represent and use
 real numbers in a variety of
 forms. The student is expected
 to:
- (A) extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of real numbers; Supporting Standard
- (B) approximate the value of an irrational number, including p and square roots of numbers less than 225, and locate that rational number approximation on a number line; Supporting Standard
- (C) convert between standard decimal notation and scientific notation; and Supporting Standard
- (D) order a set of real numbers arising from mathematical and realworld contexts. Readiness Standard

Reporting Category 2
Computations and Algebraic Relationships
16 Questions

The student will demonstrate an understanding of how to perform operations and represent algebraic relationships.

- **(8.4) Proportionality.** The student applies mathematical process standards to explain proportional and non-proportional relationships involving slope. The student is
- (A) 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; **Supporting Standard**
- (B) graph proportional relationships, interpreting the unit rate as the slope of the line that models the relationship; and *Readiness Standard*
- **(C)** 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**
- **(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:
- (A) represent linear proportional situations with tables, graphs, and equations in the form of y = kx; **Supporting Standard**
- **(B)** represent linear non-proportional situations with tables, graphs, and equations in the form of y = mx + b, where $b \neq 0$; **Supporting Standard**
- (E) solve problems involving direct variation; Supporting Standard
- **(F)** distinguish between proportional and non-proportional situations using tables, graphs, and equations in the form y = kx or y = mx + b, where $b \neq 0$; **Supporting Standard**
- (G) identify functions using sets of ordered pairs, tables, mappings, and graphs; Readiness Standard
- (H) identify examples of proportional and non-proportional functions that arise from mathematical and real-world problems; and **Supporting Standard**
- (I) 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**
- **(8.8) Expressions, equations, and relationships.** The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to:
 - (A) write one-variable equations or inequalities with variables on both sides that represent problems using rational number coefficients and constants; **Supporting Standard**
 - (B) write a corresponding real-world problem when given a one-variable equation or inequality with variables on both sides of the equal sign using rational number coefficients and constants; and Supporting Standard
 - (C) model and solve one-variable equations with variables on both sides of the equal sign that represent mathematical and real-world problems using rational number coefficients and constants. *Readiness Standard*
- **(8.9) Expressions, equations, and relationships.** The student applies mathematical process standards to use multiple representations to develop foundational concepts of simultaneous linear equations. The student is expected to:
- (A) identify and verify the values of x and y that simultaneously satisfy two linear equations in the form y = mx + b from the intersections of the graphed equations. **Supporting Standard**

Reporting Category 3
Geometry and Measurement
15 Questions

The student will demonstrate an understanding of how to represent and apply geometry and measurement concepts.

(8.3) Proportionality. The student applies mathematical process standards to use proportional relationships to describe dilations. The student is expected to:

(A) generalize that the ratio of corresponding sides of similar shapes are

- proportional, including a shape and its dilation; **Supporting Standard**(B) compare and contrast the attributes of a shape and its dilation(s) on a coordinate plane; and **Supporting Standard**
- (C) use an algebraic representation to explain the effect of a given positive rational scale factor applied to two-dimensional figures on a coordinate plane with the origin as the center of dilation. **Readiness Standard**
- **(8.6) Expressions, equations, and relationships.** The student applies mathematical process standards to develop mathematical relationships and make connections to geometric formulas. The student is expected to:
- (A) describe the volume formula V = Bh of a cylinder in terms of its base area and its height; and **Supporting Standard**
- (C) use models and diagrams to explain the Pythagorean theorem. **Supporting**Standard
- **(8.7) Expressions, equations, and relationships.** The student applies mathematical process standards to use geometry to solve problems. The student is expected to:
 - (A) solve problems involving the volume of cylinders, cones, and spheres;Readiness Standard
 - (B) use previous knowledge of surface area to make connections to the formulas for lateral and total surface area and determine solutions for problems involving rectangular prisms, triangular prisms, and cylinders; *Readiness Standard*
 - C) use the Pythagorean theorem and its converse to solve problems; and Readiness Standard
- **(D)** determine the distance between two points on a coordinate plane using the Pythagorean theorem. **Supporting Standard**
- **(8.8) Expressions, equations, and relationships.** The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to:
- (D) use informal arguments to establish facts about the angle sum and exterior angle of triangles, the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *Supporting Standard*
- **(8.10) Two-dimensional shapes.** The student applies mathematical process standards to develop transformational geometry concepts. The student is expected to:
- (A) generalize the properties of orientation and congruence of rotations, reflections, translations, and dilations of two-dimensional shapes on a coordinate plane; Supporting Standard
- (B) differentiate between transformations that preserve congruence and those that do not; Supporting Standard
- (C) explain the effect of translations, reflections over the x- or y-axis, and rotations limited to 90°, 180°, 270°, and 360° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation; and **Readiness Standard**
- (D) model the effect on linear and area measurements of dilated two-dimensional shapes. Supporting Standard

Reporting Category 4
Data Analysis and Personal Financial Literacy
7 Questions

The student will demonstrate an understanding of how to represent and analyze data and how to describe and apply personal financial concepts.

- **(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:
- (C) 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; and Supporting Standard
- (D) use a trend line that approximates the linear relationship between bivariate sets of data to make predictions. **Readiness Standard**
- **(8.11) Measurement and data.** The student applies mathematical process standards to use statistical procedures to describe data. The student is expected to:
 - (A) construct a scatterplot and d escribe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data; and Supporting Standard
 - (B) determine the mean absolute deviation and use this quantity as a measure of the average distance data are from the mean using a data set of no more than 10 data points. Supporting Standard
- **(8.12) Personal financial literacy.** The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:
- (A) solve real-world problems comparing how interest rate and loan length affect the cost of credit; Supporting Standard
- (C) explain how small amounts of money invested regularly, including money saved for college and retirement, grow over time; **Supporting Standard**
- (D) calculate and compare simple interest and compound interest earnings; and *Readiness* Standard
- (G) estimate the cost of a two-year and four-year college education, including family contribution, and devise a periodic savings plan for accumulating the money needed to contribute to the total cost of attendance for at least the first year of college. *Supporting Standard*

§111.27. Grade 8, Adopted 2012.

(a) Introduction.

- (1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.
- (2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will 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. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and pencil, and technology and techniques such as mental math, estimation, number sense, and generalization and abstraction to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical language in written or oral communication.
- (3) The primary focal areas in Grade 8 are proportionality; expressions, equations, relationships, and foundations of functions; and measurement and data. Students use concepts, algorithms, and properties of real numbers to explore mathematical relationships and to describe increasingly complex situations. Students use concepts of proportionality to explore, develop, and communicate mathematical relationships. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a change in the other. Students connect verbal, numeric, graphic, and symbolic representations of relationships, including equations and inequalities. Students begin to develop an understanding of functional relationships. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, and reasoning to draw conclusions, evaluate arguments, and make recommendations. While the use of all types of technology is important, the emphasis on algebra readiness skills necessitates the implementation of graphing technology.
- (4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (b) Knowledge and Skills

Mathematical Process Standards (8.1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to: **8.1(A)** apply mathematics to problems **8.1 (B)** use a problem-solving model that 8.1 (C) select tools, including real objects, 8.1 (D) communicate mathematical ideas, **8.1 (E)** create and use representations to **8.1 (F)** analyze mathematical relationships 8.1 (G) display, explain, and justify arising in everyday life, society, and the incorporates analyzing given information, manipulatives, paper and pencil, and reasoning, and their implications using organize, record, and communicate to connect and communicate mathematical mathematical ideas and arguments using workplace; formulating a plan or strategy, determining technology as appropriate, and techniques, multiple representations, including symbols, mathematical ideas; precise mathematical language in written a solution, justifying the solution, and including mental math, estimation, and diagrams, graphs, and language as or oral communication. evaluating the problem-solving process and number sense as appropriate, to solve appropriate; the reasonableness of the solution: problems: **Two-Dimensional** Number and Measurement **Proportionality Expressions, Equations, and Relationships Personal Financial Literacy Operations** and Data (8.9) (8.2) The student (8.3) The student (8.4) The student (8.5) The student applies (8.6)(8.7) Expressions, (8.8) Expressions, (8.10) The student (8.11) The (8.12) The student applies mathematical process standards to Expressions. equations, and equations, and Expressions. applies mathematical student applies mathematical process standards to applies mathematical applies mathematical applies mathematical use proportional and non-proportional equations, relationships. The relationships. The student equations, and process standards to mathematical develop an economic way of process standards to process standards to process standards to relationships to develop foundational student applies applies mathematical relationships. develop transformational thinking and problem solving useful and process represent and use real use proportional explain proportional relationships. process standards to use in one's life as a knowledgeable concepts of functions. The student is mathematical process The student geometry concepts. The standards to use numbers in a variety of relationships to and non-proportional expected to: The student standards to use one-variable equations or applies student is expected to: statistical consumer and investor. The forms. The student is describe dilations. relationships involving (A) represent linear proportional inequalities in problem applies geometry to solve mathematical (A) generalize the procedures to student is expected to: expected to: slope. The student is situations with tables, graphs, situations. The student is The student is mathematical problems. The student process standards properties of describe data. (A) solve real-world problems (A) extend previous and equations in the form of expected to: expected to: process is expected to: expected to: to use multiple orientation and The student is comparing how interest rate knowledge of sets y = kx; Supporting Standard standards to (A) solve problems (A) write one-variable representations to congruence of expected to: and loan length affect the (A) generalize that (A) use similar right and subsets using cost of credit; Supporting (B) represent linear non-proportional involving the equations or inequalities develop develop rotations. (A) construct a the ratio of triangles to a visual situations with tables, graphs, mathematical volume of with variables on both foundational reflections, scatterplot Standard corresponding develop an representation to and equations in the form of relationships cylinders, cones, sides that represent concepts of translations, and and describe (B) calculate the total cost of sides of similar understanding that describe y = mx + b, where $b \neq 0$; and make and spheres; problems using rational simultaneous dilations of twothe repaying a loan, including shapes are slope, *m*, given as relationships Supporting Standard connections to Readiness number coefficients and linear equations. dimensional shapes observed credit cards and easy access proportional, the rate comparing between sets of (C) contrast bivariate sets of data aeometric Standard constants; Supporting The student is on a coordinate data to loans, under various rates of including a the change in real numbers: that suggest a linear relationship formulas. The **(B)** use previous Standard expected to: plane; Supporting address interest and over different periods using an online shape and its *y*-values to the with bivariate sets of data that student is knowledge of **(B)** write a corresponding (A) identify and Standard auestions of Supporting surface area to real-world problem verify the differentiate calculator; do not suggest a linear expected to: association Standard dilation; change in x-values, $\frac{y_2-y_1}{x_2-x_1}$, is the same (A) describe make connections relationship from a graphical when given a onevalues of x between such as **(C)** explain how small amounts of approximate the Supporting representation; and Supporting to the formulas variable equation or and y that transformations money invested regularly, the linear, value of an Standard for any two points for lateral and inequality with variables including money saved for Standard volume simultaneously that preserve non-linear irrational number, (B) compare and (x_1, y_1) and (x_2, y_2) **(D)** use a trend line that formula total surface area on both sides of the satisfy two congruence and and no college and retirement, grow including p and contrast the over time; Supporting approximates the linear V = Bh of and determine equal sign using linear those that do not; association on the same line; square roots of attributes of a relationship between bivariate a cylinder solutions for rational number equations in Supporting between Standard Supporting numbers less than shape and its sets of data to make predictions. in terms problems coefficients and the form Standard bivariate (D) calculate and compare simple Standard 225, and locate explain the effect of dilation(s) on a Readiness Standard of its base involvina constants; and y = mx + bdata; and interest and compound (B) graph proportional that rational (E) solve problems involving direct area and rectangular Supporting Standard from the translations. Supporting interest earnings; and coordinate number relationships, variation; Supporting Standard prisms, triangular (C) model and solve onereflections over the Readiness Standard its height; intersections Standard plane; and interpreting the variable equations with approximation on **(F)** distinguish between proportional prisms, and of the graphed x- or y-axis, and (B) determine (E) identify and explain the Supporting a number line; Supporting cylinders: variables on both sides rotations limited to unit rate as the and non-proportional situations equations. the mean advantages and Standard Standard Supporting slope of the line using tables, graphs, and Readiness of the equal sign that Supporting 90°, 180°, 270°, absolute disadvantages of different (C) (C) use an algebraic use and 360° as equations in the form y = kx or yStandard represent mathematical Standard Standard deviation payment methods: that models the models representation = mx + b, where $b \neq 0$; (C) use the and real-world problems applied to twoand use this (F) analyze situations to convert between relationship; and and Supporting Standard Pythagorean using rational number dimensional shapes quantity as determine if they represent standard decimal to explain the Readiness diagrams (G) identify functions using sets of effect of a given theorem and its coefficients and on a coordinate a measure financially responsible notation and Standard to explain ordered pairs, tables, mappings converse to solve constants. Readiness plane using an of the decisions and identify the scientific notation; positive rational (C) use data from a the problems; and Standard algebraic benefits of financial and graphs; Readiness Standard average and **Supporting** scale factor Pythagorean table or graph to (H) identify examples of proportional Readiness (D) use informal arguments representation; and distance responsibility and the costs of Standard applied to twotheorem. financial irresponsibility; and and non-proportional functions Standard to establish facts about Readiness determine the rate data are (D) order a set of real Supporting dimensional that arise from mathematical and (D) determine the the angle sum and Standard (G) estimate the cost of a twofrom the of change or slope Standard numbers arising figures on a distance between model the effect on year and four-year college real-world problems; and exterior angle of mean using and y-intercept in from coordinate Supporting Standard two points on a triangles, the angles linear and area a data set of education, including family mathematical and mathematical and (I) write an equation in the form coordinate plane created when parallel measurements of no more contribution, and devise a plane with the real-world real-world y = mx + b to model a linear using the lines are cut by a dilated twothan 10 data periodic savings plan for origin as the problems. contexts. relationship between two Pythagorean transversal, and the dimensional points. accumulating the money center of Readiness Readiness quantities using verbal, theorem. angle-angle criterion for shapes. Supporting needed to contribute to the dilation. Standard Standard numerical, tabular, and graphical Supporting similarity of triangles. Supporting Standard total cost of attendance for at Readiness representations. *Readiness* Standard Supporting Standard Standard least the first year of college. Standard Standard Supporting Standard HOUSTON A CHALLENGE

These student expectations will not be listed under a separate reporting category. Instead, they will be incorporated into test questions across reporting categories since the application of mathematical process standards is part of each knowledge statement.

A.1(A) apply mathematics to problems arising in everyday life, society, and the workplace;

A.1 (B) 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:

A.1 (C) 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;

A.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

A.1 (E) create and use representations to organize, record, and communicate mathematical ideas;

A.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and

A.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

Reporting Category 1 Number and Algebraic Methods 11 Questions

The student will demonstrate an understanding of how to use algebraic methods to manipulate numbers, expressions, and equations.

- **(A.10) Number and algebraic methods.** The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. The student is expected to:
- (A) add and subtract polynomials of degree one and degree two; Supporting Standard
- (B) multiply polynomials of degree one and degree two; **Supporting Standard**
- (C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend; Supporting Standard
- (D) rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property; **Supporting Standard**
- (E) factor, if possible, trinomials with real factors in the form ax2 + bx + c, including perfect square t rinomials of degree two; and Readiness Standard
- (F) decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial. Supporting Standard
- (A.11) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms. The student is expected to (A) simplify numerical radical expressions involving square roots; and
- Supporting Standard

 (B) simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents. Readiness Standard
- (A.12) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. The student is expected to:
- (A) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function; Supporting Standard
- (B) evaluate functions, expressed in function notation, given one or more elements in their domains; **Supporting Standard**
- (C) identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes; Supporting Standard
- (D) write a formula for the nth term of arithmetic and geometric sequences, given the value of several of their terms; and **Supporting Standard**
- (E) solve mathematic and scientific formulas, and other literal equations, for a specified variable. **Supporting Standard**

Reporting Category 2
Describing and Graphing Linear
Functions, Equations, and Inequalities
12 Ouestions

The student will demonstrate an understanding of how to describe and graph linear functions, equations, and inequalities.

- (A.3) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. The student is expected to:
- (A) 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 y1 = m(x x1); Supporting Standard
- (B) calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems; Readiness Standard
- (C) 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; *Readiness Standard*
- (D) graph the solution set of linear inequalities in two variables on the coordinate plane; Readiness Standard
- **(E)** determine the effects on the graph of the parent function f(x) = x when f(x) is replaced by $\mathbf{a}f(x)$, $f(x) + \mathbf{d}$, $f(x \mathbf{c})$, $f(\mathbf{b}x)$ for specific values of a, b, c, and d; **Supporting Standard**
- (F) graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist; Supporting Standard
- (G) estimate graphically the solutions to systems of two linear equations with two variables in realworld problems; and Supporting Standard
- (H) graph the solution set of systems of two linear inequalities in two variables on the coordinate plane. Supporting Standard
- **(A.4) Linear functions, equations, and inequalities.** The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. The student is expected to:
- (A) calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity a s a measure of the strength of the linear association; Supporting Standard
- (B) compare and contrast association and causation in real-world problems; and *Supporting*Standard
- (C) write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for realworld problems. Supporting Standard

Reporting Category 3
Writing and Solving Linear Functions,
Equations, and Inequalities
14 Questions

The student will demonstrate an understanding of how to write and solve linear functions, equations, and inequalities.

- (A.2) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. The student is expected to:
- (A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities; *Readiness Standard*
- **(B)** 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; **Supporting Standard**
- (C) write linear equations in two variables given a table of values, a graph, and a verbal description; Readiness Standard
- (D) write and solve equations involving direct variation; Supporting Standard
- (E) write the equation of a line that contains a given point and is parallel to a given line; Supporting Standard(F) write the equation of a line that contains a given point
- and is perpendicular t o a given line; *Supporting*Standard

 (G) write an equation of a line that is parallel or
- (G) write an equation of a line that is parallel or perpendicular to the x- or y-axis and determine whether the slope of the line is zero or undefined; Supporting Standard
- (H) write linear inequalities in two variables given a table of values, a graph, and a verbal description; and Supporting Standard
- (I) write systems of two linear equations given a table of values, a graph, and a verbal description. Readiness Standard
- (A.5) Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. The student is expected to:
- (A) solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides; *Readiness Standard*
- (B) solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides; and Supporting Standard
- (C) solve systems of two linear equations with two variables for mathematical and real-world problems. **Readiness Standard**

Reporting Category 4
Quadratic Functions and Equations
11 Questions

The student will demonstrate an understanding of how to describe, write, and solve quadratic functions and equations.

- **(A.6) Quadratic functions and equations.** The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The student is expected to:
- (A) determine the domain and range of quadratic functions and represent the domain and range using inequalities; *Readiness Standard*
- **(B)** write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form $(f(x) = a(x h)^2 + k)$, and rewrite the equation from vertex form to standard form $(f(x) = ax^2 + bx + c)$; and **Supporting Standard**
- (C) write quadratic functions when given real solutions and graphs of their related equations. Supporting Standard
- **(A.7) Quadratic functions and equations.** The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. The student is expected to:
- (A) graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry; *Readiness Standard*
- (B) describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions; and Supporting Standard
- (C) determine the effects on the graph of the parent function $f(x) = x^2$ when f(x) is replaced by af(x), f(x) + d, f(x c), f(bx) for specific values o f a, b, c, and d. **Readiness Standard**
- (A.8) Quadratic functions and equations. The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:
- (A) solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula; and *Readiness* Standard
- (B) write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems. Supporting Standard

Reporting Category 5
Exponential Functions and Equations
6 Ouestions

The student will demonstrate an understanding of how to describe and write exponential functions and

- (A.9) Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:
- (A) determine the domain and range of exponential functions of the form f(x) = ab^x and represent the domain and range using inequalities; Supporting Standard
- (B) interpret the meaning of the values of a and b in exponential functions of the form f(x) = ab^x in real-world problems; Supporting
- (C) write exponential functions in the form f(x) = ab^x (where b is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay; Readiness Standard
- (D) graph exponential functions that model growth and decay and identify key features, including y-intercept and asymptote, in mathematical and real-world problems; and Readiness Standard
- (E) write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems.

 Supporting Standard



§111.39. Algebra I, Adopted 2012 (One Credit).

- (a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grade 8 or 9. Prerequisite: Mathematics, Grade 8 or its equivalent.
- - (1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.
 - (2) The process standards describe ways in which students are expected to engage in the content. The placement of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will 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. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology are technology. their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
 - (3) In Algebra I, students will build on the knowledge and skills for mathematics in Grades 6-8, which provide a foundation in linear relationships, number and operations, and proportionality. Students will study linear, quadratic, and exponential functions and their related transformations, equations, and associated solutions. Students will connect functions and their associated solutions in both mathematical and real-world situations. Students will use technology to collect and explore data and analyze statistical relationships. In addition, students will study polynomials of degree one and two, radical expressions, sequences, and laws of exponents. Students will generate and solve linear systems with two equations and two variables and will create new functions through transformations.

(A.7) Quadratic

equations. The student

mathematical process

standards when using

related transformations

to represent in multiple

solutions to equations.

Readiness

Standard

The student is expected

ways and determine.

with and without

technology, the

graphs of quadratic

functions and their

functions and

applies the

(4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and Skills

Mathematical Process Standards (A.1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

A.1(A) apply mathematics to problems arising in everyday life, society, and the workplace

A.1 (B) 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

A.1 (C) 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;

A.1 (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as A.1 (E) create and use representations to organize record, and communicate mathematical ideas:

A.1 (F) analyze mathematical relationships to connect and communicate mathematical ideas; and A.1 (G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(A.2) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without

technology, linear equations, inequalities, and systems of equations. The student is expected to: (A) determine the domain and range of a linear function in mathematical problems: determine reasonable domain and

range values for real-world

situations, both continuous and

discrete; and represent domain

and range using inequalities: Readiness Standard

(B) write linear equations in two variables in various forms. including y = mx + b, Ax + ByC, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points; Supporting Standard

(C) write linear equations in two variables given a table of values, a graph, and a verbal description Readiness Standard

(D) write and solve equations involving direct variation: Supporting Standard

write the equation of a line that contains a given point and is parallel to a given line: Supporting Standard

(F) write the equation of a line that contains a given point and is perpendicular t o a given line:

Supporting Standard (G) write an equation of a line that is parallel or perpendicular to the xor v-axis and determine whether the slope of the line is zero or

undefined; Supporting Standard (H) write linear inequalities in two variables given a table of values, a graph, and a verbal description: and Supporting Standard

write systems of two linear equations given a table of values, a graph, and a verbal description. Readiness Standard

(A.3) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. The student is

Linear Equations and Inequalities

(A) 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 $y - y_1 = m(x - x_1)$; **Supporting** Standard

(B) calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems; Readiness Standard

(C) 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; Readiness Standard (D) graph the solution set of linear

inequalities in two variables on the coordinate plane; Readiness Standard

(E) determine the effects on the graph of the parent function f(x) = xwhen f(x) is replaced by af(x), f(x)+ d, f(x - c), f(bx) for specific values o f a, b, c, and d; Supporting Standard

(F) graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist; Supporting Standard

(G) estimate graphically the solutions to systems of two linear equations with two variables in real-world problems; and Supporting

(H) graph the solution set of systems of two linear inequalities in two variables on the coordinate plane. Supporting Standard

functions. mathematical

expected to:

Supporting

Standard

(A.4) Linear equations, and inequalities. The student applies the process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. The student is

(A) calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity a s a measure of the strenath of the linear association;

Standard (B) compare and contrast association and causation in real-world problems: and Supporting Standard

(C) write, with and without technology, linear functions that provide a reasonable fit to data to estimat solutions and make predictions for real-world problems. Supporting

Standard

(A.5) Linear functions. equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. The

student is expected to

A) solve linear equations in one variable including those for which the application of the distributive property is necessary and fo which variables are included on both sides: Readiness

Standard (B) solve linear inequalities in one variable. including those for which the application of the distributive property is necessary and for which variables are included on both sides: and Supporting

Standard (C) solve systems of two linear equations with two variables for mathematical and real-world problems. Readiness Standard

(A.6) Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The

student is expected

(A) determine the

domain and (D) graph quadratic range of functions on the quadratic coordinate plane functions and and use the graph represent the to identify key domain and attributes, if possible, including range using inequalities; x-intercept, Readiness v-intercept, zeros, maximum value. Standard minimum values, (B) write equations of quadratic vertex, and the equation of the axis of symmetry:

functions given the vertex and another point on the graph, write the equation in vertex form (f(x) $= a(x - h)^2 + k$ and rewrite the equation from vertex form to standard form and Supporting Standard

(C) write quadratic functions when given real solutions and graphs of their related equations. Supporting Standard

Exponential Functions Quadratic Functions and Equations (A.8) Quadratic

functions and equations. The student applies th mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulate: statistical relationships and

evaluates their reasonableness based on realworld data. The student is expected to: (A) solve quadratic equations having real solutions by factoring. taking square roots completing the square, and applying

solutions and

predictions for

real-world

problems.

Standard

Supportina

make

describe the relationship between the linear the quadratic factors of quadratic formula; and expressions and the Readiness zeros of their Standard associated (B) write, using quadratic functions technology, and Supporting quadratic Standard functions that provide a reasonable fit to data to estimate

determine the effects on the graph of the parent function f(x) = x2when f(x) is replaced by af(x), f(x) + d, f(x - c), f(bx) for specific values of a, b, c, and d. Readiness Standard

and Equations (A.9) Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on realworld data. The student is

expected to: (A) determine the domain and range of exponential functions of the form f(x) = ab^x and represent the domain and range using inequalities; Supporting Standard (B) interpret the meaning of the values of a and b in

world problems: Supporting Standard (C) write exponential functions in the form $f(x) = ab^x$ (where b is a rational number) to describe problems arising from mathematical and realworld situations, including growth and decay;

exponential functions of

the form $f(x) = ab^x$ in real-

Readiness Standard (D) graph exponential functions that model growth and decay and identify key features, including vintercept and asymptote, in mathematical and realworld problems: and Readiness Standard (E) write, using technology,

exponential functions that provide a reasonable fit to data and make predictions for real-world problems. Supporting Standard

(A.10) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial

(A) add and subtract polynomial of degree one and degree

Standard (D) rewrite polynomial property; Supporting

(E) factor, if possible, trinomials with real factors in the form ax2 + bx + c, including perfect square t rinomials of degree two; and Readiness Standard (F) decide if a binomial can be

use the structure of a rewrite the binomial Supporting Standard

Number and Algebraic Methods

expressions. The student is expected to:

two; Supporting Standard (B) multiply polynomials of degree one and degree two;

Supporting Standard (C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend; Supporting

expressions of degree one and degree two in equivalent forms using the distributive Standard

> written as the difference of two squares and, if possible, difference of two squares to

(A.11) Number and algebraic methods. The student applies mathematical process standards and

algebraic methods to rewrite algebraic expressions into equivalent forms. The

> student is expected to: (A) simplify numerical radical expressions involvina square roots: and Supporting

> > Standard simplify numeric algebraic expressions using the laws of exponents. including integral and rational exponents. Readiness Standard

(A.12) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. The student is expected to:

(A) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function; Supporting Standard

evaluate functions, expressed in function notation, given one or more elements in their domains: Supporting Standard

identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes: Supporting Standard

(D) write a formula for the nth term of arithmetic and geometric sequences given the value of several of their terms; and Supporting Standard

(E) solve mathematic and scientific formulas, and other literal equations, for a specified variable. Supporting Standard

