

Math, Grade 6 (IMRA)

Subject: Mathematics

Grade: 06

Expectations: 59

Breakouts: 211

(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 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. 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 Statements

- (1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:
 - (A) apply mathematics to problems arising in everyday life, society, and the workplace;
 - (i) apply mathematics to problems arising in everyday life

- (ii) apply mathematics to problems arising in society
 - (iii) apply mathematics to problems arising in the workplace
- (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;
- (i) 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
 - (ii) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the reasonableness of the solution
- (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;
- (i) select tools, including real objects as appropriate, to solve problems
 - (ii) select tools, including manipulatives as appropriate, to solve problems
 - (iii) select tools, including paper and pencil as appropriate, to solve problems
 - (iv) select tools, including technology as appropriate, to solve problems
 - (v) select techniques, including mental math as appropriate, to solve problems
 - (vi) select techniques, including estimation as appropriate, to solve problems
 - (vii) select techniques, including number sense as appropriate, to solve problems
- (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
- (i) communicate mathematical ideas using multiple representations, including symbols as appropriate
 - (ii) communicate mathematical ideas using multiple representations, including diagrams as appropriate
 - (iii) communicate mathematical ideas using multiple representations, including graphs as appropriate
 - (iv) communicate mathematical ideas using multiple representations, including language as appropriate
 - (v) communicate mathematical reasoning using multiple representations, including symbols as appropriate
 - (vi) communicate mathematical reasoning using multiple representations, including diagrams as appropriate
 - (vii) communicate mathematical reasoning using multiple representations, including graphs as appropriate
 - (viii) communicate mathematical reasoning using multiple representations, including language as appropriate
 - (ix) communicate [mathematical ideas'] implications using multiple representations, including symbols as appropriate
 - (x) communicate [mathematical ideas'] implications using multiple representations, including diagrams as appropriate
 - (xi) communicate [mathematical ideas'] implications using multiple representations, including graphs as appropriate
 - (xii) communicate [mathematical ideas'] implications using multiple representations, including language as appropriate

- (xiii) communicate [mathematical reasoning's] implications using multiple representations, including symbols as appropriate
- (xiv) communicate [mathematical reasoning's] implications using multiple representations, including diagrams as appropriate
- (xv) communicate [mathematical reasoning's] implications using multiple representations, including graphs as appropriate
- (xvi) communicate [mathematical reasoning's] implications using multiple representations, including language as appropriate

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

- (i) create representations to organize mathematical ideas
- (ii) use representations to organize mathematical ideas
- (iii) create representations to record mathematical ideas
- (iv) use representations to record mathematical ideas
- (v) create representations to communicate mathematical ideas
- (vi) use representations to communicate mathematical ideas

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

- (i) analyze mathematical relationships to connect mathematical ideas
- (ii) analyze mathematical relationships to communicate mathematical ideas

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

- (i) display mathematical ideas using precise mathematical language in written or oral communication
- (ii) display mathematical arguments using precise mathematical language in written or oral communication
- (iii) explain mathematical ideas using precise mathematical language in written or oral communication
- (iv) explain mathematical arguments using precise mathematical language in written or oral communication
- (v) justify mathematical ideas using precise mathematical language in written or oral communication
- (vi) justify mathematical arguments using precise mathematical language in written or oral communication

(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;

- (i) classify whole numbers using a visual representation to describe relationships between sets of numbers
- (ii) classify integers using a visual representation to describe relationships between sets of numbers
- (iii) classify rational numbers using a visual representation to describe relationships between sets of numbers

(B) identify a number, its opposite, and its absolute value;

- (i) identify a number [and] its opposite
- (ii) identify a number and its absolute value

- (C) locate, compare, and order integers and rational numbers using a number line;
 - (i) locate integers using a number line
 - (ii) compare integers using a number line
 - (iii) order integers using a number line
 - (iv) locate rational numbers using a number line
 - (v) compare rational numbers using a number line
 - (vi) order rational numbers using a number line
 - (D) order a set of rational numbers arising from mathematical and real-world contexts; and
 - (i) order a set of rational numbers arising from mathematical contexts
 - (ii) order a set of rational numbers arising from real-world contexts
 - (E) extend representations for division to include fraction notation such as a/b represents the same number as $a \div b$ where $b \neq 0$
 - (i) extend representations for division to include fraction notation
- (3) Number and operations. 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;
 - (i) recognize that dividing by a rational number and multiplying by its reciprocal result in equivalent values
 - (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;
 - (i) determine, with computation, whether a quantity is increased or decreased when multiplied by a fraction, including values greater than or less than one
 - (ii) determine, without computation, whether a quantity is increased or decreased when multiplied by a fraction, including values greater than or less than one
 - (C) represent integer operations with concrete models and connect the actions with the models to standardized algorithms;
 - (i) represent integer operations with concrete models
 - (ii) connect the actions with the models to standardized algorithms
 - (D) add, subtract, multiply, and divide integers fluently; and
 - (i) add integers fluently
 - (ii) subtract integers fluently
 - (iii) multiply integers fluently
 - (iv) divide integers fluently
 - (E) multiply and divide positive rational numbers fluently.
 - (i) multiply positive rational numbers fluently
 - (ii) divide positive rational numbers fluently

- (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;
 - (i) compare two rules verbally in the form of $y = ax$ or $y = x + a$ in order to differentiate between additive and multiplicative relationships
 - (ii) compare two rules numerically in the form of $y = ax$ or $y = x + a$ in order to differentiate between additive and multiplicative relationships
 - (iii) compare two rules graphically in the form of $y = ax$ or $y = x + a$ in order to differentiate between additive and multiplicative relationships
 - (iv) compare two rules symbolically in the form of $y = ax$ or $y = x + a$ in order to differentiate between additive and multiplicative relationships
 - (B) apply qualitative and quantitative reasoning to solve prediction and comparison of real-world problems involving ratios and rates;
 - (i) apply qualitative reasoning to solve prediction of real-world problems involving ratios
 - (ii) apply qualitative reasoning to solve prediction of real-world problems involving rates
 - (iii) apply qualitative reasoning to solve comparison of real-world problems involving ratios
 - (iv) apply qualitative reasoning to solve comparison of real-world problems involving rates
 - (v) apply quantitative reasoning to solve prediction of real-world problems involving ratios
 - (vi) apply quantitative reasoning to solve prediction of real-world problems involving rates
 - (vii) apply quantitative reasoning to solve comparison of real-world problems involving ratios
 - (viii) apply quantitative reasoning to solve comparison of real-world problems involving rates
 - (C) give examples of ratios as multiplicative comparisons of two quantities describing the same attribute;
 - (i) give examples of ratios as multiplicative comparisons of two quantities describing the same attribute
 - (D) give examples of rates as the comparison by division of two quantities having different attributes, including rates as quotients;
 - (i) give examples of rates as the comparison by division of two quantities having different attributes, including rates as quotients
 - (E) represent ratios and percents with concrete models, fractions, and decimals;
 - (i) represent ratios with concrete models
 - (ii) represent ratios with fractions
 - (iii) represent ratios with decimals
 - (iv) represent percents with concrete models
 - (v) represent percents with fractions
 - (vi) represent percents with decimals
 - (F) represent benchmark fractions and percents such as 1%, 10%, 25%, $33\frac{1}{3}\%$, and multiples of these values using 10 by 10 grids, strip diagrams, number lines, and numbers;

- (i) represent benchmark fractions using 10 by 10 grids
 - (ii) represent benchmark fractions using strip diagrams
 - (iii) represent benchmark fractions using number lines
 - (iv) represent benchmark fractions using numbers
 - (v) represent percents using 10 by 10 grids
 - (vi) represent percents strip diagrams
 - (vii) represent percents using number lines
 - (viii) represent percents using numbers
- (G) generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money; and
- (i) generate equivalent forms of fractions, decimals, and percents using real-world problems, including problems that involve money
- (H) convert units within a measurement system, including the use of proportions and unit rates.
- (i) convert units within a measurement system, including the use of proportions
 - (ii) convert units within a measurement system, including the use of unit rates
- (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;
- (i) represent mathematical problems involving ratios using scale factors
 - (ii) represent mathematical problems involving ratios using tables
 - (iii) represent mathematical problems involving ratios using graphs
 - (iv) represent mathematical problems involving ratios using proportions
 - (v) represent mathematical problems involving rates using scale factors
 - (vi) represent mathematical problems involving rates using tables
 - (vii) represent mathematical problems involving rates using graphs
 - (viii) represent mathematical problems involving rates using proportions
 - (ix) represent real-world problems involving ratios using scale factors
 - (x) represent real-world problems involving ratios using tables
 - (xi) represent real-world problems involving ratios using graphs
 - (xii) represent real-world problems involving ratios using proportions
 - (xiii) represent real-world problems involving rates using scale factors
 - (xiv) represent real-world problems involving rates using tables
 - (xv) represent real-world problems involving rates using graphs

- (xvi) represent real-world problems involving rates using proportions
- (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; and
 - (i) solve real-world problems to find the whole given a part and the percent, including the use of concrete models
 - (ii) solve real-world problems to find the whole given a part and the percent, including the use of pictorial models
 - (iii) solve real-world problems to find the part given the whole and the percent, including the use of concrete models
 - (iv) solve real-world problems to find the part given the whole and the percent, including the use of pictorial models
 - (v) solve real-world problems to find the percent given the part and the whole, including the use of concrete models
 - (vi) solve real-world problems to find the percent given the part and the whole, including the use of pictorial models
- (C) use equivalent fractions, decimals, and percents to show equal parts of the same whole.
 - (i) use equivalent fractions, decimals, and percents to show equal parts of the same whole
- (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;
 - (i) identify independent quantities from tables
 - (ii) identify independent quantities from graphs
 - (iii) identify dependent quantities from tables
 - (iv) identify dependent quantities from graphs
 - (B) write an equation that represents the relationship between independent and dependent quantities from a table; and
 - (i) write an equation that represents the relationship between independent and dependent quantities from a table
 - (C) represent a given situation using verbal descriptions, tables, graphs, and equations in the form $y = kx$ or $y = x + b$.
 - (i) represent a given situation using verbal descriptions
 - (ii) represent a given situation using tables
 - (iii) represent a given situation using graphs
 - (iv) represent a given situation using equations in the form $y = kx$ or $y = x + b$
- (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 number exponents and prime factorization;

- (i) generate equivalent numerical expressions using order of operations, including whole number exponents
 - (ii) generate equivalent numerical expressions using prime factorization
- (B) distinguish between expressions and equations verbally, numerically, and algebraically;
- (i) distinguish between expressions and equations verbally
 - (ii) distinguish between expressions and equations numerically
 - (iii) distinguish between expressions and equations algebraically
- (C) determine if two expressions are equivalent using concrete models, pictorial models, and algebraic representations; and
- (i) determine if two expressions are equivalent using concrete models
 - (ii) determine if two expressions are equivalent using pictorial models
 - (iii) determine if two expressions are equivalent using algebraic representations
- (D) generate equivalent expressions using the properties of operations: inverse, identity, commutative, associative, and distributive properties.
- (i) generate equivalent expressions using the properties of operations: inverse properties
 - (ii) generate equivalent expressions using the properties of operations: identity properties
 - (iii) generate equivalent expressions using the properties of operations: commutative properties
 - (iv) generate equivalent expressions using the properties of operations: associative properties
 - (v) generate equivalent expressions using the properties of operations: distributive properties
- (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;
- (i) extend previous knowledge of triangles and their properties to include the sum of angles of a triangle
 - (ii) extend previous knowledge of triangles and their properties to include the relationship between the lengths of sides and measures of angles in a triangle
 - (iii) extend previous knowledge of triangles and their properties to include determining when three lengths form a triangle
- (B) model area formulas for parallelograms, trapezoids, and triangles by decomposing and rearranging parts of these shapes;
- (i) model area formulas for parallelograms by decomposing and rearranging parts of these shapes
 - (ii) model area formulas for trapezoids by decomposing and rearranging parts of these shapes
 - (iii) model area formulas for triangles by decomposing parts of these shapes
- (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
- (i) write equations that represent problems related to the area of rectangles where dimensions are positive rational numbers

- (ii) write equations that represent problems related to the area of parallelograms where dimensions are positive rational numbers
 - (iii) write equations that represent problems related to the area of trapezoids where dimensions are positive rational numbers
 - (iv) write equations that represent problems related to the area of triangles where dimensions are positive rational numbers
 - (v) write equations that represent problems related to the volume of right rectangular prisms where dimensions are positive rational numbers
- (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.
- (i) determine solutions for problems involving the area of rectangles where dimensions are positive rational numbers
 - (ii) determine solutions for problems involving the area of parallelograms where dimensions are positive rational numbers
 - (iii) determine solutions for problems involving the area of trapezoids where dimensions are positive rational numbers
 - (iv) determine solutions for problems involving the area of triangles where dimensions are positive rational numbers
 - (v) determine solutions for problems involving the volume of right rectangular prisms where dimensions are positive rational numbers
- (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;
 - (i) write one-variable, one-step equations to represent constraints or conditions within problems
 - (ii) write one-variable, one-step inequalities to represent constraints or conditions within problems
 - (B) represent solutions for one-variable, one-step equations and inequalities on number lines; and
 - (i) represent solutions for one-variable, one-step equations on number lines
 - (ii) represent solutions for one-variable, one-step inequalities on number lines
 - (C) write corresponding real-world problems given one-variable, one-step equations or inequalities.
 - (i) write corresponding real-world problems given one-variable, one-step equations or inequalities
- (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
 - (i) model one-variable, one-step equations that represent problems, including geometric concepts
 - (ii) model one-variable, one-step inequalities that represent problems, including geometric concepts
 - (iii) solve one-variable, one-step equations that represent problems, including geometric concepts
 - (iv) solve one-variable, one-step inequalities that represent problems, including geometric concepts

(B) determine if the given value(s) make(s) one-variable, one-step equations or inequalities true.

(i) determine if the given value(s) make(s) one-variable, one-step equations or inequalities true

(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 graph points in all four quadrants using ordered pairs of rational numbers.

(A) graph points in all four quadrants using ordered pairs of rational numbers

(i) graph points in all four quadrants using ordered pairs of rational numbers

(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, stem-and-leaf plots, histograms, and box plots;

(i) represent numeric data graphically, including dot plots

(ii) represent numeric data graphically, including stem-and-leaf plots

(iii) represent numeric data graphically, including histograms

(iv) represent numeric data graphically, including box plots

(B) use the graphical representation of numeric data to describe the center, spread, and shape of the data distribution;

(i) use the graphical representation of numeric data to describe the center of the data distribution

(ii) use the graphical representation of numeric data to describe the spread of the data distribution

(iii) use the graphical representation of numeric data to describe the 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

(i) summarize numeric data with numerical summaries, including the mean and median (measures of center)

(ii) summarize numeric data with numerical summaries, including the range and the interquartile range (IQR)(measures of spread)

(iii) use these summaries to describe the center of the data distribution

(iv) use these summaries to describe the spread of the data distribution

(v) use these summaries to describe the shape of the data distribution

(D) summarize categorical 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 the data distribution.

(i) summarize categorical data with numerical summaries, including the mode

(ii) summarize categorical data with numerical summaries, including the percent of values in each category (relative frequency table)

(iii) summarize categorical data with graphical summaries, including the percent bar graph

(iv) use these summaries to describe the data distribution

(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
 - (i) interpret numeric data summarized in dot plots
 - (ii) interpret numeric data summarized in stem-and-leaf plots
 - (iii) interpret numeric data summarized in histograms
 - (iv) interpret numeric data summarized in box plots
 - (B) distinguish between situations that yield data with and without variability.
 - (i) distinguish between situations that yield data with and without variability
- (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;
 - (i) compare the features of a checking account offered by different local financial institutions
 - (ii) compare the costs of a checking account offered by different local financial institutions
 - (iii) compare the features of a debit card offered by different local financial institutions
 - (iv) compare the costs of a debit card offered by different local financial institutions
 - (B) distinguish between debit cards and credit cards;
 - (i) distinguish between debit cards and credit cards
 - (C) balance a check register that includes deposits, withdrawals, and transfers;
 - (i) balance a check register that includes deposits
 - (ii) balance a check register that includes withdrawals
 - (iii) balance a check register that includes transfers
 - (D) explain why it is important to establish a positive credit history;
 - (i) 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;
 - (i) describe the information in a credit report
 - (ii) describe how long it is retained
 - (F) describe the value of credit reports to borrowers and to lenders;
 - (i) describe the value of credit reports to borrowers
 - (ii) describe the value of credit reports to lenders
 - (G) explain various methods to pay for college, including through savings, grants, scholarships, student loans, and work-study; and
 - (i) explain various methods to pay for college, including through savings
 - (ii) explain various methods to pay for college, including through grants
 - (iii) explain various methods to pay for college, including through scholarships

- (iv) explain various methods to pay for college, including through student loans
 - (v) explain various methods to pay for college, including through work-study
- (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.
- (i) compare the annual salary of several occupations requiring various levels of post-secondary education or vocational training
 - (ii) calculate the effects of the different annual salaries on lifetime income