Math, Grade 7 (IMRA)

Subject: Mathematics
Grade: 07
Expectations: 50
Breakouts: 205

(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 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 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) extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of rational numbers

(i) extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of rational numbers

(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

(i) add rational numbers fluently

(ii) subtract rational numbers fluently

(iii) multiply rational numbers fluently

(iv) divide rational numbers fluently

(B) apply and extend previous understandings of operations to solve problems using addition, subtraction, multiplication, and division of rational numbers.

(i) apply previous understandings of operations to solve problems using addition of rational numbers

(ii) apply previous understandings of operations to solve problems using subtraction of rational numbers

(iii) apply previous understandings of operations to solve problems using multiplication of rational numbers

(iv) apply previous understandings of operations to solve problems using division of rational numbers

(v) extend previous understandings of operations to solve problems using addition of rational numbers

(vi) extend previous understandings of operations to solve problems using subtraction of rational numbers

(vii) extend previous understandings of operations to solve problems using multiplication of rational numbers

(viii) extend previous understandings of operations to solve problems using division of rational numbers

(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

(i) represent constant rates of change in mathematical problems given pictorial representations

(ii) represent constant rates of change in mathematical problems given tabular representations

(iii) represent constant rates of change in mathematical problems given verbal representations

(iv) represent constant rates of change in mathematical problems given numeric representations

(v) represent constant rates of change in mathematical problems given graphical representations

(vi) represent constant rates of change in mathematical problems given algebraic representations, including d = rt

(vii) represent constant rates of change in real-world problems given pictorial representations

(viii) represent constant rates of change in real-world problems given tabular representations

(ix) represent constant rates of change in real-world problems given verbal representations

(x) represent constant rates of change in real-world problems given numeric representations

(xi) represent constant rates of change in real-world problems given graphical representations

(xii) represent constant rates of change in real-world problems given algebraic representations, including d = rt

(B) calculate unit rates from rates in mathematical and real-world problems;

(i) calculate unit rates from rates in mathematical problems

(ii) calculate unit rates from rates in real-world problems

(C) determine the constant of proportionality (k = y/x) within mathematical and real-world problems;

(i) determine the constant of proportionality (k = y/x) within mathematical problems

(ii) determine the constant of proportionality (k = y/x) within real-world problems

(D) solve problems involving ratios, rates, and percents, including multi-step problems involving percent increase and percent decrease, and financial literacy problems; and

(i) solve problems involving ratios, including multi-step problems involving percent increase

(ii) solve problems involving ratios, including multi-step problems involving percent decrease

(iii) solve problems involving ratios, including financial literacy problems

(iv) solve problems involving rates, including multi-step problems involving percent increase

(v) solve problems involving rates, including multi-step problems involving percent decrease

(vi) solve problems involving rates, including financial literacy problems

(vii) solve problems involving percents, including multi-step problems involving percent increase

(viii) solve problems involving percents, including multi-step problems involving percent decrease

(ix) solve problems involving percents, including financial literacy problems

(E) convert between measurement systems, including the use of proportions and the use of unit rates.

(i) convert between measurement systems, including the use of proportions

(ii) convert between measurement systems, including the use of unit rates

(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;

(i) generalize the critical attributes of similarity, including ratios within similar shapes

(ii) generalize the critical attributes of similarity, including ratios between similar shapes

(B) describe π as the ratio of the circumference of a circle to its diameter; and

(i) describe π as the ratio of the circumference of a circle to its diameter

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

(i) solve mathematical problems involving similar shape drawings

(ii) solve mathematical problems involving scale drawings

(iii) solve real-world problems involving similar shape drawings

(iv) solve real-world problems involving scale drawings

(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;

(i) represent sample spaces for simple events using lists

(ii) represent sample spaces for simple events using tree diagrams

(iii) represent sample spaces for compound events using lists

(iv) represent sample spaces for compound events using tree diagrams

(B) select and use different simulations to represent simple and compound events with and without technology;

(i) select different simulations to represent simple events with technology

(ii) select different simulations to represent simple events without technology

(iii) select different simulations to represent compound events with technology

(iv) select different simulations to represent compound events without technology

(v) use different simulations to represent simple events with technology

(vi) use different simulations to represent simple events without technology

(vii) use different simulations to represent compound events with technology

(viii) use different simulations to represent compound events without technology

(C) make predictions and determine solutions using experimental data for simple and compound events;

(i) make predictions using experimental data for simple events

(ii) make predictions using experimental data for compound events

(iii) determine solutions using experimental data for simple events

(iv) determine solutions using experimental data for compound events

(D) make predictions and determine solutions using theoretical probability for simple and compound events;

(i) make predictions using theoretical probability for simple events

(ii) make predictions using theoretical probability for compound events

(iii) determine solutions using theoretical probability for simple events

(iv) determine solutions using theoretical probability for compound events

(E) find the probabilities of a simple event and its complement and describe the relationship between the two;

(i) find the probabilities of a simple event and its complement

(ii) describe the relationship between [a simple event and its complement]

(F) use data from a random sample to make inferences about a population;

(i) use data from a random sample to make inferences about a population

(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;

(i) solve problems using data represented in bar graphs including part-to-whole comparisons

(ii) solve problems using data represented in bar graphs including part-to-part comparisons

(iii) solve problems using data represented in bar graphs including equivalents

(iv) solve problems using data represented in dot plots including part-to whole comparisons

(v) solve problems using data represented in dot plots including part-to part comparisons

(vi) solve problems using data represented in dot plots including equivalents

(vii) solve problems using data represented in circle graphs, including part-to-whole comparisons

(viii) solve problems using data represented in circle graphs, including part-to-part comparisons

(ix) solve problems using data represented in circle graphs, including equivalents

(H) solve problems using qualitative and quantitative predictions and comparisons from simple experiments; and

(i) solve problems using qualitative predictions from simple experiments

(ii) solve problems using qualitative comparisons from simple experiments

(iii) solve problems using quantitative predictions from simple experiments

(iv) solve problems using quantitative comparisons from simple experiments

(I) determine experimental and theoretical probabilities related to simple and compound events using data and sample spaces.

(i) determine experimental probabilities related to simple events using data

(ii) determine experimental probabilities related to simple events using sample spaces

(iii) determine experimental probabilities related to compound events using data

(iv) determine experimental probabilities related to compound events using sample spaces

(v) determine theoretical probabilities related to simple events using data

(vi) determine theoretical probabilities related to simple events using sample spaces

(vii) determine theoretical probabilities related to compound events using data

(viii) determine theoretical probabilities related to compound events using sample spaces

(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 $y = mx + b$

(i) represent linear relationships using verbal descriptions

(ii) represent linear relationships using tables

(iii) represent linear relationships using graphs

(iv) represent linear relationships using equations that simplify to the form $y = mx + b$

(8) Expressions, equations, and relationships. The student 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;

(i) model the relationship between the volume of a rectangular prism and a rectangular pyramid having both congruent bases and heights

(ii) connect that relationship [of the volumes of the two polyhedra] to the formulas

(B) explain verbally and symbolically the relationship between the volume of a triangular prism and a triangular pyramid having both congruent bases and heights and connect that relationship to the formulas; and

(i) explain verbally the relationship between the volume of a triangular prism and a triangular pyramid having both congruent bases and heights

(ii) explain symbolically the relationship between the volume of a triangular prism and a triangular pyramid having both congruent bases and heights

(iii) 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.

(i) use models to determine the approximate formulas for the circumference of a circle

(ii) use models to determine the approximate formulas for the area of a circle

(iii) connect the models to the actual [circumference] formula

(iv) connect the models to the actual [area] formula

(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;

(i) solve problems involving the volume of rectangular prisms

(ii) solve problems involving the volume of triangular prisms

(iii) solve problems involving the volume of rectangular pyramids

(iv) solve problems involving the volume of triangular pyramids

(B) determine the circumference and area of circles;

(i) determine the circumference of circles

(ii) determine the area of circles

(C) determine the area of composite figures containing combinations of rectangles, squares, parallelograms, trapezoids, triangles, semicircles, and quarter circles; and

(i) determine the area of composite figures containing combinations of rectangles, squares, parallelograms, trapezoids, triangles, semicircles, and quarter circles

(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.

(i) solve problems involving the lateral surface area of a rectangular prism by determining the area of the shape's net

(ii) solve problems involving the lateral surface area of a rectangular pyramid by determining the area of the shape's net

(iii) solve problems involving the lateral surface area of a triangular prism by determining the area of the shape's net

(iv) solve problems involving the lateral surface area of a triangular pyramid by determining the area of the shape's net

(v) solve problems involving the total surface area of a rectangular prism by determining the area of the shape's net

(vi) solve problems involving the total surface area of a rectangular pyramid by determining the area of the shape's net

(vii) solve problems involving the total surface area of a triangular prism by determining the area of the shape's net

(viii) solve problems involving the total surface area of a triangular pyramid by determining the area of the shape's net

(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;

(i) write one-variable, two-step equations to represent constraints or conditions within problems

(ii) write one-variable, two-step inequalities to represent constraints or conditions within problems

(B) represent solutions for one-variable, two-step equations and inequalities on number lines; and

(i) represent solutions for one-variable, two-step equations on number lines

(ii) represent solutions for one-variable, two-step inequalities on number lines

(C) write a corresponding real-world problem given a one-variable, two-step equation or inequality.

(i) write a corresponding real-world problem given a one-variable, two-step equation or inequality

(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;

(i) model one-variable, two-step equations

(ii) model one-variable, two-step inequalities

(iii) solve one-variable, two-step equations

(iv) solve one-variable, two-step inequalities

(B) determine if the given value(s) make(s) one-variable, two-step equations and inequalities true; and

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

(ii) determine if the given value(s) make(s) one-variable, two-step inequalities true

(C) write and solve equations using geometry concepts, including the sum of the angles in a triangle, and angle relationships.

(i) write equations using geometry concepts, including the sum of the angles in a triangle

(ii) write equations using angle relationships

(iii) solve equations using geometry concepts, including the sum of the angles in a triangle

(iv) solve equations using angle relationships

(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;

(i) compare two groups of numeric data using comparative dot plots or box plots by comparing their shapes

(ii) compare two groups of numeric data using comparative dot plots or box plots by comparing their centers

(iii) compare two groups of numeric data using comparative dot plots or box plots by comparing their spreads

(B) use data from a random sample to make inferences about a population; and

(i) use data from a random sample to make inferences about a population

(C) compare two populations based on data in random samples from these populations, including informal comparative inferences about differences between the two populations.

(i) compare two populations based on data in random samples from these populations, including informal comparative inferences about differences between the two populations

(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;

(i) calculate the sales tax for a given purchase

(ii) calculate income tax for earned wages

(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;

(i) identify the components of a personal budget, including income

(ii) identify the components of a personal budget, including planned savings for college

(iii) identify the components of a personal budget, including retirement

(iv) identify the components of a personal budget, including emergencies

(v) identify the components of a personal budget, including taxes

(vi) identify the components of a personal budget, including fixed expenses

(vii) identify the components of a personal budget, including variable expenses

(viii) calculate what percentage each category comprises of the total budget

(C) create and organize a financial assets and liabilities record and construct a net worth statement;

(i) create a financial assets and liabilities record

(ii) organize a financial assets and liabilities record

(iii) construct a net worth statement

(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;

(i) use a family budget estimator to determine the minimum household budget needed for a family to meet its basic needs in the student's city or another large city nearby

(ii) use a family budget estimator to determine the average hourly wage needed for a family to meet its basic needs in the student's city or another large city nearby

(E) calculate and compare simple interest and compound interest earnings; and

(i) calculate simple interest earnings

(ii) calculate compound interest earnings

(iii) compare simple interest and compound interest earnings

(F) analyze and compare monetary incentives, including sales, rebates, and coupons.

(i) analyze monetary incentives, including sales

(ii) analyze monetary incentives, including rebates

(iii) analyze monetary incentives, including coupons

(iv) compare monetary incentives, including sales

(v) compare monetary incentives, including rebates

(vi) compare monetary incentives, including coupons