Standard: Middle School Advanced Mathematics, Grade 7 (IMRA 26)

Subject: Mathematics
Grade: 07
Expectations: 67
Breakouts: 235

(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. To increase the number of students who complete advanced mathematics courses in high school, the middle school advanced mathematics courses are designed to enable students to complete Algebra I by the end of Grade 8.

4. The primary focal areas in Grade 7, Middle School Advanced Mathematics are numeracy; proportionality; expressions, equations, and relationships; and data science. 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, 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 continue to develop a foundational understanding of functions. 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. The use of technology, including graphing tools, is essential in middle school advanced mathematics courses to master algebra readiness skills by bridging conceptual understanding and procedural fluency.

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 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) Numeracy--foundations of real numbers. 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;

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

(B) approximate the value of an irrational number, including π and square roots of numbers less than 225, and locate that rational number approximation on a number line;

(i) approximate the value of an irrational number, including π

(ii) approximate the value of an irrational number, including square roots of numbers less than 225

(iii) locate that rational number approximation on a number line

(C) convert between standard decimal notation and scientific notation; and

(i) convert between standard decimal notation and scientific notation

(D) order a set of real numbers arising from mathematical and real-world contexts.

(i) order a set of real numbers arising from mathematical contexts

(ii) order a set of real numbers arising from real-world contexts

(3) Numeracy--operations with rational numbers. 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) Numeracy--applications of percents. The student applies mathematical process standards to represent and solve problems involving percents as proportional relationships. The student is expected to:

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

(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

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

(i) calculate simple interest earnings

(ii) calculate compound interest earnings

(iii) compare simple interest and compound interest earnings

(C) 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

(D) solve real-world problems comparing how interest rate and loan length affect the cost of credit;

(i) solve real-world problems comparing how interest rate affect[s] the cost of credit

(ii) solve real-world problems comparing how loan length affect[s] the cost of credit

(E) calculate the total cost of repaying a loan, including credit cards and easy access loans, under various rates of interest and over different periods using an online calculator;

(i) calculate the total cost of repaying a loan, including credit cards, under various rates of interest using an online calculator

(ii) calculate the total cost of repaying a loan, including credit cards, over different periods using an online calculator

(iii) calculate the total cost of repaying a loan, including easy access loans, under various rates of interest using an online calculator

(iv) calculate the total cost of repaying a loan, including easy access loans, over different periods using an online calculator

(F) explain how small amounts of money invested regularly, including money saved for college and retirement, grow over time; and

(i) explain how small amounts of money invested regularly, including money saved for college, grow over time

(ii) explain how small amounts of money invested regularly, including money saved for retirement, grow over time

(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.

(i) estimate the cost of a two-year college education, including family contribution

(ii) estimate the cost of a four-year college education, including family contribution

(iii) 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

(5) Proportionality--geometric ratios. The student applies mathematical process standards to use geometry to describe or solve problems involving proportional relationships such as dilations. The student is expected to:

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

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

(B) 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

(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

(D) compare and contrast the attributes of a shape and its dilation(s) on a coordinate plane; and

(i) compare and contrast the attributes of a shape and its dilation(s) on a coordinate plane

(E) 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.

(i) 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

(6) Proportionality--probability. 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) 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

(G) 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) One-variable expressions, equations, and relationships--applications of one-variable relationships. The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to:

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

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

(B) model and solve one-variable, two-step inequalities;

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

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

(C) write one-variable equations or inequalities with variables on both sides that represent problems using rational number coefficients and constants;

(i) write one-variable equations or inequalities with variables on both sides that represent problems using rational number coefficients and constants

(D) 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

(i) 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

(E) 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.

(i) model one-variable equations with variables on both sides of the equal sign that represent mathematical problems using rational number coefficients and constants

(ii) model one-variable equations with variables on both sides of the equal sign that represent real-world problems using rational number coefficients and constants

(iii) solve one-variable equations with variables on both sides of the equal sign that represent mathematical problems using rational number coefficients and constants

(iv) solve one-variable equations with variables on both sides of the equal sign that represent real-world problems using rational number coefficients and constants

(8) Two-variable equations and relationships--foundations of linear relationships. 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) 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

(B) distinguish between proportional and non-proportional situations using tables, graphs, and equations in the form y = kx or y = mx + b, where b ≠ 0; and

(i) distinguish between proportional and non-proportional situations using tables

(ii) distinguish between proportional and non-proportional situations using graphs

(iii) distinguish between proportional and non-proportional situations using equations in the form y = kx or y = mx + b, where b ≠ 0

(C) identify examples of proportional and non-proportional relationships that arise from mathematical and real-world problems.

(i) identify examples of proportional relationships that arise from mathematical problems

(ii) identify examples of proportional relationships that arise from real-world problems

(iii) identify examples of non-proportional relationships that arise from mathematical problems

(iv) identify examples of non-proportional relationships that arise from real-world problems

(9) Two-variable equations and relationships--applications of linear relationships. The student applies mathematical process standards to represent linear relationships using multiple representations. The student is expected to:

(A) represent linear proportional and non-proportional relationships using verbal descriptions, tables, graphs, and equations that simplifiy to the form y = mx + b.

(i) represent linear proportional relationships with verbal description

(ii) represent linear proportional relationships with tables

(iii) represent linear proportional relationships with graphs

(iv) represent linear proportional relationships with equations that simplifiy to the form of y = mx + b

(v) represent linear non-proportional relationships with verbal description

(vi) represent linear non-proportional relationships with tables

(vii) represent linear non-proportional relationships with graphs

(viii) represent linear non-proportional relationships with equations that simplifiy to the form of y = mx + b

(10) Geometric expressions, equations, and relationships--foundations of geometric concepts. The student applies mathematical process standards to develop geometric relationships and solve problems. The student is expected to:

(A) 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

(B) 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

(C) describe the volume formula V = Bh of a cylinder in terms of its base area and its height;

(i) describe the volume formula V = Bh of a cylinder in terms of its base area and its height

(D) 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

(E) 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;

(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

(F) model the relationship between the volume of a cylinder and a cone having both congruent bases and heights and connect that relationship to the formulas;

(i) model the relationship between the volume of a cylinder and a cone having both congruent bases and heights

(ii) connect that relationship to the formulas

(G) use models and diagrams to explain the Pythagorean theorem; and

(i) use models to explain the Pythagorean theorem

(ii) use diagrams to explain the Pythagorean theorem

(H) 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.

(i) use informal arguments to establish facts about the angle sum of triangles

(ii) use informal arguments to establish facts about the exterior angles of triangles

(iii) use informal arguments to establish facts about the angles created when parallel lines are cut by a transversal

(iv) use informal arguments to establish facts about the angle-angle criterion for similarity of triangles

(11) Geometric expressions, equations, and relationships--applications of geometric concepts. The student applies mathematical process standards to solve geometric problems. The student is expected to:

(A) determine the circumference and area of circles;

(i) determine the circumference of circles

(ii) determine the area of circles

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

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

(C) 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;

(i) use previous knowledge of surface area to make connections to the formulas for lateral surface area

(ii) use previous knowledge of surface area to make connections to the formulas for total surface area

(iii) determine solutions for problems involving rectangular prisms

(iv) determine solutions for problems involving triangular prisms

(v) determine solutions for problems involving cylinders

(D) solve problems involving the volume of rectangular pyramids and triangular pyramids;

(i) solve problems involving the volume of rectangular pyramids

(ii) solve problems involving the volume of triangular pyramids

(E) solve problems involving the volume of cylinders, cones, and spheres;

(i) solve problems involving the volume of cylinders

(ii) solve problems involving the volume of cones

(iii) solve problems involving the volume of spheres

(F) use the Pythagorean Theorem and its converse to solve problems; and

(i) use the Pythagorean Theorem to solve problems

(ii) use [the Pythagorean Theorem's] converse to solve problems

(G) determine the distance between two points on a coordinate plane using the Pythagorean Theorem.

(i) determine the distance between two points on a coordinate plane using the Pythagorean Theorem

(12) Geometric expressions, equations, and relationships--transformations. 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;

(i) generalize the properties of orientation rotations of two-dimensional shapes on a coordinate plane

(ii) generalize the properties of orientation reflections of two-dimensional shapes on a coordinate plane

(iii) generalize the properties of orientation translations of two-dimensional shapes on a coordinate plane

(iv) generalize the properties of orientation dilations of two-dimensional shapes on a coordinate plane

(v) generalize the properties of congruence of rotations of two-dimensional shapes on a coordinate plane

(vi) generalize the properties of congruence of reflections of two-dimensional shapes on a coordinate plane

(vii) generalize the properties of congruence of translations of two-dimensional shapes on a coordinate plane

(B) differentiate between transformations that preserve congruence and those that do not;

(i) differentiate between transformations that preserve congruence and those that do not

(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

(i) explain the effect of translations as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

(ii) explain the effect of reflections over the x- or y-axis as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

(iii) explain the effect of rotations [of] 90° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

(iv) explain the effect of rotations [of] 180° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

(v) explain the effect of rotations [of] 270° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

(vi) explain the effect of rotations [of] 360° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation

(D) model the effect on linear and area measurements of dilated two-dimensional shapes.

(i) model the effect on linear measurements of dilated two-dimensional shapes

(ii) model the effect on area measurements of dilated two-dimensional shapes

(13) Data science--applications of measurement and data. The student applies mathematical process standards to use statistical representations and procedures to analyze and describe data. The student is expected to:

(A) 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

(B) 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

(C) simulate generating random samples of the same size from a population with known characteristics to develop the notion of a random sample being representative of the population from which it was selected; and

(i) simulate generating random samples of the same size from a population with known characteristics to develop the notion of a random sample being representative of the population from which it was selected

(D) 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.

(i) determine the mean absolute deviation

(ii) 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

(14) Personal financial literacy--money management. 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) 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

(B) 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; and

(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

(C) analyze situations to determine if they represent financially responsible decisions and identify the benefits of financial responsibility and the costs of financial irresponsibility.

(i) analyze situations to determine if they represent financially responsible decisions

(ii) identify the benefits of financial responsibility

(iii) identify the costs of financial irresponsibility