

Math, Grade 4 (IMRA)

Subject: Mathematics

Grade: 04

Expectations: 53

Breakouts: 163

(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. For students to become fluent in mathematics, students must develop a robust sense of number. The National Research Council's report, "Adding It Up," defines procedural fluency as "skill in carrying out procedures flexibly, accurately, efficiently, and appropriately." As students develop procedural fluency, they must also realize that true problem solving may take time, effort, and perseverance. Students in Grade 4 are expected to perform their work without the use of calculators.
4. The primary focal areas in Grade 4 are use of operations, fractions, and decimals and describing and analyzing geometry and measurement. These focal areas are supported throughout the mathematical strands of number and operations, algebraic reasoning, geometry and measurement, and data analysis. In Grades 3-5, the number set is limited to positive rational numbers. In number and operations, students will apply place value and represent points on a number line that correspond to a given fraction or terminating decimal. In algebraic reasoning, students will represent and solve multi-step problems involving the four operations with whole numbers with expressions and equations and generate and analyze patterns. In geometry and measurement, students will classify two-dimensional figures, measure angles, and convert units of measure. In data analysis, students will represent and interpret data.
5. Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and Skills 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, compare, and order whole numbers and decimals and understand relationships related to place value. The student is expected to:

(A) interpret the value of each place-value position as 10 times the position to the right and as one-tenth of the value of the place to its left;

- (i) interpret the value of each place-value position as 10 times the position to the right
- (ii) interpret the value of each place-value position as one-tenth of the value of the place to its left

(B) represent the value of the digit in whole numbers through 1,000,000,000 and decimals to the hundredths using expanded notation and numerals;

- (i) represent the value of the digit in whole numbers through 1,000,000,000 using expanded notation
- (ii) represent the value of the digit in whole numbers through 1,000,000,000 using numerals

- (iii) represent the value of the digit in decimals to the hundredths using expanded notation
 - (iv) represent the value of the digit in decimals to the hundredths using numerals
- (C) compare and order whole numbers to 1,000,000,000 and represent comparisons using the symbols $>$,
- (i) compare whole numbers to 1,000,000,000
 - (ii) order whole numbers to 1,000,000,000
 - (iii) represent comparisons using the symbols $>$, $<$, or $=$
- (D) round whole numbers to a given place value through the hundred thousands place;
- (i) round whole numbers to a given place value through the hundred thousands place
- (E) represent decimals, including tenths and hundredths, using concrete and visual models and money;
- (i) represent decimals, including tenths, using concrete models
 - (ii) represent decimals, including tenths, using visual models
 - (iii) represent decimals, including tenths, using money
 - (iv) represent decimals, including hundredths, using concrete models
 - (v) represent decimals, including hundredths, using visual models
 - (vi) represent decimals, including hundredths, using money
- (F) compare and order decimals using concrete and visual models to the hundredths;
- (i) compare decimals using concrete models to the hundredths
 - (ii) compare decimals using visual models to the hundredths
 - (iii) order decimals using concrete models to the hundredths
 - (iv) order decimals using visual models to the hundredths
- (G) relate decimals to fractions that name tenths and hundredths; and
- (i) relate decimals to fractions that name tenths
 - (ii) relate decimals to fractions that name hundredths
- (H) determine the corresponding decimal to the tenths or hundredths place of a specified point on a number line.
- (i) determine the corresponding decimal to the tenths or hundredths place of a specified point on a number line
- (3) Number and operations. The student applies mathematical process standards to represent and generate fractions to solve problems. The student is expected to:
- (A) represent a fraction a/b a sum of fractions $1/b$, where a and b are whole numbers and $b > 0$, including when $a > b$;
 - (i) represent a fraction a/b as a sum of fractions $1/b$, where a and b are whole numbers and $b > 0$, including when $a > b$;
 - (B) decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations;
 - (i) decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete models and recording results with symbolic representations

- (ii) decompose a fraction in more than one way into a sum of fractions with the same denominator using pictorial models and recording results with symbolic representations
- (C) determine if two given fractions are equivalent using a variety of methods;
- (i) determine if two given fractions are equivalent using a variety of methods
- (D) compare two fractions with different numerators and different denominators and represent the comparison using the symbols $>$, $=$, or
- (i) compare two fractions with different numerators
 - (ii) compare two fractions with different denominators
 - (iii) compare two fractions with different numerators and different denominators
 - (iv) represent the comparison using the symbols $>$, $=$, or $<$
- (E) represent and solve addition and subtraction of fractions with equal denominators using objects and pictorial models that build to the number line and properties of operations;
- (i) represent addition of fractions with equal denominators using objects
 - (ii) represent addition of fractions with equal denominators using pictorial models that build to the number line
 - (iii) represent addition of fractions with equal denominators using properties of operations
 - (iv) represent subtraction of fractions with equal denominators using objects
 - (v) represent subtraction of fractions with equal denominators using pictorial models that build to the number line
 - (vi) represent subtraction of fractions with equal denominators using properties of operations
 - (vii) solve addition of fractions with equal denominators using objects
 - (viii) solve addition of fractions with equal denominators using pictorial models that build to the number line
 - (ix) solve addition of fractions with equal denominators using properties of operations
 - (x) solve subtraction of fractions with equal denominators using objects
 - (xi) solve subtraction of fractions with equal denominators using pictorial models that build to the number line
 - (xii) solve subtraction of fractions with equal denominators using properties of operations
- (F) evaluate the reasonableness of sums and differences of fractions using benchmark fractions 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1, referring to the same whole; and
- (i) evaluate the reasonableness of sums of fractions using benchmark fractions 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1, referring to the same whole
 - (ii) evaluate the reasonableness of differences of fractions using benchmark fractions 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1, referring to the same whole
- (G) represent fractions and decimals to the tenths or hundredths as distances from zero on a number line.
- (i) represent fractions to the tenths or hundredths as distances from zero on a number line
 - (ii) represent decimals to the tenths or hundredths as distances from zero on a number line

- (4) Number and operations. The student applies mathematical process standards to develop and use strategies and methods for whole number computations and decimal sums and differences in order to solve problems with efficiency and accuracy. The student is expected to:
- (A) add and subtract whole numbers and decimals to the hundredths place using the standard algorithm;
 - (i) add whole numbers using the standard algorithm
 - (ii) add decimals to the hundredths place using the standard algorithm
 - (iii) add whole numbers and decimals to the hundredths place using the standard algorithm
 - (iv) subtract whole numbers using the standard algorithm
 - (v) subtract decimals to the hundredths place using the standard algorithm
 - (vi) subtract whole numbers and decimals to the hundredths place using the standard algorithm
 - (B) determine products of a number and 10 or 100 using properties of operations and place value understandings;
 - (i) determine products of a number and 10 or 100 using properties of operations
 - (ii) determine products of a number and 10 or 100 using place value understandings
 - (C) represent the product of 2 two-digit numbers using arrays, area models, or equations, including perfect squares through 15 by 15;
 - (i) represent the product of 2 two-digit numbers using arrays, area models, or equations, including perfect squares through 15 by 15
 - (D) use strategies and algorithms, including the standard algorithm, to multiply up to a four-digit number by a one-digit number and to multiply a two-digit number by a two-digit number. Strategies may include mental math, partial products, and the commutative, associative, and distributive properties;
 - (i) use strategies to multiply up to a four-digit number by a one-digit number
 - (ii) use strategies to multiply a two-digit number by a two-digit number
 - (iii) use algorithms, including the standard algorithm, to multiply up to a four-digit number by a one-digit number
 - (iv) use algorithms, including the standard algorithm, to multiply a two-digit number by a two-digit number
 - (E) represent the quotient of up to a four-digit whole number divided by a one-digit whole number using arrays, area models, or equations;
 - (i) represent the quotient of up to a four-digit whole number divided by a one-digit whole number using arrays, area models, or equations
 - (F) use strategies and algorithms, including the standard algorithm, to divide up to a four-digit dividend by a one-digit divisor;
 - (i) use strategies to divide up to a four-digit dividend by a one-digit divisor
 - (ii) use algorithms, including the standard algorithm, to divide up to a four-digit dividend by a one-digit divisor
 - (G) round to the nearest 10, 100, or 1,000 or use compatible numbers to estimate solutions involving whole numbers; and
 - (i) round to the nearest 10, 100, or 1,000 or use compatible numbers to estimate solutions involving whole numbers

- (H) solve with fluency one- and two-step problems involving multiplication and division, including interpreting remainders.
- (i) solve with fluency one-step problems involving multiplication
 - (ii) solve with fluency one-step problems involving division, including interpreting remainders
 - (iii) solve with fluency two-step problems involving multiplication
 - (iv) solve with fluency two-step problems involving division, including interpreting remainders
 - (v) solve with fluency two-step problems involving multiplication and division including interpreting remainders
- (5) Algebraic reasoning. The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:
- (A) represent multi-step problems involving the four operations with whole numbers using strip diagrams and equations with a letter standing for the unknown quantity;
 - (i) represent multi-step problems involving the four operations with whole numbers using strip diagrams
 - (ii) represent multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity
 - (B) represent problems using an input-output table and numerical expressions to generate a number pattern that follows a given rule representing the relationship of the values in the resulting sequence and their position in the sequence;
 - (i) represent problems using an input-output table to generate a number pattern that follows a given rule representing the relationship of the values in the resulting sequence and their position in the sequence
 - (ii) represent problems using numerical expressions to generate a number pattern that follows a given rule representing the relationship of the values in the resulting sequence and their position in the sequence
 - (C) use models to determine the formulas for the perimeter of a rectangle ($l + w + l + w$ or $2l + 2w$), including the special form for perimeter of a square ($4s$) and the area of a rectangle ($l \times w$)
 - (i) use models to determine the formulas for the perimeter of a rectangle ($l + w + l + w$ or $2l + 2w$), including the special form for perimeter of a square ($4s$)
 - (ii) use models to determine the formula for the area of a rectangle ($l \times w$)
 - (D) solve problems related to perimeter and area of rectangles where dimensions are whole numbers.
 - (i) solve problems related to perimeter of rectangles where dimensions are whole numbers
 - (ii) solve problems related to area of rectangles where dimensions are whole numbers
- (6) Geometry and measurement. The student applies mathematical process standards to analyze geometric attributes in order to develop generalizations about their properties. The student is expected to:
- (A) identify points, lines, line segments, rays, angles, and perpendicular and parallel lines;
 - (i) identify points
 - (ii) identify lines
 - (iii) identify line segments
 - (iv) identify rays

- (v) identify angles
 - (vi) identify perpendicular lines
 - (vii) identify parallel lines
- (B) identify and draw one or more lines of symmetry, if they exist, for a two-dimensional figure;
- (i) identify one or more lines of symmetry, if they exist, for a two-dimensional figure
 - (ii) draw one or more lines of symmetry, if they exist, for a two-dimensional figure
- (C) apply knowledge of right angles to identify acute, right, and obtuse triangles; and
- (i) apply knowledge of right angles to identify acute triangles
 - (ii) apply knowledge of right angles to identify right triangles
 - (iii) apply knowledge of right angles to identify obtuse triangles
- (D) classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size.
- (i) classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size
- (7) Geometry and measurement. The student applies mathematical process standards to solve problems involving angles less than or equal to 180 degrees. The student is expected to:
- (A) illustrate the measure of an angle as the part of a circle whose center is at the vertex of the angle that is "cut out" by the rays of the angle. Angle measures are limited to whole numbers;
- (i) illustrate the measure of an angle as the part of a circle whose center is at the vertex of the angle that is "cut out" by the rays of the angle. Angle measures are limited to whole numbers
- (B) illustrate degrees as the units used to measure an angle, where $\frac{1}{360}$ of any circle is one degree and an angle that "cuts" $\frac{n}{360}$ out of any circle whose center is at the angle's vertex has a measure of n degrees. Angle measures are limited to whole numbers
- (i) illustrate degrees as the units used to measure an angle, where $\frac{1}{360}$ of any circle is one degree
 - (ii) illustrate degrees as the units used to measure an angle, where an angle that "cuts" $\frac{n}{360}$ out of any circle whose center is at the angle's vertex has a measure of n degrees
- (C) determine the approximate measures of angles in degrees to the nearest whole number using a protractor;
- (i) determine the approximate measures of angles in degrees to the nearest whole number using a protractor
- (D) draw an angle with a given measure; and
- (i) draw an angle with a given measure
- (E) determine the measure of an unknown angle formed by two non-overlapping adjacent angles given one or both angle measures.
- (i) determine the measure of an unknown angle formed by two non-overlapping adjacent angles given one or both angle measures
- (8) Geometry and measurement. The student applies mathematical process standards to select appropriate customary and metric units, strategies, and tools to solve problems involving measurement. The student is expected to:

- (A) identify relative sizes of measurement units within the customary and metric systems;
 - (i) identify relative sizes of measurement units within the customary systems
 - (ii) identify relative sizes of measurement units within the metric systems
 - (B) convert measurements within the same measurement system, customary or metric, from a smaller unit into a larger unit or a larger unit into a smaller unit when given other equivalent measures represented in a table; and
 - (i) convert measurements within the same measurement system, customary or metric, from a smaller unit into a larger unit or a larger unit into a smaller unit when given other equivalent measures represented in a table
 - (C) solve problems that deal with measurements of length, intervals of time, liquid volumes, mass, and money using addition, subtraction, multiplication, or division as appropriate.
 - (i) solve problems that deal with measurements of length using addition, subtraction, multiplication, or division as appropriate
 - (ii) solve problems that deal with intervals of time using addition, subtraction, multiplication, or division as appropriate
 - (iii) solve problems that deal with liquid volumes using addition, subtraction, multiplication, or division as appropriate
 - (iv) solve problems that deal with mass using addition, subtraction, multiplication, or division as appropriate
 - (v) solve problems that deal with money using addition, subtraction, multiplication, or division as appropriate
- (9) Data analysis. The student applies mathematical process standards to solve problems by collecting, organizing, displaying, and interpreting data. The student is expected to:
- (A) represent data on a frequency table, dot plot, or stem-and-leaf plot marked with whole numbers and fractions; and
 - (i) represent data on a frequency table, dot plot, or stem-and-leaf plot marked with whole numbers
 - (ii) represent data on a frequency table, dot plot, or stem-and-leaf plot marked with fractions
 - (iii) represent data on a frequency table, dot plot, or stem-and-leaf plot marked with whole numbers and fractions
 - (B) solve one- and two-step problems using data in whole number, decimal, and fraction form in a frequency table, dot plot, or stem-and-leaf plot.
 - (i) solve one-step problems using data in whole number form in a frequency table, dot plot, or stem-and-leaf plot
 - (ii) solve one-step problems using data in decimal form in a frequency table, dot plot, or stem-and-leaf plot
 - (iii) solve one-step problems using data in fraction form in a frequency table, dot plot, or stem-and-leaf plot
 - (iv) solve two-step problems using data in whole number form in a frequency table, dot plot, or stem-and-leaf plot
 - (v) solve two-step problems using data in decimal form in a frequency table, dot plot, or stem-and-leaf plot
 - (vi) solve two-step problems using data in fraction form in a frequency table, dot plot, or stem-and-leaf plot
- (10) Personal financial literacy. The student applies mathematical process standards to manage one's financial resources effectively for lifetime financial security. The student is expected to:

- (A) distinguish between fixed and variable expenses;
 - (i) distinguish between fixed and variable expenses
- (B) calculate profit in a given situation;
 - (i) calculate profit in a given situation
- (C) compare the advantages and disadvantages of various savings options;
 - (i) compare the advantages of various savings options
 - (ii) compare the disadvantages of various savings options
- (D) describe how to allocate a weekly allowance among spending; saving, including for college; and sharing; and
 - (i) describe how to allocate a weekly allowance among spending; saving, including for college; and sharing
- (E) describe the basic purpose of financial institutions, including keeping money safe, borrowing money, and lending.
 - (i) describe the basic purpose of financial institutions, including keeping money safe
 - (ii) describe the basic purpose of financial institutions, including borrowing money
 - (iii) describe the basic purpose of financial institutions, including lending