

Fifth Grade

§111.7. Grade 5, Adopted 2012.

(a) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and pencil, and technology and techniques such as mental math, estimation, number sense, and generalization and abstraction to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical 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 5 are expected to perform their work without the use of calculators.

(4) The primary focal areas in Grade 5 are solving problems involving all four operations with positive rational numbers, determining and generating formulas and solutions to expressions, and extending measurement to area and volume. These focal areas are supported throughout the mathematical strands of number and operations, algebraic reasoning, geometry and measurement, and data analysis. In Grades 3-5, the number set is limited to positive rational numbers. In number and operations, students will apply place value and identify part-to-whole relationships and equivalence. In algebraic reasoning, students will represent and solve problems with expressions and equations, build foundations of functions through patterning, identify prime and composite numbers, and use the order of operations. In geometry and measurement, students will classify two-dimensional figures, connect geometric attributes to the measures of three-dimensional figures, use units of measure, and represent location using a coordinate plane. In data analysis, students will represent and interpret data.

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

Notes:


(b) Knowledge and skills

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

New Process Standards	Old Process Standards	Common Core Mathematical Practices
(A) apply mathematics to problems arising in everyday life, society, and the workplace;	5.14A identify the mathematics in everyday situations;	
(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution , and evaluating the problem-solving process and the reasonableness of the solution;	5.14B solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness; 5.14C select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem	1 Make sense of problems and persevere in solving them.
(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;	5.14D use tools such as real objects, manipulatives, and technology to solve problems.	5 Use appropriate tools strategically.
(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;	5.15A explain and record observations using objects, words, pictures, numbers, and technology	4 Model with mathematics. 7 Look for and make use of structure.
(E) create and use representations to organize, record, and communicate mathematical ideas;	5.15B relate informal language to mathematical language and symbols.	2 Reason abstractly and quantitatively.
(F) analyze mathematical relationships to connect and communicate mathematical ideas; and	5.16A make generalizations from patterns or sets of examples and non-examples;	8 Look for and express regularity in repeated reasoning.
(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.	5.16B justify why an answer is reasonable and explain the solution process.	3 Construct viable arguments and critique the reasoning of others. 6 Attend to precision.






Notes

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

New Standards	Old Standards	Common Core
(A) represent the value of the digit in decimals through the thousandths using expanded notation⁺ and numerals;	5.1B use place value to read, write, compare, and order decimals through the thousandths place	<p>NBT3 Read, write, and compare decimals to thousandths.</p> <p>a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.</p> <p>b. Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and $<$ symbols to record the results of comparisons.</p>
(B) compare and order two decimals to thousandths and represent comparisons using the symbols $>$, $<$, or $=$; and		
		NBT1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
		NBT2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

Notes:



(3) **Number and operations.** The student **applies mathematical process standards** to develop and use strategies and methods for positive rational number computations in order to solve problems with efficiency and accuracy. The student is expected to:

New Standards	Old Standards	Common Core
(A) estimate to determine solutions to mathematical and real-world problems involving addition, subtraction, multiplication, or division;	5.4 use strategies, including rounding and compatible numbers to estimate solutions to addition, subtraction, multiplication, and division problems	4.OA.3
(B) multiply with fluency ⁺ a three-digit number by a two-digit number using the standard algorithm;	5.3B use multiplication to solve problems involving whole numbers (no more than three digits times two digits without technology)	NBT5 Fluently multiply multi-digit whole numbers using the standard algorithm.
(C) solve with proficiency ⁺ for quotients of up to a four-digit dividend ⁺ by a two-digit divisor using strategies ⁺ and the standard algorithm;	5.3C use division to solve problems involving whole numbers (no more than two-digit divisors and three-digit dividends without technology), including interpreting the remainder within a given context	NBT6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
(D) represent multiplication of decimals with products to the hundredths using objects and pictorial models, including area models;		NBT7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
(E) solve for products of decimals to the hundredths, including situations involving money, using strategies based on place-value understandings, properties of operations, and the relationship to the multiplication of whole numbers;		
(F) represent quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using objects and pictorial models, including area models;		
(G) solve for quotients of decimals to the hundredths, up to four-digit dividends and two-digit whole number divisors, using strategies and algorithms, including the standard algorithm;		
(H) represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations;		

(B) new (+) added (-) eliminated

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		<p>difference of fractions with like denominators. <i>For example, $2/3 + 5/4 = 8/12 + 15/12 = 23/12$. (In general, $a/b + c/d = (ad + bc)/bd$.)</i></p> <p>NF2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. <i>For example, recognize an incorrect result $2/5 + 1/2 = 3/7$, by observing that $3/7 < 1/2$.</i></p>
<p>(I) represent and solve multiplication of a whole number and a fraction that refers to the same whole using objects and pictorial models, including area models;</p>	<p></p>	<p>4.NF.4abc</p> <p>NF4 Apply and extend previous understandings of multiplication (4.NF.4abc) to multiply a fraction or whole number by a fraction.</p> <p>a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. <i>For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)</i></p> <p>b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.</p>
<p>(J) represent division of a unit fraction by a whole number and the division of a whole number by a unit fraction such as $1/3 \div 7$ and $7 \div 1/3$ using objects and pictorial models, including area models;</p>	<p></p>	<p>NF7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.</p> <p>a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. <i>For example, create a story context for $(1/3) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1/3) \div 4 = 1/12$ because $(1/12) \times 4 = 1/3$.</i></p> <p>b. Interpret division of a whole number by a unit fraction, and compute such quotients. <i>For example, create a story context for $4 \div (1/5)$, and</i></p>





		<p>use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (1/5) = 20$ because $20 \times (1/5) = 4$.</p> <p>c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $1/3$-cup servings are in 2 cups of raisins?</p> <p>Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.</p>
<p>(K) add and subtract positive rational numbers fluently; and</p>		
<p>(L) divide whole numbers by unit fractions and unit fractions by whole numbers.</p>		<p>NF7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.</p> <p>a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for $(1/3) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1/3) \div 4 = 1/12$ because $(1/12) \times 4 = 1/3$.</p> <p>b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for $4 \div (1/5)$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (1/5) = 20$ because $20 \times (1/5) = 4$.</p> <p>c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much</p>

		<p><i>chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?</i></p> <p>Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.</p>
	-5.1A use place value to read, write, compare, and order whole numbers through the 999,999,999,999 (moved to 4 th grade)	
	-5.2A generate a fraction equivalent to a given fraction such as 1/2 and 3/6 or 4/12 and 1/3 (moved to 4 th grade)	
	-5.2B generate a mixed number equivalent to a given improper fraction or generate an improper fraction equivalent to a given mixed number (moved to 4 th grade)	
	-5.2C compare two fractional quantities in problem-solving situations using a variety of methods, including common denominators (moved to 4 th grade)	
	-5.2D use models to relate decimals to fractions that name tenths, hundredths, and thousandths (moved to 4 th grade)	
	-5.3D identify common factors of a set of whole numbers	
	-5.3E model situations using addition and/or subtraction involving fractions with like denominators using concrete objects, pictures, words, and numbers (moved to 4 th grade)	
		NF3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers

(B) new (+) added (-) eliminated

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(4) **Algebraic reasoning.** The student **applies mathematical process standards** to develop concepts of expressions and equations. The student is expected to:

New Standards	Old Standards	Common Core
(A) identify prime and composite numbers;	5.5B identify prime and composite numbers using concrete objects, pictorial models, and patterns in factor pairs	4.OA.4
(B) represent and solve multi-step problems involving the four operations with whole numbers using equations with a letter standing for the unknown quantity;	5.6A select from and use diagrams and equations such as $y = 5 + 3$ to represent meaningful problem situations	
(C) generate a numerical pattern when given a rule in the form $y = ax$ or $y = x + a$ and graph;		
(D) recognize the difference between additive and multiplicative numerical patterns given in a table or graph;		
(E) describe the meaning of parentheses and brackets in a numeric expression;		OA1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. OA2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. <i>For example, express the calculation "add 8 and 7, then multiply by 2" as $2 \times (8 + 7)$. Recognize that $3 \times (18932 + 921)$ is three times as large as $18932 + 921$, without having to calculate the indicated sum or product.</i>
(F) simplify numerical expressions that do not involve exponents, including up to two levels of grouping;	 from middle school	
(G) use concrete objects and pictorial models to develop the formulas for the volume of a rectangular prism, including the special form for a cube ($V = l \times w \times h$, $V = s \times s \times s$, and $V = Bh$); and	5.10B connect models for perimeter, area, and <u>volume</u> with their respective formulas (connect models for perimeter and area moved to 4 th)	MD5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
(H) represent ⁺ and solve problems related to perimeter and/or area and related to volume.	5.10C select and use appropriate units and formulas to measure length, perimeter, area, and volume	a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the

(B) new (+) added (-) eliminated

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		associative property of multiplication. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
	-5.5A describe the relationship between sets of data in graphic organizers such as lists, tables, charts, and diagrams	
		OA3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. <i>For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so</i>

Notes:

5.4E describe [such as 4 (14 + 5) is 4 times as large as (14 + 5)]

5.4F two levels of grouping [such as (3+7)/(5-3)]



5.4H solve problems [such as rectangles and composite figures formed by rectangles] and (related to volume) [such as rectangular prisms.]

(5) **Geometry and measurement.** The student **applies mathematical process standards** to classify two-dimensional figures by attributes and properties. The student is expected to

New Standards	Old Standards	Common Core
(A) classify⁺ two-dimensional figures in a hierarchy of sets and subsets⁺ using graphic organizers based on their attributes and properties.	5.7 identify essential attributes including parallel, perpendicular, and congruent parts of two- and three-dimensional geometric figures	G3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. G4 Classify two-dimensional figures in a hierarchy based on properties.

Notes: [such as all rectangles have the property that opposite sides are parallel; therefore, every rectangle is a parallelogram.]

(6) **Geometry and measurement.** The student **applies mathematical process standards** to understand, recognize, and quantify volume. The student is expected to:

New Standards	Old Standards	Common Core
(A) recognize a cube with side length of one unit as a unit cube having one cubic unit of volume and the volume of a three-dimensional figure as the number of unit cubes (n cubic units) needed to fill it with no gaps or overlaps if possible; and		MD3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. MD4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
(B) determine the volume of a rectangular prism with whole number side lengths in problems related to the number of layers times the number of unit cubes in the area of the base.		MD5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it

(B) new (+) added (-) eliminated

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		<p>with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.</p> <p>b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.</p>
		<p>MD5c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.</p>

Notes:

(7) Geometry and measurement. *The student applies mathematical process standards to select appropriate units, strategies, and tools to solve problems involving measurement.*
The student is expected to



New Standards	Old Standards	Common Core
(A) solve problems by calculating conversions within a measurement system, customary or metric.	5.10A perform simple conversions within the same measurement system (SI (metric) or customary)	MD1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
	-5.1 IA solve problems involving changes in temperature	
	-5.1 IB solve problems involving elapsed time (moved to 4 th grade)	

Notes:

(B) new (+) added (-) eliminated




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(8) **Geometry and measurement.** The student **applies mathematical process standards** to identify locations on a coordinate plane. The student is expected to:

New Standards	Old Standards	Common Core
<p>(A) describe the key attributes of the coordinate plane, including perpendicular number lines (axes) where the intersection (origin) of the two lines coincides with zero on each number line and the given point (0, 0); the x-coordinate, the first number in an ordered pair, indicates movement parallel to the x-axis starting at the origin; and the y-coordinate, the second number, indicates movement parallel to the y-axis starting at the origin;</p>	<p></p>	<p>G1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).</p>
<p>(B) describe the process for graphing ordered pairs of numbers in the first quadrant of the coordinate plane; and</p>	<p></p>	
<p>(C) graph in the first quadrant of the coordinate plane ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table⁺.</p>	<p>5.9 locate and name points on a coordinate grid using ordered pairs of whole numbers</p>	<p>G2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.</p>
	<p>-5.8A sketch the results of translations, rotations, and reflections on a Quadrant I coordinate grid (moved to middle school)</p>	
	<p>-5.8B identify the transformation that generates one figure from the other when given two congruent figures on a Quadrant I coordinate grid (moved to middle school)</p>	






Notes:

(9) **Data analysis.** The student **applies mathematical process standards** to solve problems by collecting, organizing, displaying, and interpreting data. The student is expected to:

New Standards	Old Standards	Common Core
(A) represent categorical data with bar graphs or frequency tables and numerical data, including data sets of measurements in fractions or decimals, with dot plots or stem-and-leaf plots;		
(B) represent discrete paired data on a scatterplot; and		
(C) solve one- and two-step problems using data from a frequency table, dot plot, bar graph, stem-and-leaf plot, or scatterplot.		MD2 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots. <i>For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.</i>
	-5.12A use fractions to describe the results of an experiment (moved to middle school)	
	-5.12B use experimental results to make predictions (moved to middle school)	
	-5.12C list all possible outcomes of a probability experiment such as tossing a coin (moved to middle school)	
	-5.13A use tables of related number pairs to make line graphs	
	-5.13B describe characteristics of data presented in tables and graphs including median, mode, and range; and (moved to middle school)	
	-5.13C graph a given set of data using an appropriate graphical representation such as a picture or line graph.	

Notes:

(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:

New Standards	Old Standards	Common Core
(A) define income tax, payroll tax, sales tax, and property tax;		
(B) explain the difference between gross income and net income;		
(C) identify the advantages and disadvantages of different methods of payment, including check, credit card, debit card, and electronic payments;		
(D) develop a system for keeping and using financial records;		
(E) describe actions that might be taken to balance a budget when expenses exceed income; and		

Notes