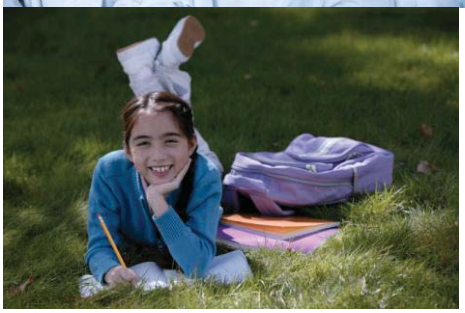

A Look at…

Fifth Grade

in California Public Schools

Including information about the new
Common Core State Standards

STANDARDS, CURRICULUM FRAMEWORKS AND INSTRUCTIONAL RESOURCES DIVISION
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Mathematics

Overview

Effective mathematics education provides students with a balanced instructional program. In such a program, students become proficient in basic computational skills and procedures, develop conceptual understandings, and become adept at problem solving. Standards-based mathematics instruction starts with basic material and increases in scope and content as the years progress. It is like an inverted pyramid, with the entire weight of the developing subject, including readiness for algebra, resting on the foundations built in the early grades.

California recently adopted new standards in mathematics, the Common Core State Standards (CCSS) with California additions. The CCSS are comprised of standards developed by the state-led Common Core State Standards Initiative and material taken from the 1997 California mathematics standards. California will implement these new standards gradually over the next several years as curriculum frameworks, instructional materials, and assessments based on the CCSS are adopted.

There are many similarities between the CCSS and the 1997 California mathematics standards, but there are also a few noteworthy differences. For instance, the CCSS are organized by "domains" which add grade-level focus and vary slightly by grade. The domains for fifth grade are Operations and Algebraic Thinking (OA), Number and Operations in Base Ten (NBT), Number and Operations – Fractions (NF), Measurement and Data (MD), and Geometry (G). Also, the CCSS do not include "key standards" as in the 1997 California mathematics standards. Instead, the CCSS are designed to have a greater focus at each grade and to develop mathematics topics in depth. In the early grades, the CCSS continue to emphasize concepts necessary for the study of more advanced mathematics in later years. To ensure that students have adequate time to achieve mastery, some of the 1997 California mathematics standards familiar to California's fifth grade teachers will be taught in different grades after the CCSS are fully implemented.

This section provides an overview of the new CCSS for fifth grade mathematics, including some highlights of how the fifth grade curriculum, based on the 1997 California mathematics standards, change with the implementation of the new CCSS. It includes a review of the important mathematical concepts and skills from fourth grade (prerequisite skills) and guidance on areas of mathematics that may be challenging for some English learners. A complete listing of the grade five CCSS with California additions for mathematics can be found at the end of this section. A complete listing of the grade five 1997 California mathematics standards is located on the CDE Content Standards Web page at http://www.cde.ca.gov/be/st/ss/documents/mathstandard.pdf.

What Fifth Grade Students Should Know

Students entering fifth grade who have met the fourth grade CCSS for mathematics are able to apply the four operations (addition, subtraction, multiplication, and division) with whole numbers to solve multi-step word problems including problems in which remainders must be interpreted. They have learned to fluently add and subtract multi-digit numbers and can also round multi-digit numbers. Students can multiply multi-digit numbers by two-digit numbers and divide four-digit dividends and one-digit divisors to find whole number quotients and remainders.

While in fourth grade, students developed an understanding of equivalence and ordering of fractions. They compared two fractions with different numerators and different denominators by creating common denominators or numerators or by comparing to benchmark fractions such as 1/2. Students decomposed a fraction into a sum of fractions with the same denominator. They solved word problems involving addition and subtraction of fractions with like denominators and multiplication of a fraction by a whole number. Students used decimal notation for fractions with denominators of 10 or 100 (e.g., rewrite 0.62 as 62/100). They also compared two decimals to hundredths by reasoning about their size and record the results of the comparisons with the symbols >, =, or <.

Students entering fifth grade can use the four operations to solve word problems involving measurement and conversion of measurements from a larger unit to a smaller unit within one system (e.g., metric or English units). They understand area and perimeter of rectangles and apply the formulas in real world problems.

Students have developed an understanding of the concept of lines and angles. They can measure angles in whole-number degrees and solve addition and subtraction problems to find unknown angles on a diagram. They can draw and identify points, lines (including parallel and perpendicular lines), and angles in two-dimensional figures. In addition, students can classify two-dimensional figures, including special triangles and quadrilaterals, based on the presence or absence of parallel or perpendicular lines or of angles of a specified size. Students understand the concept of symmetry for two-dimensional figures.

What Students Learn in Fifth Grade

Students in fifth grade apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators. They develop an understanding of the multiplication of fractions, and in limited cases, the division of fractions. Students develop fluency in multiplying and dividing decimals to hundredths and finalize fluency using the four operations with whole numbers. They find the volume of right rectangular prisms and classify two-dimensional figures into categories based on their properties. Students graph points on a coordinate plane to solve real world problems and interpret the coordinate value of points in the context of the situation.

Operations and Algebraic Thinking

In fifth grade students write and interpret numerical expression. The CCSS call for students to write and evaluate simple numerical expressions including those that contain parentheses, brackets, or braces. The 1997 California mathematics standards introduce the use of parentheses to indicate the order of operations at grade four. Both the 1997 California mathematics standards and the CCSS develop the concept of prime factorization as students express a whole number on the range 2–50 as a product of its prime factors. Students also form ordered pairs from numerical patterns generated from given rules and graph the ordered pairs on a coordinate plane.

The CCSS call for students to write and evaluate simple numerical expressions including those that contain parentheses, brackets, or braces.

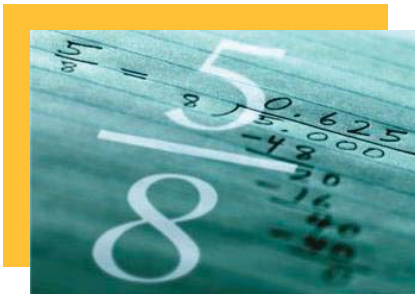
With full implementation of the CCSS, the evaluation of numerical expressions involving whole-number exponents or those in which letters stand for numbers will be introduced in grade six; both are grade five topics in the 1997 California mathematics standards. The use of the distributive property in expressions with variables will be introduced at grade six, a grade five topic in the 1997 California mathematics standards.

Number and Operations in Base Ten

In fifth grade, students achieve fluency with multi-digit addition, subtraction, multiplication and division of positive whole numbers. Students 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. Students develop an understanding of operations with decimals as they add, subtract, multiply and divide decimals to hundredths. In both the 1997 California mathematics standards and the CCSS, students use their understanding of place value to read, write, and compare decimals to thousandths and round decimals to any place. Fifth grade students expand their understanding of place value as they explain the effect of multiplying or dividing by powers of 10 on decimal position and the number of zeros in a product. They also use whole-number exponents to denote powers of 10.

With full implementation of the CCSS, operations with negative integers will be introduced in grade six, a grade five topic in the 1997 California mathematics standards.

Number and Operations—Fractions



Both the 1997 California mathematics standards and the CCSS further the development of critical skills required for understanding and working with fractions. Students extend previous understanding of equivalent fractions to add and subtract fractions with unlike denominators, including mixed numbers. They solve word problems involving addition and subtraction of fractions with unlike denominators by using visual fraction models or equations to represent the problem. They also mentally estimate and assess the reasonableness of their answers. (For example, recognize an incorrect result $2/5 + 1/2 = 3/7$, by observing that $3/7 < 1/2$.)

In fifth grade, students apply and extend previous understandings of multiplication and division to multiply and divide fractions. Students multiply a fraction or whole number by a fraction. They find the area of a rectangle with fractional side lengths by tiling it with unit squares and multiplying the side lengths to demonstrate procedural equivalence. Fifth graders interpret multiplication as scaling (resizing) by explaining the results of multiplying given numbers by fractions greater than 1 (a product greater than the given number) and less than 1 (a product smaller than the given number). They solve real world problems involving multiplication of fractions and mixed numbers.

Students interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$), a grade four topic in the 1997 California mathematics standards. They use visual fraction models or equations to solve word problems involving division of whole numbers leading to answers in the form of fractions, mixed numbers, or decimal fractions. Students divide unit fractions by non-zero whole numbers and whole numbers by unit fractions. They use the relationship between multiplication and division to explain that $(1/3) \div 4 = 1/12$ because $(1/12) \times 4 = 1/3$ and $4 \div (1/5) = 20$ because $20 \times (1/5) = 4$. Division of a fraction by a fraction, a grade five topic in the 1997 California mathematics standards, is a grade six topic in the CCSS.

With full implementation of the CCSS, problems involving percent and negative numbers on a number line are addressed at grade six; both are grade five topics in the 1997 California mathematics standards.

Measurement and Data

In both the 1997 California mathematics standards and the CCSS, students convert among different-sized standard measurement units within a given measurement system and use these conversions to solve problems.

They represent data in graphs and interpret the meaning of the data to solve problems involving information presented in the graph.

Fifth grade students understand the concept of volume and relate volume to multiplication and addition to solve real world and mathematical problems. They find the volume of right rectangular prisms using unit cubes and relate the method to multiplying the height by the area of the base to show procedural equivalence. Students use the understanding of volume to apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms with whole-number edge lengths.

With full implementation of the CCSS, the concepts of mean and median to summarize data sets are introduced in grade six.

Geometry

Students extend their understanding of two-dimensional figures as they classify them in a hierarchy based on properties. They distinguish among rectangles, parallelograms, and trapezoids and derive and use the formula for the area of a triangle and of a parallelogram by comparing it with the formula for the area of a rectangle (i.e., two of the same triangles make a parallelogram with twice the area; a parallelogram is compared with a rectangle of the same area by cutting and pasting a right triangle on the parallelogram). Students know that the sum of the angles of any triangle is 180° and the sum of the angles of any quadrilateral is 360° and use this information to solve problems.

Students know that the sum of the angles of any triangle is 180° and the sum of the angles of any quadrilateral is 360° and use this information to solve problems.

Fifth grade students graph points in the first quadrant of the coordinate plan to solve problems. With full implementation of the CCSS, the concept of graphing points on a coordinate plane is introduced at grade five; this was previously a grade four topic in the 1997 California mathematics standards. In addition, although both the 1997 California mathematics standards and the CCSS address graphing points in the first quadrant of the coordinate plane to represent real world problems in grade five, writing equations representing real world problems and graphing in all four quadrants are introduced at grade six in the CCSS. Also, the construction of three-dimensional figures from two-dimensional patterns to compute the surface area of figures is addressed at grade six in the CCSS.

Support for English Learners

Students need to develop knowledge of mathematics as a language. However, the academic language of mathematics instruction and the specialized vocabulary of mathematics can create particular challenges for English learners.

The language of mathematics is very precise compared with the English used in common discourse. English learners need opportunities to develop their knowledge of the features of language that are used to teach mathematics, such as semantics (how to translate the words of a problem into a symbolic representation), syntax (the order of words and phrases), and mathematical discourse (writing or talking about mathematical terms, concepts, etc.). The specialized vocabulary of mathematics should be explicitly taught and reinforced throughout the year.

These areas can create special challenges for English learners in the early grades:

- At an early stage students may have difficulty with such English words as first, second, last, before, every, each, more, and equal. Students may be unfamiliar with sum, difference, solve, length, and value.

- The different meanings of multiple-meaning words should be explicitly taught. These words may have a meaning in common discourse that is different from the meaning in mathematics, such as table or face (as in the face of a clock).

- The place values of some of the numbers between 10 and 20 are not obvious from their names (e.g., the number 16 is called sixteen in English, but ten plus six in other languages).

- The narrative descriptions of a word problem can require language skills that students have not yet mastered, particularly when the language of a word problem is ambiguous or includes idioms (e.g., "a dime a dozen"), comparatives (greater than, less than, most often, least often), or position words (behind, below, in front of, to the right or left of).

- Students may have learned different symbols and procedures that may result in the same answer. In some countries, students are expected to do most steps mentally instead of writing out each step.

Instruction in mathematics should be promoted despite low literacy or limited proficiency in the English language, along with critical thinking and analysis skills. Specially designed academic instruction in English (SDAIE) strategies can provide valuable instructional strategies to meet the needs of English learners. For additional resources to support the teaching of English learners, go to the CDE English Learners Web page at http://www.cde.ca.gov/sp/el/.

Use of Calculators

Although not discussed in the CCSS, the use of calculators plays a special role in mathematics teaching and learning. Initially, it is important that students in the early grades develop a facility with basic arithmetic skills without reliance on calculators. At later grades, once students are ready to use calculators to their advantage, calculators can provide a very useful tool not only for solving problems in various contexts but also for broadening students' mathematical horizons.

The Standards

The CCSS that follow are the pre-publication version of the standards prepared by the Sacramento County Office of Education (SCOE), updated on October 21, 2010. Content that is unique to California and was added to the multi-state common core standards is in bold typeface. The SCOE document is available online at http://www.scoe.net/castandards/agenda/2010/math_ccs_recommendations.pdf (Outside Source). These grade five CCSS for Mathematics were adopted by the California State Board of Education on August 2, 2010.

A complete listing of the grade five 1997 California mathematics standards is located on the CDE Web page at http://www.cde.ca.gov/be/st/ss/documents/mathstandard.pdf.

Common Core State Standards with California Additions Mathematics – Grade Five	
Operations and Algebraic Thinking (5.OA)	
Write and interpret numerical expressions.	
1.	Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
2.	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*
2.1	**Express a whole number in the range 2-50 as a product of its prime factors. For example, find the prime factors of 24 and express 24 as 2x2x2x3.**
Analyze patterns and relationships.	
3.	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. *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.*
Number and Operations in Base Ten (5.NBT)	
Understand the place value system.	
1.	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.
2.	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.
3.	Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000). b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
4.	Use place value understanding to round decimals to any place.

Perform operations with multi-digit whole numbers and with decimals to hundredths.	
5.	Fluently multiply multi-digit whole numbers using the standard algorithm.
6.	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.
7.	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.
Number and Operations—Fractions (5.NF)	
Use equivalent fractions as a strategy to add and subtract fractions.	
1.	Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*
2.	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. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*
Apply and extend previous understandings of multiplication and division to multiply and divide fractions.	
3.	Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions, mixed numbers, **or decimal fractions**, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*
4.	Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. 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 $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)* 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.
5.	Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n\ b)$ to the effect of multiplying a/b by 1.
6.	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
7.	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.[1] 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) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3. b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4. 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?
Measurement and Data (5.MD)	
Convert like measurement units within a given measurement system.	
1.	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

[1] 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.

	problems.
Represent and interpret data.	
2.	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *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.*
Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.	
3.	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.
4.	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
5.	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 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. 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. c. 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.
Geometry (5.G)	
Graph points on the coordinate plane to solve real-world and mathematical problems.	
1.	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).
2.	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.
Classify two-dimensional figures into categories based on their properties.	
3.	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.*
3.1	**Distinguish among rectangles, parallelograms, and trapezoids.**
4.	Classify two-dimensional figures in a hierarchy based on properties.
5.	**Know that the sum of the angles of any triangle is 180° and the sum of the angles of any quadrilateral is 360° and use this information to solve problems. (CA-Standard MG 2.2)**
6.	**Derive and use the formula for the area of a triangle and of a parallelogram by comparing it with the formula for the area of a rectangle (i.e. two of the same triangles make a parallelogram with twice the area; a parallelogram is compared with a rectangle of the same area by cutting and pasting a right triangle on the parallelogram). (CA-Standard MG 1.1)**
	Standards for Mathematical Practice Integrated throughout the CCSS 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

CCSS Domains

The CCSS are organized by domains. The table lists the domains for grades kindergarten through grade eight. The table identifies which domains are addressed in kindergarten through grade five (an "X" indicates the domain addressed at a grade level). The shaded rows indicate domains to be covered at later grades.

Domains	Kindergarten	Grade One	Grade Two	Grade Three	Grade Four	Grade Five
Counting and Cardinality (CC)	X					
Operations and Algebraic Thinking (OA)	X	X	X	X	X	X
Number and Operations in Base Ten (NBT)	X	X	X	X	X	X
Measurement and Data (MD)	X	X	X	X	X	X
Geometry (G)	X	X	X	X	X	X
Number and Operations – Fractions (NF)				X	X	X
Ratios and Proportional Relationships (RP)						
The Number System (NS)						
Expressions and Equations (EE)						
Statistics and Probability (SP)						
Functions (F)						