

Common Core State Standards for Mathematics

Grade 6: The Big Picture

Domains	Ratios & Proportional Relationships	The Number System	Expressions and Equations	Geometry	Statistics and Probability
Clusters	<ul style="list-style-type: none"> Understand ratio concepts and use ratio reasoning to solve problems 	<ul style="list-style-type: none"> Apply and extend previous understandings of multiplication and division to divide fractions by fractions Compute fluently with multi-digit numbers and find common factors and multiples Apply and extend previous understandings of numbers to the system of rational numbers 	<ul style="list-style-type: none"> Apply and extend previous understandings of arithmetic to algebraic expressions Reason about and solve one-variable equations and inequalities Represent and analyze quantitative relationships between dependent and independent variables 	<ul style="list-style-type: none"> Solve real-world and mathematical problems involving area, surface area, and volume 	<ul style="list-style-type: none"> Develop understanding of statistical variability Summarize and describe distributions
Mathematical Practices	<ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 	<ol style="list-style-type: none"> 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 	<ol style="list-style-type: none"> 5. Use appropriate tools strategically. 6. Attend to precision. 	<ol style="list-style-type: none"> 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. 	

In Grade 6, instructional time should focus on four critical areas:

1. *Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems*

- Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

2. *Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers*

- Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. *Writing, interpreting, and using expressions and equations*

- Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

4. *Developing understanding of statistical thinking*

- Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

GRADE 6 MATHEMATICS: Crosswalk between the Common Core State Standards (CCSS) and the Hawaii Content and Performance Standards (HCPS) III

Code	Common Core State Standard	Matched HCPS III Benchmark	Match*	Comments
6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."	No HCPS III benchmark at this grade level. <i>Related benchmarks at another grade level: 5.1.1: Represent percent and ratio using pictures or objects; and, 8.1.3: Use ratios and proportions to represent the relationship between two quantities.</i>	N/A	This Common Core Standard is a new learning expectation for this grade level. This CC standard expects students to <u>understand</u> that a ratio is an expression to describe a comparison of two quantities, and students should be given numerous opportunities to demonstrate that understanding by verbalizing the meaning of a particular ratio in terms of the context it is describing.
6.RP.2	Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar." "We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger." (Note: Expectations for unit rates in this grade are limited to non-complex fractions.)	No HCPS III benchmark at this grade level. <i>Related benchmarks at another grade level: 5.1.1: Represent percent and ratio using pictures or objects; and, 8.1.3: Use ratios and proportions to represent the relationship between two quantities.</i>	N/A	This Common Core Standard is a new learning expectation for this grade level. This CC standard expects students to <u>understand</u> the concept of a unit rate derived from a ratio that compares quantities in a given context. In addition, students should be able to apply their understanding to determine unit rates and explain what it means in terms of the context it is describing (including using appropriate labels). This CC standard builds upon students prior experiences with fractions. Sixth grade teachers should refer to the 5th grade CC standards in the Fractions domain (e.g., 5.NF.3) to plan instruction that connects to students' prior knowledge. This CC standard provides students with an important foundation for their future work with constant rates of change to describe linear relationships (to be able to interpret the "slope" of a line in terms of the context it is describing).

* Degree of Match: 1 = WEAK (major aspect of the CC not addressed in HCPS III); 2 = GOOD (minor aspect of the CC not addressed in HCPS III); 3 = EXCELLENT

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6.RP.3	<p>Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p> <p>a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.</p> <p>b. Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</p> <p>c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $\frac{30}{100}$ times the quantity); solve problems involving finding the whole, given a part and the percent.</p> <p>d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.</p>	<p>No HCPS III benchmark at this grade level.</p> <p><i>Related benchmarks at another grade level: 5.1.1: Represent percent and ratio using pictures or objects; 5.1.2: Use equivalent forms of whole numbers, fractions, ratios, decimals, and percents to solve problems; 5.4.1: Convert simple units within a system of measurement (e.g., millimeters to centimeters, feet to yard, quarts to gallons, gram to kilogram, minutes to hours, days to weeks) and, 8.1.3: Use ratios and proportions to represent the relationship between two quantities.</i></p>	N/A	<p>This Common Core Standard is a new learning expectation for this grade level.</p> <p>This CC standard builds upon the understanding that students must develop via the learning expectations in 6.RP.1 and 6.RP.2.</p>
6.NS.1	<p>Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(\frac{2}{3}) \div (\frac{3}{4})$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(\frac{2}{3}) \div (\frac{3}{4}) = \frac{8}{9}$ because $\frac{3}{4}$ of $\frac{8}{9}$ is $\frac{2}{3}$ (in general, $(\frac{a}{b}) \div (\frac{c}{d}) = \frac{ad}{bc}$). How much chocolate will each person get if 3 people share $\frac{1}{2}$ lb of chocolate equally? How many $\frac{3}{4}$-cup servings are in $\frac{2}{3}$ of a cup of yogurt? How wide is a rectangular strip of land with length $\frac{3}{4}$ mi and area $\frac{1}{2}$ square mi?</p>	<p>No HCPS III benchmark at this grade level.</p> <p><i>Related benchmark at another grade level: 5.3.2: Use a variety of strategies to multiply and divide fractions.</i></p>	N/A	<p>This Common Core Standard is a new learning expectation for this grade level.</p> <p>This CC standard builds upon students prior experiences with fractions. Sixth grade teachers should refer to the 5th grade CC standards in the Fractions domain (e.g., 5.NF.7 and 5.NF.4-6) to plan instruction that connects to students prior knowledge.</p>
6.NS.2	<p>Fluently divide multi-digit numbers using the standard algorithm.</p>	<p>No HCPS III benchmark at this grade level.</p>	N/A	<p>This Common Core Standard is a new learning expectation for this grade level.</p>

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GRADE 6 MATHEMATICS: Crosswalk between the Common Core State Standards (CCSS) and the Hawaii Content and Performance Standards (HCPS) III

Code	Common Core State Standard	Matched HCPS III Benchmark	Match*	Comments
6.NS.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	No HCPS III benchmark at this grade level. <i>Related benchmarks at another grade level: 5.3.1: Multiply decimals up to 3 places and divide decimals by whole numbers; and, 4.3.4: Add and subtract decimals to 3 places.</i>	N/A	This Common Core Standard is a new learning expectation for this grade level.
6.NS.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9 + 2)$.	6.1.2: Explain and give examples of number theory concepts (e.g., prime factorization, common factors, greatest common factor, common multiples, least common multiple, divisibility). <i>Related benchmark at another grade level: 4.2.2: Use associative, commutative, and distributive properties as they apply to operations involving whole numbers.</i>	2	This CC standard builds on students' prior experiences with multiplication, division and the distributive property. Sixth grade teachers should refer to the CC standards in previous grade levels that address factor pairs (e.g., 4.OA.4) and the distributive property (e.g., 5.OA.2, 3.OA.5).
6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	No HCPS III benchmark at this grade level. <i>Related benchmark at another grade level: 7.1.3: Describe and solve situations represented by integers and absolute value.</i>	N/A	This Common Core Standard is a new learning expectation for this grade level. Students should have numerous opportunities with concrete, semi-concrete and kinesthetic representations to develop a profound understanding of integer values (and zero pairs) that will be built upon in future learning expectations. For example, have students open up a book to any page, then turn 3 pages to the right, followed by 3 pages to the left, making the connection that each action represents a quantity having direction (3 and -3), and that performing the actions consecutively gets you back to where you started.

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6.NS.6	<p>Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.</p> <p>a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.</p> <p>b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.</p> <p>c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.</p>	<p>No HCPS III benchmark at this grade level.</p> <p><i>Related benchmark at another grade level: 7.1.3: Describe and solve situations represented by integers and absolute value.</i></p>	N/A	<p>This Common Core Standard is a new learning expectation for this grade level.</p> <p>This CC standard builds upon 6.NS.5 along with students' prior experiences with the coordinate plane (in 5th grade). Sixth grade teachers should refer to the 5th grade CC standards in the Geometry domain (5.G.1) to plan instruction that connects to students' prior knowledge of the coordinate plane.</p> <p>Building on 6.NS.5, this CC standard extends students' experiences with positive and negative numbers to make important connections between zero pairs (e.g., 4 and -4) and the representations of their locations of on a number line and in the coordinate plane.</p>
6.NS.7	<p>Understand ordering and absolute value of rational numbers.</p> <p>a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right.</p> <p>b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3^\circ \text{C} > -7^\circ \text{C}$ to express the fact that -3°C is warmer than -7°C.</p> <p>c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write $-30 = 30$ to describe the size of the debt in dollars.</p> <p>d. Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than $\\$30$.</p>	<p>6.1.1: Compare and order fractions, decimals and percents.</p> <p><i>Related benchmarks at another grade level: 7.1.3: Describe and solve situations represented by integers and absolute value; and, 8.1.2: Compare and order rational numbers and square roots.</i></p>	1	<p>The essence of the CC standard implies an emphasis on positive and negative integers. While the CC standard and the HCPS III benchmark are similar in terms of "comparing and ordering," in HCPS III, understanding the set of integers (as a subset of the set of rational numbers) was not introduced until the 7th grade. Thus, this CC standard is much different than the HCPS III benchmark 6.1.1.</p> <p>Instruction should be appropriately scaffolded to build upon students' prior knowledge and experiences with integers. In addition, students should be given numerous opportunities to demonstrate their understanding by verbalizing the meaning of a particular quantities (or comparisons of quantities) in terms of the context being described.</p>

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6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	No HCPS III benchmark at this grade level. <i>Related benchmarks at another grade level: 4.8.1: Use ordered pairs to plot points on a coordinate grid; and, 5.8.1: Determine the distance between points along horizontal and vertical lines of a coordinate system.</i>	N/A	This Common Core Standard is a new learning expectation for this grade level. This CC standard builds upon students prior experiences with the coordinate plane (in 5 th grade) and with integers (e.g., 6.NS.5 and 6.NS.6). Sixth grade teachers should refer to the 5th grade CC standards in the Geometry domain (5.G.1) to plan instruction that connects to students' prior knowledge of the coordinate plane.
6.EE.1	Write and evaluate numerical expressions involving whole-number exponents.	6.2.1: Apply the order of operations when calculating with whole numbers.	1	This CC standard is the first learning expectation in the CCSS regarding exponents. Instruction should be planned to develop students' understanding of the convention of using expressions involving exponents and how to translate the expression. This CC standard provides an important foundation for several other learning expectations that students will encounter in future grades.
6.EE.2	Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation "Subtract y from 5" as $5 - y$. b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms. c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.	6.10.3: Evaluate algebraic expressions. <i>Related benchmarks at another grade level: 4.10.1: Use symbols to represent unknown quantities in open sentences and determine the unknown quantities; and, 7.10.2: Use symbolic algebra to represent situations involving linear relationships.</i>	1	This CC standard emphasizes one of the Standards for Mathematical Practice: <i>Look for and Make Use of Structure</i> . The learning expectations in this CC standard encompass more than the skills of translating word phrases into algebraic expressions and using substitution to evaluate algebraic expressions. Students should be provided with opportunities to verbalize expressions and use appropriate vocabulary to see the structure in expressions. In general, teachers at all grade levels need to engender the ability to READ expressions and make sense of what they mean, rather than solely focusing on developing the ability to manipulate them.

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