Ohio Mathematics

Grade 5

Adopted 2017

Standards for Mathematical Practice

1. **Make sense of problems and persevere in solving them.** MP.1
2. **Reason abstractly and quantitatively.** MP.2
3. **Construct viable arguments and critique the reasoning of others.** MP.3
4. **Model with mathematics.** MP.4
5. **Use appropriate tools strategically.** MP.5
6. **Attend to precision.** MP.6
7. **Look for and make use of structure.** MP.7
8. **Look for and express regularity in repeated reasoning.** MP.8

Operations and Algebraic Thinking

A. Write and interpret numerical expressions. 5.OA.A

1. Use parentheses in numerical expressions, and evaluate expressions with this symbol. Formal use of algebraic order of operations is not necessary. 5.OA.1
2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. 5.OA.2

B. Analyze patterns and relationships. 5.OA.B

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. 5.OA.3

Number and Operations in Base Ten

A. Understand the place value system. 5.NBT.A

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. 5.NBT.1
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. 5.NBT.2

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3. Read, write, and compare decimals to thousandths. 5.NBT.3

   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). 5.NBT.3.A

   b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. 5.NBT.3.B

4. Use place value understanding to round decimals to any place, millions through hundredths. 5.NBT.4

B. Perform operations with multi-digit whole numbers and with decimals to hundredths. 5.NBT.B

5. Fluently multiply multi-digit whole numbers using a standard algorithm. 5.NBT.5

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. 5.NBT.6

7. Solve real-world problems by adding, subtracting, multiplying, and dividing decimals using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction, or multiplication and division; relate the strategy to a written method and explain the reasoning used. 5.NBT.7

   a. Add and subtract decimals, including decimals with whole numbers, (whole numbers through the hundreds place and decimals through the hundredths place). 5.NBT.7.A

   b. Multiply whole numbers by decimals (whole numbers through the hundreds place and decimals through the hundredths place). 5.NBT.7.B

   c. Divide whole numbers by decimals and decimals by whole numbers (whole numbers through the tens place and decimals less than one through the hundredths place using numbers whose division can be readily modeled). 5.NBT.7.C

Measurement and Data

A. Convert like measurement units within a given measurement system. 5.MD.A

1. Know relative sizes of these U.S. customary measurement units: pounds, ounces, miles, yards, feet, inches, gallons, quarts, pints, cups, fluid ounces, hours, minutes, and seconds. Convert between pounds and ounces; miles and feet; yards, feet, and inches; gallons, quarts, pints, cups, and fluid ounces; hours, minutes, and seconds in solving multi-step, real-world problems. 5.MD.1

B. Represent and interpret data. 5.MD.B

2. Display and interpret data in graphs (picture graphs, bar graphs, and line plots) to solve problems using numbers and operations for this grade, e.g., including U.S. customary units in fractions ½, ¼, 1/8, or decimals. 5.MD.2

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C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. 5.MD.C

3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement. 5.MD.3
   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. 5.MD.3.A
   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. 5.MD.3.B
4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. 5.MD.4
5. Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume. 5.MD.5
   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. 5.MD.5.A
   b. Apply the formulas V = l × w × h and V = B × 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.MD.5.B
   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. 5.MD.5.C

Number and Operations — Fractions

A. Use equivalent fractions as a strategy to add and subtract fractions. (Fractions need not be simplified). 5.NF.A

1. Add and subtract fractions with unlike denominators (including mixed numbers and fractions greater than 1) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. 5.NF.1
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. 5.NF.2

B. Apply and extend previous understandings of multiplication and division to multiply and divide fractions. (Fractions need not be simplified). 5.NF.B

3. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. 5.NF.3

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4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. 5.NF.4

    a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts, equivalently, as the result of a sequence of operations a × q ÷ b. 5.NF.4.A

    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.NF.4.B

5. Interpret multiplication as scaling (resizing). 5.NF.5

    a. Compare 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. 5.NF.5.A

    b. Explain 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×a)/(n×b) to the effect of multiplying a/b by 1. 5.NF.5.B

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. 5.NF.6

7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. In general, students able to multiply fractions can develop strategies to divide fractions, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade. 5.NF.7

    a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. 5.NF.7.A

    b. Interpret division of a whole number by a unit fraction, and compute such quotients. 5.NF.7.B

    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. 5.NF.7.C

Geometry

A. Graph points on the coordinate plane to solve real-world and mathematical problems. 5.G.A

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. 5.G.1

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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. 5.G.2

B. Classify two-dimensional figures into categories based on their properties. 5.G.B

3. Identify and describe commonalities and differences between types of triangles based on angle measures (equiangular, right, acute, and obtuse triangles) and side lengths (isosceles, equilateral, and scalene triangles). 5.G.3
4. Identify and describe commonalities and differences between types of quadrilaterals based on angle measures, side lengths, and the presence or absence of parallel and perpendicular lines, e.g., squares, rectangles, parallelograms, trapezoids, and rhombuses. 5.G.4