Standards for Mathematical Content Grade 3

Operations and Algebraic Thinking

Represent and solve problems involving multiplication and division.

3.OA.1. Interpret products of whole numbers (e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each). For example, show objects in rectangular arrays or describe a context in which a total number of objects can be expressed as 5 × 7.

3.OA.2. Interpret whole-number quotients of whole numbers (e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each). For example, deconstruct rectangular arrays or describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.

3.OA.3. Use multiplication and division numbers up to 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).

3.OA.4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48,
5 = ? ÷ 3, 6 x 6 = ?

Understand properties of multiplication and the relationship between multiplication and division.

3.OA.5. Make, test, support, draw conclusions and justify conjectures about properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.)

- Commutative property of multiplication: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known.
- Associative property of multiplication: 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30.
- Distributive property: Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56.
- Inverse property (relationship) of multiplication and division.

3.OA.6. Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.

Multiply and divide up to 100.

3.OA.7. Fluently multiply and divide numbers up to 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 ×5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit

numbers.

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

3.OA.8. Solve and create two-step word problems using any of the four operations. Represent these problems using equations with a symbol (box, circle, question mark) standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

3.OA.9. Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Numbers and Operations in Base Ten

Use place value understanding and properties of operations to perform multi-digit arithmetic.

3.NBT.1. Use place value understanding to round whole numbers to the nearest 10 or 100.

3.NBT.2. Use strategies and/or algorithms to fluently add and subtract with numbers up to 1000, demonstrating understanding of place value, properties of operations, and/or the relationship between addition and subtraction.

3.NBT.3. Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 x 80, 10 x 60) using strategies based on place value and properties of operations.

Numbers and Operations- Fractions

(limited in this grade to fractions with denominators 2, 3, 4, 6 and 8)

Develop understanding of fractions as numbers.

3.NF.1. Understand a fraction 1/b (e.g., 1/4) as the quantity formed by 1 part when a whole is partitioned into b (e.g., 4) equal parts; understand a fraction a/b (e.g., 2/4) as the quantity formed by a (e.g., 2) parts of size 1/b. (e.g., 1/4)

3.NF.2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/b (e.g., 1/4) on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b (e.g., 4) equal parts. Recognize that each part has size 1/b (e.g., 1/4) and that the endpoint of the part based at 0 locates the number 1/b (e.g., 1/4) on the number line.

b. Represent a fraction a/b (e.g., 2/8) on a number line diagram or ruler by marking off a lengths 1/b (e.g., 1/8) from 0. Recognize that the resulting interval has size a/b (e.g., 2/8) and that its endpoint locates the number a/b (e.g., 2/8) on the number line.

3.NF.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent if they are the same size (modeled) or the same point on a number line.

b. Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why

the fractions are equivalent (e.g., by using a visual fraction model).
c. Express and model whole numbers as fractions, and recognize and construct fractions that are equivalent to whole numbers. For example: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.
d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions (e.g., by using a visual fraction model).

Measurement and Data

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

3.MD.1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes or hours (e.g., by representing the problem on a number line diagram or clock).

3.MD.2. Estimate and measure liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm3 and finding the geometric volume of a container.)
Add, subtract, multiply, or divide to solve and create one-step word problems involving masses or volumes that are given in the same units (e.g., by using drawings, such as a beaker with a measurement scale, to represent the problem). (Excludes multiplicative comparison problems [problems involving notions of "times as much."])

3.MD.3. Select an appropriate unit of English, metric, or non-standard measurement to estimate the length, time, weight, or temperature (L).

Represent and interpret data.

3.MD.4. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

3.MD.5. Measure and record lengths using rulers marked with halves and fourths of an inch. Make a line plot with the data, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

3.MD.6. Explain the classification of data from real-world problems shown in graphical representations. Use the terms minimum and maximum. (L)

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

3.MD.7. Recognize area as an attribute of plane figures and understand concepts of area measurement.
a. A square with side length 1 unit is said to have "one square unit" and can be used to measure area.
b. Demonstrate that a plane figure which can be covered without gaps or overlaps by n (e.g., 6)

unit squares is said to have an area of n (e.g., 6) square units.

3.MD.8. Measure areas by tiling with unit squares (square centimeters, square meters, square inches, square feet, and improvised units).

3.MD.9. Relate area to the operations of multiplication and addition.
a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. For example, after tiling rectangles, develop a rule for finding the area of any rectangle.
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use area models (rectangular arrays) to represent the distributive property in mathematical reasoning. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c.
d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. For example, the area of a 7 by 8 rectangle can be determined by decomposing it into a 7 by 3 rectangle and a 7 by 5 rectangle.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.
3.MD.10. Solve real world and mathematical problems involving perimeters of polygons, including:
• finding the perimeter given the side lengths,
• finding an unknown side length,
• exhibiting rectangles with the same perimeter and different areas,
• exhibiting rectangles with the same area and different perimeters.

Geometry

Reason with shapes and their attributes.
3.G.1. Categorize shapes by different attribute classifications and recognize that shared attributes can define a larger category. Generalize to create examples or non-examples.

3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

Standards for Mathematical Practice

Instruction around the Standards of Mathematical Practices is delivered across all grades K-12. These eight standards define experiences that build understanding of mathematics and ways of thinking through which students develop, apply, and assess their knowledge.

1. Make sense of problems and persevere in solving them.
• explain correspondences between equations, verbal descriptions, tables, and graphs • draw diagrams of important features and relationships, graph data, and search for regularity or trends • use concrete objects or pictures to help conceptualize and solve a problem • understand the approaches of others to solving complex problems • identify correspondences between different approaches • check if the solution makes sense
2. Reason abstractly and quantitatively.
• represent a situation symbolically • create a coherent representation of the problem • have the ability to show how problem has a realistic meaning • reflect during the manipulation process in order to probe into the meanings for the symbols involved • use units consistently
3. Construct viable arguments and critique the reasoning of others.
• construct arguments using concrete referents such as objects, drawings, diagrams, and actions • justify conclusions, communicate conclusions, listen and respond to arguments, decide whether the argument makes sense, and ask questions to clarify the argument • reason inductively about data, making plausible arguments that take into account the context from which the data arose
4. Model with Mathematics.
• apply mathematics to solve problems arising in everyday life • identify important quantities in a practical situation and model the situation using such tools as manipulatives, diagrams, two-way tables, graphs or pictures • interpret mathematical results in the context of the situation and reflect on whether the results make sense • apply mathematical knowledge, make assumptions and approximations to simplify a complicated situation
5. Use appropriate tools strategically.
• select the available tools (such as pencil and paper, manipulatives, rulers, calculators, a spreadsheet, and available technology) when solving a mathematical problem • be familiar with tools appropriate for their grade level to make sound decisions about when each of these tools might be helpful • identify relevant external mathematical resources and use them to pose or solve problems • use technological tools to explore and deepen their understanding of concepts • detect possible errors by strategically using estimation and other mathematical knowledge

• know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data
6. Attend to precision.
• give carefully formulated explanations to each other • use clear definitions and reasoning in discussion with others • state the meaning of symbols, including using the equal sign consistently and appropriately • specify units of measure, and label axes to clarify the correspondence with quantities in a problem • calculate accurately and efficiently • express numerical answers with a degree of precision appropriate for the problem context
7. Look for and make use of structure.
• discern a pattern or structure • understand complex structures as single objects or as being composed of several objects • check if the answer is reasonable
8. Look for and express regularity in repeated reasoning.
• identify if calculations or processes are repeated • use alternative and traditional methods to solve problems • evaluate the reasonableness of their intermediate results, while attending to the details