# 4th Grade Mathematics

## UNIT 1: Whole Numbers

Place Value, Comparison, Addition, and Subtraction

| ESSENTIAL QUESTION | BIG IDEAS |
| --- | --- |
| **How can patterns help us better understand our number system?** | Students can use what they know about place value to read, write, and compare multi-digit numbers.<br><br>Students can use what they know about place value to round numbers and add and subtract multi-digit numbers.<br><br>Students generalize place value patterns to understand numbers. |

## GUIDING QUESTIONS

**Content and Process**

- How can patterns in place value be used to better understand the relationship between digits in a number? **4.NBT.1**
- How can multi-digit numbers be read, written, and compared using base-10 numerals, number names, expanded form, and unit form? **4.NBT.2**
- How can place value be used to compare numbers using greater than, less than, equal to, and not equal to symbols? **4.NBT.2**
- How is place value used to round numbers and make estimations? **4.NBT.3**
- How are place value concepts helpful when adding and subtracting multi-digit whole numbers? **4.NBT.4**

**Reflective**

- How can I use place value language to justify why adding a 0 at the end of a number when multiplying by 10 works?
- How can I apply my knowledge of place value to create different numbers using the same four digits that meet specific criteria?
- Thinking about different methods and estimates, how do I decide which is the most accurate estimate?

## FOCUS STANDARDS

**Standards of Mathematical Practice**

**MP.4** Model with mathematics.
**MP.5** Use appropriate tools strategically.
**MP.7** Look for and make use of structure.

**Standards**

**4.NBT.1** Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that*

$700 \div 70 = 10$*by applying concepts of place value and division.*

**4.NBT.2** Read and write multi-digit whole numbers using base-ten numerals, number names, expanded form, and unit form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, <, =, and ≠ symbols to record the results of comparisons. *(Note: Students should demonstrate understanding and application of place value decomposition. For example, 127 can be 1 hundred, 2 tens, 7 ones or 12 tens, 7 ones.*

**4.NBT.3** Use place value understanding to round multi-digit whole numbers to any place.

**4.NBT.4** Fluently (efficiently, accurately, and flexibly) add and subtract multi-digit whole numbers using an efficient algorithm (including, but not limited to: traditional, partial-sums, etc.), based on place value understanding and the properties of operations.

# 4th Grade Mathematics

## UNIT 2: Operations

Multiplication, Division, and Algebraic Thinking

| ESSENTIAL QUESTION | BIG IDEAS |
|---|---|
| **How does a deep understanding of operations help you solve problems flexibly?** | Students can solve problems involving multiplicative comparisons by using multiplication or division.<br><br>Students generalize place value patterns to understand numbers..<br><br>Students solve problems using their understanding of the operations and the context of the problem.<br><br>Students make connections from patterns to discover factors and multiples. |

## GUIDING QUESTIONS

**Content and Process**

- How can you interpret a multiplication equation as a comparison? **4.OA.1**
- How can you create a model and write an equation to solve word problems? **4.OA.2**
- How can the four operations be used to solve multi-step word problems? **4.OA.3**
- How does the context of a division problem help you determine how to interpret a remainder? **4.OA.3**
- What is the relationship between factors and multiples? **4.OA.4**
- How are prime and composite numbers different? **4.OA.4**
- Using a rule, how can a pattern be extended? **4.OA.5**
- How can you identify features of a pattern that are not explicit in the rule itself? **4.OA.5**

**Reflective**

- What strategies can I use to determine if there are relationships within a pattern? How can I describe and make generalizations about the pattern?
- How can I use the four operations flexibly to solve multi-step problems?
- How do I know if I have found all the factor pairs for a given number?
- How can I prove a number is prime or composite using a visual representation?

## FOCUS STANDARDS

**Standards of Mathematical Practice**

**MP.1** Make sense of problems and persevere in solving them.

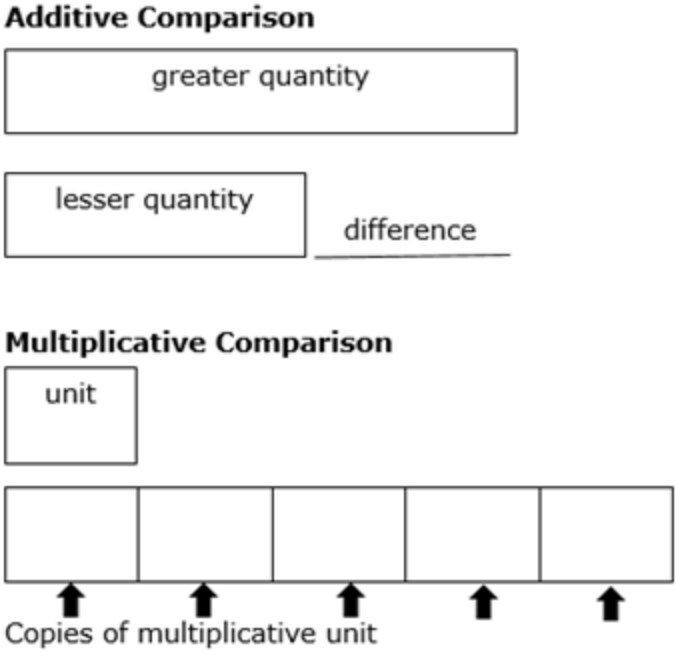
**MP.5** Use appropriate tools strategically.

**MP.8** Look for and express regularity in repeated reasoning.

**Standards**

**4.OA.1** Interpret a multiplication equation as a comparison, *(e.g. interpret as a statement that 35 is 5 times as many as 7 and 7 times as many as 5).* Represent verbal statements of multiplicative comparisons as multiplication equations.

**4.OA.2** Multiply or divide to solve word problems involving multiplicative comparison*, (e.g. by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison).*




**4.OA.3** Solve multi-step word problems posed with whole numbers and having whole number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using the situation equations and/or solution equations with a letter or symbol standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

**4.OA.4** Find all factor pairs for a whole number in the range 1 to 100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1 to 100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1 to 100 is prime or composite.

**4.OA.5** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers.* Explain informally why the numbers will continue to alternate in this way.

# 4th Grade Mathematics

## UNIT 3: Multi-Digit Operations and Measurement

Multiplication, Division, Perimeter, and Area

| ESSENTIAL QUESTION | BIG IDEAS |
|---|---|
| **How can I use what I know about place value to help demonstrate number flexibility when solving problems?** | Students can solve multi-digit multiplication problems.<br><br>Students can solve multi-digit division problems.<br><br>Students apply area and perimeter formulas to real world problems.<br><br>Students measure using various units. |

## GUIDING QUESTIONS

**Content and Process**

- How can a one-digit whole number be multiplied by a whole number up to four digits? **4.NBT.5**
- How can arrays, area models, and partial products be used to multiply? **4.NBT.5**
- How can someone divide up to four-digit dividends by one-digit divisors, with remainders? **4.NBT.6**
- How can rectangular arrays and area models be used to divide? **4.NBT.6**
- How can the relationship between multiplication or division be used to estimate and find a quotient? **4.NBT.6**
- What are the units of measurements within a measurement system? **4.MD.1**
- How are larger units of measurement converted to a smaller unit of measurement in the same system? **4.MD.1**
- What is the formula for perimeter of a rectangle to solve problems? **4.MD.3**
- What is the formula for area of a rectangle to solve problems? **4.MD.3**

**Reflective**

- How do I multiply a two-digit number by a two-digit number?
- How could I illustrate and explain my calculations by using equations, rectangular arrays, and/or array models?
- How do I decide what units to use when measuring?
- How can I apply area and perimeter formulas for rectangles in real world and/or mathematical problems?

## FOCUS STANDARDS

**Standards of Mathematical Practice**

**MP.1** Make sense of problems and persevere in solving them.

**MP.5** Use appropriate tools strategically.

**MP.8** Look for and express regularity in repeated reasoning.

**Standards**

**4.NBT.5.** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

**4.NBT.6.** Find whole-number quotients and remainders with up to four-digit dividends and one-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.

**4.MD.1.** Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs* (*1, 12*), (*2, 24*), (*3, 36*),

**4.MD.3.** Apply the area and perimeter formulas for rectangles in real world and mathematical problems explaining and justifying the appropriate unit of measure. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

# 4th Grade Mathematics

## UNIT 4: Fractions, Decimals, and Measurement

Addition, Subtraction, and Multiplication

| ESSENTIAL QUESTION | BIG IDEAS |
|---|---|
| **Why do we need fractions and decimals and how can they help us with measurement?** | Students represent fractions with denominators of 10 and 100 with visual models.<br><br>Students read, write, and compare decinamls to hundredths.<br><br>Students solve time, money, and measurement problems. |

## GUIDING QUESTIONS

**Content and Process**

- How are visual models (area models, number lines and/or collection/set models) used to show equivalent fractions? **4.NF.1**
- How can visual models be used to find a common denominator for a set of fractions (limited to denominators 2, 3, 4, 5, 6, 8, 10, 12, 100)? **4.NF.1**
- How can visual models be used to compare fractions? **4.NF.2**
- How can adding and subtracting fractions of the same whole be represented with visual models? **4.NF.3a**
- How can fractions be decomposed into a sum of fractions with like denominators? **4.NF.3b**
- Using equivalent fractions, how can you add or subtract mixed numbers with like denominators? **4.NF.3c**
- How can visual fraction models and/or equations be used to represent and solve word problems involving fractions? **4.NF.3d**
- How can a fraction be represented visually as a multiple of a unit fraction? **4.NF.4a**
- How can various models and strategies be used to multiply a whole number by a fraction? **4.NF.4b**
- How can visual fraction models and equations be used to represent and solve word problems? **4.NF.4c**
- How can tenths be expressed as hundredths in order to add fractions? **4.NF.5**
- How are fractions with denominators of 10 or 100 represented as decimals? **4.NF.6**
- How are decimals represented as numbers on a number line? **4.NF.6**
- How can the size of two decimal numbers be compared using relational symbols? **4.NF.7**
- How can diagrams, such as a number line, be used to represent measurement quantities? **4.MD.2**
- How can a data display (line plot, bar graph, pictograph) be created to show a set of measurements in fractions of a unit? **4.MD.4**
- How can a data display (line plot, bar graph, pictograph) of measurements e used to solve problems involving additing and subtracting fractions? **4.MD.4**

**Reflective**

- How can I prove two or more fractions are equivalent?
- What strategies are useful to me when comparing and ordering fractions with different denominators?
- How does my knowledge of fractions and place value help me compare decimals?
- What strategies can I use to put decimal numbers on a number line?
- How do models help me visualize the value of decimal numbers?
- How does my understanding of equivalence help me add and subtract fractions? Why?
- How can I use visual models to justify my answer when adding, subtracting, or multiplying fractions?
- What conclusions can I draw based on information in a data display?

## FOCUS STANDARDS

**Standards of Mathematical Practice**
**MP.2** Reason abstractly and Quantitatively.
**MP.3** Construct viable arguments and critique the reasoning of others.
**MP.4** Model with mathematics.
**MP.6** Attend to precision.

**Standards**

**4.NF.1.** Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{(n \cdot a)}{(n \cdot b)}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

**4.NF.2.** Compare two fractions with different numerators and different denominators, *(e.g. by creating common numerators or denominators, or by comparing to a benchmark fraction such as* $\frac{1}{2}$*).* Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with relational symbols >, <, =, or ≠, and justify the conclusions, *(e.g. by using visual fraction models).*

**4.NF.3.** Understand a fraction $\frac{a}{b}$ with *a* > 1 as a sum of fractions $\frac{1}{b}$.

- **4.NF.3a.** Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- **4.NF.3b.** Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, *e.g. by using a visual fraction model. Examples:* $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$; $\frac{3}{8} = \frac{1}{8} + \frac{2}{8}$; $2\frac{1}{8} = 1 + 1 + \frac{1}{8} = \frac{8}{8} + \frac{8}{8} + \frac{1}{8}$
- **4.NF.3c** Add and subtract mixed numbers with like denominators, e.g. by replacing each mixed number with an equivalent fraction (simplest form is not an expectation), and/or by using properties of operations and the relationship between addition and subtraction.
- **4.NF.3d** Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g. by using visual fraction models and equations to represent the problem.

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

- **4.NF.4a.** Understand a fraction

$\frac{a}{b}$ as a multiple of $\frac{1}{b}$ . *For example, use a visual fraction model to represent* $\frac{5}{4}$ *as 5 copies of* $\frac{1}{4}$*, recording the conclusion by the equation* $\frac{5}{4} = 5 \cdot \frac{1}{4}$.

- **4.NF.4b.** Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express* $3 \cdot \frac{2}{5}$ *as* $6 \cdot \frac{1}{5}$*, recognizing this product as* $\frac{6}{5}$*. (In general,* $n \cdot \frac{a}{b} = \frac{n \cdot a}{b}$*)*
- **4.NF.4c.** Solve word problems involving multiplication of a fraction by a whole number, *(e.g. by using visual fraction models and equations to represent the problem.) For example, if each person at a party will eat* $\frac{3}{8}$ *of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

**4.NF.5** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express* $\frac{3}{10}$ *as* $\frac{30}{100}$*, and add* $\frac{3}{10} + \frac{4}{100} = \frac{34}{100}$.

**4.NF.6** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as* $\frac{62}{100}$*; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

**4.NF.7** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the relational symbols >, < =, or ≠, and justify the conclusions, *(e.g. by using a visual model.).*

**4.MD.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

**4.MD.4** Make a data display (line plot, bar graph, pictograph) to show a set of measurements in fractions of a unit . Solve problems involving addition and subtraction of fractions by using information presented in the data display. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

# 4th Grade Mathematics

## UNIT 5: Geometry and Measurement

Figures, Classification, and Symmetry

| ESSENTIAL QUESTION | BIG IDEAS |
| --- | --- |
| **How do geometric shapes exist in our everyday world?** | Students can use what they know about angles and parallel and perpendicular lines to classify figures.<br><br>Students can draw, identify, and classify shapes by their attributes.<br><br>Students make sense of symmetry. |

## GUIDING QUESTIONS

**Content and Process**

- How can points, lines, line segments, rays, angles, and perpendicular and parallel lines in two-dimensional figures be identified and drawn? **4.G.1**
- How can two-dimensional figures be classified based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles (right, acute, obtuse, straight, reflex)? **4.G.2**
- How can lines of symmetry be identified and drawn? **4.G.3**

**Reflective**

- How do I categorize triangles based on angles?
- How do I prove a shape has symmetry?
- How can I put shapes together and take them apart to form other shapes?

## FOCUS STANDARDS

**Standards of Mathematical Practice**

**MP.5** Use appropriate tools strategically.

**MP.7** Look for and make use of structure.

**MP.8** Look for and express regularity in repeated reasoning.

**Standards**

**4.G.1** Draw points, lines, line segments, rays, angles (right, acute, obtuse, straight, reflex), and perpendicular

and parallel lines. Identify these in two-dimensional figures.

**4.G.2** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles (right, acute, obtuse, straight, reflex). Recognize and categorize triangles based on angles (right, acute, obtuse, and equiangular) and/or sides (scalene, isosceles, and equilateral).

**4.G.3** Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.