Grade 4 Mathematics, Quarter 1, Unit 1.1

Understanding Place Value and Properties of Operations

Overview

Number of instructional days: 10 (1 day = 60 minutes)

Content to be learned

- Recognize that a digit represents a different value depending on its position in a multidigit number.
- Explain that a digit in one place denotes 10 times the value of the place to its right.
- Read and write multidigit whole numbers using numeric and word forms.
- Write multidigit whole numbers using expanded form.
- Compare two multidigit whole numbers based on meanings of the digits in each place.
- Record comparisons using the symbols <, =, and >.
- Round multidigit whole numbers to any place.
- Add and subtract multidigit whole numbers using the standard algorithm.
- Apply content with whole numbers no greater than 1,000,000.

Mathematical practices to be integrated

Look for and make use of structure.

- Recognize patterns and structure in the place value system.
- Recognize patterns and structure in adding and subtracting multidigit whole numbers.

Reason abstractly and quantitatively.

- Make sense of quantities and their relationship to problem situations.
- Create a coherent representation of the problem at hand.
- Attend to the meaning of quantities (not just how to compute them) and know and flexibly use different properties of operations and objects.

Essential questions

- How does the value of a place compare to the value of the place to its immediate right? (i.e., What is the relationship between two adjacent place values in base 10?)
- What are some ways you can represent the value of a digit in a multidigit whole number?
- How is place value used to read and write numbers up to 1,000,000? How do the commas help you read a number?
- How is place value used to write a number in its expanded form?
- How is place value used to compare two numbers?
- What is the meaning of the symbols <, >, and =?
- What are the strategies for rounding multidigit whole numbers to any place up to 1,000,000? Why does that strategy make sense?
- How can you explain the rounding process using a model such as a number line?
- What role does place value play in the standard algorithm for addition and subtraction?

Written Curriculum

Common Core State Standards for Mathematical Content

Number and Operations in Base Ten[2]	**4.NBT**

[2] Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

Generalize place value understanding for multi-digit whole numbers.

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 ÷ 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, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

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

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

4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

Common Core Standards for Mathematical Practice

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Clarifying the Standards

Prior Learning

Students were introduced to place value in kindergarten as bundles of 10 ones and some more ones (numbers from 1 to 20). In grade 3, students developed an understanding of number value into the thousands place. They also applied their understanding of place value to round numbers to the nearest 10 or 100. Comparison of numbers began in kindergarten and reached the thousands place by grade 3. Students from grades K–3 used their understanding of place value to fluently add and subtract up to and including 1,000.

Current Learning

Students transition from a generalized understanding of place value to a multiplicative understanding. Any place value is 10 times greater than the place value to its right. Students can view place values as multiples of 10. With these understandings, they can explain that multiplying by 10 causes the digits in a multiplicand to shift one place to the left (e.g., 7×10 becomes 10 times greater or 70; 70×10 becomes 10 times greater or 700).

Grade 4 is the final exposure to place value of whole numbers. It is important for students to understand place value beyond just place naming. They need to conceptually understand the relationship between a number's digits and its value. For example, 3,426 can be described as having 34 hundreds, 342 groups of tens, or 3,426 ones. Students read and write multidigit numbers in numeric, word, and expanded forms (numbers less than or equal to 1,000,000). They compare two multidigit numbers with comparison symbols (>, <, =). Students use place value and understand properties (see table 3 of Common Core Standards for properties of operations) to solve addition and subtraction of multidigit whole numbers (to 1,000,000) using the standard algorithm. As is the nature with decimals and fraction, the addition and subtraction algorithms for whole numbers also require adding or subtracting from like base-10 units (ones from ones, tens with tens, etc.). Keep in mind that an algorithm is defined by its steps, not by how the steps are notated; therefore, minor variations in the recording of an algorithm are allowed.

Future Learning

Students will continue to understand the structure of place value, extending their knowledge to include decimal values as one-tenth of the value of the digit to the left. In grade 5, students will extend the use of comparison symbols to decimals. Grade 5 is the last year for the Number and Operations in Base Ten domain, so it is critical that students gain a solid understanding of place value and its role in arithmetic. This will be the final time that the place value standard for decimals is addressed. Students will continue to use place value understandings within multistep problems. Fifth-grade students will extend this knowledge with decimals to hundredths and exponents.

Additional Findings

According to *Principles and Standards for School Mathematics*, students in grades 3–5

- "are likely to develop and use methods that are not the same as the conventional algorithms. Students should be able to explain their method regardless and understand that many methods exist. They should recognize the need to develop efficient and accurate methods." (p. 155)
- "should explore whole numbers using a variety of models and contexts. Students who understand the structure of numbers and the relationships among numbers can work with them flexibly." (p. 149)

- "understand the place value structure of the base ten number system and are able to represent and compare whole numbers and decimals." (p. 148)

According to *A Research Companion to Principles and Standards for School Mathematics*, the "written place value system is a very efficient system; it lets people write very large numbers. Yet it is very abstract and can be misleading: the digits in every place look the same. To understand the meaning of the digits in various places, children need experience in some kind of size, quantity, supports." (p. 78)

Younger students view numbers as single digits side by side: 827 is functionally "827," not eight groups of 100, two groups of 10, and seven 1s. (p. 79)

Grade 4 Mathematics, Quarter 1, Unit 1.2

Multiplying with Whole Numbers to Solve Problems

Overview

Number of instructional days: 15 (1 day = 60 minutes)

Content to be learned

- Identify and verbalize which quantity is being multiplied and which number tells how many times.
- Interpret a multiplication equation as a verbal comparison statement.
- Interpret a verbal comparison statement as a multiplication equation.
- Distinguish the difference between additive and multiplicative comparisons. (See the Current Learning section.)
- Multiply to solve word problems involving multiplicative comparisons.
- Multiply four-digit by one-digit whole numbers using a strategy based on place value and properties of operations.
- Illustrate, explain, and represent multiplication strategy using rectangular arrays, area models, and equations.
- Solve multistep word problems using addition, subtraction, and multiplication of whole numbers with whole number solutions.
- Represent these word problem situations with a letter (variable) representing the unknown quantity.
- Assess the reasonableness of answers using mental computation and estimation (including rounding).

Mathematical practices to be integrated

Make sense of problems and persevere in solving them.

- Explain the meaning of a problem and look for ways to solve it.
- Check thinking by asking what makes sense and try different approaches.

Reason abstractly and quantitatively.

- Make sense of quantities and their relationship to problem situations.
- Attend to the meaning of quantities (not just how to compute them) and know and flexibly use different properties of operations and objects.

Model with mathematics.

- Represent problem situations in multiple ways.
- Connect representations and explain the connections.

Essential questions

- What information do the numbers in a multiplication equation represent? (e.g., number of groups, size of the group, total number)
- How could you make a multiplicative comparison statement about a set of numbers (e.g., 3, 6, and 18)?
- How could you write your comparison statement as equation? (one possible comparison of 18 is 3 times as many as 6; $3 \times 6 = 18$)
- How do additive and multiplicative comparisons differ?
- How can you draw a rectangular array or area model to illustrate a multiplicative comparison? What equation represents your drawing?
- How is place value represented in your multiplication strategy?
- When did you use the properties of operations in your multiplication strategy?
- What information is given and what information are you trying to find? How could you record this as an equation or number sentence?
- Based on the given information, what do you expect would be a reasonable answer? How did you make that approximation?
- How did you decide what operation to use? Why does that operation make sense?

Written Curriculum

Common Core State Standards for Mathematical Content

Operations and Algebraic Thinking	**4.OA**

Use the four operations with whole numbers to solve problems.

4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ 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.[1]

[1] See Glossary, Table 2.

4.OA.3 Solve multistep 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 equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Number and Operations in Base Ten[2] 4.NBT

[2] Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

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

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.

Common Core Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They

are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Clarifying the Standards

Prior Learning

In grade 3, students developed an understanding of the meaning of multiplication of whole numbers within 100 through activities and problems involving equal-sized groups, arrays, and area models; they determined the unknown in a multiplication equation. Students used properties of operations to calculate products of whole numbers; using increasingly sophisticated strategies based on these properties, they solved multiplication problems involving single-digit factors.

Current Learning

In grade 4, students apply their understanding of models for multiplication, place value, and properties of operations, in particular the Distributive Property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multidigit whole numbers. They select and accurately apply appropriate methods to estimate or mentally calculate products. Students develop fluency with efficient procedures for multiplying whole numbers, understand and explain why the procedures work based on place value and properties of operations (see Table 3 of CCSS), and use them to solve problems. They understand that an additive comparison focuses on the difference between two quantities (how many more), while the multiplicative comparison focuses on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other (how many times as much).

Future Learning

In grade 5, students will use the meaning of fractions and of multiplication and division and the relationship between multiplication and division to understand and explain why the procedures for multiplying fractions make sense. They will finalize fluency with multidigit multiplication. Students will develop fluency in these computations and make reasonable estimates of their results. They will compute products and quotients of decimals to hundredths efficiently and accurately.

In grade 6, students will begin studying ratio and proportional relationships, where they will continue to explore multiplicative comparisons.

Additional Findings

According to *Principles and Standards for School Mathematics*, students in grades 3–5

- utilize "computational methods that are based on mathematical ideas that the student understands well, including the structure of the base ten number system, properties of multiplication, and number relationships." (p. 152)
- "are likely to develop and use methods that are not the same as the conventional algorithms. Students should be able to explain their method regardless and understand that many methods exist. They should recognize the need to develop efficient and accurate methods." (p. 155)
- "who understand the structure of numbers and the relationships among numbers can work with them flexibly." (p. 149)

Grade 4 Mathematics, Quarter 1, Unit 1.3

Factors, Multiples, and Patterns

Overview

Number of instructional days: 5 (1 day = 60 minutes)

Content to be learned

- Find all factor pairs for a whole number in the range 1–100.
- Recognize that a whole number is a multiple of each of its factors.
- Determine whether a whole number (1–100) is a multiple of a given one-digit number.
- Determine whether a given whole number (1–100) is prime or composite.
- Generate a number or shape pattern that follows a given rule.
- Identify additional features of the pattern that result from applying a given rule.

Mathematical practices to be integrated

Look for and make use of structure.

- Look closely to discern a pattern or structure.

Look for and express regularity in repeated reasoning.

- Notice if calculations are repeated.
- Look for general methods and shortcuts.

Essential questions

- What are the factors of a number? How do you find them?
- How can you be certain you have found all the factor pairs for a given number?
- What are the multiples of a number? How do you find them? How many multiples does a number have?
- How is a whole number related to its factors?
- How do you determine if a number (1–100) is a multiple of a given one-digit number?
- What is the difference between a prime and composite number?
- How do you determine if a number is prime or composite?
- Given a rule, how could you generate a pattern?
- What patterns do you notice?

Written Curriculum

Common Core State Standards for Mathematical Content

Operations and Algebraic Thinking	4.OA

Gain familiarity with factors and multiples.

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

Generate and analyze patterns.

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.*

Common Core Standards for Mathematical Practice

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Clarifying the Standards

Prior Learning

In grade 3, students learned how to interpret products of whole numbers. Students did not use the terms *factors* and *multiples*, but they understood division as an unknown-factor problem. They fluently multiplied and divided within 100. Students identified arithmetic patterns, explained them using properties of operations, and understood that shapes in different categories may share attributes.

Current Learning

In grade 4, students generate and analyze patterns that follow a given rule while also looking for features of the pattern outside of the rule. They gain familiarity with factors and multiples for whole numbers in the range 1–100.

Future Learning

Students will apply knowledge of factors and multiples of a number in their work with fractions (e.g., renaming fractions, finding common denominators).

In grade 5, students will generate two numerical patterns using two given rules for comparison's sake. They will identify relationships between these patterns and rules and form ordered pairs from the two patterns. Students will graph the ordered pairs on a coordinate plane. They will extend previous understandings of multiplication to multiply fractions.

Additional Findings

According to *Principles and Standards for School Mathematics*, students in grades 3–5

- utilize "computational methods that are based on mathematical ideas that the student understands well, including … properties of multiplication, and number relationships." (p. 152)
- "should identify classes of numbers and examine their properties … they should recognize that different types of numbers have particular characteristics." (p. 151)

According to *A Research Companion to Principles and Standards for School Mathematics,* "Finding and using patterns greatly simplifies the task of learning multiplication combinations. Thus, approaching multiplication learning as pattern finding greatly simplifies the task and constitutes a core mathematical approach." (p. 77)

Grade 4 Mathematics, Quarter 1, Unit 1.4

Understanding Multidigit Multiplication

Overview

Number of instructional days: 10 (1 day = 60 minutes)

Content to be learned

- Multiply a whole number of up to four digits by a one-digit whole number using strategies based on place value and the properties of operations.
- Multiply two 2-digit numbers using strategies based on place value and the properties of operations.
- Illustrate and explain the calculations by using equations, rectangular arrays, and/or area models.

Mathematical practices to be integrated

Construct viable arguments and critique the reasoning of others.

- Justify conclusions and communicate them to others.
- Understand and use assumptions, definitions, and results in constructing arguments.
- Learn to determine how their argument applies and make plausible justifications.

Model with mathematics.

- Apply the math they know to solve everyday problems.

Look for and express regularity in repeated reasoning

- Notice if calculations are repeated and look for general methods and shortcuts.
- Evaluate the reasonableness of their results.

Essential questions

- How can you multiply numbers using place value?
- How can you show multiplication of whole numbers by using a graphic representation?
- What strategies can be used to multiply a two-digit number by a two-digit number?

Written Curriculum

Common Core State Standards for Mathematical Content

Number and Operations in Base Ten[2]	**4.NBT**

[2] Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.

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

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.

Common Core Standards for Mathematical Practice

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Clarifying the Standards

Prior Learning

In grade 3, students multiplied one-digit whole numbers by multiples of 10 using strategies based on place value and properties of operations. By the end of grade 3, students knew from memory all the products of two 1-digit numbers.

Current Learning

In grade 4, students use place value understanding and properties of operations to perform multidigit arithmetic with four digits by a one-digit number and two digits by two-digit numbers. Students explain the calculation using equations, arrays, and area models. The standard algorithm for multiplication is not addressed until grade 5. See Table 3 of CCSS for properties of operations.

Future Learning

In grade 5, students are expected to fluently multiply multidigit whole numbers by multidigit whole numbers using the standard algorithm.

Additional Findings

According to *Principles and Standards for School Mathematics*, for students in grades 3–5,

> "Multiplicative reasoning should become a focus. Multiplicative is more than just doing multiplication … it is about understanding situations in which multiplication is the appropriate operation." (p. 143)
>
> "Development of number sense should continue, with a focus on multiplication … Their understanding of the meaning of these operations should grow deeper as they encounter a range of representations and problem situations, learn about the properties of this operation and develop fluency in this whole number computation." (p. 149)
>
> "Further meaning for multiplication should develop as students build on and describe area models. The area model is important because it helps students develop an understanding of the multiplicative properties." (p.152)