

Mathematics: Grade 4

Overview

In the *Computation and Algebraic Thinking* domain, grade four students apply competencies addressed in the *Number Sense* domain and earlier grade levels to solve real-world and mathematical problems. The primary operational focus of the domain is on multiplication and division with whole numbers and addition and subtraction with fractions and mixed numbers.

Grade four students use models, place value understanding, and properties of operations (particularly the distributive property) to develop generalizable methods for multi-digit multiplication and division. As students continue to build procedural fluencies that are flexible, accurate, and efficient, they also learn to justify procedures based on their operational understanding.

Grade three students are expected to multiply and divide within 100,^{3.CA.5} and grade four students multiply four-digit whole numbers by one-digit whole numbers (as well as multiplying two two-digit numbers) and divide four-digit numbers by one-digit divisors.^{4.CA.1-2} In grade five, students solve real-world problems involving multiplication and division generally and divide four-digit whole numbers by two-digit divisors.^{5.CA.1-2} Grade four students are also expected to show their understanding of properties of operations,^{4.CA.3} which supports learning around evaluating expressions in grades five and six.

In grade four, students consider real-world multiplicative comparison situations which may include ‘times as many’ reasoning,^{4.CA.5} whereas problems in earlier grades focused on ‘how many more or less’ thinking. Grade four comparison problems help students shift to the multiplicative reasoning that will be essential for the ratio and proportion work in grades six and seven.

Students in grade four rely significantly on grade three learning as they engage in operations with fractions within a real-world context. They solve real-world problems including adding and subtracting fractions and mixed numbers with common denominators,^{4.CA.6-8} while grade five students solve similar real-world fraction problems that include unlike denominators.^{5.CA.4}

Algebra I Predecessor Skills

Algebra I is a key predictor of long-term academic success, strongly linked to graduation rates, college opportunities, and future earning potential. Unfortunately, many students start Algebra I with substantial learning gaps, particularly in foundational algebra-related skills from prior grades. The TNTP report [Unlocking Algebra](#) reveals that many students begin Algebra I without mastery of foundational skills—known as **Algebra I Predecessor Skills**—introduced in earlier grades. Of particular importance are a subset of the Predecessor Skills located in grades six through eight, known as the **Algebra I Key Predecessor Skills**. Students who have mastered the Algebra I Predecessor Skills—shown to be the most predictive of success—are nearly six times more likely to grasp targeted grade-level Algebra I content.

The 2023 Mathematics Instructional Frameworks have been updated to identify standards that correlate with Algebra I Key Predecessor Skills and Predecessor Skills in grades three through eight. Mastery of these targeted skills significantly boosts the likelihood of learning grade-level content and provides targeted Tier 2 support to accelerate student achievement and ensures that students can meaningfully engage with grade-level Algebra I material. To learn more about the Algebra Predecessor Skills, visit the [TNTP Unlocking Algebra: Algebra 1 Predecessor Skills Guide](#).

Computation and Algebraic Thinking			
Standard	4.CA.1: 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. Describe the strategy and explain the reasoning. (E)		
Algebra I	<input type="checkbox"/> Key Predecessor Skill	<input checked="" type="checkbox"/> Predecessor Skill	<input type="checkbox"/> Not Applicable
Evidence Statements		Academic Vocabulary	
<ul style="list-style-type: none"> • Multiply up to four-digit whole numbers by a one-digit whole number using strategies based on place value and the properties of operations. • Multiply two two-digit numbers using strategies based on place value and the properties of operations. • Justify solutions using verbal and written explanations of strategies based on place value and the properties of operations. • Apply knowledge of the multiplication of four-digit by one-digit and two-digit by two-digit numbers to solve problems. 		<ul style="list-style-type: none"> • Multiplication (multiply) • Whole number • Equal-sized groups of • Array • Area model • Decomposition • Compensation • Partial Products • Factor • Product • Value • Expression • Equation 	
Suggested Models		Suggested Manipulatives	
Coming Soon		Coming Soon	
Clarification Statements		Common Misconceptions	
<ul style="list-style-type: none"> • In grade three, students were introduced to the concept of multiplication and used direct modeling strategies to represent one-digit by one-digit facts. Students should build upon this foundational knowledge to multiply larger numbers in grade four using strategies. These strategies may include, but are not limited to: <ul style="list-style-type: none"> ○ Direct modeling: equal groups of items, base ten blocks, area models. ○ Decomposition: decomposing at least one factor in a way that shows the understanding of place value and makes it easier for a student to multiply <ul style="list-style-type: none"> ■ By decades: $37 \times 4 = (30 \times 4) + (7 \times 4)$ ■ By partitioning the multiplier: $37 \times 3 = (37 \times 2) + 37$ ■ By tens and ones: $37 \times 4 = (10$ 		<ul style="list-style-type: none"> • Students may not multiply zeros in multi-digit numbers when they are bracketed by other numbers (e.g., 3007). • Students may use strategies that consider the tens and ones separately, as is done in addition (e.g., $24 \times 48 = (20 \times 40) + (4 \times 8)$). • Students may believe computation must always begin in the ones place. 	

$$\times 4) + (10 \times 4) + (10 \times 4) + (7 \times 4).$$

- Compensation: changing the problem to an easier one and then adjusting or compensating by halving one factor and doubling the other
 - Adjustment: $17 \times 30 = 20 \times 30 = 600$; $3 \times 30 = 60$; $600 - 60 = 540$
 - Compensation: $34 \times 5 = 17 \times 10 = 170$.
- Partial products: multiply the value of each digit of the first factor by the value of each digit of the second factor; add the partial products to find the final product
 - $37 \times 42 = (30 \times 40 = 1200) + (30 \times 2 = 60) + (40 \times 7 = 280) + (7 \times 2 = 14)$; $1200 + 280 + 60 + 14 = 1554$.
- Students should use mathematical reasoning and appropriate vocabulary to justify their solutions regardless of the strategy used. Justifications should include understanding of the mathematical concepts and processes used in solving the problem.
- The use of a standard algorithm for multiplication and understanding why it works is not an expectation until grade five. Grade four students are expected to develop fluency; the ability to efficiently, accurately, and flexibly apply strategies or procedures in a reasonable amount of time to solve problems with multiplication strategies.
- While solving real-world problems is not specifically stated in this standard, it is important to continue to provide students with opportunities to learn through problem-solving. Providing context to procedural learning allows students to make connections to and retain learning.
- Combining this standard along with 4.CA.3 will help support students' development and understanding of place value and multiplication strategies.

Algebra I Predecessor Skill(s)

- I will multiply 2-digit by 2-digit numbers using area models to represent partial products.

Looking Back

Looking Ahead

<p>3.CA.3: Model the concept of multiplication of whole numbers using equal-sized groups, arrays, area models, and equal intervals on a number line. Model the properties of 0 and 1 in multiplication using objects or drawings. (E)</p>	<p>5.CA.2: Solve real-world problems involving multiplication and division of whole numbers (e.g., by using equations to represent the problem). In division problems that involve a remainder, explain how the remainder affects the solution to the problem. (E)</p>
<p>3.CA.6 Demonstrate fluency with mastery of multiplication facts and corresponding division facts of 0 to 10.</p>	

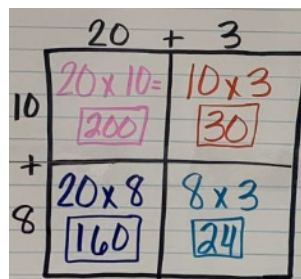
Prior Knowledge Skills

- Understanding of repeated addition, multiplication expressions and equations, arrays, equal groups, and number line models.
- Understand place value to the thousands.
- Decompose numbers in different ways.
- Add and subtract with and without regrouping up to 10,000.
- Model the concept of multiplication of whole numbers using arrays and area models.

Proficiency Level Progression

<p>Below Proficiency: Multiply a whole number of up to four digits by one digit without regrouping using any strategy based on place value or properties of operations.</p>	<p>Approaching Proficiency: Multiply a whole number of up to two or three digits by one digit with regrouping using any strategy based on place value or properties of operations.</p>	<p>At Proficiency: Multiply a whole number of up to four digits by one digit and two two-digit numbers with regrouping using any strategy based on place value or properties of operations. Justify the solution by describing the strategy or reasoning.</p>	<p>Above Proficiency: Apply knowledge of the multiplication of four-digit by one-digit and two-digit by two-digit numbers to solve problems.</p>
<p><i>The skills listed in each Proficiency Level should carry over into or support the other Proficiency Levels.</i></p> <ul style="list-style-type: none"> ● Apply strategies for multiplication which include: direct modeling (equal groups of items, base ten blocks, area model, etc.), decomposing, compensation, and partial products. ● Apply the properties 	<ul style="list-style-type: none"> ● Model using an array, area model or a drawing using place value understanding a multiplication expression of whole numbers up to 3-digits by 1-digit that involves regrouping the partial products. <i>(Example: 623 x 4)</i> ● Estimate to determine an approximate answer to a multiplication expression of whole 	<ul style="list-style-type: none"> ● Model using an array, area model or a drawing using place value understanding a multiplication expression of whole numbers up to 4-digits by 1-digit that may involve regrouping the partial products. <i>(Example: 8,674 x 3)</i> ● Estimate to determine an approximate answer to a multiplication expression of whole numbers of 2-digits by 	<ul style="list-style-type: none"> ● Estimate to determine an approximate answer to a one-step real-world problem involving multiplication of up to 4-digits by 1-digit or 2-digits by 2-digits. ● Make a plan to solve a real-world problem using appropriate problem-solving strategies. (e.g., models, equations, etc.) ● Solve a real-world problem involving

<p>of operations through decomposition and partial products (e.g., $5 \times 3 = 3 \times 5$, $(2 + 3) \times 3$, etc.) <i>However, students do not need to explicitly name the properties.</i></p> <ul style="list-style-type: none"> • Model using an array, area model or a drawing using place value understanding a multiplication expression of whole numbers up to 4-digits by 1-digit that does not involve regrouping of the partial products. (Example: $3,402 \times 2$) • Estimate to determine an approximate answer to a multiplication expression of whole numbers up to 4-digits by 1-digit. • Solve a multiplication expression of whole numbers up to 4-digits by 1-digit that does not involve regrouping of the partial products. (Example: $3,402 \times 2$) • Solve a multiplication expression of whole numbers up to 4-digits by 1-digit that does not involve regrouping of the partial products by using place value understanding and the distributive property. (Example: $2 \times 3,402 = 2 \times (3,000 + 400 + 2)$) 	<p>numbers up to 3-digits by 1-digit.</p> <ul style="list-style-type: none"> • Solve a multiplication expression of whole numbers up to 3-digits by 1-digit that involves regrouping the partial products. (Example: 623×4) • Solve a multiplication expression of whole numbers up to 3-digits by 1-digit that involves regrouping the partial products by using place value understanding and the distributive property. (Example: $4 \times 623 = 4 \times (600 + 20 + 3)$) 	<p>2-digits.</p> <ul style="list-style-type: none"> • Solve a multiplication expression of whole numbers up to 4-digits by 1-digit that may involve regrouping the partial products. (Example: $8,674 \times 3$) • Solve a multiplication expression of whole numbers up to 4-digits by 1-digit that may involve regrouping the partial products by using place value understanding and the distributive property. (Example: $3 \times 8,674 = 3 \times (8,000 + 600 + 70 + 4)$) • Model using an array, area model or a drawing using place value understanding a multiplication expression of whole numbers of 2-digits by 2-digits that may involve regrouping the partial products. (Example: 23×18) • Solve a multiplication expression of whole numbers of 2-digits by 2-digits that may involve regrouping the partial products. (Example: 23×18) • Solve a multiplication expression of whole numbers of 2-digits by 2-digits that may involve regrouping the partial products by using place value understanding and the distributive property. (Example: 23×18) 	<p>multiplication of up to 4-digits by 1-digit or 2-digits by 2-digits using any strategy based on place value or properties of operations.</p> <ul style="list-style-type: none"> • Make a plan and solve a multiplication problem which is missing a factor or part of a product.
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- Justify the solution to a multiplication expression of whole numbers up to 4-digits by 1-digit or 2-digit by 2-digit using mathematical reasoning and appropriate academic vocabulary to describe and explain the strategy used.

Instructional Resources

- [Implementing the Mathematics Process Standards: Grades Three through Five](#)
- [Mathematics Grades 3-5 Vertical Articulation Guide](#)
- [Learning Progressions & Content Supports: Grade 3 through Grade 5](#)
- [Graham Fletcher-The Progression of Multiplication Video](#)
- [Partnership for Inquiry Learning-Multiplying and Dividing Fluently Grade 4: Part 1](#)
- [PBS Learning Media-Area Model Video](#)
- [PBS Learning Media-Partial Products Video](#)
- [Math is Visual-Exploring Multiplication Properties Through Doubling and Halving Video](#)
- [Inside Mathematics-The Baker](#)
- [Number Strings-Number String Structure and Design](#)
- [Number Strings-Chocolate Arrays](#)
- [Number Strings-Closed to Open Array](#)
- [Graham Fletcher-3-Act Math Task: Where's the Beef?](#)

Universal Supports for All Learners

- [Mathematics Learning Recovery Series: Part 2-Addressing the Gaps in Student Learning](#)
- [Mathematics Learning Recovery Series: Part 3-Instructional Strategies for All Learners](#)

Instructional Strategies

- [What Works Clearinghouse-Concrete-Semi-Concrete-Abstract Video \(Print Recommendations\)](#)
- [What Works Clearinghouse-Clear & Concise Mathematical Language Video \(Print Recommendations\)](#)
- [NYSED-Frayer Vocabulary Model Scaffolding Example & Template](#)

- [Magma Math: Math Teaching Practices](#)
- [Problem Solving Instructional Support](#)
- [WIDA-Doing and Talking Mathematics: A Teachers Guide to Meaning-Making with English Learners](#)
- [Virginia Department of Education Students with Disabilities in Mathematics Frequently Asked Questions](#)

Tiered Supports and Strategies

Tier II	Tier III
Coming Soon	Coming Soon

Assessment Considerations

- [Indiana Assessment Framework: Mathematics](#)
- [4.CA.1 ILEARN Item Specification](#)
- [Mathematics Performance Level Descriptors: Grades 3-5](#)
- [Guide to the 2023 ILEARN Performance Level Descriptors](#)
- [ILEARN Released Items Repository](#)
- [Quality Mathematic Items for Classroom Assessments \(Featuring New ILEARN Item Specifications\)](#)

Contact the Indiana Department of Education with any questions.