

# Winchester Math Curriculum Grade 5

<b>Subject</b>	Mathematics
<b>Grade/Course</b>	Grade Five
<b>Unit of Study</b>	Unit 5: Multiplying Whole Numbers by Fractions
<b>Pacing</b>	February
<b>Unit Summary</b>	This unit begins with an in-depth study of what happens when you multiply a whole number by a fraction. In Session 2, students learn to play Target One Fractions, a game designed to help fifth graders develop strategies for multiplying whole numbers by unit and common fractions. As the module continues, students develop skills and concepts related to multiplication of whole numbers and fractions through discussion, problem solving, and a problem string.
<b><u>Overarching Mathematical Practices</u></b>	
<p><b>5.MP.1 Make sense and persevere in solving problems.</b></p> <p>5.MP.2 Reason abstractly and quantitatively.</p> <p>5.MP.3 Construct viable arguments and critique the reasoning of others.</p> <p><b>5.MP.4 Model with mathematics.</b></p> <p>5.MP.5 Use appropriate tools strategically.</p> <p>5.MP.6 Attend to precision.</p> <p>5.MP.7 Look for and make use of structure.</p> <p>5.MP.8 Look for and express regularity in repeated reasoning.</p>	
<b><u>Unit CT Core Content Standards</u></b>	
<p><u>5.NF.A.1</u> Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.</p> <p><u>5.NF.B.4.A</u> <b>Interpret the product <math>(a/b) \times q</math> as <math>a</math> parts of a partition of <math>q</math> into <math>b</math> equal parts; equivalently, as the result of a sequence of operations <math>a \times q \div b</math>.</b></p> <p><u>5.NF.B.4.B</u> <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.</b></p> <p><u>5.NF.B.5.A</u> Comparing 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.</p> <p><u>5.NF.B.5.B</u> <b>Explaining 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</b></p>	

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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  $a/b = (n \times a)/(n \times b)$  to the effect of multiplying  $a/b$  by 1.

5.NF.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.B.7.A

Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for  $(1/3) \div 4$ , and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that  $(1/3) \div 4 = 1/12$  because  $(1/12) \times 4 = 1/3$ .*

5.NF.B.7.B

Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for  $4 \div (1/5)$ , and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that  $4 \div (1/5) = 20$  because  $20 \times (1/5) = 4$ .*

5.NF.B.7.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.

**“Unwrapped” Standards**

<b>Skills</b>	<b>Content</b>
Add and subtract	fractions with unlike denominators (including mixed numbers) using equivalent fractions
Produce	equivalent sums or differences of fractions with like denominators (for adding and subtracting unlike denominators)
Interpret	<ul style="list-style-type: none"> <li>the product <math>(a/b) \times q</math> as <math>a</math> parts of a partition of <math>q</math> into <math>b</math> equal parts</li> <li>division of a whole number by a unit fraction and compute such quotients</li> <li>division of a unit fraction by a non-zero whole number and compute such quotients</li> </ul>
Find	the area of a rectangle with fractional side lengths by tiling it with unit squares
Show	area by tiling is the same as by multiplying side lengths
Multiply	fractional side lengths to find areas of rectangles
Represent	fraction products as rectangular areas
Compare	the size of a product to the size of one factor on the basis of the size of the other factor

Explain	<ul style="list-style-type: none"> <li>• why multiplying a given number by a fraction greater than 1 results in a product greater than a given number</li> <li>• why multiplying a given number by a fraction less than 1 results in product smaller than the given number</li> </ul>
Relate	the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying $a/b$ by 1
Solve	real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions

Essential Questions	Corresponding Big Ideas
<ol style="list-style-type: none"> <li>1. How can fractions be modeled, compared, and ordered?</li> <li>2. How do we model with mathematics?</li> <li>3. What does it mean to persevere in solving a problem?</li> </ol>	<ol style="list-style-type: none"> <li>1. Fractions, including equivalents, improper, and mixed numbers, can be modeled, ordered and compared in a variety of ways by mathematical principles, properties, and/or models, such as locations on a number line.</li> <li>2. Many skills are used to model with mathematics and to represent problem situations, such as; deciding what information is important, locating information to solve a problem, interpreting and creating graphs, creating equations, making charts, etc... . It is also important to evaluate results in the context of the situation and reflect on whether the results make sense.</li> <li>3. Persevering through problems means to explore and reason through tasks, take responsibility for making sense of tasks by connecting to prior learning and ideas, and using tools and representations to support thinking and problem solving to reach a solution.</li> </ol>

Evidence of Learning - Assessment		
Pre/Post Assessment	Interim Assessment	Additional Evidence of Learning
<ul style="list-style-type: none"> <li>• Unit 5 Pre-Assessment - Module 1, Session 1</li> <li>• Unit 5 Post-Assessment - Module 4, Session 6</li> </ul>	<ul style="list-style-type: none"> <li>• Whole Numbers Times a Fraction Checkpoint - M2, S1</li> <li>• Fraction Times Fraction - M3, S4</li> </ul>	Options <ul style="list-style-type: none"> <li>• <a href="#">Exit tickets</a></li> </ul> Observational Assessments <ul style="list-style-type: none"> <li>• Target One Fractions - M1, S2</li> <li>• Tic-Frac-Toe - M3, S4</li> </ul>

**Smarter Balanced Interim Assessment**

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[Smarter Balanced General Scoring Rubrics](#) - 4 Rubrics included - Score Pt 4 to Score Pt 1

### Smarter Balanced Interim Blocks

- Interim assessment blocks may be used for a variety of assessment purposes, including: pre/post, interim and formative (additional evidence of learning).
- The [Style Guide](#), which aligns with the expectations of Smarter Balanced Assessments, will support the creation of unit- and standard-aligned items for instructional use.
- The items on the interim assessments are developed under the same conditions, protocols, and review procedures as those used in the summative assessments. Therefore, they assess the same Common Core State Standards, adhere to the same principles of Universal Design in order to be accessible to all students, and provide evidence to support Smarter Balanced claims in mathematics and ELA/literacy. The interim assessment items are non-secure but non-public. This means that educators may view the items, however, they should not be made public outside of classroom, school or district.

#### Unit-aligned Smarter Balanced Interim Assessment Block (IAB)\*:

Interim Assessment Block - access through [CSDE Assessment Portal](#)

- IAB - Measurement and Data

*\*Some interim blocks show clear, strong alignment to priority standards within the unit. Other blocks have been placed in one specific unit but could be aligned to the priority standards of several units. Blocks have been spread out over the course of all units for a more balanced approach to assessment throughout the school year. These interim blocks, used in partnership with the Style Guide, will support the creation of unit- and standard-aligned items for instructional use.*

## Learning Plan

### Researched-based Instructional Resources and Methods

#### Sequence of Instruction:

**Number Corner → Problem + Investigations → Work Places → Math Forum\* → Daily Practice or Home Connection**

Bridges Number Corner - The focus areas of Number Corner Aligned to Unit 5 are

#### Fractions

- Introducing Fraction Multiplication on a Grid
- Exploring Patterns in Multiplying Fraction
- Multiplying Fractions

#### Measurement

- Liquid Volume
- Measuring Liquid Volume - Metric and Customary
- Discussion on Measuring Liquid Volume
- Convert between Units
- Problem Solving

#### Computation

- Adding and Subtracting Decimals
- Multiplying and Dividing Whole Numbers and Decimals
- Practicing Standard Algorithm for Multiplication

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Bridges - Whole Group, Small Group and Independent Problem Centered Activities

Module 1	Module 2	Module 3	Module 4
Problem + Investigation <ul style="list-style-type: none"> <li>Sessions 2-5</li> </ul> Problem String <ul style="list-style-type: none"> <li>Session 5</li> </ul> Work Place <ul style="list-style-type: none"> <li>Sessions 1-5</li> </ul> Math Forum <ul style="list-style-type: none"> <li>None</li> </ul> Daily Practice <ul style="list-style-type: none"> <li>Sessions 1-5</li> </ul> Home Connection <ul style="list-style-type: none"> <li>Sessions 1,3,5</li> </ul>	Problem + Investigation <ul style="list-style-type: none"> <li>Sessions 1-4</li> </ul> Problem String <ul style="list-style-type: none"> <li>None</li> </ul> Work Place <ul style="list-style-type: none"> <li>None</li> </ul> Math Forum <ul style="list-style-type: none"> <li>None</li> </ul> Daily Practice <ul style="list-style-type: none"> <li>Sessions 1-5</li> </ul> Home Connection <ul style="list-style-type: none"> <li>Sessions 2, 4</li> </ul>	Problem + Investigation <ul style="list-style-type: none"> <li>Sessions 1-3</li> </ul> Problem String <ul style="list-style-type: none"> <li>None</li> </ul> Work Place <ul style="list-style-type: none"> <li>Sessions 2,4</li> </ul> Math Forum <ul style="list-style-type: none"> <li>Session 2</li> </ul> Daily Practice <ul style="list-style-type: none"> <li>Sessions 1-4</li> </ul> Home Connection <ul style="list-style-type: none"> <li>Sessions 1,3</li> </ul>	Problem + Investigation <ul style="list-style-type: none"> <li>Sessions 1-5</li> </ul> Problem String <ul style="list-style-type: none"> <li>None</li> </ul> Work Place <ul style="list-style-type: none"> <li>Sessions 1, 6</li> </ul> Math Forum <ul style="list-style-type: none"> <li>None</li> </ul> Daily Practice <ul style="list-style-type: none"> <li>Sessions 1-6</li> </ul> Home Connection <ul style="list-style-type: none"> <li>Sessions 1,3,5</li> </ul>

**Possible Misconceptions**

1. Students may see the pattern that to multiply fractions you “simply” multiply the numerators and denominators.
2. Watch for students who have difficulty determining the part of the unit square when finding the area of a rectangle with fractional side lengths.
3. Students are often puzzled when they find that the product is less than one or both of the factors.

**Teacher Moves**

1. This is the correct algorithm or procedure. However, only references to real-life situations and using models and visual representations will help students develop a conceptual understanding of what is actually happening when they multiply fractions.
2. Thinking in terms of the whole rectangle will help them define the number of parts when the dimensions are fractional parts of the whole. Reinforcing when they multiply a fraction by a fraction they are taking part of a part will help students to see that the “overlap” is the number of pieces (or numerator), and the total number of pieces in the whole is the denominator.
3. In previous work with multiplication with whole numbers, the product was always greater than both factors. Give students many opportunities to use visual models to “see” what is happening when they multiply with fractions. Discussions in which students explain their thinking will

<p>4. Students may struggle determining which number goes where is division problems? “Am I dividing the fraction by the whole number or the whole number by the fraction?”.</p>	<p>also help to identify and address misconceptions.</p> <p>4. Drawing pictures using the informations in the problems and focusing on what they want to find out will help. Model asking questions and encourage them to ask themselves similar questions, such as;</p> <ol style="list-style-type: none"> <li>What is being divided or broken up?</li> <li>Am I trying to determine how much in a group or how many groups?</li> <li>What visual representations can I use to show the actions of the problem?</li> </ol>
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### Vocabulary and Representations

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary)
<p>area* dimension divide* equivalent* expression* factor* group grouping length* multiply* product* sharing whole number</p> <p>*Smarter Balanced Vocabulary IS focused on major mathematical concepts. (Not all possible words have been identified by SBAC) + Students are not responsible for these vocabulary words at this grade level, however they should have some understanding of the mathematical concept</p>	<p>array* area model* associative property of multiplication +* commutative property of multiplication +* denominator* division* equation* equivalent fractions* fraction* improper fractions linear units numerator* mixed number* perimeter* quotient* square unit* rectangle* rectangular array unit fraction* visual fraction model</p>

### **Mathematics Teaching Practice Resources**

<ol style="list-style-type: none"> <li><b>Bridges</b> - Reference Math Practices in Action Notes - The notes identify how particular mathematical practice is employed in a specific activity.</li> <li>Additional instructional resources are available from the resources tab in Bridges units.</li> <li><a href="#">Developing Positive (Growth Mindset) Norms in the Classroom</a></li> <li><a href="#">Mistakes are Powerful</a> - Resource to develop students’ perseverance through mistakes</li> <li><a href="#">Grade 5 Standards + Practices Examples and Explanations</a></li> </ol>
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6. [Math Practices Teacher Question Starters](#)
7. [Implementing the Standards of Mathematics Practice](#)
8. [Illustrating the Standards of Mathematical Practice](#)
9. [Math Practice Standards Posters Gr. 4-5](#)
10. [Number Talks Matter - Number Talks at a Glance](#) and Fluency without Fear
11. [Three Act Math Tasks](#)
12. [Standards + Mathematical Practices - Examples and Explanations](#) - Grade 5
13. [Journal Prompts for Math](#)
14. [Bridges Interactive Math Manipulatives](#)
15. [Open Middle](#)
16. [National Library of Virtual Manipulatives](#)
17. [Illustrative Math – Grade 5](#)
18. [Bridging Practices - UCONN](#) – Training and a Task Repository to develop and support student capacity for argumentation in mathematics
19. [Connecting Decimals and Fractions](#)
20. [Models That Show Fraction Equivalence](#)
21. [Accountable Talk Moves](#)
22. [Contribution Checklist](#)
23. [Sentence Frames that Can Build Metacognitive Thinking](#)
24. [Sample Language Frames for Mathematics](#)
25. [Building a Mathematical Mindset Community](#)
26. [Teacher/Student Actions](#)
27. [Vocabulary Development Frayer Model](#) – Elementary and secondary video and resources.
28. Learn Zillion
  - [Add and Subtract Fractions with Unlike Denominators using Number Lines](#)
  - [Multiply a Fraction by a Fraction Using Visual Representations](#)
  - [Multiply Mixed Numbers using Visual Representations](#)
29. K-5 Math Teaching Resources
  - [Find a Fractional Part of a Group](#)
  - [Find Areas of Rectangles with Fractional Side Lengths](#)
  - [Comparing Factors \(with fractions\)and Products](#)

### **Suggestions for Differentiation, Scaffolding and Intervention**

#### **Differentiation or Intervention**

**Any teacher moves/strategies that address misconceptions can be used in differentiation or as intervention.**

**Math Teaching Practice Resources contain resources that provide opportunities for differentiation, intervention, or extension aligned to the strategies below.**

- [How to Select Math Intervention Content](#)
- [Coherence Map in Math](#) – The coherence map shows how standards within and across grades build upon each other. You can use the map to assist you in to build student understanding by linking together concepts within and across grades and identify gaps in a student's knowledge by tracing a standard back through its logical prerequisites.

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- [CT Dept. of Education Evidence-based Practice Guides](#) – These guides provide links to “evidence-based activities, strategies and interventions (collectively referred to as 'interventions').”
- Evidenced-based strategies for supporting struggling students (U.S. Dept. of Education – [What Works Clearinghouse](#))
- Ensure instructional materials are systematic and explicit. In particular, they should include numerous clear models of easy and difficult problems, with accompanying teacher think alouds.
- Provide students with opportunities to solve problems in a group and communicate problem-solving strategies.
- Teach students about the structures of various problem types, how to categorize problems based on structure, and how to determine appropriate solutions for each problem type.
- Students should work with visual representations of mathematical ideas.
- If visual representations are not sufficient for developing accurate abstract thought and answers, use concrete manipulative first. (Include the next line for middle school and older students only) Although this can also be done with students in upper elementary and middle school grades, use of manipulatives with older students should be expeditious because the goal is to move toward understanding of and facility with visual representations and finally to the abstract.
- Provide carefully constructed questions to help direct students in determining what to do to solve problems, but they shouldn't be told how to reach the solution.
- Instruction during the intervention should be explicit and systematic. This includes providing models of proficient problem solving, verbalization of thought processes, guided practice, corrective feedback, and frequent cumulative review.

#### Intervention for facts

- Provide about 10 minutes per session of instruction to build quick retrieval of basic arithmetic facts. Consider using technology, flashcards, and other materials for extensive practice to facilitate automatic retrieval.
- For students in K -2 explicitly teach strategies for efficient counting to improve the retrieval of mathematics facts.
- Teach students in grade 2-8 how to use their knowledge of properties, such as commutative, associative, and distributive to derive facts in their heads.
- [How to Promote Acquisition of Math Facts – Intervention for struggling students](#)
- [National Center on Intensive Intervention - Basic Facts](#)
- Once a strategy has been taught, it is important to reinforce it. The reinforcement or practice exercises should be varied in type and focus as much on the discussion of how students obtained their answers as on the answers themselves.
- Having students work in groups (as opposed to handing your bright students a workbook to work on when the classroom material isn't challenging enough) with other children ready for advanced material shows them that mathematics is not a solitary discipline -- mathematics is exciting and vibrant and creative and fun.
- [Concrete, Representational, Abstract Progression](#)

#### EL Strategies

- [Colorin Colorado](#) – A Bilingual site for educators and families of English learners
- [Stanford University - Principles for Mathematics Instruction of ELs](#)
- [CT State Dept. Of Education English Learner Standards and Resources](#)

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- Nonverbal responses, such as thumbs up, will help you check for understanding without requiring students to produce language. ELLs can participate and show that they understand a concept, or agree or disagree with an idea, without having to talk. This is especially important for students whose comprehension of English is more advanced than their ability to speak the language.
- Pre-teach vocabulary in ways that connect to students' prior knowledge.
- Display posters of graphic representations of vocabulary words.
- <http://www.cal.org/siop/lesson-plans/>
- Provide support to assist in explaining thinking with sentence starters and work banks.
- Use Work Place Sentence Frames or other sentence frames to assist students in math discourse.
- Speak slowly and use clear articulation. Reduce the amount of teacher talk and use a variety of words for the same idea. Exaggerate intonation and place more stress on important new concepts or questions. After asking a question, wait for a few moments before calling on a volunteer. Writing the question on the board will also help.
- English language learners are not always able to answer the questions posed to them, especially when the questions are open-ended. Provide support for and improve the participation of students with lower levels of English proficiency by using a prompt that requires a physical response, like "Show me a half, a third, etc.." or "Touch the larger number."
- [Increase academic language knowledge for English learner success.](#)

#### Extension

- Extension activities aligned with Bridges lessons are included in each module
- [Equation Mix-Up](#) - The task requires students to arrange a given set of numbers (each used only once), operations, quotients, and products to make all the equations true.
- [Math Fraction Menu Project](#)

### Interdisciplinary Connections

#### Children's Literature \* Bridges recommended titles - # Titles embedded in Bridges Units

- |  |  |
|--|--|
| *The Lion's Share by Matthew McElligott                        | *Music Math by Kathleen Collins          |
| *The Wishing Club by Donna Jo Napoli                           | *Fractions in Disguise by Edward Einhorn |
| *Fabulous Fractions by Lynette Long                            |  |
| *The Hershey's Milk Chocolate Fractions Book by Jerry Pallotta |  |
| *Sir Cumference and the Fraction Faire by Cindy Neuschwander   |  |

#### Music

- \*Music Math by Kathleen Collins

#### ELA

##### CCSS.ELA-LITERACY.SL.5.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

##### CCSS.ELA-LITERACY.SL.5.1.A

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

##### CCSS.ELA-LITERACY.SL.5.1.B

Follow agreed-upon rules for discussions and carry out assigned roles.

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CCSS.ELA-LITERACY.SL.5.1.C

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

CCSS.ELA-LITERACY.SL.5.1.D

Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions