# Winchester Math Curriculum Grade 3

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| **Subject** | Mathematics |
| **Grade/Course** | Grade Three |
| **Unit of Study** | Unit 7: Extending Multiplication and Fractions |
| **Pacing** | April |
| **Unit Summary** | Students learn to multiply single digits by multiples of 10. They apply concepts and strategies of multiplication and division to solve problems. Students continue to work with fractions on a number line and are introduced to linear and area models that allow them to see fractions as parts of a set as well as a whole. |

## Overarching Mathematical Practices

3.MP.1 Make sense and persevere in solving problems.
3.MP.2 Reason abstractly and quantitatively.
**3.MP.3 Construct viable arguments and critique the reasoning of others.**
3.MP.4 Model with mathematics.
3.MP.5 Use appropriate tools strategically.
**3.MP.6 Attend to precision**.
**3.MP.7 Look for and make use of structure.**
3.MP.8 Look for and express regularity in repeated reasoning.

## Unit CT Core Content Standards

**3.OA.B.5: Apply properties of operations as strategies to multiply and divide. (Note: Students need not use formal terms for these properties.) Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)**
**3.OA.C.7: Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.**
**3.OA.D.9: Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.**
**3.NBT.A.3: Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.**

***Grade 3 expectations in the fraction domain are limited to fractions with denominators 2, 3, 4, 6, and 8.**

**3.NF.A.1: Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.**

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

a. **. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to**

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**1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line.**

**b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.**

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

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

**b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.**

**c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.**

**3.MD.C.7: Relate area to the operations of multiplication and addition.**

**c. tiling to show in a concrete case that the area of a rectangle with whole-number side lengths** a **and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.**

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

3.NBT.A.3

Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

## "Unwrapped" Standards

| Skills | Content |
|---|---|
| Apply | Properties of operations as strategies to multiply and divide |
| Fluently multiply and divide | Within 100 using strategies |
| Identify | Arithmetic patterns |
| Explain | Arithmetic patterns using properties of operations |
| Multiply | One-digit whole numbers by multiples of 10 using place value strategies and properties of operations |
| Understand | ● A fraction as the quantity formed by part(s) when a whole is partitioned into equal parts<br>● A fraction as a number on the number line<br>● Two fractions as equivalent if they are the same size or |

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| | same point on a number line |
| Represent | ● A fraction on a number line by defining the interval from 0 to 1 as the whole<br>● A fraction on a number line by marking off equal lengths |
| Partition | ● Wholes into equal parts<br>● Shapes into part with equal areas |
| Recognize | ● Each part of whole has an equal size<br>● The resulting interval on the number line is represented by a/b<br>● Fractions that are equivalent to whole numbers |
| Explain | Equivalence of fractions |
| Compare | Fractions by reasoning about their size |
| Recognize and generate | Simple equivalent fractions |
| Express | Whole numbers as fraction |
| Relate | Area to operations of multiplication and addition |
| Use | Area models to represent the distributive property in math reasoning |
| Express | Equally divided areas of shapes |

| Essential Questions | Corresponding Big Ideas |
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| 1. Why do we need mathematical operations? | 1. Operations create relationships between numbers and help us make sense and solve problems in our world. |
| 2. How can we represent multiplication and division situations mathematically? | 2. Quantities and operations can be represented numerically, visually, and concretely in various ways. Problem solving depends upon choosing wise ways to represent operations. |
| 3. What is a fraction? | 3. A fraction is a number that represents how many parts of a whole. It is also a division relationship between two numerical values. |

| Evidence of Learning - Assessment | | |
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| **Pre/Post Assessment** | **Interim Assessment** | **Additional Evidence of Learning** |

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| • Unit 7 Pre-Assessment Module 1, Session 1<br>• Unit 7 Post-Assessment - Module 4, Session 5 | • Multiplication Division Checkpoint - Module 2. Session 2<br>• Fractions Checkpoint - Module 4, Session 2 | Options<br>• Exit tickets<br>Observational Assessments<br>• Dozens of Eggs - M3, S5<br>• Racing Fractions - M4, S1 |

## Smarter Balanced Interim Assessment

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.

Interim Assessment Block - access through CSDE Assessment Portal

- IAB - Fractions

· **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 Talk/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 7 are:

- Fractions:
  - Recognizing fractions as some number of equal parts of a whole

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- Comparing fractions and recognizing equivalent fractions
- Locating and representing fractions on a number line

- Multiplication and Division - Number Corner for April
  - Solve for the unknown in multiplication and division equations
  - Multiply using the commutative, associative, and distributive properties
  - Solve division equations by finding the unknown factor
  - Fluently multiply and divide to 100 using strategies
- Math Practice Standards
  - Make sense of problems and persevere in solving them
  - Construct viable arguments and critique the reasoning of other

| Bridges - Whole Group, Small Group, and Independent Problem Centered Activities | | | |
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| Module 1 | Module 2 | Module 3 | Module 4 |
| Problem + Investigation<br>● Session 2-5<br>Problem String<br>● None<br>Work Place<br>● Session 1-3<br>Math Forum<br>● None<br>Daily Practice<br>● Session 1-5<br>Home Connection<br>● Session 2 + 4 | Problem + Investigation<br>● Session 1-5<br>Problem String<br>● Session 1<br>Work Place<br>● Session 5<br>Math Forum<br>● None<br>Daily Practice<br>● Session 1-5<br>Home Connection<br>● Session 2 + 4 | Problem + Investigation<br>● Session 1-4<br>Problem String<br>● Session 1<br>Work Place<br>● Session 4-5<br>Math Forum<br>● None<br>Daily Practice<br>● Session 1-5<br>Home Connection<br>● Session 1, 3, 5 | Problem + Investigation<br>● Session 1-4<br>Problem String<br>● None<br>Work Place<br>● Session 1,2,4,5<br>Math Forum<br>● None<br>Daily Practice<br>● Session 1-5<br>Home Connection<br>● Session 2 - 4 |

| **Possible Misconceptions** | **Teacher Moves** |
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| 1. Confusion multiplying by zero with addition to zero.<br><br>2. Understanding groups of things as single entities while also understanding that a group contains a given number of objects.<br><br>3. After adding and subtracting, some students are confused that the product of two numbers is quite a lot larger than the sum of those two numbers.<br>4. Students often consider multiplication and | 1. Provide students with problems and use models to help reinforce the correct understanding.<br>2. Experiences with making and counting groups using concrete models and pictures, especially in contextual situation is extremely useful. Also have students explain to you what each number represents (groups or number of objects in a group)in equations. Make explicit connections to the symbolic notation.<br>3. Using array models for multiplication makes these results less confusing to students.<br><br>4. It is important for student to understand |

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| division as discrete operations and do not understand the importance of the relationship between them as they learn basic facts or solve problems. | division in terms of finding a missing factor and relate this work to writing division expressions and equations. Students need much experience identifying what information is known and what they are looking for using concrete materials and drawing pictures as well as asking themselves the right question, such as "How many groups of 7 can I make from 28?" Relating work with models to written missing factor multiplication equations and division equations is essential for students to develop this understanding. |
| 5. Considers the number of pieces in the whole but does not understand they must be the same size. | 5. Extensive use of concrete representations such as; fraction strips, area models, fraction bars, number lines, etc… |
| 6. Students do not understand that when partitioning a whole shape, number line, or a set into unit fractions, the intervals must be equal.<br>○ Many third graders have a good sense of numbers to 1000 or more, fewer have a good sense of fraction size and may have difficulty reasoning about the impact on the size of the fraction if its denominator is doubled or tripled.<br>○ Given the same size whole, the smaller the denominator, the smaller the piece. | 6. Provide plenty of experiences with partitioning varying shapes, sets of shapes, and number lines into equal parts. |
| 7. The fraction names the point on a number line. | 7. Embed in instruction that the fraction that names a point on a number line describes the distance of that point from 0 and not the point itself. |
| 8. Students think all shapes can be divided the same way | 8. Present shapes other than circles, squares or rectangles to prevent students from over generalizing that all shapes can be divided the same way.<br>○ For example, have students fold a triangle into eighths. Provide oral directions for folding the triangle:<br>▪ Fold the triangle into half by folding the left vertex (at the base of the triangle) over to meet the right vertex. |

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| | ▪ Fold in this manner two more times.<br>▪ Have students label each eighth using fractional notation. Then, have students count the fractional parts in the triangle (one-eighth, two-eighths, three-eighths, and so on). |

## Vocabulary and Representations

| Tier 2 (Academic Vocabulary) | Tier 3 (Domain Specific Vocabulary |
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| add*<br>area*<br>benchmark<br>decompose<br>divide*<br>division<br>estimate*<br>expression*<br>factor*<br>number line<br>product*<br>reasonableness<br>remainder*<br>round*<br>strategy<br>unknown | addend*<br>area model*<br>array*<br>associative property +*<br>commutative property +<br>denominator*<br>distributive property +<br>equation*<br>identity property of multiplication +<br>multiplication<br>numerator*<br>quotient*<br>unit fraction*<br>zero property of multiplication +<br><br>*Smarter Balanced Vocabulary is focused on major mathematical concepts. (Not all possible words have been identified by SBAC)<br><br>+ Students are not responsible for these vocabulary words, however they should understand the mathematical concept. |

## Mathematics Teaching Practice Resources

1. **Bridges** - Reference Math Practices in Action Notes - The notes identify how particular mathematical practice is employed in a specific activity.
    a. Session 3 and 4 Teacher Tip
    b. additional resources will be able to be linked with purchase of Bridges
2. **Math Practices Teacher Question Starters**
3. **Implementing the Standards of Mathematics Practice**
4. Illustrating the Standards of Mathematical Practice

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5. Grade 3 - Standards + Practice Explanations and Examples
6. Math Practice Standards Posters Gr. 2-3
7. **Supporting Productive Struggle**
8. **Use and Connect Mathematical Representations**
9. Number Talks Matter - Number Talks at a Glance and Fluency without Fear
10. Bridges Interactive Math Manipulatives
11. National Library of Virtual Manipulatives
12. **Multiplication, Division, and Fractions**
    - K-5 Math Teaching Resources:
        - Domino Multiplication - 3.OA.C 7
        - Turn Your Array - 3.OA.B.5
        - Decompose a Factor - 3.OA.B.5
        - Six Sticks (Division Facts) - 3.OA.C.7
        - Roll a Rule - 3.OA.D.9
        - Odd and Even Sums - 3.OA.D.9
        - Odd and Even Products - 3. OA.D.9
        - Patterns in the Multiplication Table - 3.OA.D.9
        - Geometry
13. Common Multiplication and Division Situations
14. Math Games
15. Open Middle - Challenging Math Problems Worth Solving
16. Math Cards
17. Learnzillion
18. Understanding the Relationship between Multiplication and Division
19. Splitting Rectangles - Relating Multiplication and Division to Area
20. **Fractions**
    - Illustrative Math-Progression of Fractions Videos:
        - 1. Meaning of Unit Fractions
        - 2. Equivalent Fractions
        - 3. Comparing Fractions
    - Math Games
    - Using a Number Line to Develop an Understanding of the Relationship of Fractions Grades 3-5. Video at bottom of write-up

21. Illuminations Resources - Fraction Resources
        - Equivalent Fractions
        - Fraction Models
        - Fun with Fractions
        - Fun with Pattern Block Fractions
22. Greg Tang Math-Satisfraction
23. Three Act Math Tasks

## Suggestions for Differentiation, Scaffolding and Intervention

**Differentiation or Intervention**

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

**Math Teaching Practice Resources contain resources that provide opportunities for differentiation,**

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**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.
- 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.

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- Struggles with basic facts - need more experience with concrete and pictorial representations, including describing what their models represent to make connection to basic facts. Time and experience with developing strategies that are based on patterns and properties will help support learning the facts. It is important to give students time to learn and understand these concepts before procedural skill practice takes place.
- 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
- 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:**

- Students can create their own multiplication and division problems
- Students can create story problems that have a two step process.
- Give the student the product and ask them to find out how many different factors could be used to solve the problem. Which factors would be the most likely? Explain the reasoning and strategy used.
- Once students have solved several set of problems, those who easily identify the information in a problem and make connections between previous work with multiplication and the work with division can begin to solve problems that involve remainders.
- Ask students to create and solve their own story problems
- Activities using ½ as a benchmark:
    - Venn diagrams are useful in helping students organize and compare fractions to determine the relative size of the fractions, such as more than 1/2, exactly 1/2 or less than 1/2.
    - Fraction bars showing the same sized whole can also be used as models to compare fractions.

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- Students are to write the results of the comparisons with the symbols >, =, or <, and justify the conclusions with a model.
- Have students create additional fraction strips and write about relationships.
- Have student write a letter to a new student in the class who does not know multiplication. Have them explain what they understand about multiplication and the best ways to learn and use multiplication. They can use diagrams to help to show what you mean.

## Interdisciplinary Connections

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

**Fractions**

Jump, Kangaroo, Jump by Stuart J. Murphy
*Fraction Action, by Loreen Leedy
Eating Fractions, by Bruce McMillan
Full House, by Dayle Ann Dodds
The Wishing Club, by Donna Jo Napoli
Apple Fractions, by Jerry Pallotta

**Multiplication/Division**

*Two of Everything, by Lily Toy Hong
The Best of Times, by Greg Tang
Ten Times Better, by Richard Michelson
* Amanda Bean's Amazing Dream, Cindy Neuschwander
*The Doorbell Rang, by Pat Hutchins
*Anno's Mysterious Multiplying Jar, by Masaichiro Anno

**ELA**

CCSS.ELA-LITERACY.SL.3.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.3.1.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.3.1.B
Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
CCSS.ELA-LITERACY.SL.3.1.C
Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
CCSS.ELA-LITERACY.SL.3.1.D
Explain their own ideas and understanding in light of the discussion.

**Science**

- Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.
- Accurately read quantitative information is science texts.

**Art/Technology**

Publish and/or present final products in a myriad of ways, including the use of arts and technology.

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