

Winchester Math Curriculum Grade 3

Subject	Mathematics
Grade/Course	Grade Three
Unit of Study	Unit 2: Introduction to Multiplication
Pacing	October
Unit Summary	This unit introduces multiplication by immersing students in a wide variety of multiplicative situations. When solving problems that are embedded in different contexts and that invite them to think of the operation in different ways, students make use of a variety of models for multiplication, including equal groups, arrays, the number line, and ratio tables. They also apply the associative and distributive properties to develop efficient, reliable, and generalizable strategies for multiplying. They track these strategies on a multiplication table featuring products from 0 to 100 and apply what they have learned by solving problems that involve scaled graphs and story problems with multiple steps and operations.
<u>Overarching Mathematical Practices</u>	
<p>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.</p>	
<u>Unit CT Core Content Standards</u>	
<p>3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5×7.</p> <p>3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$.</p> <p>3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.*See Multiplication and Division Problem Situations in Math Teaching Practice Resources below.</p> <p>3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations $8 \times ? = 48$, $5 = _ \div 3$, $6 \times 6 = ?$</p> <p>3.OA.B.5 Apply properties of operations as strategies to multiply and divide.2 Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found</p>	

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by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)

3.OA.B.6 Understand division as an unknown-factor problem. *For example, find $32 \div 8$ by finding the number that makes 32 when multiplied by 8.*

3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

3.OA.D.8 Solve two-step word problems using the four operations. 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. (This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in conventional order when there are no parentheses to specify a particular order)

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.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

3.MD.C.7.B Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.

3.MD.C.7.C Use 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 $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.

"Unwrapped" Standards

Skills	Content
Interpret	<ul style="list-style-type: none"> ● products of whole numbers ● whole number quotients of whole numbers
Use	<ul style="list-style-type: none"> ● multiplication and division within 100 to solve word problem situations involving equal groups, arrays, and measurement quantities ● tiling to show the area of a rectangle ● area models to represent the distributive property

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Determine	the unknown number in a multiplication or division equation relating three whole numbers
Apply	properties of operations as strategies to multiply and divide
Fluently multiply and divide	within 100 using strategies (by end of grade know from memory)
Identify	arithmetic patterns
Explain	patterns using properties of operations
Multiply	side lengths to find area in context
Represent	whole number products as rectangular areas

Essential Questions	Corresponding Big Ideas
<ol style="list-style-type: none"> How can we represent multiplication and division situations mathematically? Why is it important to understand arithmetic patterns? How do we model with mathematics? 	<ol style="list-style-type: none"> Quantities and operations can be represented numerically, visually, and concretely in various ways. Problem solving depends upon choosing wise ways to represent the operation. The understanding of patterns allows for flexible and fluent thinking and the formation of rules about numbers, quantities, and relationships. Many skills are used to model with mathematics 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.

Evidence of Learning - Assessment		
Pre/Post Assessment	Interim Assessment	Additional Evidence of Learning
<ul style="list-style-type: none"> Unit 2 - Pre-Assessment Module 1, Session 2 Unit 2 - Post-Assessment Module 4, Session 4 Number Corner Checkup 1 	<ul style="list-style-type: none"> Multiplication Checkpoint - M2, S1 Pet Store Story Problems Work Sample - M3, S1 	Options <ul style="list-style-type: none"> Exit tickets Observational Assessments <ul style="list-style-type: none"> Loops and Groups - M1, S5 Frog Jump Multiplication - M2, S3

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- Cover Up - M2, S5
- Double Help - M3, S5

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 - Performance Task

· **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 for Number Corner aligned to Unit 2 are:

Geometry

- Identify, investigate, and compare properties of polygons
- Introduction of classification systems for quadrilaterals

Measurement

- Introduction of measurement of liquid volume in metric units including fractional amounts
- Solve problems involving addition and subtraction of volume measurements

Computation

- Development of fluency in multiplication
- Investigating how changing the value of the endpoint affects the numbers along the line
- Subtracting two- and three-digit numbers

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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"> Sessions 1,3,5 Problem String <ul style="list-style-type: none"> Sessions 2,4 Work Place <ul style="list-style-type: none"> Sessions 5,6 Math Forum <ul style="list-style-type: none"> Sessions 4,6 Daily Practice <ul style="list-style-type: none"> Sessions 1-6 Home Connection <ul style="list-style-type: none"> Sessions 2,4,6 	Problem + Investigation <ul style="list-style-type: none"> Sessions 1-5 Problem String <ul style="list-style-type: none"> Session 3-5 Work Place <ul style="list-style-type: none"> Sessions 1,3,5 Math Forum <ul style="list-style-type: none"> None Daily Practice <ul style="list-style-type: none"> Sessions 1-5 Home Connection <ul style="list-style-type: none"> Sessions 2,4 	Problem + Investigation <ul style="list-style-type: none"> Sessions 1-5 Problem String <ul style="list-style-type: none"> Sessions 1-3 Work Place <ul style="list-style-type: none"> Sessions 4-5 Math Forum <ul style="list-style-type: none"> None Daily Practice <ul style="list-style-type: none"> Sessions 1-5 Home Connection <ul style="list-style-type: none"> Sessions 1,3,5 	Problem + Investigation <ul style="list-style-type: none"> Sessions 1-3 Problem String <ul style="list-style-type: none"> None Work Place <ul style="list-style-type: none"> Sessions 1-4 Math Forum <ul style="list-style-type: none"> None Daily Practice <ul style="list-style-type: none"> Sessions 1-4 Home Connection <ul style="list-style-type: none"> Sessions 1,3
Instructional Support			
Possible Misconceptions		Teacher Moves	
<ol style="list-style-type: none"> In previous work with addition, both addends represented the count or number of items that are joined for a total count. In multiplication, one factor represents the number of groups, sets or collections, and the other factor represents the number of items in each group, set, or collection. Students who have trouble identifying information in a problem situation (which number represents the total, the number of groups, and/or number of items in a group). Students often confuse multiplying zero with adding to zero. The distributive property forms the foundation for all future work with multiplying whole numbers. However, in Grade 3, students should use this valuable property to help learn more difficult facts through array models. 		<ol style="list-style-type: none"> Students need multiple experiences identifying which factor represents the number of groups and which factor represents the number of items in each group. Early experiences with concrete models and pictures and explicit connections to the symbolic notation will not only help students to identify multiplication situations but will also support student understanding of division. They need more experience making explicit connections between their representations (concrete models or pictures) and determining the number of groups or the number of items in a group. Although this property seems obvious, providing students with problems and using models will help to reinforce the correct understanding. Introduce and continue work with this property using models throughout the early work with multiplication. Students need opportunities to use and describe this property in order to make sense of it. 	

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<p>5. The development of conceptual understanding must precede drill and practice exercises. Students who struggle with facts need more experience with concrete and pictorial representations, including describing what their models represent to make connections to basic facts.</p> <p>6. Student who have difficulty describing patterns.</p>	<p>5. They need time and experience with developing strategies that are based on patterns and properties to help support learning facts. It is important to give students time to learn and understand these concepts before procedural skill practice takes place.</p> <p>6. They should start with simple examples and build to more complex patterns. They are more likely to notice visual patterns before numerical patterns. If possible, project the multiplication or additional tables and shaded patterns for all to see. This will help struggling students to visualize the patterns and then look at characteristics of the numbers.</p>
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Vocabulary and Representations

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary)
<p>columns efficient groups of* multiple price per pound product* rows table variable</p> <p>*Smarter Balanced Vocabulary is focused on major mathematical concepts. (Not all possible words have been identified by SBAC)</p> <p>+ Students are not responsible for these vocabulary words at this grade level, however they should have some understanding of the mathematical concept.</p>	<p>area model* array* commutative property of multiplication + distributive property of multiplication + division* equal groups model equation* factor* measuring strip multiplication multiply* ratio table scaled bar graph* scaled picture graph* times 10 zero property of multiplication +</p>

Mathematics Teaching Practice Resources

<ol style="list-style-type: none"> 1. Bridges - Reference Math Practices in Action Notes - The notes identify how particular mathematical practice is employed in a specific activity. 2. Math Practices Teacher Question Starters 3. Implementing the Standards of Mathematics Practice 4. Illustrating the Standards of Mathematical Practice 5. Multiplication and Division Problem Situations 6. Grade 3 - Standards + Practice Explanations and Examples 7. Math Practice Standards Posters Gr. 2-3
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8. [Journal Prompts for Math](#)
9. [Accountable Talk Moves](#)
10. [Contribution Checklist](#)
11. [Sentence Frames that Can Build Metacognitive Thinking](#)
12. [Sample Language Frames for Mathematics](#)
13. [Building a Mathematical Mindset Community](#)
14. [Teacher/Student Actions](#)
15. [Number Talks Matter - Number Talks at a Glance](#) and Fluency without Fear
16. [Bridges Interactive Math Manipulatives](#)
17. [Multiplication and Division Problem Situations](#)
18. [Illustrative Math – Grade 3](#)
19. [National Library of Virtual Manipulatives](#)
20. [Three Act Math Tasks](#)
21. Learn Zillion
 - [Represent Multiplication Using Arrays](#)
 - [Interpret Products Using a Number Line](#)
 - [Solve Multiplication Problems Using the Distributive Property](#)
 - [Understand the Commutative Property of Multiplication in Word Problems](#)
22. K-5 Math Teaching Resources
 - [Building Arrays](#)
 - [Word Problems with Arrays](#)
 - [Multiples Game](#)
 - [Division Squares](#)

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, 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.

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- 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. (Multiplication and Division Problem Types are linked in Math Teaching Practice Resources).
- Difficulty identifying information in a problem situation can be improved by providing more experiences making explicit connections between their representations (models, or pictures).
- 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.
- 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.
- Work Places Sentence Frames - Bridges Grade 3 Resource .
- At times, partner struggling students with students who are very articulate about their mathematical thinking so they can hear (through conversations) how these students have made sense of the problems

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.
- 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.
- [Concrete, Representational, Abstract Progression](#)
- 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..

Strategies to Support English Learners

- [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.

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- 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:

- Have pairs of students describe patterns on a multiplication table and then use arrays, equations, and writing to explain why the pattern exists.
- 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.
- Have student develop real world situations for given expressions.
- [Sample Problems to Extend and Encourage Flexible Thinking](#) - Create similar problems for students to engage in productive struggle and solve.
- Have children explore different operations to reach target numbers and find the least number of steps to reach the target. One operation must be multiplication or division.

Interdisciplinary Connections

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

- *Two of Everything by Lily Toy Hong
- *Too Many Kangaroo Things to Do! by Stuart J. Murphy
- *Spunky Monkeys on Parade by Stuart J. Murphy
- *Each Orange Had 8 Slices by Paul Giganti Jr.
- *Double the Ducks by Stuart J. Murphy
- *Bunches and Bunches of Bunnies by Louise Matthews
- *Amanda Bean’s Amazing Dream by Cindy Neuschwander
- *The Best of Times by Greg Tang

Science

Cross-cutting Concept -Patterns - Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) Patterns of change can be used to make predictions. (3-LS1-1)

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.