Winchester Math Curriculum Grade 3

Subject	Mathematics
Grade/Course	Grade Three
Unit of Study	Unit 5: Multiplication, Division, and Area
Pacing	February
Unit Summary	Unit 5 returns to the study of multiplication, especially as it relates to division. Students again build arrays, but use them to model and solve division as well as multiplication problems. Story problems play a major role in the first two modules, helping students to connect their everyday experiences with division to more formal mathematical concepts. As they solve and pose story problems, students encounter two different interpretations of division—sharing and grouping—and have numerous opportunities to build understandings of both. Much of the work in Modules 2 and 3 revolves around fact families, while Module 4 features an introduction to area, a topic that will be revisited in Unit 6.

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.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.*

3.OA.A.2
Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 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 ÷ 8.*

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.

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*

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equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?

3.OA.B.6
Understand division as an unknown-factor problem. ***For example, find 32 ÷ 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 × 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.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.

3.MD.C.5.A
A square with side length 1 unit, called "a unit square," is said to have "one square unit" of area, and can be used to measure area.

3.MD.C.5.B
A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.

3.MD.C.6
Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

3.MD.C.7.A
Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

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.

"Unwrapped" Standards

Skills	Content
Interpret	● products of whole numbers as groups of objects ● whole number quotients as number of objects in a share when equally partitioned into groups
Use	multiplication and division with 100 to solve word problems involving equal groups, arrays, and measurement quantities

Determine	unknown whole number in multiplication and division equations
Understand	● division as an unknown factor problem ● a square with a side length of 1 unit is “one square unit” of area and can used to measure area. ● a plane figure covered without gaps or overlaps by n square units has an area of n square units
Fluently multiply and divide	within 100 using strategies
Know	from memory all products of two one-digit numbers
Solve	two-step word problems using four operations
Represent	● problems using equations with a letter standing for the unknown quantity ● whole number products as rectangular areas in mathematical reasoning
Assess	reasonableness of answers with mental computation and estimation
Measure	areas by counting square units
Find	the area of a rectangle with whole number side lengths by tiling it
Show	area from tiling would be the same with multiplying the side lengths
Multiply	side lengths to find areas of rectangles in context of solving real-world problems

Essential Questions	Corresponding Big Ideas
1. How can we represent multiplication and division situations mathematically?	1. Quantities and operations can be represented numerically, visually, and concretely in various ways. Problem solving depends upon choosing wise ways to represent the operation.
2. How do we model with mathematics?	2. 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,

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3. How can analyzing operations on numbers and the results help us to become more efficient at computation? 4. How can strategies help us multiply and divide?	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. 3. Analyzing problems and their answers can help us to see patterns that can lead to a deeper understanding of number sense and shortcuts for efficient computation. 4. Strategies can help us build a better understanding of the relationships between numbers and operations. Some strategies that can help us multiply and divide are; using concrete drawings and pictures, arrays, area models, the relationship between multiplication and division, and properties of operation

Evidence of Learning - Assessment

Pre/Post Assessment	Interim Assessment	Additional Evidence of Learning
● Unit 5 Pre-Assessment - Module 1, Session 1 ● Unit 5 Post-Assessment - Module 4, Session 6	● Multiplication and Division Checkpoint - M2, S4 ● Division Checkpoint - M4, S1	Options ● Exit tickets Observational Assessments ● Solvinge Game Store Problems - M1, S6 ● Scout them Out - M2, S2 ● Line 'Em Up - M3, S3 ● Division Capture - M3, S4

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 - Operations and Algebra

· *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:
Measurement

- Identifying Perimeter
- Identifying Area

Fractions of a Dollar

- Collecting Tenths of a Dollar
- Collecting Fourths and Halves of a Dollar

Computational Fluency

- Multiples of Three
- Multiples of Four
- Multiples of Eight

Comparing Fractions

- Labeling Number Lines with Halves, Fourths, and Eighths
- Labeling Number Lines with Thirds, Sixths
- Find the Fractions
- Equivalent Whole Numbers and Fractions

Data

- Looking at Graphs
- Interpreting Graphs
- Making Graphs

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

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Module 1	Module 2	Module 3	Module 4
Problem + Investigation ● Sessions 1-6 Problem String ● None Work Place ● Sessions 2-4,6 Math Forum ● None Daily Practice ● Sessions 1-6 Home Connection ● Sessions 1,3,5	Problem + Investigation ● Sessions 1, 3-4 Problem String ● None Work Place ● Sessions 1-4 Math Forum ● Session 2 Daily Practice ● Sessions 1-4 Home Connection ● Sessions 1,3	Problem + Investigation ● Sessions 1, 3-4 Problem String ● None Work Place ● Sessions 2-4 Math Forum ● Session 2 Daily Practice ● Sessions 1-4 Home Connection ● Sessions 1,3	Problem + Investigation ● Sessions 1-5 Problem String ● None Work Place ● Sessions 2-6 Math Forum ● None Daily Practice ● Sessions 1-6 Home Connection ● Sessions 1,3,5

Possible Misconceptions	Teacher Moves
1. 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 represent the number of items in each group, set, or collection. Some students can have difficulty with this change.	1. 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.
2. Because multiplication is commutative (3 x 7 = 7 x 3), some students think that 21 ÷ 3 and 3 ÷ 21 mean the same thing. This is especially true when the equations are written two different ways.	2. Connecting concrete and pictorial models to all the forms of division equations is essential to eliminating this misconception. Students read the box division sign as “3 goes into 21”. Although these words are commonly used, they do not reinforce the meaning of division. Getting students to read this as “3 divides 21” or “21 divided by 3” or “How many groups of 3 are in 21?” is a habit that should be developed early in division instruction. The sharing model (How many in a group?) is often easier for students to recognize as division. The measurement model is more difficult. Students need to work with many problem situations for each type of division using concrete materials and drawing pictures.
3. Students who have trouble identifying	3. These students need additional

information in a problem situation (which number represents the total, the number of groups, and/or the number of items in a group) need more instruction. 4. Students often consider multiplication and division as discrete operations and do not understand the importance of the relationship between them as they learn basic facts or solve problems. 5. Students who struggle with basic facts	experiences making explicit connections between their representations (concrete models or pictures) and determining the number of groups or the number of items in a group. 4. It is important for students to understand division in terms of finding the 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. 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. They need more time and experience with developing strategies that are based on patterns and properties to help support learning their facts. It is important to give students time to learn and understand these concepts before procedural skill practice takes place.
Vocabulary and Representations	
Tier 2 (Academic Vocabulary)	**Tier 3 (Domain Specific Vocabulary**
area* column divide* equal* expression* factor* group length*	array* dimension(s) dividend* division* divisor* equal sign* equation* estimate*

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measure* multiply* product* remainder* share story problem reasonable answer row width	fact family quotient* rectangle* side length square square inch* square foot* square meter* square yard* square unit* *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.

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.
2. **Math Practices Teacher Question Starters**
3. **Implementing the Standards of Mathematics Practice**
4. Illustrating the Standards of Mathematical Practice
5. Grade 3 - Standards + Practice Explanations and Examples
6. Math Practice Standards Posters Gr. 3
7. Number Talks Matter - Number Talks at a Glance and Fluency without Fear
8. National Library of Virtual Manipulatives
9. Three Act Math Tasks
10. Multiplication and Division Situations
11. Illustrative Math – Grade 3 - Resources and activities for grade 3 aligned by standard.
12. Bridging Practices - UCONN – Training and a Task Repository to develop and support student capacity for argumentation in mathematics
13. Journal Prompts for Math
14. Bridges Interactive Math Manipulatives
15. Accountable Talk Moves
16. Contribution Checklist
17. Sentence Frames that Can Build Metacognitive Thinking
18. Sample Language Frames for Mathematics
19. Building a Mathematical Mindset Community
20. Teacher/Student Actions
21. Vocabulary Development Frayer Model – Elementary and secondary video and resources.
22. Learn Zillion
    - Representing Multiplication with Arrays
    - Interpret Products using a Number Line
    - Solving Multiplication Problems by Drawing and Array
    - Visualizing Division Word Problems

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- Use Repeated Subtraction for Division
- Solve Problems using the Idea of Equal Groups
- Understanding Multiplication Problems: Equal Groups

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.
- 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.

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- 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
- 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
- Arrays All Around - Real world examples of rectangular arrays and real world problems
- Dream Clubhouse - Students are challenge to use concepts of geometry and measurement and the four operation to solve problems of real world architects.
- Field Trip Exploration - Students will apply their understanding of four operations to solve problems

Interdisciplinary Connections

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

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*_Two of Everything_ by Lily Toy Hong
*_The King's Chessboard_ by David Birch
*_One Hundred Hungry Ants_ by Elinor Pinczes
*_Bats on Parade_ by Kathi Appelt
*_The Great Divide_ by Dayle Ann Dodds
*_A Remainder of One_ by Elinor J. Pinczes
*_Too Many Kangaroo Things to Do!_ by Stuart J. Murphy
*_Sea Squares_ by Joy N. Hulme
*_Each Orange Had Eight Slices_ by Paul Giganti Jr.
*_The Doorbell Rang_ by Pat Hutchins
*_Divide and Ride_ by Stuart J. Murphy

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.

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