Winchester Math Curriculum Grade 5

Subject	Mathematics
Grade/Course	Grade Five
Unit of Study	Unit 4: Multiplying and Dividing Whole Numbers and Decimals
Pacing	January
Unit Summary	In this unit, students return to the study of multiplication and division strategies, including the standard multiplication algorithm. In the first two modules, students investigate a number of strategies that capitalize on their estimation and mental math skills and help them continue to develop strong number sense. These include strategies that leverage the relationship between multiplication and division; the fact that 5 is half of 10; the relationships between fractions, decimals, and whole numbers; and the process of doubling and halving. In Module 3, the teacher formally introduces the standard multiplication algorithm after reviewing the area model and partial products. Module 4 reinforces the connection between multiplication and division, using the area model and ratio tables to help students develop a degree of comfort with long division.

Overarching Mathematical Practices

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

Unit CT Core Content Standards

5.OA.A.1
Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.A.2
Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

5.NBT.B.5
Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.B.6
Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.NBT.B.7

Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

5.NF.B.4.A

Interpret the product (*a/b*) × *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a* × *q* ÷ *b*.

5.MD.A.1

Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

"Unwrapped" Standards	
Skills	**Content**
Use	● parentheses, brackets, or braces in numerical expressions ● measurement conversions to solve multi-step real world problems
Evaluate	expressions
Write	simple expressions
Interpret	● numerical expressions without evaluating them ● the product (*a/b*) x *q* as *a* parts of a partition of *q* into *b* equal parts
Find	whole number quotients with up to four-digit dividends and two-digit divisors using strategies
Illustrate and Explain	division calculations using equations, rectangular arrays, and/or area models
Add, subtract, multiply, and divide	decimals to hundredths using concrete models, drawings, and strategies
Relate	strategies to written methods
Explain	reasoning used
Convert	among different sized standard measurement units within a given measurement system

Essential Questions	Corresponding Big Ideas
1. How do standard algorithms use our number system to facilitate efficient computation?	1. Our base ten place value system is used to express numbers and the numbers can be partitioned and regrouped in different base ten values to assist in computation. Standard algorithms are short-cut processes of these partitions and regroupings to make computation more efficient.

2. How can estimation help in solving division problems?	2. The tool of estimation can be used with benchmark numbers to make approximations of possible responses in order to more easily find the accurate answer and the reasonableness of a given answer.
3. How does understanding place value help us to compare, order, round, and compute whole numbers and decimals?	3. Place value is the basis for our entire base ten number system and important to all mathematics. Understanding the meaning of place value and its appropriate use promotes accurate understanding of the position of digits and decimal points and their value and how to manipulate them appropriately for accurate and efficient computation.
4. Why do we model real-life situations with mathematics?	4. 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.

Evidence of Learning - Assessment

Pre/Post Assessment	Interim Assessment	Additional Evidence of Learning
● Unit 4 Pre-Assessment - Module 1, Session 1 ● Unit 4 Post-Assessment - Module 4, Session 5 ● Number Corner Checkup 2	● Multiplication Work Sample - M2, S1 ● Multiplication and Division Checkpoint - M2, S4 ● Multiplication Algorithm Checkpoint - M4, S1	Options ● Exit Tickets Observational Assessments ● The Product Game - Version 2 - M1, S2 ● Multiplication Battle - M2, S1 ● Beat the Calculator: Multiplication - M3, S1 ● Estimate and Check - M4, S1 ● Lowest Remainder Wins - M4, 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.

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

Interim Assessment Block - access through CSDE Assessment Portal

- IAB - Number and Operation in Base Ten

· *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 4 are:
Geometry
- Classifying and Drawing Special Quadrilaterals
  - kites
  - parallelograms
  - trapezoids
- Comparing different shapes to other parallelograms
- Defining attributes

Measurement
- Measuring to the nearest ½ inch
- Organize the measurements on line plots
- Plot height against foot length on coordinate grid
- Analyze the data

Computation
- Finding sums and locating solutions on number line
- Estimation to make predictions

- Solutions expressed as fraction and decimal quotients of whole numbers
- Recognize and use equivalent fractions

Problem Solving
- Solve problems involving multiplication of whole numbers and decimals
- Solve problems and discuss strategies

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

Module 1	Module 2	Module 3	Module 4
Problem + Investigation ● Session 3 Problem String ● Session 1-3 Work Place ● Session 2,4 Math Forum ● Session 4 Daily Practice ● Sessions 1-4 Home Connection ● Sessions 1,3	Problem + Investigation ● Session 2-4 Problem String ● Session 1-3 Work Place ● Session 1 Math Forum ● None Daily Practice ● Sessions 1-4 Home Connection ● Sessions 1,3	Problem + Investigation ● Session 1-7 Problem String ● None Work Place ● Session 1,4,5 Math Forum ● None Daily Practice ● Sessions 1-5 Home Connection ● Sessions 2, 4	Problem + Investigation ● Session 1-4 Problem String ● Session 1-5 Work Place ● Session 1,4,5 Math Forum ● None Daily Practice ● Sessions 1-5 Home Connection ● Sessions 2, 4

Possible Misconceptions	Teacher Moves
1. Confusion with regrouping in multi-digit multiplication.	1. Students who are confused need additional experiences with the partial product algorithm. Once they are proficient multiplying using partial products, they can begin to consider how using regrouping can save several steps. Scaffold examples for the students and give them time to understand how both the partial product and the regrouping algorithms are alike.
2. Division is a complex operation, and students who depend on following rote steps cannot determine whether their answer is reasonable.	2. Emphasis on place value and connections to multiplication will help students to develop a deeper understanding of division. All division experience should be developed in the context of asking questions such as "How many groups of 20 can you make from 700? and then allowing students to estimate and identify the number of objects (for example, If I make 30 groups of 20 that would be 600, and if I make 40 groups that would be 800,

3. Students may need additional experiences with the meaning of the remainder, building on previous work from Grade 4.

4. Student misconceptions when working with decimal numbers are usually based on place value. Simply telling students to line up the decimal points when adding and subtracting decimals does not build important understanding that similar place values are added or subtracted and can lead to errors.

5. Students may see a pattern and see that to multiply fractions you "simply" multiply the numerators and multiply the denominators. This is the correct procedure or algorithm, however is does not build conceptual understanding which is necessary.

and that is too high). Such reasoning will help students to hone in on a good estimate and use partial products to determine the exact quotient.

3. Problems in which the remainder is the answer, in which the remainder is dropped, or in which the quotient should be one more All these remainder types should be included in division problems students are asked to solve.

4. Since the rules for multiplication and division of decimals are much easier to teach than developing place value understanding we are often tempted to provide students with these rules at some point. DON'T DO IT! Students need time to see the structure of multiplication and division of decimals and how it relates to whole number multiplication and divisions. Without this foundation students may move decimal points when it is convenient rather than when it is necessary. Place value understanding also allows students to determine whether answers are reasonable. It is far more meaningful to students when they can generalize rules after many experiences and good questions from the teacher.

5. 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.

Vocabulary and Representations	
Tier 2 (Academic Vocabulary)	**Tier 3 (Domain Specific Vocabulary**
column dimension divide* error analysis estimate/estimation* evaluate* expression* factor*	algorithm array* area model* of multiplication dividend* divisible/divisibility division* divisor* equation*

multiply* product* remainder* row *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.	multiplication partial product quotient* ratio table regroup* standard algorithm

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. Developing Positive (Growth Mindset) Norms in the Classroom
3. Mistakes are Powerful - Resource to develop students' perseverance through mistakes
4. Grade 5 Standards + Practices Examples and Explanations
5. **Math Practices Teacher Question Starters**
6. **Implementing the Standards of Mathematics Practice**
7. Illustrating the Standards of Mathematical Practice
8. Math Practice Standards Posters Gr. 4-5
9. Teacher/Student Actions
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. Open Middle
14. Bridges Interactive Math Manipulatives
15. National Library of Virtual Manipulatives
16. Journal Prompts for Math
17. Illustrative Math – Grade 5 - Resources and activities for grade 5 aligned by standard.
18. Accountable Talk Moves
19. Contribution Checklist
20. Sentence Frames that Can Build Metacognitive Thinking
21. Sample Language Frames for Mathematics
22. Building a Mathematical Mindset Community
23. Learn Zillion
    - Multiply Multi-Digit Whole Numbers Using the Area Model Strategy
    - Multiply Multi-Digit Whole Numbers Using the Standard Algorithm
    - Multiply Multi-Digit Whole Numbers Using the Partial Product Strategy
    - Use an Area Model for Division of 4-Digit Dividends by 2-Digit Divisors
    - Divide 4-Digit Dividends by 2-Digit Divisors by Estimating and Adjusting the Quotient
    - Divide 4-Digit Dividends by 2-Digit Divisors by Setting Up an Equation
    - Use Area Model to Multiply Decimals by Decimals
    - Add Decimals Using a Variety of Strategies and Models
    - Solve Real-World Problems by Adding, Subtracting, or Multiplying Decimals

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.
- [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.
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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](#)
- 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
- [The Bicycle Dilemma](#) - Students explore the standard algorithm for multiplication of decimal numbers as they begin the task by solving various equations that utilize the same digits, which elicits the same digits for a product.
- Refer to extension activities aligned with Bridges lessons are included in each module.
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Interdisciplinary Connections

Children's Literature * Bridges recommended titles - # Titles embedded in Bridges Units
Great Estimations by Bruce Goldstone   Greater Estimations by Bruce Goldstone
Parting is Such Sweet Sorrow: Fractions and Decimals by Linda Powley

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.

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

Science

- Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.