Winchester Math Curriculum Grade 4

Subject	Mathematics
Grade/Course	Grade Four
Unit of Study	Unit 6: Multiplication & Division, Data & Fractions
Pacing	March
Unit Summary	The instruction in Unit 6 is designed to help students understand, in ways that are both deep and robust, the many connections between multiplication and division. Each module in the unit is rich with opportunities to model and solve problems, share and explain strategies, play games, apply computational skills and concepts in a variety of contexts.

Overarching Mathematical Practices

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

Unit CT Core Content Standards

4.OA.A.3
Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. 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.
4.OA.B.4
Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.
4.NBT.B.5
Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
4.NBT.B.6
Find whole-number quotients and remainders with up to four-digit dividends and one-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.
4.NF.A.1
Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

4.NF.B.3.C
Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
4.NF.C.6
Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram*.
4.MD.A.3
Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
4.MD.B.4
Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection*.

"Unwrapped" Standards	
Skills	**Content**
Solve	- multi-step words with whole numbers and four operations (including problems in which remainders must be interpreted - add/subtract fraction problems using info in line plots
Represent	problems using equations
Assess	reasonableness of answers
Find	- all factor pairs for numbers to 100 - whole number quotients and remainders using strategies
Recognize	- a whole number is a multiple of its factors - equivalent fractions
Generate	equivalent fractions
Determine	- a given whole is a multiple of a given one-digit number - a whole number as prime or composite
Multiply	- a whole number, up to four digits, by one-digit whole number - two two-digit numbers using strategies
Illustrate and explain	calculations using equations, arrays, and/or area models
Explain	why one fraction is equivalent to another fraction using visual fraction models
Add/Subtract	mixed numbers with like denominators
Use	decimal notations for fractions with 10 or 100
Apply	area and perimeter formulas for rectangles in problems
Make	a line plot

Essential Questions	Corresponding Big Ideas
1. How do the four operations' relationships help to solve problems?	1. The four basic computation operations are interrelated, and the properties of each may be used to understand the others and this understanding helps to effectively solve problems.
2. Why compare and order fractions?	2. Comparing and ordering fractions helps us understand the fractions are numbers that have an order, just like whole numbers.
3. Why would you need to find the area or perimeter of something?	3. We use area and perimeter to make sense of the spaces around us.

Evidence of Learning - Assessment		
	Interim Assessment	**Additional Evidence of Learning**
● Unit 6 Pre-Assessment Module 1, Session 1 ● Unit 6 Post- Assessment Module 4, Session 3 ● Number Checkup 3	● Multiplication Problem Strings Work Sample, M1, S4 ● Area and Perimeter Checkpoint, M2, S5	Options ● Exit Tickets Observational Assessments ● Factors and Multiples - M2, S3 ● Area or Perimeter - M2, S4 ● Fraction Spin and Add -, M3, S3 ● Lowest Remainder Wins - 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.

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

Interim Assessment Block - access through CSDE Assessment Portal

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● IAB - Measurement and Data

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

Learning Plan
Researched-based Instructional Resources and Methods

Sequence of Instruction:
Number Talk/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 6 are:
Fractions
- Adding fractions and mixed numbers
- Building fraction models to deepen understanding of equivalent fractions
- Multiplying a whole number by a fraction
- Strategies for fractions with unlike denominators
- Solve story problems multiplying fractions by a whole number

Computational Fluency
- Decimals
- Adding tenths and hundredths

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

Module 1	Module 2	Module 3	Module 4
Problem + Investigation ● Sessions 2-7 Problem String ● Sessions 3, 4, 7 Work Place ● Sessions 1, 2, 5, 6, 7 Math Forum ● None Daily Practice ● Sessions 1-7 Home Connection ● Sessions 1, 3, 5, 7	Problem + Investigation ● Sessions 1-3 Problem String ● None Work Place ● Sessions 3, 4, 5 Math Forum ● Sessions 2, 4 Daily Practice ● Sessions 1-5 Home Connection ● Sessions 2, 4	Problem + Investigation ● Sessions 1-4 Problem String ● Session 4 Work Place ● Sessions 1, 3, 5 Math Forum ● Session 5 Daily Practice ● Sessions 1-5 Home Connection ● Sessions 1, 3, 5	Problem + Investigation ● Session 2 Problem String ● Session 1 Work Place ● Sessions 1-3 Math Forum ● None Daily Practice ● Sessions 1-3 Home Connection ● Session 2

Possible Misconceptions	Teacher Moves

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1. Students may ignore place value when multiplying multi-digit numbers.	1. Use concrete materials to review place value understanding (multiplying by a multiple of ten will give product that is expressed as tens; 6 x 70 = 6 x 7 tens= 42 tens = 420) At this time the use of partial products and distributive property will help reinforce each part of a multiplication equation. Extending simple area models to area models for multi-digit multiplication examples will also reinforce the role of partial products.
2. Watch for students who get the place value of digits confused when dividing.	2. Use the relationship between multiplication and division and students' previous experiences with estimation to help students' realize the place value of the quotient. Consistently model questions such as the following to help students hone in on the quotient.
	Martin has 183 hot wheels cars in his collection. He has boxes that each hold 8 Hot Wheels cars. How many boxes will he need to store the cars?
	- Can he fill 10 boxes? Yes. How many cars will 10 boxes hold? 80 cars - Can he fill 20 boxes? Yes. How many cars will 20 boxes hold? 160 cars - Can he fill 30 boxes? No. How many cars would 30 boxes hold? 240 cars - So if 20 boxes will hold 160 cars, how many cars still need to be put in a box? 23 cars - How many boxes will hold 23 cars? 2 boxes - So how many boxes will be full? 20 +2 = 22 boxes - Are there any cars that are not in a box? 1 car - If he wants to put all of the cars in a box, how many boxes will he need? 23 boxes
	Use partial quotients to allow student to chunk the numbers into smaller pieces, make the problem more manageable, and avoid mistakes when there is a zero in the quotient. Give students opportunities to

3. One of the most important understandings of decimal numbers is the relationship of a decimal to one whole as well as a decimal number to other decimal numbers. Just as students need to understand that 100 is the same as 100 ones, they should also understand that it is also the same as 10 tens. Similarly, when working with decimal numbers less than one whole, a foundational understanding that need to be developed is that 0.01 represents one out of 100 parts of the whole, and it is also one of 10 parts of a tenth (a tenth of a tenth).

4. Some fourth graders may be confused when given a rectangle with only two of the side lengths shown or a problem situation with only two of the side lengths provided. The students may add only the dimensions shown to find the perimeter.

5. Students are often confused between the concepts of perimeter and area. The formulas fourth graders learn must be developed through experience and not just memorization.

6. Some students may not know what measurement to use if the object measures between ⅛ and ¼ inch.

7. Another error occurs when students use whole number names when counting fractional parts on a number line.

find and use compatible numbers in determining the quotient. Give students opportunities to find and use compatible numbers in determining the quotient.

3. Students need many activities using concrete models to understand this concept. Similarly one tenth (0.1) is equivalent to ten hundredths (0.10). Use money as a familiar context will also help reinforce this understanding. $.10 is one tenth of a dollar. Ten dimes makes one dollar. $.01 is one hundredth of a dollar. One hundred pennies make 1 dollar. Additionally, ten pennies make a dime, so we can think of $.10 as 10 hundredths or one tenth.

4. To avoid this misconception, have students write the dimension on the other sides of the rectangle.

5. Provide additional experiences for students to discover both area and perimeter. Help students notice that the formula for area is l x w = a. The answer for area will always be in square units. The formula for perimeter can be 2l x 2w = p, and the answer will always be in linear units.

6. Help students understand that measuring is approximate and items will not exactly measure to ⅛, ¼, ½, or one whole inch.

7. Remind students that the fraction name should be used instead. For example, if two-eighths is displayed on the line plot three times, then there would be six-eighths.

Vocabulary and Representations

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary

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capacity	area model of multiplication*
dimension	array*
divide*	commutative property of multiplication
division*	composite number*
efficient	customary system of measurement
equation*	decimal*
equivalent*	decimal notation
factor*	factor pairs*
gallon*	line plot*
gram (g)*	linear measurement
mass*	metric system*
model	milliliter (ml)*
multiple*	multiplication
multiply*	multiplication table
ounce (oz)*	multiplicative comparison +
pint (pt)*	open number line
pound (lb)*	prime number*
product*	quotient*
quart (qt*)	ratio table +
reasonableness	rectangular array*
remainder*	tile array
unit*	
weight*	

*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, 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.
   a. additional resources will be able to be linked with the purchase of Bridges.
2. **Math Practices Teacher Question Starters**
3. **Implementing the Standards of Mathematics Practice**
4. Illustrating the Standards of Mathematical Practice
5. Math Practice Standards Posters Gr. 4-5
6. Grade 4 - Standards + Practices - Explanations and Examples
7. Number Talks Matter - Number Talks at a Glance and Fluency without Fear
8. **Use and Connect Mathematical Representations**
9. **Pose Purposeful Questions**
10. Mistakes are Powerful - Resource to develop students' perseverance through mistakes
11. Addition and Subtraction Problem Types
12. Multiplication and Division Situations (Problem Types)

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13. [Journal Prompts for Math](#)
14. Bridges [Interactive Math Manipulatives](#)
15. [Illustrative Math – Grade 4](#) - Resources and activities for the grade aligned by standard.
16. [Bridging Practices - UCONN](#) – Training and a Task Repository to develop and support student capacity for argumentation in mathematics
17. [Accountable Talk Moves](#)
18. [Contribution Checklist](#)
19. [Sentence Frames that Can Build Metacognitive Thinking](#)
20. [Sample Language Frames for Mathematics](#)
21. [Building a Mathematical Mindset Community](#)
22. [Teacher/Student Actions](#)
23. [Fletcher Three Act Tasks](#)
24. [Vocabulary Development Frayer Model](#) – Elementary and secondary video and resources.
25. Learn Zillion
    a. [Multiplication and Division Strategies with Larger Numbers](#)
    b. [Decimals and Fractions](#)
    c. [Applying Area and Perimeter](#)

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,

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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.
- 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 who can estimate for division fluently can begin to work on finding actual quotients.
- Provide students the opportunity to write problems and exchange and solve.
- Select open-ended questions that promote a deeper exploration of a concept. For example, designing their own room...find the area and perimeter of the room, find the area of the carpet, etc...

Interdisciplinary Connections

Children's Literature - * Bridges recommended texts - # Bridges - texts embedded in unit.
*Each Orange had 8 Slice*s by Paul Giganti
Sea Squares by Joy M. Hulme
Top Ten of Everything by R. Ashe
A Remainder Of One by E. Pinczes

ELA
[CCSS.ELA-LITERACY.SL.4.1](#)
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.
[CCSS.ELA-LITERACY.SL.4.1.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.4.1.B](#)
Follow agreed-upon rules for discussions and carry out assigned roles.
[CCSS.ELA-LITERACY.SL.4.1.C](#)
Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
[CCSS.ELA-LITERACY.SL.4.1.D](#)
Review the key ideas expressed and 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.