Winchester Math Curriculum Grade 3

Subject	Mathematics
Grade/Course	Grade Three
Unit of Study	Unit 4: Measurement and Fractions
Pacing	January
Unit Summary	This unit begins with measurement concepts and skills. Students tell time to the minute and solve elapsed time problems. Then the class discusses the need for measuring by reading a book about the biggest, tallest, and fastest animals in the world. At the end of the first module, students estimate, measure, and compare the masses of different objects. In the second module, students work with volume and solve measurement-related story problems. The third module introduces them to fractions, using several different models to build, compare, and investigate the relationships among unit and common fractions. A short project at the end of the unit brings it all together, as students measure lengths to fractions of an inch and display measurement data on line plots.

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.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.NBT.A.2
Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

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

3.NF.A.2.A

Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.

3.NF.A.2.B

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

3.NF.A.3.A

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

3.NF.A.3.B

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

3.NF.A.3.C

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

3.NF.A.3.D

Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

3.MD.A.1

Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

3.MD.A.2

Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

3.MD.B.4
Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

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

"Unwrapped" Standards	
Skills	**Content**
Solve	● two-step word problems using four operations ● one-step problems involving masses or volume that are in given in the same units (using strategies and drawings) ● word problems involving addition and subtraction of time intervals in minutes (by representing the problem on a number line diagram)
Represent	● problems using equations with a letter standing for the unknown quantity ● a fraction *1/b* on a number line by defining the interval from 0 to 1 as the whole and partitioning into *b* equal parts ● a fraction *a/b* on a number line
Assess	the reasonableness of answers using mental computation and estimation strategies
Fluently add and subtract	within 1000 using strategies
Understand	● a fraction *1/b* as the quantity formed by 1 part of a whole partitioned into b parts ● a fraction *a/b* as the quantity formed by a parts of size *1/b* ● two fractions as equivalent if they are the same size or the same point on a number line
Recognize	● each part on a number line has the size of *1/b* ● intervals on a number line diagram has the size of *a/b* and that its endpoint locates the number *a/b* on the number line ● fractions that are equivalent to whole numbers ● comparison(of fractions) are only valid when the two fractions refer to the same whole
Recognize and generate	simple equivalent fractions ½ = 2/4, 4/6 = ⅔, etc..
Explain	why fractions are equivalent using a visual fraction model
Express	● whole numbers as fractions ● the area of each part of a whole as a unit fraction of a whole
Compare	two fractions with the same numerator or denominator by

	reasoning about their size
Record	results of comparisons with symbols >, =, <
Justify	conclusions (using visual fraction models)
Tell and Write	time to the nearest minute
Measure	time intervals in minutes
Measure and estimate	liquid volumes and mass of objects
Generate	measurement data by measuring lengths
Show	data by make a line plot
Partition	shapes into parts with equal areas

Essential Questions	Corresponding Big Ideas
1. How do we compare fractions?	1. Fractions of the same whole can be compared by reasoning about their size or location on a number line
2. What is a fraction?	2. A fraction is a number that represents how many parts of a whole. It is also a division relationship between two numerical values.
3. Why is it important to be able to tell and understand time?	3. Time measurement is a means to organize and structure each day, events, and our lives.

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 4 ● Number Corner Checkup 2	● Time Checkpoint - M2, S1 ● Measurement Checkpoint - M3, S1	Options ● Exit tickets Observational Assessments ● Tic Tac Tock - M1, S2 ● Measurement Scavenger Hunt - M2, S2 ● Hexagon Spin and Tell - M3, S3

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 - 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 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:
Exploring Fractions

- Halves, thirds, fourths, sixths, eighths, and twelfths
- Find equivalent fractions
- Find equations for fractions
- Explore whole numbers as fractions

Measurement

- Find mass in grams
- Create a collection close to 1000 grams
- Use estimation strategies
- Comparing mass

Multiplication

- Multiplying 0, 1, and 2
- Discuss patterns in groups of facts

- Review categories of facts
- Using the distributive property
- Using a number line
- Using arrays
- Seeing patterns and solving problems efficiently

Rounding

- Round to the nearest 100
- Mark number lines in multiples of 50, and 100 from 0

Bridges - Whole Group, Small Group, and Independent Problem Centered Activities			
Module 1	Module 2	Module 3	Module 4
Problem + Investigation ● Sessions 2-6 Problem String ● None Work Place ● Sessions 1,2,5 Math Forum ● None Daily Practice ● Sessions 1-6 Home Connection ● Sessions 2,4,6	Problem + Investigation ● Sessions 1, 3-4 Problem String ● None Work Place ● Sessions 2,3,5 Math Forum ● Sessions 4-5 Daily Practice ● Sessions 1-5 Home Connection ● Sessions 1,3,5	Problem + Investigation ● Sessions 1-5 Problem String ● None Work Place ● Sessions 3-5 Math Forum ● None Daily Practice ● Sessions 1-5 Home Connection ● Sessions 1,3,5	Problem + Investigation ● Sessions 1-3 Problem String ● None Work Place ● Sessions 3-4 Math Forum ● None Daily Practice ● Sessions 1-4 Home Connection ● Sessions 2-3

Possible Misconceptions	**Teacher Moves**
1. There are many foundational fraction concepts and it is important to take the time necessary to develop student understanding of each idea.	1. This is best accomplished through extensive work with concrete representations, including fraction strips, area models, fraction bars, geoboards, and similar items. Do not work with too many representations at the same time. Begin with activities that use area models and reinforce those ideas with fraction strips and then number line. For most students one experience with a concept will not be adequate to develop deep understanding.
2. Students who have any of the following misconceptions: a. given the same size whole, the smaller the denominator the smaller the piece	2. These students need additional experiences connecting concrete representations to fraction concepts.

b. fraction pieces must be the same shape and size c. considers the number of pieces in the whole but does not understand they must be the same size d. writes the fraction as a part to part relationship rather than a part to whole. 3. It is not critical for students to differentiate between the intervals between points and actual points on the number line. 4. As students work with equivalent fractions, it is important that they understand that different fractions can name the same quantity and there is a multiplicative relationship between equivalent fractions. 5. The following are possible misconceptions: a. The numerator cannot be greater than the denominator. b. The larger the denominator, the larger the piece. c. Fractions are a part of a whole; therefore, you cannot have a fraction that is greater than 1 whole. d. In building sets of equivalent fractions, students use addition or subtraction to find equivalent fractions. 6. Some third graders may have difficulty simply reading a clock to tell time.	3. You want to be careful not to cause any misconceptions. The fraction that names a point on the number line describes the distance of that point from 0 and not the point itself. 4. Students need multiple experiences using concrete materials as they explore each of these important concepts. They need to explain their reasoning and explicitly connect visual representations (concrete and pictorial) to numerical representations. It is important that students have time to make these connections, describe patterns, and make generalizations rather than practicing rote rules. 5. These students need more work with concrete and then pictorial representations. 6. Before teaching elapsed time, make sure students tell time to the minute. Allow students to use a clock with moveable hands, but keep in mind that numerous ongoing practices telling time to the minute use a clock or number line to show elapsed time will help students become proficient. 7. To avoid this common error, allow

7. Students may incorrectly think about size as they determine estimates for mass.	students to handle and touch all objects before they give an estimate.

Vocabulary and Representations

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary
analog clock benchmark capacity compare cup (c) digital clock distance fair share gallon (gal.) half-hour(hr.)* height hour (hr.)* inch (in.)* minute (min.)* order ounce (oz.) pound (lb.) quart (qt.) referent table timeline 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 at this grade level, however they should have some understanding of the mathematical concept.	centimeter (cm*) common fractions congruent + customary system data denominator* eighth/eighths equation* equivalent equivalent fractions + fourth/fourths fraction gram (g)* horizontal scale kilogram (kg)* liquid volume* line plot* + liter (l*) mass* meter (m)* metric system* milliliter (ml*) millimeter (mm)* nearest half-inch (in.) nearest quarter-inch (in.) numerator* pan balance scale sixth/sixths third/thirds unit fraction volume*

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. 2-3

7. Bridges Interactive Math Manipulatives
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. **Supporting Productive Struggle**
15. **Use and Connect Mathematical Representations**
16. Number Talks Matter - Number Talks at a Glance and Fluency without Fear
17. National Library of Virtual Manipulatives
18. Three Act Math Tasks
19. Illustrative Math – Grade 3 - Resources and activities for grade 2 aligned by standard.
20. LearnZillion
    - Represent Fractions in Different Ways
    - Reading the Exact Time on a Clock
    - Identify Start, End Time, and Change in Time in Elapsed Time Problems
    - Solving Elapsed Time Problems to the Nearest Hour
    - Solving Elapsed Time Problems to the Nearest Five Minutes
    - Understand Mass and How it is Measured
21. K-5 Math Teaching Resources
    - Fractions on a Number Line
    - Pizza for Dinner
    - Time Intervals - Word Problems
    - More or Less than a Liter

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.
- 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:

- Create fraction pattern block puzzles and develop answer keys.
- What is the Fractional Part?
- Fraction Flags
- Fraction Bar Riddles
- Provide students who are secure in telling time to the minute opportunities for problem solving involving elapsed time
- Extension activities aligned with Bridges lessons are included in each module

Interdisciplinary Connections

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

**Millions to Measure* by Steven Kellogg
**What Time is It?* by Sheila Keenan
**Clocks and More Clocks* by Pat Hitchins
**Pastry School in Paris* by Cindy Neuschwander
**Piece = Part = Portion* by Scott Gifford
**Fraction Action* by Loreen Leedy
**Telling Time* by Jules Older
**The Warlord's Alarm* by Virginia Pilegard
**All About Time* by Andre Verdet
**Inch by Inch* by Leo Lionni
**Fraction Fun* by David A. Adler

Science

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

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.

Physical Education

- Students can keep track of time of activities to understand how long it takes to complete activities to better estimate time.