

# Winchester Math Curriculum Grade 4

<b>Subject</b>	Mathematics
<b>Grade/Course</b>	Grade Four
<b>Unit of Study</b>	Unit 8: Playground Design
<b>Pacing</b>	May/June
<b>Unit Summary</b>	In this final unit of the year, students design and build scaled model playgrounds that incorporate simple machines. They investigate simple machines in playground equipment and conduct research to help them make decisions about safety issues. They then survey the school community to find the most important playground items to use in their designs and use graphs to visualize the data they collect. Students use the information to create a scaled map of their designs, from which they build a scaled 3D model. They also discuss the needs of plants and plant a model grass field in preparation for finding the scaled measurements and cost for planting a much larger field. They work with mass, liquid volume, area and perimeter during this portion of the unit. An optional Playground Model Showcase gives students an opportunity to prepare their work for sharing with friends and family members or students from other classrooms.
<b><u>Overarching Mathematical Practices</u></b>	
<p>4.MP.1 Make sense and persevere in solving problems.</p> <p>4.MP.2 Reason abstractly and quantitatively.</p> <p>4.MP.3 Construct viable arguments and critique the reasoning of others.</p> <p><b>4.MP.4 Model with mathematics.</b></p> <p><b>4.MP.5 Use appropriate tools strategically.</b></p> <p><b>4.MP.6 Attend to precision.</b></p> <p>4.MP.7 Look for and make use of structure.</p> <p>4.MP.8 Look for and express regularity in repeated reasoning.</p>	
<b><u>Unit CT Core Content Standards</u></b>	
<p><u>4.MD.A.1</u> Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.</p> <p><u>4.MD.A.2</u> Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.</p> <p><u>4.MD.A.3</u> Apply the area and perimeter formulas for rectangles in real world and mathematical problems.</p>	

**4.MD.C.5**

Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

**4.MD.C.6**

Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

**4.G.A.1**

Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

**4.G.A.3**

Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

**“Unwrapped” Standards**

<b>Skills</b>	<b>Content</b>
Know	relative size of measurement units
Express	measurements in a larger unit in terms of a smaller unit
Record	measurement equivalents in a two-column table
Use	four operations to solve word problems involving measurement, including problems involving simple fractions or decimals
Represent	measurement quantities using diagrams
Apply	area and perimeter formula for rectangles in real world and math problems
Recognize	<ul style="list-style-type: none"> <li>angles as geometric shapes wherever two rays share a common endpoint</li> <li>a line of symmetry for a two-dimensional figure</li> </ul>
Understand	concepts of angle measurement
Measure	angles using a protractor
Sketch	angles of specified measure
Draw	*points, lines, line segments, rays, angles, and parallel and perpendicular lines.
Identify	<ul style="list-style-type: none"> <li>the above* components in two-dimensional figures</li> <li>line-symmetric figures</li> </ul>
Draw	lines of symmetry
<b>Essential Questions</b>	<b>Corresponding Big Ideas</b>
1. What is the purpose of measurement?	1. Measurement is used to describe, compare, precisely explain, and solve problems in the world.
2. How do geometric relationships help us	2. Geometry offers ways to interpret and

<p>solve problems?</p> <p>3. How can we use measurements to solve real world problems?</p>	<p>compare real-world objects</p> <p>3. Objects have attributes that can be measured in many ways. The measurements can be combined and broken down into parts to solve problems.</p>
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**Evidence of Learning - Assessment**

Pre/ Post Assessment	Interim Assessment	Additional Evidence of Learning
<p>May - Number Corner Checkup 4 June - Comprehensive Growth Assessment</p>		<p>Options</p> <ul style="list-style-type: none"> <li>● <a href="#">Exit Tickets</a></li> </ul> <p>Observational Assessments</p> <ul style="list-style-type: none"> <li>● Slide Experiment Student - M1, S2</li> <li>● Merry-go- Round Bars - M1, S6</li> <li>● The Current Playground and Playground Sketch - M2, S1</li> <li>● Playground Costs and Analyzing Playground Costs - M2, S4</li> <li>● Scaled Measurements and Scaled Playground Design - M3, S3</li> <li>●</li> </ul>

**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 - N/A

*\*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 for Unit 8:**

Measurement and Data

- Use coordinate graphing to create line graphs
- Relationships between various units of measure converting amounts from larger to smaller units
- Measurement story problems

Computational Fluency

- Multiply whole numbers by fractions including investigating connections between fractions, division, and multiplication
- Computational Fluency - Add decimals to hundredths

Geometry

- Line and rotational symmetry, rotations, and reflections

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

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

**Possible Misconceptions**

1. Some students may have difficulty converting a word problem into the necessary mathematical form needed to

**Teacher Moves**

1. To address this, teachers need to provide multiple experiences with measurement problems on an ongoing basis.

solve the problem.

2. Students are often confused between the concepts of area and perimeter. The formula fourth graders learn must be developed through experience not just memorization.
3. Some students misunderstand that the larger the unit, the smaller the number you get when you measure. Student may incorrectly think that larger units will give larger measures.
4. Some students may have difficulty visualizing both obtuse and acute angles.
5. Some students may look at a protractor with a set of double numbers and not know the number to use when finding the measure of an angle.
6. Some students' angle measurements are incorrect because some protractors have an edge along the bottom. Students are incorrectly lining up the protractor as zero degrees begins at  $\frac{1}{4}$  of an inch above the bottom edge.
7. Some students may incorrectly believe there is only one line of symmetry for each shape or object.

2. Provide additional experiences for students to discover both area and perimeter. Help students notice that the formula for area is  $l \times w = a$ . The answer for area will always be in square units. The formula for perimeter can be  $2l + 2w = p$ , and the answer will always be in linear units.
3. Provide additional experiences for students to measure the same object with two different measuring units. Help students learn that it takes fewer yardsticks to measure a hallway than it takes rulers.
4. The students may need to compare two angles by using a transparency to trace an angle and place it over another angle. This will help them notice the rays of the angles.
5. To address this misconception, students should think about the size of an angle. If the angle is less than a 90 degree right angle, it is an acute angle with a measurement of 0 to 89 degrees. If the angle is greater than 90 degrees, it will be an obtuse angle and will be between 91 and 179 degrees.
6. This common error can be addressed by pointing it out to students, Show students how they can get inaccurate angle measures if they do not correctly line up the protractor.
7. Instead of merely drawing a line of symmetry while looking at a picture or worksheet, provide multiple paper copies of multiple shapes. Ask students to fold shapes more than one way. The misconceptions will be addressed through numerous paper-shape-folding experiences to find the lines of symmetry.

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary)
average + axle composition compost drainage effort generalization lever load mass* model poll ranking sampling scale screw simple machine soil tally trend wedge wheel	angle* formula fulcrum gram (g)* gravity inclined plane mean + nutrients pendulum protractor pulley range + spreadsheet + variable +  *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. [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. [Facilitate Meaningful Math Discourse](#)
11. [Mistakes are Powerful](#) - Resource to develop students' perseverance through mistakes
  
12. [Journal Prompts for Math](#)
13. [Bridges Interactive Math Manipulatives](#)
14. [Illustrative Math – Grade 4](#) - Resources and activities for the grade aligned by standard.
15. [Bridging Practices - UCONN](#) – Training and a Task Repository to develop and support student capacity for argumentation in mathematics
  
16. [Accountable Talk Moves](#)
  
17. [Contribution Checklist](#)

18. [Sentence Frames that Can Build Metacognitive Thinking](#)
19. [Sample Language Frames for Mathematics](#)
20. [Building a Mathematical Mindset Community](#)
21. [Teacher/Student Actions](#)
22. [Fletcher Three Act Tasks](#)
23. [Vocabulary Development Frayer Model](#) – Elementary and secondary video and resources.

## 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.

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 as 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

- Ask students how they can determine an ounce of clay if they know a box or prepared portion is 1 pound. Have them share their thinking.
- Have students cut sticks of clay into ounces and work together to find the mass of the soil in the filled milk carton.
- Either ask student to approximate the mass in whole ounces or have them divide clay into smaller pieces to find fractions of an ounce.
- Discuss the differences between metric and customary units of measure. Have student make a table and record the measurements in both systems. Have them discuss what they notice.

## Interdisciplinary Connections

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

# Kids Discover - Simple Machines Magazine

*Simple Machines, Wheels, Levers, Pulleys* by David Adler

*Simple Machines* by D.J. Ward

*Pull, Lift, Lower A Book about Pulleys* by Michael Dahl

*How Do You Lift a Lion?* by Robert E. Wells

### 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

- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved