

Winchester Math Curriculum Grade 4

Subject	Mathematics
Grade/Course	Grade Four
Unit of Study	Unit 5: Geometry and Measurement
Pacing	February
Unit Summary	In this unit, students are formally introduced to a host of new geometric concepts, including angles and angle measure, parallel and perpendicular lines, and reflective symmetry. In Module 1, students focus on comparing, analyzing, classifying, and measuring angles. In Module 2, students investigate parallel and perpendicular lines as well as line symmetry and use these terms and concepts to sort and classify a wide variety of polygons. During Module 3, students measure the area and perimeter of rectangles, making generalizations that support the introduction of the formulas for both. Module 4 features a return to angle measure, with an emphasis on the fact that angles involve turns or rotations around a fixed point and are additive in nature.
<u>Overarching Mathematical Practices</u>	
<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>4.MP.4 Model with mathematics.</p> <p>4.MP.5 Use appropriate tools strategically.</p> <p>4.MP.6 Attend to precision.</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>	
<u>Unit CT Core Content Standards</u>	
<p><u>4.NBT.B.4</u> Fluently add and subtract multi-digit whole numbers using the standard algorithm.</p> <p><u>4.NBT.B.5</u> 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</p> <p><u>4.MD.A.3</u> Apply the area and perimeter formulas for rectangles in real world and mathematical problems.</p> <p><u>4.MD.C.5</u> Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint.</p> <p><u>4.MD.C.5.A</u> An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An</p>	

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angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles.

4.MD.C.5.B

An angle that turns through n one-degree angles is said to have an angle measure of n degrees.

4.MD.C.6

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

4.MD.C.7

Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle 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.2

Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

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

Skills	Content
Fluently add and subtract	multi-digit whole numbers
Multiply	<ul style="list-style-type: none"> ● four digit whole numbers by one digit whole number using strategies ● two two-digit whole numbers using strategies
Apply	area and perimeter formulas for rectangles in real world and math problems
Recognize	<ul style="list-style-type: none"> ● angles as geometric shapes formed from two rays sharing an end point ● an angle is measured with reference to a circle with its center at the common endpoint of the rays ● an angle that turns through $\frac{1}{360}$ of a circle is called a "one-degree angle," and can be used to measure angles.

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	<ul style="list-style-type: none"> an angle that turns through n one-degree angles is said to have an angle measure of n degrees. angle measure as additive right triangles as a category in classifying figures a line of symmetry for two-dimensional figures 	
Measure	angles in whole number degrees	
Sketch	angles of specified measure	
Solve	addition and subtraction problems to find unknown angles	
Draw	<ul style="list-style-type: none"> points, lines, line segments, rays, angles (right, acute, obtuse) and parallel and perpendicular lines lines of symmetry 	
Identify	<ul style="list-style-type: none"> points, lines, line segments, rays, angles (right, acute, obtuse) and parallel and perpendicular lines in two-dimensional figures. right triangles line-symmetric figures 	
Classify	two-dimensional figures based on lines and angles	
Essential Questions		
<ol style="list-style-type: none"> What are the tools of measurement and how are they used? How are mathematical attributes used to classify figures? Why is it important to select the appropriate tools for measurement? What is a mathematical argument? 	Corresponding Big Ideas <ol style="list-style-type: none"> The tools of measurement vary based on the mathematical attributes being measured and the degree of precision needed. One tool that can be used in all measurement is estimation if precision is not necessary. To be more precise line segments can be measured with rulers and angles measured with protractors. Figures are classified by the lines, side lengths, number of sides, and angle types Using the appropriate tools makes measurements accurate, easy to understand and able to be replicated by others. A sequence of statements with the aim of demonstrating that a claim is true or false. 	
Evidence of Learning - Assessment		
	Interim Assessment	Additional Evidence of Learning
<ul style="list-style-type: none"> Unit 5 Pre-Assessment - Module 1, Session 1 Unit 5 Post-Assessment - Module 4, Session 4 	<ul style="list-style-type: none"> Angles Checkpoint - M2, S1 Lines and Angles Work Sample - M2, S2 	Options <ul style="list-style-type: none"> Exit tickets Observational Assessments

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	<ul style="list-style-type: none"> ● Geometry Checkpoint - M3, S2 	<ul style="list-style-type: none"> ● Angle Puzzles - M1, S4 ● Mosaic Game - M2, S3 ● Solving Polygon Puzzles - M2, S5 ● Polygon Bingo - M2, S6
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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 - Geometry

**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:

Geometry

- Working with Rays and Endpoints
- Line Segments forming Triangles
- Looking Angles and Polygons
- Constructing Angles and Polygons
- Exploring Quadrilaterals
- Identify, compare, and classify, lines, angles, and polygons

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Measurement

- Measuring Degrees in a Circle
- Adding Degrees
- Build Understanding that Angle Measure is Additive
- Using a Protractor

Computation

- Identify, Compare, and Order Decimals using a Number Line
- Adding, Subtracting, with Like and Unlike Denominators
- Multiplying Fractions
- Equivalence of Fractions and Decimals
- Converting Between Fractions and Whole Numbers

Problem Solving

- Interpret, Estimate and Solve Problems

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

Module 1	Module 2	Module 3	Module 4
Problem + Investigation <ul style="list-style-type: none"> ● Sessions 2, 3, 5, 6 Problem String <ul style="list-style-type: none"> ● None Work Place <ul style="list-style-type: none"> ● Sessions 1, 4 Math Forum <ul style="list-style-type: none"> ● None Daily Practice <ul style="list-style-type: none"> ● Sessions 1-6 Home Connection <ul style="list-style-type: none"> ● Sessions 2, 4, 6 	Problem + Investigation <ul style="list-style-type: none"> ● Sessions 1-5 Problem String <ul style="list-style-type: none"> ● None Work Place <ul style="list-style-type: none"> ● Sessions 3, 5, 6 Math Forum <ul style="list-style-type: none"> ● None Daily Practice <ul style="list-style-type: none"> ● Sessions 1-6 Home Connection <ul style="list-style-type: none"> ● Sessions 2, 4, 6 	Problem + Investigation <ul style="list-style-type: none"> ● Sessions 1-4 Problem String <ul style="list-style-type: none"> ● None Work Place <ul style="list-style-type: none"> ● Session 3 Math Forum <ul style="list-style-type: none"> ● None Daily Practice <ul style="list-style-type: none"> ● Sessions 1-4 Home Connection <ul style="list-style-type: none"> ● Sessions 2, 4 	Problem + Investigation <ul style="list-style-type: none"> ● Sessions 1, 2 Problem String <ul style="list-style-type: none"> ● None Work Place <ul style="list-style-type: none"> ● Sessions 2, 3, 4 Math Forum <ul style="list-style-type: none"> ● Session 3 Daily Practice <ul style="list-style-type: none"> ● Sessions 1-4 Home Connection <ul style="list-style-type: none"> ● Sessions 2, 3

Possible Misconceptions

1. 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.
2. Students are often confused between the concepts of perimeter of area.

Teacher Moves

1. To avoid this misconception, have students write the dimensions on the other sides of the rectangle.
2. The formulas fourth graders learn MUST be developed through experience not just memorization. To address this, provide additional experiences for students to discover both area and perimeter. Help students notice that the formula for area

<ol style="list-style-type: none"> 3. Some students may have difficulty visualizing obtuse and acute angles. 4. Some students may look at a protractor with a set of double lines and not know the number to use when finding the measure of an angle. 5. 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 about $\frac{1}{4}$ of inch about the bottom edge. 6. Some students may be able to understand and recognize angle measure as additive but may not be able to solve word problems. 7. Students may incorrectly think a wide angle with short sides is smaller than a narrow angle with long sides. 8. Some students may confuse the name of a a turned looking square with the term diamond. 9. Another common difficulty for fourth graders is comprehending how and why many of the shapes are called quadrilaterals, but have different names based on their properties 	<p>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.</p> <ol style="list-style-type: none"> 3. To address this, the students may need to compare the two angles by using a transparency to trace and angle and place it over the other angle. This can help them notice the difference in the rays of the two angles. 4. Students should think about the size of the angle. If the angle is less the 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. 5. To address this common error, point this out to students. Show students how they can get inaccurate angle measures if they do not correctly line up the protractor. 6. Provide multiple experiences and activities for students to solve word problems on an ongoing basis. 7. Help fourth grades compare two angles by tracing one and placing it over the other, which will help them understand the length of the sides does not determine whether one angle is larger or smaller than another angle. The measure of angle does not change. 8. To address this misconception, remind students that there is no geometric shape names a diamond. 9. Listen to students thinking as they begin sorting concrete objects and describing their properties. Help students rediscover the specific properties of each shape and what makes them part of the group of quadrilaterals and classified as a specific shape.
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Vocabulary and Representations

Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary)
<p> angle* area* center corner degree* distance feet (ft)* (foot)* figure fraction* horizontal inches (in)* intersect(ing)* line* measure* miles (mi)* plane figure* point* properties ray* reflection rotation + surface vertical width yard (yd)* </p> <p> *Smarter Balanced Vocabulary is focused on major mathematical concepts. (Not all possible words have been identified by SBAC) </p> <p> + Students are not responsible for these vocabulary words at this grade level, however they should have some understanding of the mathematical concept. </p>	<p> acute angle* asymmetrical + centimeter (cm)* circumference + closed figure congruent + diameter + ellipse + equilateral equilateral triangle geometry hexagon* interior angle + isosceles trapezoid + isosceles triangle line of symmetry* line segment* line symmetry + linear units obtuse angle* one-degree angle* open figure metric system metric units* parallelogram* perimeter* perpendicular* protractor* quadrilateral* radius + rectangle* rhombus* right angle* right triangle scalene triangle square square foot* square inch* square unit* straight angle symmetry* trapezoid vertex* zero angle + </p>

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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.
 - 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. [Teacher/Student Actions](#)
9. [Geometry Mathematical Background](#)
10. [Cycle of Instructional Strategies for Geometry](#)
11. [Bridging Practices - UCONN](#) – Training and a Task Repository to develop and support student capacity for argumentation in mathematics
12. [Illustrative Math – Grade 4](#)
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. [Fletcher Three Act Tasks](#)
21. [Vocabulary Development Frayer Model](#) – Elementary and secondary video and resources.
22. LearnZillion
 - [Compose and Decompose Angles](#)
 - [Find Missing Side Lengths using the Formula for Perimeter](#)
 - [Find the Perimeter of a Rectangle using an Area Model](#)
 - [Find the Area of a Rectangle using the Standard Formula](#)
 - [Introduction to Protractors](#)
 - [Measure Angles to the Nearest Degree with a Protractor](#)
 - [Draw and Classify Various Types of Angles](#)
 - [Identify Points, Lines, Line Segments, and Rays](#)
 - [Label and Name Points, Lines, Rays and Angles using Math Notation](#)
 - [Classify Two-Dimensional Figures by Examining Their Properties](#)
 - [Classify Triangles by Examining Their Properties](#)

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.

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- [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](#)

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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
- Students can create origami that uses symmetry as the foundation of pieces.
- [Earth's Rotation](#) - Students will apply math concepts related to measuring angles to diagram the Earth's rotation throughout a 24-hour period.
- [Angles, Degrees, Protractors - Oh My!](#) - Students make and use their own protractors.

Interdisciplinary Connections

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

Sir Cumference and the Great Knight of Angleland by Cindy Neuschwander

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.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.

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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

Art

Use measurement tools and figures to create artwork.