

Winchester Math Curriculum Grade 5

Subject	Mathematics
Grade/Course	Grade Five
Unit of Study	Unit Six - Graphing, Geometry, and Volume
Pacing	March
Unit Summary	In this unit, students are formally introduced to several new geometric concepts, including coordinate graphing and the use of hierarchies to classify two-dimensional shapes by their properties. Students also review volume, working from counting the cubes that will fit into a box to measuring prisms in continuous units and using standard formulas ($V = l \times w \times h$ and $V = b \times h$) to find their volumes. Module

Overarching Mathematical Practices

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

Unit CT Core Content Standards

5.OA.B.3

Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

5.NF.B.4.A

Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$.

5.NF.B.4.B

Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.B.6

Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.MD.C.5.A

Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths,

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equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

5.MD.C.5.B

Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

5.MD.C.5.C

Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

5.G.A.1

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

5.G.A.2

Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

5.G.B.3

Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

5.G.B.4

Classify two-dimensional figures in a hierarchy based on properties.

“Unwrapped” Standards

Skills	Content
Generate	two numerical patterns using two given rules
Identify	relationships between corresponding terms
Form	ordered pairs
Graph	ordered pairs on coordinate plane
Interpret	<ul style="list-style-type: none"> the product $(a/b) \times q$ coordinate values of points in context
Find	<ul style="list-style-type: none"> area of a rectangle with fractional side lengths by tiling volume of right rectangular prism by packing with unit cubes

	<ul style="list-style-type: none"> volumes of solid figures
Show	<ul style="list-style-type: none"> area tiling is the same as multiplying side lengths multiplying edge lengths, equivalently by multiplying the height by the area of the base is the same result as tiling
Multiply	fractional side lengths to find area of rectangles
Represent	<ul style="list-style-type: none"> fraction products as rectangular areas problems using visual fraction models and equations threefold whole number products as volume associative property of multiplication real world and math problems by graphing points
Solve	real world problems involving fractions/mixed numbers
Apply	<ul style="list-style-type: none"> formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prism with whole number edge lengths in context adding volumes of non-overlapping parts to solve real world problems
Recognize	volume as additive
Use	<ul style="list-style-type: none"> axes to define coordinate system ordered pairs of numbers as coordinates
Understand	<ul style="list-style-type: none"> first number indicates how far to travel from the origin second number indicates how far to travel in the direction of the second axis the axes and the coordinates correspond, x-axis - x-coordinate, y-axis - y-coordinate attributes belonging to a category also belong to all subcategories
Classify	two-dimensional shapes
Essential Questions	Corresponding Big Ideas
<ol style="list-style-type: none"> What is the purpose of the coordinate plane? Why is it important to solve real world problems involving measurement? How do we know when we have reasoned mathematically? 	<ol style="list-style-type: none"> The coordinate plane can be used to model and compare numerical patterns. Measurement processes are used in everyday life to describe and quantify the world. We have reasoned mathematically when we use relevant prior knowledge to contextualize or decontextualize quantities, symbols, representations, or problems.
Evidence of Learning - Assessment	

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Pre/Post Assessment	Interim Assessment	Additional Evidence of Learning
<ul style="list-style-type: none"> Unit 6 Pre-Assessment - Module 1, Session 1 Unit 6 Post-Assessment - Module 4, Session 4 Number Checkup 3 	<ul style="list-style-type: none"> Graphing Patterns Checkpoint - M1, S7 Shape Classification Checkpoint - M3, S1 Multiplying Mixed Numbers and Fractions - M4, S3 	<p>Options</p> <ul style="list-style-type: none"> Exit Tickets <p>Observational Assessments</p> <ul style="list-style-type: none"> Dragon's Treasure - M1, S7 Polygon Search - M3, S3 Volume Bingo - M3, S5

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 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/Decimals

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- Area of arrays reduced by powers of 10
- Multiplying multi-digit whole and decimal numbers
- Interpret expressions without evaluating them

Measurement and Data

- Measure to the nearest eighth of an inch
- Create a line plot using data
- Answer questions related to line plot

Computational Fluency

- Estimate answers to division problems
- Solve division problems
- Find 10 times or $\frac{1}{10}$ of quotients
- Add and Subtract fractions and mixed numbers
- Add fractions with multiple addends
- Convert fractions to equivalent fractions with common denominators

Problem Solving

- Pose and answer questions with multiplication and division of whole numbers
- Pose and answer questions with multiplication and division of decimals to the hundredths

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 2-6 Problem String <ul style="list-style-type: none"> • None Work Place <ul style="list-style-type: none"> • Sessions 1-7 Math Forum <ul style="list-style-type: none"> • None Daily Practice <ul style="list-style-type: none"> • Sessions 1-7 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"> • Sessions 4 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 1,3 	Problem + Investigation <ul style="list-style-type: none"> • Sessions 1-4 Problem String <ul style="list-style-type: none"> • Session 5 Work Place <ul style="list-style-type: none"> • Sessions 3-5 Math Forum <ul style="list-style-type: none"> • Session 3 Daily Practice <ul style="list-style-type: none"> • Sessions 1-5 Home Connection <ul style="list-style-type: none"> • Sessions 1,3,5 	Problem + Investigation <ul style="list-style-type: none"> • Sessions 1-3 Problem String <ul style="list-style-type: none"> • Session 1 Work Place <ul style="list-style-type: none"> • Sessions 1,3,5 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 2,3

Possible Misconceptions

1. Students often reverse coordinates when plotting on the coordinate plane. They use the first number to count up the y-axis and then count over the second number in the ordered pair on the x-axis.

Teacher Moves

1. Have students identify and label the x-axis and the y-axis on their coordinate planes. Remind them that since x is before y alphabetically, they move across the x-axis first and then up the y-axis. Student should also describe the difference of the location, for example (3, 5) and (5, 3) on the coordinate plane. Give students many

<ol style="list-style-type: none"> 2. Watch for misconceptions from previous multiplication standards. 3. Some students many think only about one of the dimensions needed to find volume. Some students believe that if an object is tall it has a lot of volume, ignoring the other two dimensions. 4. Some students may think when describing geometric shapes and placing them in subcategories, the last category is the only classification that can be used. 5. The x and y axes may confuse students because this is not the first time they are working with coordinates using the first quadrant of the coordinate grid. Some students may not understand the first number of the ordered pair (x-axis) indicates how far to move horizontally from the origin and must occur first. Some students may not think the order is critical. 6. Fifth graders may not realize how important the order is in plotting a coordinate point. 7. Some students may not realize that a coordinate system differs from a grid system. 	<p>opportunities to describe how to plot a point using a variety of ordered pairs.</p> <ol style="list-style-type: none"> 2. Students who struggle understanding why they should multiply in thee problems need more experience using visual representations. It is helpful to have them break the problem into smaller parts and explain their thinking as they complete each part of the problem. 3. Provide additional experiences for students to measure and compare a variety of objects by using all three dimensions to address the misconception. 4. As students are creating a chart with subcategories, have them talk about why attributes belonging to a category of two-dimensional figures also belong to all subcategories of the category. 5. To address the misconception, students can plot points so that the position of the coordinates is switched. For example, have students plot (4,5) and (5,4) and ask them to explain and discuss the importance of order used to plot the points. 6. A reminder of the order in ordered pairs may help.In labeling points, the x-coordinate is always given first, then the y-coordinate. Additional experiences for the students to plot coordinates correctly may be necessary. 7. In a coordinate system, the lines, not the area surrounding the lines, are labeled. Providing the opportunity to talk about this may help.
Vocabulary and Representations	
Tier 2 (Academic Vocabulary)	Tier 3 (Domain Specific Vocabulary
adjacent	acute angle*

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<p>area* arrangement base category dimension formula hierarchy + origin* point* property (properties) sequence* subcategory volume*</p> <p>*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.</p>	<p>acute triangle area model* axes congruent coordinates* coordinate grid coordinate pair* coordinate plane* coordinate system* corresponding terms + cubic centimeter cubic inch cubic unit equilateral triangle first quadrant* isosceles triangle kite linear pattern + mixed number* non-linear pattern + obtuse angle* obtuse triangle ordered pair* parallel* parallelogram* quadrilateral* ratio + right angle* right rectangular prism* right triangle scalene triangle square foot* x-axis* x-coordinate* y-axis* y-coordinate*</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.
2. Bridges - [Geometry Mathematics Background](#)
3. Bridges - [Cycle of Instructional Strategies for Geometry](#)
4. [Mistakes are Powerful](#) - Resource to develop students' perseverance through mistakes
5. [Grade 5 Standards + Practices Examples and Explanations](#)

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6. [Math Practices Teacher Question Starters](#)
7. [Implementing the Standards of Mathematics Practice](#)
8. [Illustrating the Standards of Mathematical Practice](#)
9. [Math Practice Standards Posters Gr. 4-5](#)
10. [Number Talks Matter - Number Talks at a Glance](#) and Fluency without Fear
11. [Three Act Math Tasks](#)
12. [Standards + Mathematical Practices - Examples and Explanations](#) - Grade 5
13. [Open Middle](#)
14. [Bridges Interactive Math Manipulatives](#)
15. [National Library of Virtual Manipulatives](#)
16. [Illustrative Math – Grade 5](#) - Resources and activities for the grade aligned by standard.
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. [Vocabulary Development Frayer Model](#) – Elementary and secondary video and resources.
24. K-5 Math Teaching Resources
 - [Geometry](#)
 - [Patterns of a Coordinate Plane](#)
25. Learn Zillion
 - [Understanding volume](#)
 - [Solving problems involving volume](#)
 - [Multiplying fraction](#)
 - [Classifying two-dimensional figures](#)
 - [Coordinate plane](#)

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.

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- 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.
- 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](#)
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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

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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
- Allow students to create a picture using ordered pairs on the coordinate plane. Have the students make a list of the ordered pairs for their picture on a separate sheet of paper, Place directions, a pencil, and coordinate grids and allow student to trade and have others complete the picture on the coordinate grid.
- Student can try problems such as, "What is the volume of a cube with an edge that measures 5 cm? Or, "What is the volume of a cube with an edge that measures 10 cm?"
- Students can create a picture using ordered pairs on the coordinate plane. Have the student make a list of the ordered pairs to share with other students to create the picture from the ordered pairs.

Interdisciplinary Connections

Children's Literature - *Bridges recommended texts -# Bridges - texts embedded in unit

How Big is a Foot? by Rolf Myller

The Wishing Club by Donna Jo Napoli

The Warlord's Puzzle by Virginia Pilegard

A Fly on the Ceiling by Julie Glass

ELA

[CCSS.ELA-LITERACY.SL.5.1](#)

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

[CCSS.ELA-LITERACY.SL.5.1.A](#)

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.5.1.B](#)

Follow agreed-upon rules for discussions and carry out assigned roles.

[CCSS.ELA-LITERACY.SL.5.1.C](#)

Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

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CCSS.ELA-LITERACY.SL.5.1.D

Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions

Art

Create pictures using ordered pairs on the coordinate plane.

Create greeting cards using geometry.