Model Curricula Alignment for Connecticut Mathematics

Resource Name: Open Up Resources Math

Alignment Grade 8

Model Unit Name	**Model Unit Standards**	**Resource Unit(s) Number**	**Resources Lessons**	**Pacing**
This is the title of the unit in the model curricula	*These are the standards addressed in the unit*	*This is the unit(s) that aligns with the model unit from the resource*	*These are the lessons from the identified units that align to the standards within the model unit*	*This is the expected number of days for instruction*
Real Numbers	8.NS.A.1, 8.NS.A.2, 8.EE.A.1, 8.EE.A.2, 8.EE.A.3, 8.EE.A.4	Unit 7, Unit 8	**8.NS.A.1** - 8.8.14, 8.8.15 **8.NS.A.2** - 8.8.1, 8.8.4, 8.8.5, 8.8.12, 8.8.13 **8.EE.A.1** - 8.7.2, 8.7.3, 8.7.4, 8.7.5, 8.7.6, 8.7.7, 8.7.8, 8.7.11, 8.7.14 **8.EE.A.2** - 8.8.2, 8.8.3, 8.8.4, 8.8.5, 8.8.10, 8.8.12, 8.8.13 **8.EE.A.3** - 8.7.9, 8.7.10, 8.7.11, 8.7.12, 8.7.14, 8.7.16 **8.EE.A.4** - 8.7.10, 8.7.11, 8.7.12, 8.7.13, 8.7.14, 8.7.15, 8.7.16	24 days + Assessment days
Pythagorean Theorem	8.EE.A.2, 8.G.B.6, 8.G.B.7, 8.G.B.8	Unit 8	**8.EE.A.2** - 8.8.2, 8.8.3, 8.8.4, 8.8.5, 8.8.10, 8.8.12, 8.8.13 **8.G.B.6** - 8.8.7, 8.8.9 **8.G.B.7** - 8.8.6, 8.8.7, 8.8.8, 8.8.10 **8.G.B.8** - 8.8.11	10 days + Assessment days

Congruence and Similarity	8.G.A.1, 8.G.A.2, 8.G.A.3, 8.G.A.4, 8.G.A.5	Unit 1, Unit 2	**8.G.A.1** - 8.1.2, 8.1.3, 8.1.4, 8.1.6, 8.1.7, 8.1.8, 8.1.9, 8.1.10, 8.1.11, 8.1.13, 8.1.14, 8.3.8 **8.G.A.2** - 8.1.11, 8.1.12, 8.1.13, 8.1.15, 8.2.6, 8.2.7 **8.G.A.3** - 8.1.5, 8.1.6, 8.2.4, 8.2.5, 8.2.12 **8.G.A.4** - 8.2.6, 8.2.7, 8.2.9	26 days + Assessment days
			8.G.A.5 - 8.1.14, 8.1.15, 8.1.16, 8.2.8, 8.2.13, 8.9.2	
Linear Relationships	8.EE.B.5, 8.EE.B.6, 8.EE.C.7, 8.F.A.1, 8.F.A.2, 8.F.A.3, 8.F.B.4, 8.F.B.5	Unit 3, Unit 4, Unit 5	**8.EE.B.5** - 8.3.2, 8.3.3, 8.3.4, 8.3.6 **8.EE.B.6** - 8.2.10, 8.2.11, 8.2.12, 8.3.7, 8.3.10, 8.3.11, 8.3.14 **8.EE.C.7** - 8.4.3, 8.4.4, 8.4.5, 8.4.6, 8.4.7, 8.4.8, 8.4.9 **8.F.A.1** - 8.5.1, 8.5.2, 8.5.3, 8.5.4, 8.5.5, 8.5.17, 8.9.1 **8.F.A.2** - 8.5.7, 8.5.8 **8.F.A.3** - 8.5.4, 8.5.7, 8.5.8, 8.5.18 **8.F.B.4** - 8.5.8, 8.5.9, 8.5.10, 8.5.11 **8.F.B.5** - 8.5.5, 8.5.6, 8.5.10	40 days + Assessment days
Systems of Linear Relationships	8.EE.C.7, 8.EE.C.8, 8.F.A.2, 8.F.B.4	Unit 4, Unit 5	**8.EE.C.7** - 8.4.3, 8.4.4, 8.4.5, 8.4.6, 8.4.7, 8.4.8, 8.4.9 **8.EE.C.8** -8.3.13, 8.3.14, 8.4.9, 8.4.10, 8.4.11, 8.4.12, 8.4.13, 8.4.14, 8.4.15, 8.4.16 **8.F.A.2** - 8.5.7, 8.5.8 **8.F.B.4** - 8.5.8, 8.5.9, 8.5.10, 8.5.11	12 days + Assessment days

Volume	8.G.C.9	Unit 5	**8.G.C.9** - 8.5.13, 8.5.14, 8.5.15, 8.5.16, 8.5.17, 8.5.18, 8.5.19, 8.5.20, 8.5.21, 8.5.22	12 days + Assessment days
Patterns in Data	8.SP.A.1, 8.SP.A.2, 8.SP.A.3, 8.SP.A.4,	Unit 6	**8.SP.A.1** - 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.6.5, 8.6.6, 8.6.7, 8.6.8 **8.SP.A.2** - 8.6.4, 8.6.5, 8.6.6, 8.6.8 **8.SP.A.3** - 8.6.6, 8.6.8 **8.SP.A.4** - 8.6.9, 8.6.10	13 days + Assessment days

Scope and Sequence

If a district uses this resource to implement the state model curriculum for grade 8, the following scope and sequence should be followed to ensure alignment and attention to the progressions of mathematics.

Open Up Resources values the progression of content found within OUR Grades 6-8. Units and Lessons are intentionally crafted such that supporting work highlights and strengthens the major work of the grade. As such we find the best scope and sequence for our content is found within the course guide for each course on the OUR website as detailed below.

Students begin grade 8 with transformational geometry. They study rigid transformations and congruence, then dilations and similarity (this provides background for understanding the slope of a line in the coordinate plane). Next, they build on their understanding of proportional relationships from grade 7 to study linear relationships. They express linear relationships using equations, tables, and graphs, and make connections across these representations. They expand their ability to work with linear equations in one and two variables. Building on their understanding of a solution to an equation in one or two variables, they understand what is meant by a solution to a system of equations in two variables. They learn that linear relationships are an example of a special kind of relationship called a function. They apply their understanding of linear relationships and functions to contexts involving data with variability. They extend the definition of exponents to include all integers, and in the process codify the properties of exponents. They learn about orders of magnitude and scientific notation in order to represent and compute with very large and very small quantities. They encounter irrational numbers for the first time and informally extend the rational number system to the real number system, motivated by their work with the Pythagorean Theorem.

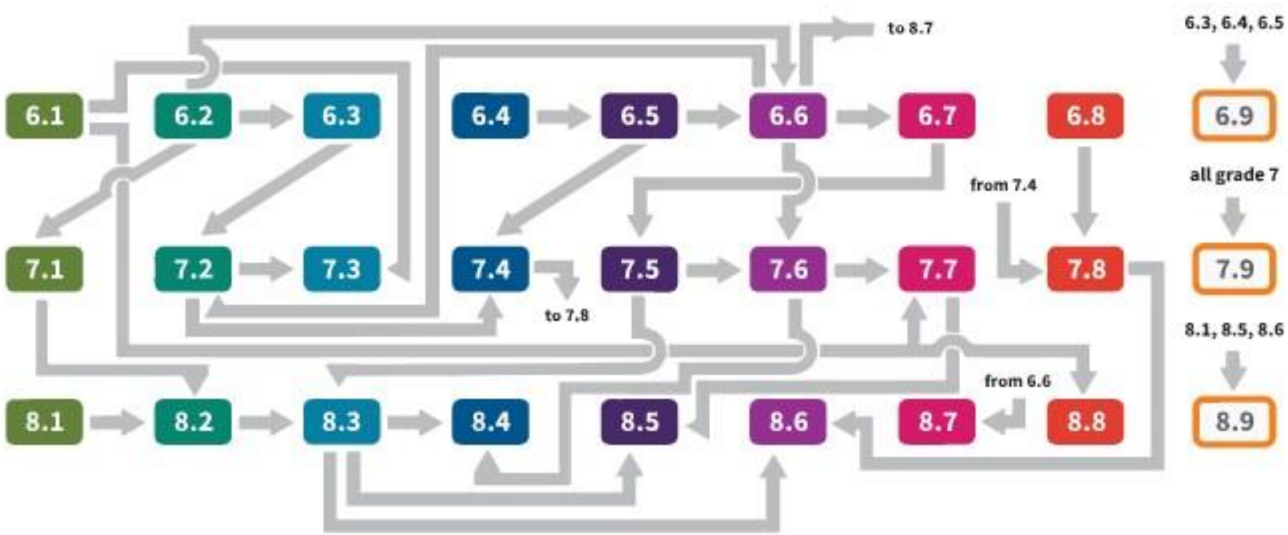
Curriculum Pacing Guide

week 1, week 2, week 3, week 4, week 5, week 6, week 7, week 8, week 9, week 10, week 11, week 12, week 13, week 14, week 15, week 16, week 17, week 18, week 19, week 20, week 21, week 22, week 23, week 24, week 25, week 26, week 27, week 28, week 29, week 30, week 31, week 32, week 33, week 34, week 35, week 36

Grade 6	Grade 7	Grade 8
Unit 1 Area and Surface Area (21-22 days)	Unit 1 Scale Drawings (13-15 days)	Unit 1 Rigid Transformations and Congruence (20 days)
Unit 2 Introducing Ratios (19 days)	Unit 2 Introducing Proportional Relationships (17 days)	Unit 2 Dilations, Similarity, and Introducing Slope (15 days)
Unit 3 Rates and Percentages (18-19 days)	Unit 3 Measuring Circles (11-13 days)	Unit 3 Linear Relationships (17 days)
Unit 4 Dividing Fractions (20 days)	Unit 4 Proportional Relationships and Percentages (17-19 days)	Unit 4 Linear Equations and Linear Systems (18 days)
Unit 5 Arithmetic in Base Ten (16-18 days)	Unit 5 Rational Number Arithmetic (19 days)	Unit 5 Functions and Volume (25 days)
Unit 6 Expressions and Equations (18-20 days)	Unit 6 Expressions, Equations, and Inequalities (25 days)	Unit 6 Associations in Data (12-13 days)
Unit 7 Rational Numbers (20 days)	Unit 7 Angles, Triangles, and Prisms (19 days)	Unit 7 Exponents and Scientific Notation (18 days)
Unit 8 Data Sets and Distributions (21 days)	Unit 8 Probability and Sampling (20-22 days)	Unit 8 Pythagorean Theorem and Irrational Numbers (17 days)
Unit 9 Putting It All Together (0-18 days)	Unit 9 Putting It All Together (0-13 days)	Unit 9 Putting It All Together (0-10 days)

The curriculum was designed in a manner such that concepts build and create a reliance between some units. The Unit Dependency Chart displays the relationship between and among units.

OPEN-UP resources



A more descriptive progression of learning including connections within and among units can be found in the Scope and Sequence tab of each course.
https://access.openupresources.org/curricula/our6-8math/en/grade-8/teacher_scope_and_sequence.html

Order	Unit Number/Title and Lessons	Lesson Objectives	# of days (assume 1 hour of instruction)	Number of weeks

Supports of Diversity, Equity and Inclusion
Please provide any information relative to supporting culturally responsive instruction, multi-language learners, and students with disabilities

Supporting English Language Learners

This curriculum builds on foundational principles for supporting language development for all students. The How to Use These Materials tab of the Course Guide aims to provide guidance to help teachers recognize and support students' language development in the context of mathematical sense-making. Embedded within the curriculum are instructional supports and practices to help teachers address the specialized academic language demands in math when planning and delivering lessons, including the demands of reading, writing, speaking, listening, conversing, and representing in math (Aguirre & Bunch, 2012). Therefore, while these instructional supports and practices can and should be used to support all students learning mathematics, they are particularly well-suited to meet the needs of linguistically and culturally diverse students who are learning mathematics while simultaneously acquiring English.

This table reflects the attention and support for language development at each level of the curriculum

course	• foundation of curriculum: theory of action and design principles that drive a continuous focus on language development • student glossary of terms
unit	• unit-specific progression of language development included in each unit overview
lesson	• language goals embedded in learning goals describe the language demands of the lesson • definitions of new glossary terms
activity	• additional supports for English language learners based on language demands of the activity • math language routines

Supporting Students with Disabilities

The philosophical stance that guided the creation of these materials is the belief that with proper structures, accommodations, and supports, all children can learn mathematics. Lessons are designed to maximize access for all students, and include additional suggested supports to meet the varying needs of individual students. While the suggested supports are designed for students with disabilities, they are also appropriate for many children who struggle to access rigorous, grade-level content. Teachers should use their professional judgment about which supports to use and when, based on their knowledge of the individual needs of students in their classroom.

Design Principles

These materials reflect three key design principles that support and engage all students in today's diverse mathematics classrooms. The design principles and related supports work together to make each activity in each lesson accessible to all students.

Principle 1: Access for All

This foundational design principle draws from the Universal Design for Learning (UDL) framework, and shapes the instructional goals, recommended practices, lesson plans, and assessments to support a flexible approach to instruction, ensuring all students have an equitable opportunity to learn. For more information about Universal Design for Learning, visit http://www.udlcenter.org.

Principle 2: Presume Competence

All students are individuals who can learn, apply, and enjoy mathematics. The activities in these materials position students to capitalize on their existing abilities, and provide supports that eliminate potential barriers to learning when they arise. Each lesson is designed for a wide range of abilities, and all students are given access to grade-level problems. Student competence to engage with mathematical tasks should be assumed, with additional supports provided only when needed.

Principle 3: Strengths-based approach

All students, including students with disabilities, are resourceful and resilient members of the mathematics community. When the unique strengths and interests of students with disabilities are highlighted during class discussions, their contributions enhance the learning of all students in the classroom.

Design Elements for All Students

Each lesson is carefully designed to maximize engagement and accessibility for all students. Purposeful design elements that support all learners, but that are especially helpful for students with disabilities include:

Lesson Structures are Consistent

The structure of every lesson is the same: warm-up, activities, synthesis, cool-down. By keeping the components of each lesson similar from day to day, the flow of work in class becomes predictable for students. This reduces cognitive demand and enables students to focus on the mathematics at hand rather than the mechanics of the lesson.

Concepts Develop from Concrete to Abstract

Mathematical concepts are introduced simply, concretely, and repeatedly, with complexity and abstraction developing over time. Students begin with concrete examples, and transition to diagrams and tables before relying exclusively on symbols to represent the mathematics they encounter.

Individual to Pair or Small Group to Whole Class Progression

Providing students with time to think through a situation or question independently before engaging with others allows students to carry the weight of learning, with supports arriving just in time from the community of learners. This progression allows students to first activate what they already know, and continue to build from this base with others.

Opportunities to Apply Mathematics to Real-World Contexts

Giving students opportunities to apply the mathematics they learn clarifies and deepens their understanding of core math concepts and skills and provides motivation and support. Mathematical modeling is a powerful activity for all students, but especially students with disabilities. Each unit has a culminating activity designed to explore, integrate, and apply all the big ideas of the unit. Centering instruction on these contextual situations can provide students with disabilities an anchor with which to base their mathematical understandings.

Supports for Students with Disabilities

The inclusion of additional supports for students with disabilities offers additional strategies for teachers to meet the individual needs of a diverse group of learners. Lesson and activity-level supports for students with disabilities are aligned to an area of cognitive functioning and are paired with a suggested strategy aimed to increase access and eliminate barriers. These lesson-specific supports help students succeed with a specific activity without reducing the mathematical demand of the task. All of the supports can be used discreetly and are designed to be used as needed. Many of these supports can be implemented throughout the academic year; for example, peer tutors can help build classroom culture, provide opportunities for teamwork, and build collaboration skills while also supporting those who struggle. Other supports should be faded out as students gain understanding and fluency with key ideas and procedures. Additional supports for students with disabilities are designed to address students' strengths and needs in the following areas of cognitive functioning, which are integral to learning mathematics (Addressing Accessibility project, Brodesky et al., 2002):

- Conceptual Processing includes perceptual reasoning, problem-solving, and metacognition.
- Expressive & Receptive Language includes auditory and visual language processing and expression.
- Visual-Spatial Processing includes processing visual information and understanding relation in space (e.g., visual mathematical representations and geometric concepts).
- Executive Functioning includes organizational skills, attention, and focus.
- Memory includes working memory and short-term memory.
- Social-Emotional Functioning includes interpersonal skills and the cognitive comfort and safety required in order to take risks and make mistakes.
- Fine-motor Skills include tasks that require small muscle movement and coordination such as manipulating objects (graphing, cutting, writing).

Suggestions for supports fall under the following categories:

Eliminate Barriers

Eliminate any barriers that students may encounter that prevent them from engaging with the important mathematical work of a lesson. This requires flexibility and attention to areas such as the physical environment of the classroom, access to tools, organization of lesson activities, and means of communication.

Processing Time

Increased time engaged in thinking and learning leads to mastery of grade-level content for all students, including students with disabilities. Frequent switching between topics creates confusion and does not allow for content to deeply embed in the mind of the learner. Mathematical ideas and representations are carefully introduced in the materials in a gradual, purposeful way to establish a base of conceptual understanding. Some students may need additional time, which should be provided as required.

Peer Tutors

Develop peer tutors to help struggling students access content and solve problems. This support keeps all students engaged in the material by helping students who struggle and deepening the understanding of both the tutor and the tutee. For students with disabilities, peer tutor relationships with non-disabled peers can help them develop authentic, age-appropriate communication skills, and allow them to rely on natural support while increasing independence.

Assistive Technology

Assistive technology can be a vital tool for students with learning disabilities, visual spatial needs, sensory integration, and students with autism. Assistive technology supports suggested in the materials are designed to either enhance or support learning, or to bypass unnecessary barriers. Physical manipulatives help students make connections between concrete ideas and abstract representations. Often, students with disabilities benefit from hands-on activities, which allow them to make sense of the problem at hand and communicate their own mathematical ideas and solutions.

Visual Aids

Visual aids such as images, diagrams, vocabulary anchor charts, color coding, or physical demonstrations, are suggested throughout the materials to support conceptual processing and language development. Many students with disabilities have working memory and processing challenges. Keeping visual aids visible on the board allows students to access them as needed so that they can solve problems independently. Leaving visual aids on the board especially benefits students who struggle with working or short-term memory issues.

Graphic Organizers

Word webs, Venn diagrams, tables, and other metacognitive visual supports provide structures that illustrate relationships between mathematical facts, concepts, words, or ideas. Graphic organizers can be used to support students with organizing thoughts and ideas, planning problem-solving approaches, visualizing ideas, sequencing information, or comparing and contrasting ideas.

Brain Breaks

Brain breaks are short, structured, 2–3 minute movement breaks taken in between activities, or to break up a longer activity (approximately every 20–30 minutes during a class period). Brain breaks are a quick, effective way of refocusing and re-energizing the physical and mental state of students during a lesson.

Brain breaks have also been shown to positively impact student concentration and stress levels, resulting in more time spent engaged in mathematical problem-solving. This universal support is beneficial for all students, but especially those with ADHD. **Extensions**

Are you ready for more?

Select classroom activities include an opportunity for differentiation for students ready for more of a challenge. Every extension problem is made available to all students with the heading "Are You Ready for More?" These problems go deeper into grade-level mathematics and often make connections between the topic at hand and other concepts at grade level or that are outside of the standard K-12 curriculum. They are not routine or procedural and intended to be used on an opt-in basis by students if they finish the main class activity early or want to do more mathematics on their own. It is not expected that an entire class engages in Are You Ready for More? problems and it is not expected that any student works on all of them. Are You Ready for More? problems may also be good fodder for a Problem of the Week or similar structure.

Culturally Responsive Instruction

As described by Zaretta Hammond, culturally responsive teaching is about "rebuilding trust with [students] through a learning partnership, and using that rapport and trust to get permission from students to push them into their zone of proximal development." Three strategies that Hammond suggests accomplish this are "gamifying, make it social, and storifying it".

One way that materials "gamify" instruction is by carefully selecting instructional routines. The following instructional routine exemplifies gamification in order to draw on students prior knowledge and frames of reference.

MLR4: Information Gap

Some activities are set up for students to have a dialogue in a specific way. In Info Gap, one student partner gets a question card with a math question that doesn't have enough given information, and the other partner gets a data card with information relevant to the problem on the question card. Students ask each other questions like "What information do you need?" and are expected to explain what they will do with the information. The first few times students engage in these activities, the teacher should demonstrate, with a partner, how the discussion is expected to go. Once students are familiar with these structures, less set-up will be necessary. While students are working, the teacher can ask students to restate their question more clearly or paraphrase what their partner said. This activity structure is designed to strengthen the opportunities and supports for high-quality mathematical conversations. Mathematical language is learned by using mathematical language for real and engaging purposes. These activities were designed such that students need to communicate in order to bridge information gaps. During effective discussions, students should be supported to do the following: pose and answer questions, clarify what is asked and happening in a problem, build common understandings, and share experiences relevant to the topic.

In order to make mathematics more social, Open Up Resources has been intentional about shifting from the traditional I do, we do, you do and instead has flipped the experience to be you do then we do, ending with the teacher and students stamping the learning. Changing this orientation allows students to come to conclusions for themselves and then build understanding with and from their peers. In addition, a few language and instructional routines also create a communal environment for learning. Stronger and Clearer Each Time has students think or write individually about a response, use a structured partner strategy with multiple opportunities to refine and clarify the response through conversation, and then finally revise their original written response. Collect and Display is another routine that stabilizes the fleeting language that students use during partner, small-group, or whole-class activities in order for a student's own output to be used as a reference in developing their mathematical language. The teacher listens for and scribes the student output using written words, diagrams, and pictures. This collected output can be organized, revoiced, or explicitly connected to other languages in a display for all students to use.

Each lesson in the materials presents real-world situations in problem-based tasks to provide a “story” based element to the content. In a problem-based curriculum, students work on carefully crafted and sequenced mathematics problems during most of the instructional time. Teachers help students understand the problems and guide discussions to ensure the mathematical takeaways are clear to all. Some concepts and procedures follow from definitions and prior knowledge so students can, with appropriately constructed problems, see this for themselves. In the process, they explain their ideas and reasoning and learn to communicate mathematical ideas. The goal is to give students just enough background and tools to solve initial problems successfully, and then set them to increasingly sophisticated problems as their expertise increases. However, not all mathematical knowledge can be discovered, so direct instruction is sometimes appropriate.

A problem-based approach may require a significant realignment of the way math class is understood by all stakeholders in a student’s education. Families, students, teachers, and administrators may need support making this shift. The materials are designed with these supports in mind. Family materials are included for each unit and assist with the big mathematical ideas within the unit. Lesson and activity narratives, Anticipated Misconceptions, and instructional supports provide professional learning opportunities for teachers and leaders.

The value of a problem-based approach is that students spend most of their time in math class doing mathematics: making sense of problems, estimating, trying different approaches, selecting and using appropriate tools, evaluating the reasonableness of their answers, interpreting the significance of their answers, noticing patterns and making generalizations, explaining their reasoning verbally and in writing, listening to the reasoning of others, and building their understanding. Mathematics is not a spectator sport.