

Conceptual Curriculum Map (CCM)

Content Area: Math
Grade Level: 9-12

Course: Geometry

Unit 1 Constructions and Rigid Transformations	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe -Constructions -Rigid Transformations -Evidence & Proof 9-10 Days	Experiment with transformations in the plane <ul style="list-style-type: none"> HSG.CO.A.1 HSG.CO.A.2 HSG.CO.A.5 Understand congruence in terms of rigid motions <ul style="list-style-type: none"> HSG.CO.B.6 Prove geometric theorems <ul style="list-style-type: none"> HSG.CO.C.9 HSG.CO.D.12 	In this unit, students first informally explore geometric properties using straightedge and compass constructions. Students then begin to use the rigorous definitions they developed to prove statements involving angles and distances. Students transition to more formal definitions that don't rely on the coordinate plane, and the focus shifts from transforming whole figures towards a more point-by-point analysis.	Proving statements in this unit prepares students for congruence proofs in the next unit. Students need to practice using precise mathematical language and justifying claims mathematically. This allows students to build conjectures and observations before formally defining rotations, reflections, and translations.
Unit 2 Congruency	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe -Congruent Triangles 12 Days	Understand congruence in terms of rigid motions HSG.CO.B.6 HSG.CO.B.7 HSG.CO.B.8 Prove geometric theorems HSG.CO.C.9 HSG.CO.C.10 HSG.CO.C.11	In this unit, students begin by reasoning about the relationships between congruent parts of figures, and congruent figures. Students use transformations to prove three theorems about triangle congruence: Side-Angle-Side Triangle Congruence, Angle-Side-Angle Triangle Congruence, and Side-Side-Side Triangle Congruence.	Students use transformations as tools for reasoning and generalizing. Students practice reasoning abstractly and quantitatively and constructing viable arguments. Applications of fractions are required for the next unit on Similarity. Prior knowledge

		Throughout this unit, we will re-activate prior knowledge of operations with fractions with spaced practice.	needs to be activated so that students can access the new geometry concepts.
Unit 3 Similarity	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe ... Properties of Dilations Similarity Transformations and Proportional Reasoning Similarity in Right Triangles 9 Days	Understand similarity in terms of similarity transformations HSG.SRT.A.1 HSG.SRT.A.2 HSG.SRT.A.3 Prove theorems involving similarity HSG.SRT.B.4 HSG.SRT.B.5	In this unit, students use dilations and rigid transformations to justify triangle similarity theorems including the Angle-Angle Triangle Similarity Theorem. Students explicitly build on their work with congruence and rigid motions, establishing that triangles are similar by dilating them strategically. The unit balances a focus on proof with a focus on using similar triangles to find unknown side lengths and angle measurements.	This unit previews many of the important concepts that students rely on to make sense of trigonometry in later units. The latter part of the unit focuses on similar right triangles. In addition, students are introduced to some of the applications of right triangles that they will explore in more depth in the trigonometry unit, such as finding the heights of objects through indirect measurement.
Unit 4 Right Triangle Trigonometry	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe Angles and Steepness Defining Trigonometric Ratios	Prove theorems involving similarity HSG.SRT.B.5 Define trigonometric ratios and solve problems involving right triangles HSG.SRT.C.6 HSG.SRT.C.7 HSG.SRT.C.8	In this unit students build an understanding of ratios in right triangles which leads to naming cosine, sine, and tangent as trigonometric ratios. Students examine special cases of similar right triangles to solidify the idea that any right triangles with a single congruent acute angle are similar.	Right Triangle Trigonometry is used in applications across multiple fields including architecture, construction, crime scene investigation, engineering, navigation and physics. Practicing without naming the ratios allows students to connect similarity, proportional

11 Days		<p>Students practice estimating both side lengths and angle measures using a table, and then they learn the names cosine, sine, and tangent.</p> <p>Students practice looking up the cosine, sine, or tangent of a given angle in a calculator with simple triangles, then they apply trigonometry to several contexts.</p>	<p>reasoning, and scale factors to right triangles with a congruent acute angle before the calculator takes over some of the computation.</p> <p>Students encounter several contexts to both make sense of and apply right triangle measurement.</p> <p>Special right triangles are an opportunity to practice, build on important ideas, and are frequently included on college entrance exams.</p>
Unit 5 Solid Geometry	Long-Term Outcomes/Transfer Goals <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe ... Scaling and Area Volume 8 Days	<p>Create equations that describe numbers or relationships. HSA-CED.A.2</p> <p>Interpret the structure of expressions. HSA-SSE.A.1.a HSA-SSE.A.1.b</p> <p>Explain volume formulas and use them to solve problems HSG.GMD.A.1 HSG.GMD.A.3</p> <p>Apply geometric concepts in modeling situations HSG-MG.A.1 HSG-MG.A.2 HSG-MG.A.3</p>	<p>In this unit, students practice spatial visualization in three dimensions, study the effect of dilation on area, and apply volume formulas to solve problems involving surface area to volume ratios, and density.</p>	<p>Students apply what they know about volume to solve real world scientific problems.</p> <p>They calculate densities and analyze surface area to volume ratios in chemistry and biology applications.</p>
Unit 6 Coordinate Geometry	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		

	Standards	Conceptual Overview	Rationale
Focus & Timeframe ... Transformations in the Plane Distances, Circles, and Parabolas Proving Geometric Theorems Algebraically 9 Days	Experiment with transformations in the plane HSG.CO.A.2 Use coordinates to prove simple geometric theorems algebraically HSG.GPE.B.4 HSG.GPE.B.5	Students encounter a new coordinate transformation notation such as $(x,7) \rightarrow (x+3, y+1)$. Then they use transformations and the Pythagorean Theorem to build equations of circles, parabolas, parallel lines, and perpendicular lines from definitions. Students apply these ideas to proofs, such as classifying quadrilaterals. Finally, students use weighted averages to partition segments, scale figures, and locate the intersection point of the medians of a triangle.	Coordinate Geometry provides a connection between algebra and geometry through graphs of lines and curves. This unit brings together students' experience from previous years with their new understanding from this course for an in-depth study of coordinate geometry. The new coordinate transformation notation connects transformations to functions. Students apply concepts of transformations and construct viable arguments in proofs.
Unit 7 Circles	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe ... Lines, Angles, and Circles Polygons and Circles Measuring Circles 9 Days	Understand and apply theorems about circles HSG.C.A.2 HSG.C.A.3 Find arc lengths and areas of sectors of circles HSG.C.C.5	In this unit, students analyze relationships between segments and angles in circles, which leads to the construction of inscribed and circumscribed circles of triangles. Students solve problems involving arc length and sector area, and they use the similarity of all circles and ideas of arc length to develop the concept of radian measure for angles.	Students apply properties of circles to real world applications. Students learn radian measure as it is needed for higher level math courses, and it is important for the transition towards trigonometric functions.
Unit 8 Trigonometric Functions	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		

	Standards	Conceptual Overview	Rationale
Focus & Timeframe ... Unit Circle Periodic Functions Trigonometry Transformations 12 days	Analyze functions using different representations. HSF.IF.C.7 HSF.IF.C.7.E Extend the domain of trigonometric functions using the unit circle. HSF.TF.A.2 Model periodic phenomena with trigonometric functions. HSF.TF.B.5 Prove and apply trigonometric identities. HSF.TF.C.8	<p>In this unit, students are introduced to trigonometric functions. While they have studied a variety of function types with different key features previously, this is the first time students are asked to consider periodic functions, that is, functions whose output values repeat at regular intervals.</p> <p>Students first consider circular motion and learn to use right triangle trigonometry to identify the coordinates of a point on a circle.</p> <p>The unit circle is introduced, and students study the symmetry of its coordinates and reason about radian angles knowing a full circle has an angle of 2π.</p> <p>From the unit circle, the domain of cosine, sine, and tangent are expanded and students begin to think about them as functions.</p> <p>Students graph these functions using their knowledge of the unit circle and expand the domain of the functions a second time to angles beyond 2π and less than 0.</p>	Students apply their knowledge of transformations to trigonometric functions and use these functions to model periodic situations.
Unit 9 Trigonometric Extensions	Long-Term Outcomes/Transfer Goals: <ul style="list-style-type: none"> Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. 		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe ... Reciprocal Functions Law of Sines/Cosines	Extend the domain of trigonometric functions using the unit circle. HSF.TF.A.2 Apply trigonometry to general triangles HSG.SRT.D.10 HSG.SRT.D.11	<p>In this unit students will apply their knowledge of sine, cosine and tangent to the reciprocal functions, secant, cosecant and cotangent.</p> <p>Students will solve for missing sides and angles of non-right triangles with the law of sines and law of cosines.</p>	<p>Reciprocal trigonometric functions are used to simplify equations.</p> <p>Students need to understand that the methods for solving right triangles are not appropriate for non-right triangles and that the law of sines and law of cosines must</p>

4 days			be used for those situations.
Midterm	Performance task: NASA task		