

Congruence, Proof, and Constructions

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
Grade Level Summary	The purpose of the course is to formalize, deepen and extend students' geometric and algebraic experiences. Students will continue their work with similarity and congruence. Students explore more complex geometric concepts, and relationships, including: formal mathematical arguments, transformations, the coordinate system, right triangle trigonometry, circles and probability.				
Module Title	Module 1: Congruence, Proof, and Constructions				
Module Overview	<p>In this module, students will formalize, deepen, and extend their experience with rigid transformations and use these to develop notions about what it means for two objects to be congruent. Students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proofs. Students prove theorems—using a variety of formats. They apply reasoning to complete geometric constructions and explain why they work.</p> <p>Focus Standards:</p> <p>CC.2.3.HS.A.1 Use geometric figures and their properties to represent transformations in the plane.</p> <p>CC.2.3.HS.A.2 Apply rigid transformations to determine and explain congruence.</p> <p>CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.</p> <p>CC.2.3.HS.A.4 Apply the concept of congruence to create geometric constructions.</p>				
Transformations	In this lesson, you will experiment with transformations in the plane.	LEARN how definitions and representations are different from one another.		<a href="https://learnzillion.com/lesson_plans/6488-realize-that-definitions-and-representations-can-be-distinct">https://learnzillion.com/lesson_plans/6488-realize-that-definitions-and-representations-can-be-distinct</a>	
		LEARN about the importance of precise definitions of terms.		<a href="https://learnzillion.com/lesson_plans/6164-understand-the-importance-of-precise-definitions">https://learnzillion.com/lesson_plans/6164-understand-the-importance-of-precise-definitions</a>	
		LEARN why certain terms in geometry are "undefined".		<a href="https://learnzillion.com/lesson_plans/6215-understand-why-point-and-line-are-undefinable-terms">https://learnzillion.com/lesson_plans/6215-understand-why-point-and-line-are-undefinable-terms</a>	
		LEARN how to define geometric terms precisely.		<a href="https://learnzillion.com/lesson_plans/6595-define-geometric-terms-precisely">https://learnzillion.com/lesson_plans/6595-define-geometric-terms-precisely</a>	
		LEARN about and view each of the rigid transformations in the coordinate plane.		<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/introduction-to-transformations">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/introduction-to-transformations</a>	
		MANIPULATE figures in a plane in order to see translations, rotations, dilations, and reflections.	Follow the directions on each of the webpages to experiment with the types of transformations.	<a href="http://www.mathopenref.com/tocs/transformstoc.html">http://www.mathopenref.com/tocs/transformstoc.html</a>	

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
		LEARN ABOUT and EXPERIMENT with translations and the notation for translations in the coordinate plane.		<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/a/intro-to-translations">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/a/intro-to-translations</a>	
				<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/a/properties-of-translations">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/a/properties-of-translations</a>	
		LEARN ABOUT and EXPERIMENT with rotations in the coordinate plane.		<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/using-rotation-widget">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/using-rotation-widget</a>	
				<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/a/intro-to-rotations">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/a/intro-to-rotations</a>	
		LEARN ABOUT and EXPERIMENT with reflections in the coordinate plane.		<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/using-reflection-tool">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/using-reflection-tool</a>	
				<a href="https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/e/performing-reflections-on-the-coordinate-plane">https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/e/performing-reflections-on-the-coordinate-plane</a>	

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
		<p>FIND GENERALIZATIONS about the transformation of reflections, translations, and rotations through experimentation with the Transformations Manipulative app.</p>	<p>Drag a shape from the dock of the app and choose a transformation type (reflection, rotation, or translation) from the bottom right. Experiment by dragging points or lines on the plane. Record the coordinates for the pre-image and the image. Import a screenshot into the Explain Everything App. Repeat this with another shape but the same transformation type. After you have done this a few times, tell about what you notice or what generalizations you can make for that transformation type. Repeat the same steps for new transformation type.</p>	<p><a href="https://itunes.apple.com/us/app/transformations-manipulative/id1049393987?mt=8">https://itunes.apple.com/us/app/transformations-manipulative/id1049393987?mt=8</a></p>	<p><a href="https://www.mathplayground.com/TransformationWorkshop/Workshop.html">https://www.mathplayground.com/TransformationWorkshop/Workshop.html</a></p>
				<p><a href="https://itunes.apple.com/us/app/explain-everything-interactive/id431493086?mt=8">https://itunes.apple.com/us/app/explain-everything-interactive/id431493086?mt=8</a></p>	
		<p>EXPERIMENT with compositions of transformations.</p>	<p>Use the Transformations Manipulative App again, but this time experiment with Compositions of transformations. Pick a shape. Use the tools at the bottom of the screen to translate, reflect, and/or rotate a shape. Then combine that with another transformation. Experiment by dragging points or lines on the plane. Notice what happens to each of the images. Repeat this with another shape and another combination of transformations. Import one of your screens into the Explain Everything App. Record your observations about how composing transformations effects the images.</p>	<p><a href="https://itunes.apple.com/us/app/transformations-manipulative/id1049393987?mt=8">https://itunes.apple.com/us/app/transformations-manipulative/id1049393987?mt=8</a></p>	<p><a href="https://www.mathplayground.com/TransformationWorkshop/Workshop.html">https://www.mathplayground.com/TransformationWorkshop/Workshop.html</a></p>

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
		PERFORM a composition of transformations.	Now that you have experimented with compositions of transformations, try the following challenge: 1. Start with a rectangle, parallelogram, trapezoid, or another regular polygon. 2. use a combination of reflections and/or rotations to map the figure directly onto itself. (The pre-image and final image should be indistinguishable.) 3. Is there one rotation that will do this? 4. Is there a set of two reflections that will do this? Import one of your mappings into Explain Everything and record the series of steps needed to map the figure onto itself.	<a href="https://itunes.apple.com/us/app/explain-everything-interactive/id431493086?mt=8">https://itunes.apple.com/us/app/explain-everything-interactive/id431493086?mt=8</a>	
		MAP a geometric figure to a different location in the plane using a transformation.	Use the options in the Transformations App to map given figures to new locations in the plane. Make sure to try at least 6-8 questions with each of the transformation types, so you see a variety of questions.	<a href="https://itunes.apple.com/us/app/transformations/id576236897?mt=8">https://itunes.apple.com/us/app/transformations/id576236897?mt=8</a>	<a href="https://play.google.com/store/apps/details?id=air.uk.co.feemaths.transformations&amp;hl=en">https://play.google.com/store/apps/details?id=air.uk.co.feemaths.transformations&amp;hl=en</a>
Congruence Through Rigid Transformations	In this lesson, you will understand congruence in terms of rigid transformations.	EXPERIMENT WITH the tools provided at the website to determine if two geometric figures are congruent.	If two figures are congruent, then you will be able to move or map one directly onto the other by using a series of rigid transformations (reflections, rotations, and translations). Use the tools at this website, to determine if the given figures are congruent to one another.	<a href="https://www.khanacademy.org/math/geometry/congruence/transformations-congruence/e/exploring-rigid-transformations-and-congruence">https://www.khanacademy.org/math/geometry/congruence/transformations-congruence/e/exploring-rigid-transformations-and-congruence</a>	

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
		TRANSFORM figures in these two separate tasks to find patterns.	There is some new notation used for reflections in these tasks the "r" means to reflect and the script letter enclosed in parentheses is the line over which the figure is supposed to be reflected. Print the tasks about reflecting hexagons and octagons. Perform the reflections in the directions and notice some things about the resulting shape patterns. What generalizations can you make?	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/419/original/student_task_1338.pdf?1462402942">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/419/original/student_task_1338.pdf?1462402942</a>	
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/418/original/student_task_1337.pdf?1462402935">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/418/original/student_task_1337.pdf?1462402935</a>	
		MAP one figure onto another.		<a href="https://www.khanacademy.org/math/geometry/congruence/transformations-congruence/e/defining-congruence-through-rigid-transformations">https://www.khanacademy.org/math/geometry/congruence/transformations-congruence/e/defining-congruence-through-rigid-transformations</a>	
				<a href="http://www.mathplayground.com/ShapeMods/ShapeMods.html">http://www.mathplayground.com/ShapeMods/ShapeMods.html</a>	
Prove Geometric Theorems	In this lesson, you will prove geometric theorems.	INVESTIGATE the properties that make triangles congruent.	Work through each section of the applet answering the questions as you go.	<a href="https://www.geogebra.org/m/g4MVuP5N">https://www.geogebra.org/m/g4MVuP5N</a>	
		VERIFY the triangle congruence postulates.	Read through the page of triangle congruence postulates. Determine if they verify what you found through the previous investigation.	<a href="http://www.mathsisfun.com/geometry/triangles-congruent-finding.html">http://www.mathsisfun.com/geometry/triangles-congruent-finding.html</a>	
		PRACTICE determining triangle congruence.	Import and solve the tasks in Explain Everything.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/666/original/student_task_33.pdf?1462398387">http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/666/original/student_task_33.pdf?1462398387</a>	

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/851/original/student_task_340.pdf?1462399483">http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/851/original/student_task_340.pdf?1462399483</a>	
Geometric Construction	In this lesson, you will make geometric constructions.	LEARN about and PRACTICE line constructions	Click on the Line option. Watch the demonstration for each option and then practice it.	<a href="https://itunes.apple.com/us/app/geometry-constructions-tutor/id658504973?mt=8">https://itunes.apple.com/us/app/geometry-constructions-tutor/id658504973?mt=8</a>	<a href="https://play.google.com/store/apps/details?id=air.rulercompass&amp;hl=en">https://play.google.com/store/apps/details?id=air.rulercompass&amp;hl=en</a> - Explore how to use the tools and watch how to do basic constructions

Similarity, Proof, and Trigonometry

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
Grade Level Summary	The purpose of the course is to formalize, deepen and extend students' geometric and algebraic experiences. Students will continue their work with similarity and congruence. Students explore more complex geometric concepts, and relationships, including: formal mathematical arguments, transformations, the coordinate system, right triangle trigonometry, circles and probability.				
Module Title	Module 2: Similarity, Proof, and Trigonometry				
Module Overview	Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. Students apply geometric concepts including: shapes, their measure, properties, and volume in describing objects and modeling situations. They identify criteria for similarity of triangles, use similarity to solve problems, and apply similarity in right triangles to understand right triangle trigonometry, with particular attention to special right triangles and the Pythagorean Theorem.  CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures. CC.2.3.HS.A.6 Verify and apply theorems involving similarity as they relate to plane figures. CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.				
Similarity Transformations	In this lesson, you will understand similarity in terms of similarity transformations.	LEARN about similarity of triangles and PRACTICE creating similar figures through transformations.	Read and engage in all activities in chapter 3: What make two figures similar?	<a href="https://itunes.apple.com/us/book/similarity/id879835608?mt=11">https://itunes.apple.com/us/book/similarity/id879835608?mt=11</a>	<a href="https://www.khanacademy.org/math/geometry/hs-geo-similarity/hs-geo-similarity-definitions/v/testing-similarity-through-transformations">https://www.khanacademy.org/math/geometry/hs-geo-similarity/hs-geo-similarity-definitions/v/testing-similarity-through-transformations</a> - Work through all videos and practice exercises
		LEARN how dilations relate to similarity.	Read and engage in all activities in chapter 7: Dilations and Similarity.	<a href="https://itunes.apple.com/us/book/similarity/id879835608?mt=11">https://itunes.apple.com/us/book/similarity/id879835608?mt=11</a>	
		DETERMINE if two triangles are similar using transformations.	Import the task into Explain Everything and solve them.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/033/original/student_task_603.pdf?1462400580">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/033/original/student_task_603.pdf?1462400580</a>	
Theorems Involving Similarity	In this lesson, you will prove theorems involving similarity.	LEARN about theorems for similarity.	Read and engage in all activities in chapter 4: Triangle Similarity Theorems.	<a href="https://itunes.apple.com/us/book/similarity/id879835608?mt=11">https://itunes.apple.com/us/book/similarity/id879835608?mt=11</a>	<a href="https://www.khanacademy.org/math/geometry/hs-geo-similarity/hs-geo-triangle-similarity-intro/v/similar-triangle-basics">https://www.khanacademy.org/math/geometry/hs-geo-similarity/hs-geo-triangle-similarity-intro/v/similar-triangle-basics</a> - Work through all videos and practice exercises
		EXPERIMENT with an online applet to prove Angle-Angle Similarity.		<a href="https://www.geogebra.org/student/mdYDd4ybH">https://www.geogebra.org/student/mdYDd4ybH</a>	
Similar Triangles	In this lesson, you will identify similar triangles and use their properties to SOLVE problems.	PROVE triangles are similar.	Import the task into Explain Everything and solve them.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/299/original/student_task_1095.pdf?1462402190">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/299/original/student_task_1095.pdf?1462402190</a>	

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
		PROVE the Pythagorean Theorem using similar triangles.	Import the task into Explain Everything and solve them.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/537/original/student_task_1568.pdf?1462403672">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/537/original/student_task_1568.pdf?1462403672</a>	
		APPLY understanding of similarity and congruence to solve a real world problem.	Import the task into explain everything and solve it.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/075/original/student_task_651.pdf?1462400833">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/075/original/student_task_651.pdf?1462400833</a>	
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/540/original/student_task_1572.pdf?1462403690">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/540/original/student_task_1572.pdf?1462403690</a>	
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/196/original/student_task_916.pdf?1462401561">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/196/original/student_task_916.pdf?1462401561</a>	
Trigonometric Ratios	In this lesson, you will define trigonometric ratios and solve problems involving right triangles.	DERIVE the trigonometric ratios through use of similar triangles.	Import the task into explain everything and solve it.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/566/original/student_task_1635.pdf?1462403844">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/566/original/student_task_1635.pdf?1462403844</a>	
		VERIFY how the trigonometric ratios are derived from triangles similarity considerations.		<a href="https://www.khanacademy.org/math/geometry-home/geometry/right-triangles-topic/trig-ratios-similarity-geo/v/similarity-to-define-sine-cosine-and-tangent">https://www.khanacademy.org/math/geometry-home/geometry/right-triangles-topic/trig-ratios-similarity-geo/v/similarity-to-define-sine-cosine-and-tangent</a>	
		REVIEW the Pythagorean Theorem.	Engage in all components of the app.	<a href="https://www.brainingcamp.com/content/pythagorean-theorem/">https://www.brainingcamp.com/content/pythagorean-theorem/</a>	
		SOLVE problems involving right triangles.	Import the tasks in Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/251/original/student_task_1002.pdf?1462401890">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/251/original/student_task_1002.pdf?1462401890</a>	
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/414/original/student_task_1322.pdf?1462402911">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/414/original/student_task_1322.pdf?1462402911</a>	
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/414/original/student_task_1322.pdf?1462402911">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/414/original/student_task_1322.pdf?1462402911</a>	



Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
Modeling Situations	In this lesson, you will apply geometric concepts in modeling situations.	MODEL the mathematical situations using geometry.	Import the tasks in Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/569/original/student_task_1638.pdf?1462403861">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/569/original/student_task_1638.pdf?1462403861</a>	
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/410/original/student_task_1316.pdf?1462402887">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/410/original/student_task_1316.pdf?1462402887</a>	

Extending to Three Dimensions

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL
Grade Level Summary	The purpose of the course is to formalize, deepen and extend students' geometric and algebraic experiences. Students will continue their work with similarity and congruence. Students explore more complex geometric concepts, and relationships, including: formal mathematical arguments, transformations, the coordinate system, right triangle trigonometry, circles and probability.			
Module Title	Module 3: Extending to Three Dimensions			
Module Overview	Students will use their experience with two-dimensional objects(formulas for circumference and area) to create an understanding of three-dimensional objects, to include the derivation of volume and surface area formulas. In this module, dimensional analysis of volume and surface area when affected by a scale factor is also included. Students develop the concept of how cross sections of three-dimensional objects are related to two-dimensional objects. Additionally, students apply their knowledge of three-dimensional objects to model real-world situations.			
	CC.2.3.HS.A.12 Explain volume formulas and use them to solve problems.			
	CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.			
	CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.			
Volume	In this lesson, you will explain volume formulas and use them to solve problems.	EXPLAIN the formula for area of a circle.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/536/original/student_task_1567.pdf?1462403666">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/536/original/student_task_1567.pdf?1462403666</a>
		EXPLAIN the formula for circumference of a circle.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/535/original/student_task_1565.pdf?1462403660">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/535/original/student_task_1565.pdf?1462403660</a>
		EXPLAIN the formulas for volumes of prisms		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/679/original/student_task_1918.pdf?1462404532">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/679/original/student_task_1918.pdf?1462404532</a>
		EXPLAIN the formulas for volume of special pyramids		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/681/original/student_task_1920.pdf?1462404544">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/681/original/student_task_1920.pdf?1462404544</a>
		UNDERSTAND the formula for the volume of a sphere		<a href="https://www.geogebra.org/m/a9jQQFz?doneurl=%2Fsearch%2Fperform%2Fsearch%2Fvolume%2Fmaterials%2F%2Fagefrom%2F10%2Fageto%2F19">https://www.geogebra.org/m/a9jQQFz?doneurl=%2Fsearch%2Fperform%2Fsearch%2Fvolume%2Fmaterials%2F%2Fagefrom%2F10%2Fageto%2F19</a>
		SOLVE a problem involving volume.		<a href="http://map.mathshell.org/download.php?fileid=756">http://map.mathshell.org/download.php?fileid=756</a>
		SOLVE a problem involving volume.		<a href="http://map.mathshell.org/download.php?fileid=770">http://map.mathshell.org/download.php?fileid=770</a>
		SOLVE a problem involving volume.		<a href="http://map.mathshell.org/download.php?fileid=828">http://map.mathshell.org/download.php?fileid=828</a>
		SOLVE a problem involving volume.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/970/original/student_task_514.pdf?1462400200">http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/970/original/student_task_514.pdf?1462400200</a>

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL
		SOLVE a problem involving volume.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/976/original/student_task_527.pdf?1462400236">http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/976/original/student_task_527.pdf?1462400236</a>
		SOLVE a problem involving volume.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/664/original/student_task_1899.pdf?1462404433">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/664/original/student_task_1899.pdf?1462404433</a>
		SOLVE a problem involving volume.		<a href="https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/3/tasks/1688">https://www.illustrativemathematics.org/content-standards/HSG/GMD/A/3/tasks/1688</a>
Relationships Between 2D and 3D Objects	In this lesson, you will visualize and analyze relationships between 2D and 3D objects.	VISUALIZE relationships between 2D and 3D figures		<a href="https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/v/vertical-slice-of-rectangular-pyramid">https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/v/vertical-slice-of-rectangular-pyramid</a>
				<a href="https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/v/ways-to-cut-a-cube">https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/v/ways-to-cut-a-cube</a>
		PRACTICE finding the cross section of 3D objects		<a href="https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/e/slicing-3d-figures">https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/e/slicing-3d-figures</a>
				<a href="https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/e/cross-sections-of-3d-shapes">https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/e/cross-sections-of-3d-shapes</a>
		VISUALIZE relationships between 2D and 3D figures	Download a copy of the sheet entitled "Cross Section Flyer Exploration Questions" from the Learner tab and import into Explain Everything. Use the Cross Section Flyer Activity applet to complete the worksheet	<a href="http://www.shodor.org/interactivate/activities/CrossSectionFlyer/">http://www.shodor.org/interactivate/activities/CrossSectionFlyer/</a>
		PRACTICE finding the cross section of 3D objects		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/969/original/student_task_512.pdf?1462400194">http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/969/original/student_task_512.pdf?1462400194</a>
		APPLY your learning to a real world situation about 3D printing	Import the handout into Explain Everything to complete	3D printing packet

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL
		VISUALIZE forming a 3D shape from rotating a 2D shape		<a href="https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/v/rotating-2d-shapes-in-3d">https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/v/rotating-2d-shapes-in-3d</a>
		PRACTICE forming a 3D shape from rotating a 2D shape		<a href="https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/e/rotate-2d-shapes-to-make-3d-objects">https://www.khanacademy.org/math/geometry/basic-geometry/cross-sections/e/rotate-2d-shapes-to-make-3d-objects</a>

Connecting Algebra and Geometry Through Coordinates

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
Grade Level Summary	The purpose of the course is to formalize, deepen and extend students' geometric and algebraic experiences. Students will continue their work with similarity and congruence. Students explore more complex geometric concepts, and relationships, including: formal mathematical arguments, transformations, the coordinate system, right triangle trigonometry, circles and probability.				
Module Title	Module 4: Connecting Algebra and Geometry Through Coordinates				
Module Overview	Students use the concepts of slope, midpoint, and distance to prove geometric relationships on the coordinate plane. Students continue their study of quadratics by connecting the geometric and algebraic definitions of the parabola.				
	CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.				
Prove Geometric Theorems Algebraically	In this lesson, you will use coordinates to prove simple geometric theorems algebraically	LEARN about finding the midpoint of a line segment.		<a href="https://www.khanacademy.org/math/geometry/analytic-geometry-topic/distance-and-midpoints/v/midpoint-formula">https://www.khanacademy.org/math/geometry/analytic-geometry-topic/distance-and-midpoints/v/midpoint-formula</a>	
		PRACTICE finding the midpoint of a line segment.		<a href="https://www.khanacademy.org/math/geometry/analytic-geometry-topic/distance-and-midpoints/e/midpoint_formula">https://www.khanacademy.org/math/geometry/analytic-geometry-topic/distance-and-midpoints/e/midpoint_formula</a>	
		DERIVE the midpoint formula.		<a href="https://www.khanacademy.org/math/geometry/analytic-geometry-topic/distance-and-midpoints/e/midpoint_formula">https://www.khanacademy.org/math/geometry/analytic-geometry-topic/distance-and-midpoints/e/midpoint_formula</a>	
		PROVE a conjecture about a quadrilateral using the Geogebra app	Follow the task directions using the Geogebra app	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/035/original/student_task_605.pdf?1462400592">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/035/original/student_task_605.pdf?1462400592</a>	
				Geogebra app	<a href="https://www.geogebra.org">https://www.geogebra.org</a>
		LEARN about parallel and perpendicular lines.		<a href="https://www.khanacademy.org/math/geometry/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/v/parallel-and-perpendicular-lines-intro">https://www.khanacademy.org/math/geometry/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/v/parallel-and-perpendicular-lines-intro</a>	
		LEARN about parallel and perpendicular lines in a coordinate plane.		<a href="https://www.khanacademy.org/math/geometry/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/v/classify-lines">https://www.khanacademy.org/math/geometry/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/v/classify-lines</a>	

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL	Alternative to IOS or Notes
		SOLVE problems about parallel and perpendicular lines.		<a href="https://www.khanacademy.org/math/geometry/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/e/classifying-lines-as-parallel--perpendicular--or-neither">https://www.khanacademy.org/math/geometry/analytic-geometry-topic/parallel-perpendicular-lines-coordinate-plane/e/classifying-lines-as-parallel--perpendicular--or-neither</a>	
		PROVE a figure in a coordinate plane is a square.		<a href="http://map.mathshell.org/download.php?fileid=792">http://map.mathshell.org/download.php?fileid=792</a>	
		DETERMINE the appropriate theorems necessary to solve this task.	Follow the task directions using the Geogebra app	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/427/original/student_task_1347.pdf?1462402991">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/427/original/student_task_1347.pdf?1462402991</a>	
				Geogebra app	<a href="https://www.geogebra.org">https://www.geogebra.org</a>
		DETERMINE the appropriate theorems necessary to solve this task.	Follow the task directions using the Geogebra app	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/428/original/student_task_1348.pdf?1462402997">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/428/original/student_task_1348.pdf?1462402997</a>	
				Geogebra app	<a href="https://www.geogebra.org">https://www.geogebra.org</a>
		PROVE similarity and perpendicularity using given information.	Import the task into Explain Everything to demonstrate your solution.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/651/original/student_task_1876.pdf?1462404353">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/651/original/student_task_1876.pdf?1462404353</a>	
				Explain Everything app	
		PROVE lines are parallel if and only if they have the same slope.	Import the task into Explain Everything to demonstrate your solution.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/652/original/student_task_1880.pdf?1462404358">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/652/original/student_task_1880.pdf?1462404358</a>	
				Explain Everything app	
		FIND missing coordinates within similar triangles.	Import the task into Explain Everything to demonstrate your solution.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/586/original/student_task_1685.pdf?1462403963">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/586/original/student_task_1685.pdf?1462403963</a>	
				Explain Everything app	
		DETERMINE coordinates of a triangle after a dilation and compare the image to the original figure.	Use Geogebra to recreate and solve the task.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/644/original/student_task_1867.pdf?1462404310">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/644/original/student_task_1867.pdf?1462404310</a>	
				Geogebra app	<a href="https://www.geogebra.org">https://www.geogebra.org</a>

## Circles with and without coordinates

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL
Grade Level Summary	The purpose of the course is to formalize, deepen and extend students' geometric and algebraic experiences. Students will continue their work with similarity and congruence. Students explore more complex geometric concepts, and relationships, including: formal mathematical arguments, transformations, the coordinate system, right triangle trigonometry, circles and probability.			
Module Title	Module 5: Circles with and without coordinates			
Module Overview	<p>In this module, students prove basic theorems about circles. Students study relationships among segments on chords, secants, and tangents as an application of similarity. In the Cartesian coordinate system, students use the distance formula to write and graph the equation of a circle when given the radius and the coordinates of its center. Students apply techniques for solving quadratic equations, relating back to work done in Algebra, to determine intersections between lines and circles or parabolas and between two circles.</p> <p>CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.</p> <p>CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.</p> <p>CC.2.3.HS.A.10 Translate between the geometric description and the equation for a conic section.</p> <p>CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.</p> <p>CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.</p>			
Theorems About Circles	In this lesson, you will understand and apply theorems about circles	PROVE that all circles are similar using an online interactive applet.		<a href="http://www.geogebra.org/student/mBEJMyM8q">www.geogebra.org/student/mBEJMyM8q</a>
		PROVE that all circles are similar by hand.	Import the task into Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/437/original/student_task_1368.pdf?1462403069">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/437/original/student_task_1368.pdf?1462403069</a>
		LEARN about inscribed and central angles.		<a href="https://m.youtube.com/watch?v=MyzGVbCHh5M">https://m.youtube.com/watch?v=MyzGVbCHh5M</a>
		PROVE Thales Theorem.	Use Explain Everything to answer the questions from the applet.	<a href="https://www.geogebra.org/m/JhKWzRJB">https://www.geogebra.org/m/JhKWzRJB</a>
		PROVE the converse of Thales Theorem.	Look at the bottom applet. Import the proof into Explain Everything to complete it.	<a href="http://www.cut-the-knot.org/Curriculum/Geometry/GeoGebra/ThalesTheorem.shtml">http://www.cut-the-knot.org/Curriculum/Geometry/GeoGebra/ThalesTheorem.shtml</a>
		APPLY knowledge of circle theorems to solve a task with circles inscribed in triangles.	Import the task into Explain Everything and solve.	<a href="http://map.mathshell.org/download.php?fileid=764">http://map.mathshell.org/download.php?fileid=764</a>
		APPLY your knowledge of volume, Pythagorean theorem, and circles to solve a real world problem.	Import the task into Explain Everything and solve.	<a href="http://map.mathshell.org/download.php?fileid=774">http://map.mathshell.org/download.php?fileid=774</a>
Arc Lengths and Area of Sectors of Circles	In this lesson, you will find arc lengths and area of sectors of circles	EXPLORE arc measures and solve problems about it.	Watch the videos and engage in the activities.	<a href="https://www.khanacademy.org/math/geometry-home/geometry/cc-geometry-circles/arc-measures/v/intro-arc-measure">https://www.khanacademy.org/math/geometry-home/geometry/cc-geometry-circles/arc-measures/v/intro-arc-measure</a>
		RELATE the arc length to the circumference of the circle and the central angle.	Watch the first two videos and complete the first set of exercises.	<a href="https://www.khanacademy.org/math/geometry-home/geometry/cc-geometry-circles/central-angles-and-arc-length-in-degrees/v/length-of-an-arc-that-subtends-a-central-angle">https://www.khanacademy.org/math/geometry-home/geometry/cc-geometry-circles/central-angles-and-arc-length-in-degrees/v/length-of-an-arc-that-subtends-a-central-angle</a>

Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL
		APPLY finding arc length to a real world situation	Import the task into Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/570/original/student_task_1639.pdf?1462403867">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/570/original/student_task_1639.pdf?1462403867</a>
		APPLY finding arc length to a real world situations	Import the task into Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/048/original/student_task_621.pdf?1462400670">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/048/original/student_task_621.pdf?1462400670</a>
		LEARN about and CALCULATE the area of a sector.	Watch the video and engage in the activity.	<a href="https://www.khanacademy.org/math/geometry-home/geometry/cc-geometry-circles/circles/v/area-of-a-sector-given-a-central-angle">https://www.khanacademy.org/math/geometry-home/geometry/cc-geometry-circles/circles/v/area-of-a-sector-given-a-central-angle</a>
Conic Sections	In this lesson, you will translate between the geometric description and the equation for a conic section	LEARN what a conic section is.		<a href="https://www.khanacademy.org/math/precalculus/conics-precalc/conic-section-intro/v/introduction-to-conic-sections">https://www.khanacademy.org/math/precalculus/conics-precalc/conic-section-intro/v/introduction-to-conic-sections</a>
		DERIVE the equation of a circle using the Pythagorean Theorem.	Import the task into Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/461/original/student_task_1425.pdf?1462403215">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/461/original/student_task_1425.pdf?1462403215</a>
		DERIVE the equation of a parabola given a focus and directrix.	Import the task into Explain Everything and solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/531/original/student_task_1561.pdf?1462403637">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/531/original/student_task_1561.pdf?1462403637</a>
Prove Geometric Theorems Algebraically	In this lesson, you will use coordinates to prove simple geometric theorems algebraically	PROVE the slopes of perpendicular lines are opposite reciprocals.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/646/original/student_task_1871.pdf?1462404322">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/646/original/student_task_1871.pdf?1462404322</a>
		PROVE that a theorem about triangles inscribed in circles.		<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/416/original/student_task_1332.pdf?1462402923">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/416/original/student_task_1332.pdf?1462402923</a>
Modeling Situations	In this lesson, you will apply geometric concepts in modeling situations	MODEL a geometric situation using mathematical representations.	Import each task into Explain Everything to solve.	<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/914/original/student_task_415.pdf?1462399861">http://s3.amazonaws.com/illustrativemathematics/attachments/000/009/914/original/student_task_415.pdf?1462399861</a>
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/319/original/student_task_1127.pdf?1462402311">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/319/original/student_task_1127.pdf?1462402311</a>



Module Title	Message	Assignment / Call to Action (200 Character Max)	Content Directions	Resource / URL
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/320/original/student_task_1128.pdf?1462402317">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/320/original/student_task_1128.pdf?1462402317</a>
				<a href="http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/110/original/student_task_720.pdf?1462401044">http://s3.amazonaws.com/illustrativemathematics/attachments/000/010/110/original/student_task_720.pdf?1462401044</a>

Teacher Resources

<b>Module 1</b>	There is a lesson in the MathShell materials that provides tasks and a cardsort with transformations.	<a href="http://map.mathshell.org/lessons.php?unit=9365&amp;collection=8">http:// map.mathshell.org/ lessons.php? unit=9365&amp;col lection=8</a>		
<b>Module 2</b>	This is a complete lesson involving similarity.	<a href="http://map.mathshell.org/lessons.php?collection=8&amp;unit=9305">http:// map.mathshell.org/ lessons.php? collection=8&amp; unit=9305</a>		