CARNEGIE LEARNING

1 Reasoning with Shapes

MATHia Unit	MATHia Workspace	Overview	TEKS	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1 Using a Rectangular Coordinate System															
From Informal to Formal Geometric Thinking	Introduction to Geometric Figures	Students watch an animation defining some of these basic geometric figures: point, line, line segment, ray, and angle. They identify these figures highlighted in a diagram. Students learn the symbols used to name these geometric figures. They analyze when these figures have more than one name.	G.4A	✔											
	Naming Lines, Rays, Segments, and Angles	Students practice identifying geometric entities from their names, writing names for various geometric entities, and identifying when an entity has multiple possible names.	G.4A		✔								•		
	Working with Measures of Segments and Angles	Students practice writing measure statements for segments and angles using appropriate notation.	G.5A		✔								•		
Slopes of Parallel and Perpendicular Lines	Introduction to Parallel and Perpendicular Lines	Students answer questions related to an animation demonstrating that the rotation of a point (x, y) 90° counterclockwise on the coordinate plane is given by the coordinates (-y, x). Students answer questions to discover that the slopes of perpendicular lines are negative reciprocals of each other. Students then use graphs of functions to understand that the slopes of parallel lines are equal. Finally, students use their knowledge of parallel and perpendicular lines as graphs of functions to solve problems in a real-world context.	G.2B	✔		•									
	Modeling Parallel and Perpendicular Lines	Students determine the equations of lines parallel or perpendicular to given lines.	G.2C		✔							•		•	
Distances on the Coordinate Plane	Deriving the Distance Formula	Students answer questions related to an animation demonstrating how the Distance Formula is derived using the Pythagorean Theorem. Students then use interactive Explore Tools and the Distance Formula to solve mathematical problems about the distances between two points on the coordinate plane.	G.2B	✔		•					•				

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Distances on the Coordinate Plane (continued)	Calculating Distances using the Distance Formula	Students use the distance formula to determine distances between points.	G.2B		✔						•				
	Calculating Perimeter and Area Using the Distance Formula	Students use the distance formula to determine perimeters and areas of different shapes.	G.2B		✔								•		
Composite Figures	Solving Area Problems	Students use the areas of rectangles and triangles to solve area problems with composite figures.	G.11B	✔											
	Calculating Area of Composite Figures	Students practice calculating the area of various mathematical and real-world composite figures.	G.11B		✔										
Topic 2 Rigid Motions on a Plane															
Geometric Components of Rigid Motions	Developing Definitions of Rigid Motions	Students learn the formal definitions for translation, reflection, and rotation as rigid motions. Students then apply these formal definitions to other situations involving mathematical transformations.	G.3B G.3C	✔									•		
	Exploring Rigid Motions and Dilations	Students use an interactive Explore Tool to perform translations, reflections, rotations, and dilations. Students also identify vertical and horizontal symmetry and observe and predict changes in the scale factors of dilations when they represent reductions, enlargements, or congruences. Students then describe sequences of geometric transformations that map one figure onto a congruent or similar figure.	G.3B G.6C	✔							•				
	Describing Rigid Motions Using Coordinates	Students watch an animation showing how rigid motions--translations, reflections, and rotations--are defined on the coordinate plane using algebraic notation. Students identify and produce rigid motions of shapes using coordinates and the coordinate plane.	G.3A	✔		•									

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Reflectional and Rotational Symmetry	Rotations and Reflections on the Plane	Students apply the formal definitions of reflection and rotation to identify rigid motions that carry rectangles, non-rectangular parallelograms, trapezoids, and regular polygons onto themselves. Students learn that figures which can be reflected or rotated onto themselves have reflectional or rotational symmetry.	G.3D	✔						•			•		
	Reflectional Symmetry	The student uses a diagram tool to draw the reflectional symmetries, if any, for a variety of polygons. For each reflectional symmetry, the student writes a reflection function.	G.3D		✔								•		
	Rotational Symmetry	The student uses a diagram tool to draw the rotational symmetries, if any, for a variety of polygons. For each rotational symmetry, the student writes a rotation function.	G.3D		✔								•		
Topic 3 Congruence Through Transformations															
Formal Reasoning in Euclidean Geometry	Calculating and Justifying Angle Measures	Students calculate the measure of the sought angle by following a prescribed path of angle measures.	G.5A		✔								•		
	Calculating Angle Measures	Students calculate the measure of the sought angle by following an open solution path.	G.5A		✔								•		
Triangle Congruence Theorems	Introduction to Triangle Congruence	Students practice writing and identifying triangle congruency statements, as well as corresponding sides and angles, given a diagram of congruent triangles or a triangle congruency statement. They then watch a video that introduces the four theorems of triangle congruence--SAS, SSS, AAS, and ASA. Finally, students use a sorting tool to match images of pairs of triangles with congruency markings to the theorem by which they are proven congruent.	G.6B	✔		•				•					

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1	Reasoning with Shapes					Strategies									
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Triangle Congruence Theorems (continued)	Using Triangle Congruence	Students use SSS, SAS, AAS, and ASA congruence theorems to determine whether two triangles are congruent. They then prove two triangle are congruent by the same group of theorems when given statements about the geometric figures shown. Finally, students complete a two-column proof to identify the reasons for given congruency statements.	G.6B	✔										•	•

2 Establishing Congruence

MATHia Unit	MATHia Workspace	Overview	TEKS	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1 Composing and Decomposing Shapes															
Using Circles to Make Conjectures	Introduction to Circles	Students watch an animation defining some of the terminology of circle parts. They then identify chords, tangents, points of tangency, and secants of circles. Next, students sort inscribed and central angles. Finally, they classify minor and major arcs as well as semicircles.	G.12A	✔		•				•					
	Exploring the Inscribed Angle Theorem	Student use an Explore Tool to determine the measures of major and minor arcs. They investigate the measure of inscribed angles whose sides intersect the endpoints of a circle's diameter. Students investigate the measure of inscribed angles that intercept the same arc. They investigate the measures of central angles and inscribed angles that have the same intercepted arc. Students use the Inscribed Angle Theorem and the Explore Tool to determine the measure of inscribed angles that intercept a given arc and the measure of an inscribed angle's intercepted arc.	G.12A	✔							•				
	Determining Central and Inscribed Angles in Circles	Students calculate the measure of an arc or an angle using the definition of a central angle, the Arc Addition Postulate, or the Inscribed Angle Theorem.	G.12B		✔								•		
Triangle Sum and Exterior Angle Theorems	Introduction to Triangle Sum and Exterior Angle Theorems	Students are informally introduced to the Triangle Sum Theorem. They derive the Exterior Angle Theorem using the Triangle Sum Theorem and substitution.	G.6D	✔											
	Solving Problems Using Triangle Sum and Exterior Angles	Students determine the remote interior angles of a triangle given an exterior angle. They use the Triangle Sum and Exterior Angle Theorems to calculate unknown angle measures in diagrams.	G.6D		✔								•		

2 Establishing Congruence

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Conjectures About Quadrilaterals	Using Circles to Draw Quadrilaterals	Students use an Explore Tool to investigate different quadrilaterals that can be drawn using two concentric circles. They answer questions about the diagonals of special quadrilaterals and use the relationship of the diagonals to draw a quadrilateral with a given diagonal. Students then complete tables determining whether or not special quadrilaterals have given properties.	G.6E	✔							•		•	
	Angles of an Inscribed Quadrilateral	Students are shown an inscribed quadrilateral and prove the Inscribed Quadrilateral-Opposite Angles Conjecture. They then use the theorem to determine the measure of an angle in an inscribed quadrilateral given the measure of the opposite angle.	G.6E G.12A	✔										•	•
Points of Concurrency	Points of Concurrency	Students watch animations about the points of concurrency and answer questions about these points. They analyze a table showing the point of concurrency for different types of triangles and complete a table identifying the location of a point of concurrency for each type of triangle..	G.5A G.5C	✔		•								•	

Topic 2 Justifying Line and Angle Relationships

Forms of Proof	Introduction to Proofs	Students are introduced to proof by answering questions related to two animations demonstrating the Triangle Sum Theorem and the Vertical Angle Theorem.	G.6A	✔		•				•					•
	Completing Measure Proofs	Students complete the steps in a scaffolded proof, supplying appropriate statements and reasons to prove a variety of fundamental angle and segment theorems.	G.6A		✔										•
	Connecting Steps in Angle Proofs	Students arrange the steps of more complex proofs into logical order.	G.5A		✔										•

2 Establishing Congruence

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Forms of Proof (continued)	Using Angle Theorems	Students use a wide variety of postulates, properties, and theorems to solve mathematical problems related to angles in geometrical figures and diagrams. The Congruent Complements Theorem, Congruent Supplements Theorem, Angle Addition Postulate, angle bisection, Vertical Angle Theorem, and the Transitive Property are all discussed.	G.5A	✔											
Lines Cut by a Transversal	Classifying Angles Formed by Transversals	Students follow worked examples and complete sorting activities as they learn to identify angles and angle pairs formed by lines cut by a transversal.	G.5A	✔						•					
	Calculating Angle Measures Formed by Transversals	Calculate the measure of the sought angle by using angle relationships formed by two lines cut by a single transversal.	G.5A		✔								•		
	Calculating Angles Formed by Multiple Transversals	Calculate the measure of the sought angle by using angle relationships formed by three parallel lines cut by a single transversal or two parallel lines cut by two transversals.	G.5A		✔								•		
Proving Parallel Lines Theorems	Proving Parallel Lines Theorems	Students apply basic angle theorems to prove the alternate interior, alternate exterior, same side interior, and side side exterior parallel line theorems.	G.6A		✔										•
	Proving the Converses of Parallel Lines Theorems	Students apply basic angle theorems to prove the alternate interior converse, alternate exterior converse, same side interior converse, and side side exterior converse parallel line theorems.	G.6A		✔										•
Interior and Exterior Angles of Polygons	Proving Triangle Theorems	Students apply previously proved theorems to prove the triangle sum and exterior angle theorems.	G.6D		✔										•
Proving Triangles Congruent	Proving Triangles Congruent using SAS and SSS	Students prove triangles congruent using the side-angle-side and side-side-side congruence theorems in a variety of diagrams.	G.6B		✔										•
	Proving Triangles Congruent using AAS and ASA	Students prove triangles congruent using the angle-angle-side and angle-side-angle congruence theorems in a variety of diagrams.	G.6B		✔										•

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2 Establishing Congruence

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Proving Triangles Congruent (continued)	Proving Theorems using Congruent Triangles	Students use congruent triangle theorems to prove the perpendicular bisector theorem, isosceles triangle base angle theorem and its converse, and the angle bisector theorem.	G.6B		✔										•
Special Right Triangles	Introduction to Special Right Triangles	Students use what they know about the Pythagorean Theorem to identify patterns in 45-45-90 and 30-60-90 triangles. They use the relationships between the side lengths of the special right triangles to solve for unknown side lengths. Students sort triangles according to whether they are a 45-45-90 triangle, a 30-60-90 triangle, or neither.	G.9B	✔						•					
	Calculating the Lengths of Sides of Special Right Triangles		G.9B		✔								•		
Solving Problems with Congruence	Using Triangle Theorems	Students apply angle, parallel line, and triangle theorems to prove relationships between elements in more complex diagrams.	G.6D		✔										•
Angle Relationships Inside and Outside Circles	Determining Interior and Exterior Angles in Circles	Students calculate the measure of an arc or an angle using Interior Angles of a Circle Theorem and Exterior Angles of a Circle Theorem.	G.12A		✔								•		

Topic 3 Using Congruence Theorems

Extending Triangle Congruence Theorems	Proving Triangles Congruent using HL and HA	Students prove triangles congruent using the hypotenuse-leg and hypotenuse-angle congruence theorems in a variety of diagrams.	G.6B		✔										•

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2 Establishing Congruence

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Properties of Quadrilaterals	Understanding Parallelograms	Students are given the properties of parallelograms and use the information to determine the side parallel to a given side of a parallelogram as well as the sides or angles that are congruent to a given side or angle of a parallelogram. They then determine a missing statement to prove a quadrilateral is a parallelogram using the Parallelogram/ Congruent-Parallel Side Theorem. Finally, students identify quadrilaterals by properties of their sides, angles, and diagonals.	G.6E	✔									•		
	Determining Parts of Quadrilaterals and Parallelograms	Students are given a parallelogram and asked to calculate the length of the bisected diagonals, the measure of the angles, and the length of the opposite side and base.	G.6E		✔								•		
Parallelogram Proofs	Proofs about Parallelograms	Students apply their knowledge of congruent triangles and parallel lines in order to prove several theorems about parallelograms.	G.6E		✔										•

3 Investigating Proportionality

MATHia Unit	MATHia Workspace	Overview	TEKS	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1 Similarity															
Dilating Figures	Understanding Similarity	Students watch an animation which demonstrates that when figures are similar, a series of rigid motions and dilations can transform one figure on top of the other to match exactly. Students recall that similar figures have corresponding side lengths that are proportional and congruent corresponding angles. Students identify similar figures and determine corresponding side lengths and corresponding angle measures, given similar figures.	G.7A	✔		•									
	Specifying a Sequence of Transformations	Students select multiple transformations from translation, rotation, dilation, and reflection about any line to match a pre-image to a target image, given a reference point.	G.3C		✔							•			
	Describing Transformations Using Coordinates	Students watch a brief animation showing how dilations are defined on the coordinate plane using algebraic notation. They compare and contrast shapes and their dilations on the coordinate plane and then define a similar figure as one which is obtained from an original figure by a sequence of dilations and rigid motions. Students also define a congruent figure as one which is obtained from an original figure by a sequence of rigid motions. Finally, students identify sequences of rigid motions or rigid motions and dilations which produce a transformed figure and differentiate between transformations that produce congruent figures and those that produce similar figures that are not congruent.	G.3A	✔		•								•	
Theorems About Proportionality	Proofs Using Similar Triangles	Students use the AA Similarity Postulate, SSS Similarity Theorem, and SAS Similarity Theorem to prove the parallel segment proportionality theorem and triangle midsegment theorem.	G.8A		✔										•

3 Investigating Proportionality

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Application of Similar Triangles	Calculating Corresponding Parts of Similar Triangles	Students calculate corresponding parts of similar triangles, both in context and out of context.	G.7B		✔								•		
Partitioning Segments in Given Ratios	Partitioning Segments in Given Ratios	Students watch an animation describing the usefulness of directed line segments and how to interpret fractions of directed segments. Students observe directed line segments divided into two lengths by a point and determine the ratio of those lengths, starting with horizontal and vertical line segments and then moving to non-vertical and non-horizontal segments.	G.2A	✔		•						•			
	Partitioning Segments Proportionally	Students determine the coordinates of points that partition given line segments into different ratios.	G.2A		✔								•		

Topic 2 Trigonometry

Trigonometric Ratios	Introduction to Trigonometric Ratios	Students use similar triangles to define and understand the trigonometric ratios sine, cosine, and tangent. Students then explore the sine, cosine, and tangent and estimating these ratios using an interactive Explore Tool with a unit circle, including describing the ratios as percents of different lengths. Students solve problems in various contexts using the trigonometric ratios and the Explore Tool.	G.9A								•		•	•	
	Relating Sines and Cosines of Complementary Angles	Students use the interactive unit circle trig ratio Explore Tool to explore complementary angles and to see that the sine of an angle is equal to the cosine of its complement, and vice versa.	G.9A	✔							•				
	Using One Trigonometric Ratio to Solve Problems	Students calculate the measures of sides and angles of a right triangle using trigonometric ratios, the Pythagorean Theorem, and/or the Triangle Sum Theorem in both contextual and abstract problems.	G.9A		✔								•		

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3	Investigating Proportionality					Strategies									
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Trigonometric Ratios (continued)	Using Multiple Trigonometric Ratios to Solve Problems	Students calculate the measures of sides and angles of two right triangles that share a side using trigonometric ratios, the Pythagorean Theorem, and/or the Triangle Sum Theorem in both contextual and abstract problems.	G.9A G.9B		✔								•		

CARNEGIE LEARNING

4 Connecting Geometric and Algebraic Descriptions

MATHia Unit	MATHia Workspace	Overview	TEKS	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1 Circles and Volume															
Similarity Relationships in Circles	Relating Arc Length and Radius	Students explore the difference between the degree measure of an arc and the length of an arc. They then practice calculating the fraction of a circle's circumference that an arc occupies and writing an expression that can be used to calculate an arc's length. Students then calculate the arc length given the radius or diameter of the circle. Next, they relate the arc length to the circle's radius and are introduced to the units radians and the theta symbol. Finally, students practice determining different measurements of a circle using the formula theta = s/r.	G.12D	✔											
	Determining Chords in Circles	Students calculate the length of an arc using the radius or diameter, the circumference, and the arc-to-circle ratio.	G.12A		✔								●		
	Calculating the Area of a Sector	Students are given the definition of a sector of a circle and practice identifying sectors. They then work through an example that develops the formula for determining the area of a sector of a circle before using the formula to find areas of different sectors of circles.	G.12C	✔						●					
Volume	Creating Three-Dimensional Shapes from Two-Dimensional Figures	Students rotate two-dimensional figures about an axis to create three-dimensional shapes and relate the dimensions of the plane figure to the solid. They then identify vocabulary highlighting the difference between right and oblique solids. Finally students create solids by stacking congruent or similar shapes.	G.10A	✔									●		
	Calculating Volume of Cylinders	Students use mathematical and real-world objects to determine the volume of cylinders.	G.11D		✔									●	
	Calculating Volume of Pyramids	Students calculate the volume of pyramids in mathematical and real-world contexts using given measurements.	G.11D		✔									●	

4 Connecting Geometric and Algebraic Descriptions

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Volume (continued)	Calculating Volume of Cones	Students use mathematical and real-world objects to determine the volume of cones.	G.11D		✔									•	
	Calculating Volume of Spheres	Students use mathematical and real-world objects to determine the volume of spheres.	G.11D		✔									•	
Surface Area	Introduction to Formulas for the Surface Area of Solids	Students use the faces of a cylinder, square pyramid, and cone to determine surface area formulas for the solids rewritten in different ways. They use the formulas to determine the surface area of each solid.	G.11C	✔											
	Calculating Surface Area of Solids	Students use mathematical and real-world objects to determine the surface areas of cylinders, pyramids, cones, and spheres.	G.11C		✔									•	
Topic 2 Conic Sections															
Cross-Sections	Visualizing Cross Sections of Three-Dimensional Shapes	Students watch an animation showing two different intersections of a plane and a solid. They then describe cross-sections of different solids given the intersection of a plane. Finally, students identify the solid from a given cross-section.	G.10A	✔		•				•					
Equation of a Circle	Deriving the Equation of a Circle	Students are given a circle on the coordinate plane with a defined center. They use the Pythagorean Theorem to derive the standard form for the equation of a circle.	G.12E	✔											
	Determining the Radius and Center of a Circle	Students are given an equation for a circle. They then rewrite the equation if necessary in standard form to identify the radius and center of the circle.	G.12E	✔						•					

CARNEGIE LEARNING

5 Making Informed Decisions

MATHia Unit	MATHia Workspace	Overview	TEKS	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1 Independence and Conditional Probability															
Independence and Conditional Probability	Independent Events	Students define "independent events." They investigate different scenarios to determine whether the events given are independent or not independent. Students then investigate compound probability with "and" and use the equation P(A and B) = P(A) x P(B) to verify whether two events are independent or not.	G.13C G.13E	✔											
Topic 2 Computing Probabilities															
Computing Probabilities	Understanding Frequency Tables	Students review how to read a two-way frequency table and construct a relative frequency table. Students then use two-way frequency tables to determine probabilities, including conditional and other compound probabilities, and they use information from frequency tables to check for the independence of events.	G.13C G.13D	✔										•	
	Calculating Compound Probabilities from Two-Way Tables	Students determine probabilities of compound events from two-way frequency tables via the Addition Rule.	G.13C		✔										
	Conditional Probability	Students use an interactive Explore Tool to explore probability using area and random points. Students then explore the idea of conditional probability, using the interactive tool to visualize the conditional probability formula P(A | B) = P(A and B) / P(B). Students apply what they know about conditional probability to make predictions and check for independence of events using the Explore Tool.	G.13D	✔							•				
	Recognizing Concepts of Conditional Probability	Students investigate conditional probabilities using two-way frequency tables. They apply the concept of conditional probability in a variety of different situations involving a change in the sample space as a result of an event occurring.	G.13D	✔											