

	Name of Course: Geometry Massachusetts and National Standards: Massachusetts State Frameworks Link to Syllabus	
	Unit ONE: Points, Lines, Planes and Angle Relationships	
Essential Questions	How can geometric terminology, properties, postulates, and theorems be applied to understand geometric models? How can a geometric model be used to solve real world problems involving lines, angles and planes?	
Standards	G-CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (★) G-CO.C.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent, and conversely prove lines are parallel; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. G-GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio. A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems (Include equations arising from linear, quadratic, and exponential functions with integer exponents) A-REI.B Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	
Concepts and skills	<i>Students will know...</i> - Undefined terms: point, lines and plane - Relationship between intersecting two or more lines, two or more planes, and lines and planes	<i>Mathematical Practices</i> - Make sense of problems and persevere in solving them. - Reason abstractly and quantitatively. - Construct viable arguments and critique the reasoning of others.

	• Defined terms: segment, ray, acute angle, right angle, obtuse angle, straight angle, and adjacent angles. • Special Angle Pairs: vertical, complementary, supplementary, angle bisectors, and linear pair • Segment Addition Postulate • Angle Addition Postulate • Midpoint formula • Pythagorean Theorem • Distance formula for one-dimensional lines • Distance formula for two-dimensional lines	4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> • Identify and name a point, line and plane. • Identify and name the point, line, or plane that results from: two or more lines intersecting, two or more planes intersecting, and a line intersecting a plane. • Identify, name, and define a segment, ray, acute angle, right angle, obtuse angle, straight angle, and a pair of adjacent angles, in a given diagram. • Create a geometric model given a verbal description that includes a segment, ray, acute angle, right angle, obtuse angle, straight angle, and/or a pair of adjacent angles. • Identify each of the special angle pairs in a given geometric model. • Create a geometric model given a verbal description of a special angle pair. • Apply the properties, postulates, and theorems of special angle pairs to solve for unknown angles or variables. • Apply the segment addition postulate to solve for unknown segment lengths. • Apply the segment addition postulate to create an equation and solve for unknown variable and segment lengths. • Apply the angle addition postulate to solve for unknown angle measures. • Apply the angle addition postulate to create an equation and solve for unknown variables and angle measures. • Use the correct notation to symbolically create an equation comparing side lengths (angle measures) for a given geometric model. • Calculate the midpoint for a given line. • Calculate the distance of a one-dimensional and two-dimensional line. • Apply pythagorean theorem to prove the distance formula. • Approximate a square root to compare length measurements. • Solve equations in one-variable. (Algebra Connection) • Apply the order of operations to simplify an expression involving absolute value, exponents, radicals, and fractions. (Algebra Connection)	

Assessments, products, vocabulary, practice	Vocabulary: point, lines, plane, Segment, ray, acute, right, obtuse, straight, adjacent, vertical, complementary, supplementary, angle bisectors, linear pair, distance, midpoint, segment addition postulate, angle addition postulate, and pythagorean theorem.
Text, Materials, and Resources	All Things Algebra (Gina Wilson) Geometry (Jurgensen/Brown/Jurgensen) Geometry for Enjoyment and Challenge (Rhoad/Milauskas/Whipple)

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	Unit TWO: Parallel Lines
Essential Questions	How can I develop, understand, apply, and explain the properties of parallel and perpendicular lines to construct a mathematical argument ?
Standards	G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). G-CO.C.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent, and conversely prove lines are parallel; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints. G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (e.g., using the distance formula).*

	G-CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	
Concepts and skills	Students will know... • Transversal • Angle pairs formed by two or more lines cut by a transversal: corresponding, alternate interior, alternate exterior, and same side interior (consecutive interior). • Postulates and theorems involving parallel lines cut by a transversal: Same Side Interior Angles (Consecutive Angles) Postulate, Corresponding Angles Theorem, Alternate Interior Angle Theorem, and Alternate Exterior Angle Theorem. • Coordinate Geometry: slope, slope-intercept form, standard form, and point-slope form. • Relationship between parallel lines in the coordinate plane. • Relationship between perpendicular lines in the coordinate plane.	<i>Mathematical Practices</i> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> • Identify the transversal in a geometric model. • Identify the angles pairs formed by two or more lines cut by a transversal in a geometric model. (corresponding, alternate interior, alternate exterior, and same-side interior (consecutive). • Apply the theorems involving angle pairs formed by parallel lines cut by a transversal to determine missing angle measures in a geometric model. • Apply the theorems involving angle pairs formed by parallel lines cut by a transversal to create an equation and solve for an unknown variable in a geometric model. • Determine the slope of a line given an equation, two points, or a line parallel or perpendicular to the given line. (Algebra Connection) • Graph a line in the coordinate plane given a point and slope, two points, an equation. (Algebra Connection) • Determine the equation of a line in various forms (slope intercept, standard and point-slope). (Algebra Connection) • Determine the equation of a line parallel (perpendicular) to another line in the coordinate plane. (Algebra Connection)	

	• Determine if two lines in the coordinate plane are parallel, perpendicular, or neither. (Algebra Connection) • Prove lines in the coordinate plane are parallel or perpendicular. • Compute the perimeter of polygons and area of triangles and rectangles.
Assessments, products, vocabulary, practice	
Text, Materials, and Resources	

	Name of Course: Geometry Massachusetts and National Standards: Link to Standard Additional Standards for specific subject Link to Syllabus
	Unit Three: Triangles
Essential Questions	→ How can I develop, understand, apply, and explain the properties of triangles to construct a mathematical argument?
Standards	G.CO.C.10 Prove theorems about Triangles including: measures of interior angles, isosceles triangles, the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. G-SRT.B.4 Prove theorems about triangles Angle Bisector Theorem and Side-Splitter Theorem G-CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

	G-CO.B.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. G-CO.C.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent, and conversely prove a triangle is isosceles; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.	
Concepts and skills	<i>Students will know...</i> • The different types of triangles and their respective names. • Triangle Angle Sum Theorem • Triangle Exterior Angle Theorem • Triangle Inequality • Isosceles Triangle Theorem and Converse • Equilateral Triangle • Medians, Altitudes, and Perpendicular Bisectors • Write congruence statement and justify using SSS, SAS, ASA, AAS, and HL congruence theorems • Use a congruency statement to identify congruent parts of triangles congruent using CPCTC • Midpoint, angle bisector, or segment bisector proofs using congruent triangles	<i>Mathematical Practices</i> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> • Classify a triangle by its sides and angles. • Solve for the missing sides and/or angles of a triangle by utilizing the properties of the triangle in questions . • Justify triangles congruent using the appropriate method and arguments. • Identify a median, altitude and perpendicular bisector and use these segments to solve for missing sides and angles. • Write a congruence statement for a pair of congruent triangles. • Use a congruence statement to identify congruent parts of triangles. • Create an inequality statement to describe the relationship between the sides of a triangle. (Algebra Connection) • Use the coordinate plane to determine the median, altitude and perpendicular bisector of a triangle. (Algebra Connection)	

Assessments, products, vocabulary, practice	
Text, Materials, and Resources	

	Name of Course: Geometry Massachusetts and National Standards: Massachusetts State Frameworks Link to Syllabus
	Unit Four: Polygons and Quadrilaterals
Essential Questions	→ How can you use stated assumptions, definitions, and previously established results in constructing mathematical arguments regarding polygons?
Standards	G-CO.C.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. G-CO.C.11.a Prove theorems about polygons. Theorems include the measures of interior and exterior angles. Apply properties of polygons to the solutions of mathematical and contextual problems. G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (e.g., using the distance formula).* G-GPE.B.4 Use coordinates to prove simple geometric theorems algebraically, including the distance formula and its relationship to the Pythagorean Theorem. <i>For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.</i>

Concepts and skills	<i>Students will know...</i> • Types of Quadrilaterals • Properties of Parallelograms • Properties of Special Parallelograms (Rectangles, Rhombus, Square) • Properties of Trapezoids (including Isosceles) • Name of Polygons • Polygon Interior Angle Sum Theorem • Polygon Exterior Angle Sum Theorem • Definition of a Regular Polygon	<i>Mathematical Practices</i> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> • Name a polygon using its identifiable properties. • Solve for missing pieces of polygons using its properties. • Calculate the sum of the interior (exterior) angles of any convex polygon. • Apply theorems about regular polygons to calculate the measure of the interior and exterior angles of a regular polygon. • Use coordinate geometry to prove a figure is a specific type of quadrilateral (parallelogram, rectangle, square, rhombus, or trapezoid). (Algebra Connection)	
Assessments, products, vocabulary, practice		
Text, Materials, and Resources		

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	Link to Syllabus	
	Unit Five: Similarity	
Essential Questions	→ How are ratio and proportions used to solve problems regarding similar figures?	
Standards	G-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: G-SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. G-SRT.A.3 Use the properties of similarity transformations to establish the Angle-Angle (AA) criterion for two triangles to be similar. G-SRT.B.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. G-SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. G-SRT.C.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	
Concepts and skills	<i>Students will know...</i> • Ratios and Extended Proportions • Properties of Proportions • Similarity Statements • Similar Polygons - identifying the scale factor and solving for missing sides and/or angles. • Proving/Determining if Triangles are Similar (AA~, SSS~, SAS~) • Angle Bisector Theorem	<i>Mathematical Practices</i> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

	• Side-Splitter Theorem • Applications of Similarity • Triangle Proportionality Theorem • (+) Geometry Mean	
Content Objectives "I can Statements"	<i>I can...</i> • Solve a proportion with linear or quadratic terms. (Algebra Connection) • Classify polygons as similar or not similar using the definition of similarity. • Use ratios and proportions to solve for missing sides of similar polygons. • Prove two triangles similar using appropriate techniques and terminology. • Use similar figures to solve application problems.	
Assessments, products, vocabulary, practice		
Text, Materials, and Resources		

	Name of Course: Geometry Massachusetts and National Standards: Massachusetts State Frameworks Additional Standards for specific subject Link to Syllabus
	Unit Six: Right Triangles
Essential Questions	→ How are quantities and their relationships used to solve problems involving right triangles?
Standards	G-SRT.C.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

	G-SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles to find side lengths. G-SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.* N-Q.A.3.a Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure.*	
Concepts and skills	<i>Students will know...</i> • Square Roots • Pythagorean Theorem • Converse of the Pythagorean Theorem • Special Right Triangles (45-45-90 and 30-60-90) • (+) Altitude on Hypotenuse Theorems • Right Triangle Trigonometry (SOH CAH TOA) ◦ Solving for missing sides and angles • Applications of Trigonometry (Angles of Elevation and Depression)	<i>Mathematical Practices</i> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> • Simplify a radical to lowest terms. (Algebra Connection) • (+) Solve a radical equation. (Algebra Connection) • Solve for the missing components of a right triangle using the appropriate method. ◦ pythagorean theorem ◦ ratios of special right triangles ◦ right triangle trigonometry • Create and label a right triangle to describe a real world situation and use it to solve for an unknown value. • (+) Create and use a system of equations to solve for a missing side length. (Algebra Connection)	
Assessments, products, vocabulary, practice		

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	Name of Course: Geometry Massachusetts and National Standards: Link to Standard Additional Standards for specific subject Link to Syllabus
	Unit SEVEN: Area, Surface Area and Volume
Essential Questions	→ How can the shape and dimensions of a polygon be used to find its area? And how can that area be interpreted and applied in the context of a real world application? → How can I develop, understand, apply, and explain the surface area and volume of three dimensional solids to construct a mathematical argument?
Standards	N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.* N-Q.A.3.a Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure.* G-C.B.5 Derive, using similarity, the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles (e.g., using the distance formula).*

	G-MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).* S-CP.B.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.* (Geometric Probability) G-GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.* G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*	
Concepts and skills	<i>Students will know...</i> - Find the area of polygons including... - Rectangles, Squares, Triangles, Parallelograms, Rhombus, Trapezoids, Regular Polygons and Composite Shapes - Calculations include the application of pythagorean theorem, special right triangles and trigonometry to find information needed in area calculation. - Find the area and circumference of circles - Find the area of a sector and length of an arc based on the central angle and radius of a circle - Calculate geometric probabilities based upon area	<i>Mathematical Practices</i> - Make sense of problems and persevere in solving them. - Reason abstractly and quantitatively. - Construct viable arguments and critique the reasoning of others. - Model with mathematics. - Use appropriate tools strategically. - Attend to precision. - Look for and make use of structure. - Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	★ I can find the area of 2 dimensional shapes, polygons, and circles using appropriate formulas and units.	
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vocabulary, practice	
Text, Materials, and Resources	

	Name of Course: Geometry Massachusetts and National Standards: Link to Standard Additional Standards for specific subject Link to Syllabus	
	Unit EIGHT: Transformations	
Essential Questions	→ How can transformations be used to describe congruence and similarity of figures?	
Standards	G-CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). G-CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. G-CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another	
Concepts and skills	<i>Students will know...</i> - Definition of: - Rigid Motion	<i>Mathematical Practices</i> - Make sense of problems and persevere in solving them. - Reason abstractly and quantitatively.

	○ Translation ○ Reflection ○ Rotation ○ Dilation ● Sequences of Transformations	3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> ● Identify a transformation given a diagram. ● Identify a transformation or composition of transformations as a rigid motion. ● Translate a figure onto another to justify congruence. ● Reflect a figure about a line onto another to justify congruence. ● Rotate a figure about a point onto another figure to justify congruence. ● Complete a transformation on a figure in the coordinate plane. ● Dilate a figure in the coordinate plane about the origin to justify similar figures. ● Use function notation to describe a transformation. (Algebra Connection)	
Assessments, products, vocabulary, practice		
Text, Materials, and Resources		

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	Unit Nine: Transformations	
Essential Questions	→	
Standards		
Concepts and skills	<i>Students will know...</i>	<i>Mathematical Practices</i> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i>	
Assessments, products, vocabulary, practice		
Text, Materials, and Resources		

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	Link to Standard Additional Standards for specific subject Link to Syllabus	
	Unit TEN: Circles	
Essential Questions	→ How can I develop, understand, apply, and explain the properties of circles and the interaction of linear components within those circles to construct a mathematical argument?	
Standards	G-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. G-C.A.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral and other polygons inscribed in a circle.	
Concepts and skills	<i>Students will know...</i> - Definitions of the following angles - Central Angles - Inscribed Angles - Chord Chord Angles - Chord Tangent Angles	<i>Mathematical Practices</i> - Make sense of problems and persevere in solving them. - Reason abstractly and quantitatively. - Construct viable arguments and critique the reasoning of others. - Model with mathematics. - Use appropriate tools strategically. - Attend to precision. - Look for and make use of structure. - Look for and express regularity in repeated reasoning.
Content Objectives "I can Statements"	<i>I can...</i> - Name and describe the angle relationships formed by various lines, segments and rays within and tangent to circles. - Calculate the degree measurement of various angles formed by various lines, segments and rays within and tangent to circles.	

Assessments, products, vocabulary, practice	
Text, Materials, and Resources	