Geometry Mapping/Pacing Guide
2018-19

Topics & Standards *Quarter 1* *Time Frame Weeks 1-8*	**CONGRUENCE** **Experiment with transformations in the plane** • **G.CO.1** Know precise definitions of *ray,* angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and *arc length*. **Make geometric constructions** • **G.CO.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.* **Prove geometric theorems** *both formally and informally using a variety of methods* • **G.CO.9** *Prove and apply theorems about lines and angles. Theorems include but are not restricted to the following: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.* **EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS** **Use coordinates to prove simple geometric theorems algebraically** *and to verify specific geometric statements* • **G.GPE.5** *Justify* 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.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.* **MODELING WITH GEOMETRY** **Apply geometric concepts in modeling situations** • **G.MG.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). **GEOMETRIC MEASUREMENT AND DIMENSION G-GMD** **Explain volume formulas and use them to solve problems** • **G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Be sure to use the "Why" information at the beginning of each chapter for support with the Big Ideas. **Key Concepts and Skills** • Develop an awareness of the structure of a mathematical system, connecting definitions, postulates, logical reasoning, and theorems.	• Communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models. • Validate conclusions using mathematical properties and relationships.

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- Use one- and two-dimensional coordinate systems to represent points, lines, rays, line segments, and figures.
- Communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.
- Validate conclusions using mathematical properties and relationships.

Curriculum Units & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum & Textbook)*	*Key Concept tools & practices for Differentiation*
Units: *Geometric Reasoning, Lines, and Congruent Triangles* **Formative & Summative Assessments** - 4-7 tasks that reach DOK 3-4 - At least (1) GRASPS per quarter & - *Illuminate weekly* **MGraw-Hill Glencoe Assessment Resources (Formative, Pre/Post, and Summative):** - Chapter Readiness Checks, Chapter Tests, Quizzes, & Mid-chapter tests - Aleks Software	**Other Resources** - *ODE Model Curriculum -* https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Geom-_Math_Model-Curriculum.pdf.aspx?lang=en-US - *Critical Areas of Focus* http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/Transitioning-to-the-2017-Learning-Standards-in-Ma/GEOMETRY-CAF.pdf.aspx	**Glencoe Geometry** - Chapter 1: Tools of Geometry - Chapter 2: Reasoning and Proof - Chapter 3: Parallel and Perpendicular Lines - Chapter 4: Congruent Triangles (continued in Q2) ***Be sure to incorporate when needed the following instructional resources available for each chapter; found in the "Resources" tab:** - Intro. Video & Animations - Interactive Student Guide - Anticipation Guides & Student Built Vocabulary - eSolutions - "Before you Read" & "Key Points" notes guide - Chapter Projects - Interactive Whiteboard Presentations	**Available on ConnectED:** - Dinah Zike's Foldables - Virtual Manipulatives - *"abc* Vocab" Activities - TI Easy Files - H.O.T. Questions embedded in each textbook lesson - *Multi-lingual Glossary & Audio in the ebook **Other tools and practices:** - Graph paper, Ruler, Protractor - Computer dynamic geometry software (Geometer's Sketchpad, Cabri, Geogebra, *or* Aleks, Gizmo). - Web-based applets that demonstrate dilations - Physical models of triangles - Journals - Concept/Anchor Charts - Non-linguistic representations - Discourse and questioning

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Topics & Standards
 	
Quarter 2
 	
Time Frame Weeks 1-8
	CONGRUENCE
	Prove geometric theorems *both formally and informally using a variety of methods*
	   • **G.CO.10** *Prove and apply theorems about triangles. Theorems include but are not restricted to the following: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; 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.CO.11** *Prove and apply theorems about parallelograms. Theorems include but are not restricted to the following: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*
	Make geometric constructions
	   • **G.CO.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*
	EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS
	Use coordinates to prove simple geometric theorems algebraically *and to verify specific geometric statements*
	   • **G.GPE.4** *Use coordinates to prove simple geometric theorems algebraically and to verify geometric relationships algebraically, including properties of special triangles, quadrilaterals, and circles. For example, determine if a figure defined by four given points in the coordinate plane is a rectangle; determine if a specific point lies on a given circle. (G, M2)*
	SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY
	Understand similarity in terms of similarity transformations
	   •***G.SRT.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.3*** *Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.*
	Prove and apply theorems both formally and informally involving similarity using a variety of methods.
	   •***G.SRT.4*** *Prove and apply theorems about triangles. Theorems include but are not restricted to the following: 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.5*** *Use congruence and similarity criteria for triangles to solve problems and to justify relationships in geometric figures that can be decomposed into triangles.*
	MODELING WITH GEOMETRY
	Apply geometric concepts in modeling situations
	   • **G.MG.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).

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- **G.MG.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).

Be sure to use the "Why" information at the beginning of each chapter for support with the Big Ideas. **Key Concepts and Skills** • Use geometric concepts and properties to solve problems. • Graph on a coordinate plane. • Use numeric and geometric patterns to make generalizations about geometric properties. • Use logical reasoning to prove statements are true. • Represent relationships using tables and graphs. • Solve linear equations.	• Use slope and equations of lines to investigate geometric relationships, including special segments of triangles. • Analyze geometric relationships in order to verify conjectures. • Use numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons. • Test conjectures about the properties and attributes of polygons. • Use formulas involving length, slope, and midpoint. • Test conjectures about the properties and attributes of polygons.

Curriculum Unis & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum & supplemental)*	*Key Concept tools & Practices for Differentiation*
Units: *Triangles, Quadrilaterals, and Similarity* **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 • At least (1) GRASPS per quarter & • *Illuminate* **MGraw-Hill Glencoe Assessment Resources (Formative, Pre/Post, and Summative):**	**Other Resources** • *ODE Model Curriculum* - https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Geom-_Math_Model-Curriculum.pdf.aspx?lang=en-US • *Critical Areas of Focus* http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/Transitioning-to-	**Glencoe Geometry** • Chapter 4: Congruent Triangles • Chapter 5: Relationships in Triangles • Chapter 6: Quadrilaterals • Chapter 7: Proportions and Similarity ***Be sure to incorporate when needed the following instructional resources available for each chapter; found in the "Resources" tab:** • Intro. Video & Animations • Interactive Student Guide	**Available on ConnectED:** • Dinah Zike's Foldables • Virtual Manipulatives • *"abc* Vocab" Activities • TI Easy Files • H.O.T. Questions embedded in each textbook lesson • *Multi-lingual Glossary & Audio in the ebook **Other tools and practices:** • Tracing paper (patty paper) • Transparencies, Graph paper • Ruler, Protractor, Dot paper • Pantograph Photocopy machine • Computer dynamic geometry software (Geometer's

	• Chapter Readiness Checks, Chapter Tests, Quizzes, & Mid-chapter tests • Aleks Software	the-2017-Learning-Standards-in-Ma/GEOMETRY-CAF.pdf.aspx	• Anticipation Guides & Student Built Vocabulary • eSolutions • "Before you Read" & "Key Points" notes guide • Chapter Projects • Interactive Whiteboard Presentations	Sketchpad, Cabri , Geogebra, *or Aleks, Gizmo*). • Web-based applets that demonstrate dilations • Physical models of triangles • Clinometers • Area models • Journals • Concept/Anchor Charts • Non-linguistic representations • Discourse and questioning

Topics & Standards *Quarter 3* *Time Frame Weeks 1-8*	**CONGRUENCE** **Experiment with transformations in the plane** • **G.CO.1** Know precise definitions of *ray,* angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and *arc length*. • **G.CO.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.3** *Identify the symmetries of a figure, which are the rotations and reflections that carry it onto itself. a. Identify figures that have line symmetry; draw and use lines of symmetry to analyze properties of shapes. b. Identify figures that have rotational symmetry; determine the angle of rotation, and use rotational symmetry to analyze properties of shapes.* • **G.CO.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. • **G.CO.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. **Understand congruence in terms of rigid motions** • **G.CO.6** *Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.* **EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS** **Translate between the geometric description and the equation for a conic section** • **G.GPE.1** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. **Use coordinates to prove simple geometric theorems algebraically**

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• **G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

MODELING WITH GEOMETRY

Apply geometric concepts in modeling situations

• **G.MG.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. ★

• **G.MG.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).

SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY

Understand similarity in terms of similarity transformations

• **G.SRT.1** Verify experimentally the properties of dilations given by a center and a scale factor:

   a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.

   b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

Define trigonometric ratios and solve problems involving right triangles

• **G.SRT.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.7** Explain and use the relationship between the sine and cosine of complementary angles.

•**G.SRT.8** *Solve problems involving right triangles.**

   a. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems if one of the two acute angles and a side length is given. (G, M2)

CIRCLES

Understand and apply theorems about circles

• **G.C.1** Prove that all circles are similar *using transformational arguments.*

• **G.C.2** *Identify and describe relationships among angles, radii, chords, tangents, and arcs and use them to solve problems. Include the relationship between central, inscribed, and circumscribed angles and their intercepted arcs; 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.3** *Construct the inscribed and circumscribed circles of a triangle; prove and apply the property that opposite angles are supplementary for a quadrilateral inscribed in a circle.*

• **G.C.4** Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles

• **G.C.5** *Find arc lengths and areas of sectors of circles.*

   a. Apply similarity to relate the length of an arc intercepted by a central angle to the radius. Use the relationship to solve problems. (G, M2)

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b. Derive the formula for the area of a sector, and use it to solve problems. (G, M2)		

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<p>Be sure to use the "Why" information at the beginning of each chapter for support with the Big Ideas.</p>
<p>Key Concepts and Skills</p>

Solve real-life problems including those involving proportional relationships.
Describe effects when dimensions change proportionally.
Use symbols to represent unknowns and variables.
Look for patterns and represent generalizations algebraically.
Use ratios to solve problems involving similar figures.
Test conjectures about the properties and attributes of polygons and their component parts based on explorations and concrete models.

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Use and extend similarity properties to justify conjectures about geometric figures.
Use the Pythagorean Theorem.
Identify and apply patterns from right triangles to solve meaningful problems, including special right triangles (45°-45°-90° and 30°-60°-90°) and triangles with sides that are Pythagorean triples.
Apply, and justify triangle similarity relationships, such as trigonometric ratios using a variety of methods.
Use congruence transformations to make conjectures and justify properties of geometric figures.
Find areas of sectors and arc lengths of circles using proportional reasoning.
Use numeric and geometric patterns to make generalizations about geometric properties including properties of angle relationships in circles.

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Curriculum Units & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum /Textbook)*	*Concept Tools & Practices for Differentiation*
Units: *Trigonometry, Transformations, and Circles* **Formative & Summative Assessments** 4-7 tasks that reach DOK 3-4 - At least (1) GRASPS per quarter & *Illuminate weekly* **MGraw-Hill Glencoe Assessment Resources**	**Other Resources** *ODE Model Curriculum -* https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Geom-_Math_Model-Curriculum.pdf.aspx?lang=en-US	**Glencoe Geometry** - Chapter 8: Right Triangles and Trigonometry - Chapter 9: Transformations and Symmetry - Chapter 10: Circles ***Be sure to incorporate when needed the following instructional resources available**	**Available on ConnectED:** - Dinah Zike's Foldables - Virtual Manipulatives *"abc* Vocab" Activities - TI Easy Files - H.O.T. Questions embedded in each textbook lesson *Multi-lingual Glossary & Audio in the ebook **Other tools and practices:** - Tracing paper (patty paper)

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• Chapter Readiness Checks, Chapter Tests, Quizzes, & Mid-chapter tests
• Aleks Software | • *Critical Areas of Focus* http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/Transitioning-to-the-2017-Learning-Standards-in-Ma/GEOMETRY-CAF.pdf.aspx | for each chapter; found in the "Resources" tab:
• Intro. Video & Animations
• Interactive Student Guides
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• Web-based applets that demonstrate dilations
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Topics & Standards Quarter 4 *Time Frame Weeks 1-8*	**I. EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS** **Use coordinates to prove simple geometric theorems algebraically** 　• **G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.* **MODELING WITH GEOMETRY** **Apply geometric concepts in modeling situations** 　• **G.MG.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). 　• **G.MG.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.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). **GEOMETRIC MEASUREMENT AND DIMENSION** **Explain volume formulas and use them to solve problems** 　• **G.GMD.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle,* and informal limit arguments. 　• **G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. **Visualize relationships between two-dimensional and three- dimensional objects** 　• **G.GMD.4** Identify the shapes of two-dimensional cross-sections of three- dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. ***Understand the relationships between lengths, area, and volumes.*** 　• *G.GMD.5 Understand how and when changes to the measures of a figure (lengths or angles) result in similar and non-similar figures.* 　• *G.GMD.6 When figures are similar, understand and apply the fact that when a figure is scaled by a factor of k , the effect on lengths, areas, and volumes is that they are multiplied by k , k 2 , and k 3 , respectively.* **STATISTIC - CONDITIONAL PROBABILITY AND THE RULES OF PROBABILITY** **Understand independence and conditional probability and use them to interpret data** 　• **S.CP.1** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). 　• **S.CP.2** Understand that two events *A* and *B* are independent if *and only if* the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent. 　• **S.CP.3** Understand the conditional probability of *A* given *B* as *P(A* and *B)/P(B),* and interpret independence of A and B as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of B. 　• **S.CP.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the*

probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.

- **S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

Use the rules of probability to compute probabilities of compound events in a uniform probability model

- **S.CP.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.
- **S.CP.7** Apply the Addition Rule, *P(A or B) = P(A) + P(B) – P(A and B)*, and interpret the answer in terms of the model.

Be sure to use the "Why" information at the beginning of each chapter for support with the Big Ideas. **Key Concepts and Skills** • Find areas of regular polygons, circles, and composite figures. • Find areas of sectors and arc lengths of circles using proportional reasoning. • Find surface areas and volumes of prisms, pyramids, spheres, cones, cylinders, and composites of these figures. • Describe the effect on area and volume when one or more dimensions of a figure are changed.	• Represent relationships using tables and graphs. • Solve linear equations. • Understand sample spaces and design simulations • Compute probabilities for independent, dependent, mutually exclusive, not mutually exclusive, and conditional events. • Calculate geometric probabilities.

Curriculum Units & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum /Textbook)*	*Concept Tools & Practices for Differentiation*
Units: *Areas, Volume, and Probability* **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 • At least (1) GRASPS per quarter &	**Other Resources** • *ODE Model Curriculum -* https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Model-Curricula-in-Mathematics/HS_Course_Geom-_Math_Model-Curriculum.pdf.aspx?lang=en-US	**Glencoe Geometry** • Chapter 13: Probability and Measurement • Chapter 11: Areas of Polygons and Circles • Chapter 12: Extending Surface Area and Volume ***Be sure to incorporate when needed the following**	**Available on ConnectED:** • Dinah Zike's Foldables • Virtual Manipulatives • *"abc* Vocab" Activities • TI Easy Files • H.O.T. Questions embedded in each textbook lesson • *Multi-lingual Glossary & Audio in the ebook

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