FAIRFIELD PUBLIC SCHOOLS

Geometry
Honors

FAIRFIELD PUBLIC SCHOOLS

Grade(s):	☐ K ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5	☐ 6 ☐ 7 ☑ 8	☑ 9 ☑ 10 ☑ 11 ☑ 12 ☐ Other __________
Discipline/Course:	**Discipline:** Mathematics **Course:** Geometry Honors		
Course Title:	Geometry H		
Prerequisite(s):	Algebra I Honors (B or higher) or Algebra I (A- or higher) and teacher recommendation advised		
Course Description: *Program of Studies*	Geometry allows students to deepen and extend their understanding of geometry in middle grades. Students explore more complex geometric situations and deepen their explanations of geometric relationships, moving towards formal mathematical arguments. Through the lens of transformations, students explore the relationships between geometric figures, applying both theoretical and algebraic means. Students will create mathematical models to understand and explain authentic scenarios, engage in mathematical arguments, and make connections across multiple representations. This course is for students with a strong mathematical background in algebraic and geometric skills, which will be built upon and extended beyond the traditional Geometry course. The depth of topics, as well as the pacing, is intended for students who exhibit strong standards of mathematical practice and habits of learning. Honors-level courses are similar to College Preparatory courses by design, yet they require students to explore topics and concepts more deeply and have a strong mathematical procedure and skill, and fluency that exceeds grade-level expectations. Students in Honors classes are expected to manipulate, create, and solve expressions and equations without significant scaffolding, and at a much quicker pace.		

	Students should also be capable of attending to precise details, which increases the reliability of mathematical results and minimizes miscommunication of mathematical explanations. The expectations for skill demonstration, content mastery, and work habits are above grade level.
Course Essential Questions:	● How is mathematics used to measure, model, and calculate change? ● How can mathematics be used to provide models of data and physical phenomena to help us describe, interpret, and make predictions? ● How does the choice of method, tool, or representation affect the efficiency and reliability of problem-solving? ● How can we communicate mathematical ideas clearly and effectively? ● How does what we measure influence how we measure? How does how we measure influence what we measure (or don't measure)? ● Why do we classify shapes, and how do their properties help us solve problems? ● How does perspective affect the way we see and interpret space? ● How is construction different than drawing? ● How do geometric transformations inform how we use figures?
Course Enduring Understandings:	● Change in real-world situations can be measured, represented, and predicted using geometric properties, algebraic expressions, equations, tables, graphs, and functions. ● Identifying mathematical patterns reveals structure in data and natural phenomena, which can be modeled to make meaningful predictions and solve problems. ● While there are multiple ways to analyze or solve a problem, selecting appropriate representations, strategies, and tools leads to more efficient, accurate, and reliable conclusions. ● Mathematics can be used to solve problems outside of the mathematics classroom. ● Mathematics is built on reason and justification. ● Reasoning allows us to make conjectures and to prove conjectures. ● Classifying helps us to build networks of mathematical ideas.

Duration: **Credit:**	☐ Semester ☑ Full-Year	☐ 0.5 Credit (s) ☑ 1.0 Credit(s) ☐ 1.5 Credit(s) ☐ N/A
Course Materials/Resources:	enVision Geometry, Savvas Learning Company College Board Pre-AP Geometry	
FPS Course Academic Expectation(s):	☑ Exploring and Understanding (EU) ☐ Synthesizing and Evaluating (SE) ☐ Creating and Constructing (CC) ☑ Conveying Ideas (CI) ☐ Collaborating Strategically (CS) ☐ Using Communication Tools (UCT)	
Unit Overview	**Unit 1:** Foundations of Geometry and Measurement (~5 weeks) **Unit 2:** Congruence (~8 weeks) **Unit 3:** Similarity and Right Triangles (~5 weeks) **Unit 4:** Figures on the Coordinate Plane (~5 weeks) **Unit 5:** Circles (~4 weeks) **Unit 6:** Measurement in Data: Probability and Statistics (~3 weeks) **Unit 7:** Probability (~3 weeks)	

Unit Number and Title:	**Unit 1** - Foundations of Geometry and Measurement
Duration:	~5 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	This unit introduces students to the basic objects of geometry and the tools used to explore these objects throughout the remainder of the course. The basic objects students investigate in this unit include lines, rays, segments, and angles. These figures serve as the building blocks of more complex objects that students explore in later units. Students continue to expand their understanding of measurement by developing techniques for quantifying and comparing the attributes of geometric objects. The tools they use to analyze objects may include straightedges, compasses, rulers, protractors, dynamic geometry software, and the coordinate plane. Throughout the course, specific learning objectives require students to prove geometric concepts. Students' use of proofs is a means of communicating reasoning. The format of a student's proof is not as important as their ability to justify a mathematical claim or provide a counterexample disproving one. They should develop an understanding that a mathematical proof establishes the truth of a statement by combining previously developed truths into a logically consistent argument.
Learning Goals	
Standard(s):	

Experiment with transformations in the plane.	
G-CO.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.
Prove geometric theorems	

	G-CO.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; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*
	G-CO.10	Prove theorems about triangles. *Theorems include: 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 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.
	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.*
	Use coordinates to prove simple geometric theorems algebraically	
	G-GPE.4	Use coordinates to prove simple geometric theorems algebraically
	G-GPE.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).

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<tr><td>G-GPE.6</td><td>Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</td></tr>
<tr><td colspan="2">Apply geometric concepts in modeling situations</td></tr>
<tr><td>G-MG.3</td><td>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).</td></tr>
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<tr><td>Essential Question(s):</td><td>

How do geometric relationships and measurements help us to solve problems and make sense of our world?
How do mathematical ideas interconnect and build on one another to produce a coherent whole?
How does geometry model the physical world?
How can the language of geometry be used to communicate mathematical ideas coherently and precisely?
How does the language of geometry provide immediate experience with the physical world?
How does the geometric principle of congruence apply to the real world?
How do parallel lines, transversals, and related angles model the physical world?
How do triangles, their sides, angles, and special segments model the physical world?

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<tr><td>Enduring Understanding(s):</td><td>

A formal mathematical argument establishes new truths by logically combining previously known facts.
Measuring features of geometric figures is the process of assigning numeric values to attributes of the figures, which allows the attributes to be compared.
Pairs of lines in a plane that never intersect or that intersect at right angles have special geometric and algebraic properties.

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<tr><td>Learning Goal(s):
Students will know and</td><td>Content: (Students will know:)</td></tr>
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will be able to use their learning to: (Content/ Skills)	● Undefined terms ○ point ○ line ○ plane ● Defined terms ○ segment ○ ray ○ opposite rays ○ angle ● Angle bisector ● Construction ● Midpoint formula ● Distance formula ● Parallel lines and angle relationships ○ transversals ○ angle pair relationships ○ linear pair ○ supplementary angles ○ vertical angles ○ adjacent angles ○ alternate interior angles ○ alternate exterior angles ● Angles in triangles and parallel lines ○ interior angle theorem ○ angle addition postulate ● Slopes of parallel and perpendicular lines ● Triangle inequality theorem **Skills:** (Students will be able to…) ● use the addition postulates.

	• construct copies of segments, angles, and bisectors of angles. • apply construction to solve problems. • identify congruent segments and angles. • use the midpoint formula to find the midpoint of a segment on a coordinate plane. • use the distance formula to find the length of a segment on the coordinate plane. • use reasoning to identify patterns, make a conjecture, and prove theorems. • use theorems to find the measures of angles formed by parallel lines and a transversal. • use the sum of the angle measures in a triangle to solve problems. • compare slopes on a coordinate plane to determine if lines are parallel or perpendicular. • determine whether a figure can make a triangle given three sides. • know and directly apply relevant theorems such as the: a. triangle angle sum theorem. b. vertical angle theorem and the relationship of angles formed when a transversal cuts parallel lines. • determine which statements may be required to prove certain relationships or to satisfy a given theorem.

Unit Number and Title:	**Unit 2** - Congruence
Duration:	~ 8 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	In previous grades, students were asked to draw triangles based on given measurements. They also have prior experience with rigid motions—translations, reflections, and rotations—and have strategically applied a rigid motion to informally show that two triangles are congruent. In this unit, students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. This unit formalizes the concept of congruence and symmetry of planar objects by identifying the essential components of rigid motion transformations. Students make conjectures and construct viable arguments to prove theorems— using a variety of formats—and solve problems about triangles. Students will use congruence of lines and angles to analyze and prove the congruence of triangles given congruent angles and sides. Students will then focus on congruent points in a triangle using perpendicular bisectors, angle bisectors, medians, and altitudes. Students will use their knowledge of algebra to solve equations based on congruence relationships, including multivariable and polynomial expressions. This will allow students to apply their knowledge of systems of equations and solving quadratic equations in a geometric context.
Learning Goals	
Standard(s):	

Experiment with transformations in the plane	
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	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
	G-CO.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segment
	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.
	G-CO.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.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
	Prove geometric theorems	
	G-CO.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; points on a perpendicular*

	bisector of a line segment are exactly those equidistant from the segment's endpoints.
G-CO.10	Prove theorems about triangles. *Theorems include: 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.*
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.*
Understand and apply theorems about circles	
G-C.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle
Prove theorems involving similarity	
G-SRT.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Essential Question(s):	• How do transformations provide a way of studying figures? • What relationship between sides and angles of triangles can be used to prove triangles congruent?

	● How are the sides, segments, and angles of triangles related? ● How does the geometric principle of congruence in triangles apply to the real world? ● How can we prove congruence on the coordinate plane?
Enduring Understanding(s):	● Reflections are rigid motions across a line of reflection. ● A translation is a rigid motion that moves all points of the preimage the same distance in the same direction. ● Rotation is a rigid motion described by its center of rotation and the angle of rotation. ● A composition of rigid motions can be represented by a combination of at least two of the following: translation, reflection, or glide reflection. ● A figure that can be mapped onto itself is a rigid motion. ● Figures that have the same size and shape are congruent. ● If a rigid motion or composition of rigid motions can map one figure onto another, then the figures are congruent. ● There is a set of criteria for proving triangles congruent, depending on the information provided. ● Congruent figures have equal corresponding angle measures and equal distances between corresponding pairs of points. ● If two triangles are congruent, then all their corresponding sides and angles are congruent. ● A rigid motion transformation preserves both the distance between pairs of points and the angle measures

Learning Goal(s):
Students will know and will be able to use their learning to:
(Content/ Skills)
	Content: (Students will know:)
	
	● Image
	● Pre-image
	● Composition of rigid motions
	● Rigid transformations
	    ○ reflection
	    ○ line of reflection
	    ○ glide reflection

	◦ translation ◦ rotation ◦ angle of rotation ◦ center of rotation • Symmetry ◦ point symmetry ◦ reflectional symmetry ◦ rotational symmetry • Triangles congruency: SSS, SAS, ASA, AAS, and HL • Congruent parts of congruent triangles are congruent (CPCTC) • Proof: two-column, flow chart, Paragraph, and/or Coordinate • Special segments ◦ midsegment ◦ altitude ◦ median ◦ angle Bisector • Geometric measurement on coordiante plane ◦ distance formula ◦ midpoint formula ◦ slope • Centers of triangles ◦ circumcenter ◦ incenter ◦ centroid ◦ orthocenter **Skills:** (Students will be able to…) • identify the rule for a reflection given both an image and its preimage, and draw reflected images. • translate figures, write translations, and find images of translation.

	- compose rigid motions and prove that all translations are the composition of two reflections. - write rotations and find the images of rotation. - compose rigid motions including rotation, translation, and reflection. - compose rigid motions that will map one figure in the coordinate plate to another. - transform a figure in the coordinate plane, given a rule. - identify the types of symmetry a figure has. - use rigid motion (transformations) to demonstrate congruence. - demonstrate that two figures are congruent by using one or more rigid motions to map one onto the other. - use properties and theorems of isosceles and equilateral triangles to solve problems. - identify congruent triangles using triangle properties. - prove triangles congruent by identifying their corresponding parts. - use perpendicular bisectors and angle bisectors to solve the problem. - find the point of concurrency of the altitudes of the triangles and medians of the triangles. - use angle measures of a triangle to compare the side lengths of a triangle. - analyze triangles using special segments and centers. - determine which statements may be required to prove certain relationships or to satisfy a given theorem. - use concepts and theorems relating to the congruence of triangles to solve problems.

Unit Number and Title:	**Unit 3** – Similarity and Right Triangles
Duration:	~ 5 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of triangles, make sense of and persevere in solving similarity problems, and apply similarity to right triangles to prove the Pythagorean Theorem. Students will learn that changing by a scale factor of k changes all lengths by a factor of k, but angle measures remain unchanged, and will examine the relationship between scale factor, side length, and area. Students attend to precision in showing that trigonometric ratios are well defined, and apply trigonometric ratios to find missing measures of general (not necessarily right) triangles. Utilizing the Law of Sines and Cosines, students will find side lengths and angles of non-right triangles. Students model and make sense out of indirect measurement problems and geometry problems that involve ratios or rates.
Standards	

Experiment with transformations in the plane	
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.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.
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*.
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.
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 theorems involving similarity.	
	G-SRT.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.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
	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	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
	Apply trigonometry to general triangles	
	G-SRT.9	(+) Derive the formula $A = \frac{1}{2}\, ab\, Sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side
	G-SRT.10	(+) Prove the Law of Sines and Cosines and use them to solve problems
	G-SRT.11	(+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measures in right and non-right triangles (e.g. surveying problems, resultant forces)

Essential Question(s):	● How do transformations provide a way of studying figures? ● How is similarity used to measure indirectly and explore comparable objects? ● How is trigonometry used to understand the functional and aesthetic uses of right triangles? ● How do triangles, their sides, angles, and special segments model the physical world?
Enduring Understanding(s):	● Similar figures have equal corresponding angle measurements, and the distances between corresponding pairs of points are proportional. ● Changing a figure by a scale factor changes all the lengths, but angle measures remain unchanged. ● Changing a figure by a scale factor of k, changes the area by a scale factor of k^2 ● Utilizing trigonometric ratios, we can find measures both directly and indirectly.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Using non-rigid motion (Dilations) ● Scale factor ● Similar polygons ● Triangle similarity: AA, SSS, SAS ● Proportionality theorems ● Right Triangles ○ the Pythagorean Theorem ○ special right triangles ○ the tangent, sine, and cosine ratios ○ angles of elevation and depression ○ solving for angles and side lengths in right triangles ○ similar right triangles (geometric mean) ○ law of cines ○ law of cosines ○ area of a Triangle (½ ab SinC)

	Skills: (Students will be able to…)
	
	● apply knowledge that changing by a scale factor of k changes all lengths by a factor of k, but angle measures remain unchanged.
	● determine which statements may be required to prove certain relationships or to satisfy a given theorem.
	● use concepts and theorems relating to the similarity of triangles to solve problems.
	● solve problems in a variety of contexts using:
	    ○ the Pythagorean theorem
	    ○ properties of special right triangles
	    ○ right triangle trigonometry.
	● use similarity to calculate values of sine, cosine, and tangent.
	● solve problems using the relationship between the sine and cosine of complementary angles.

Unit Number and Title:	**Unit 4** - Figures on the Coordinate Plane
Duration:	~ 5 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
Unit Overview:	Building on their work with the Pythagorean Theorem, students analyze geometric relationships in the context of a rectangular coordinate system, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines, relating back to previous units. Students attend to precision as they connect the geometric and algebraic definitions of circles. In the Cartesian coordinate system, students explain the correspondence between the definition of a circle and the equation of a circle written in terms of the distance formula, its radius, and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane and apply techniques for solving quadratic equations. They solve design problems by representing figures in the coordinate plane, and in doing so, they leverage their knowledge from synthetic geometry by combining it with the solving power of algebra inherent in analytic geometry.
Standards:	

Experiment with transformations in the plane.	
G-CO.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.
G-CO.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.

Prove geometric theorems	
G-CO.10	Prove theorems about triangles. *Theorems include: 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.*
Understand and apply theorems about circles.	
G-C.1	Prove that all circles are similar.
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	
G-GPE.4	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.
Apply geometric concepts in modeling situations	
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).
Prove theorems involving similarity.	

	G-SRT.5 — Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
Essential Question(s):	● How can geometric relationships be proved by applying algebraic properties to geometric figures represented in the coordinate plane? ● What do you need to know about side lengths to show that a figure is a parallelogram? ● What must be true about a point if it lies on a circle? ● If you take the square root of both sides of the equation of the circle, what does the equation tell you? ● How are appropriate techniques, tools, and formulas used in geometry to determine measurements?
Enduring Understanding(s):	● The geometry of a circle is completely determined by its radius. ● Algebra is used to determine properties of geometric figures on the coordinate plane. ● Slopes can be used to determine whether segments are parallel or perpendicular. ● The Distance Formula can be used to find lengths of segments. ● The Midpoint Formula can be used to bisect segments. ● The equation of a circle in the coordinate plane is given by $(x - h)^2 + (y - k)^2 = r^2$, where (h, k) is the center of the circle and r is the radius. ● Knowing certain geometric properties of a figure can distinguish one figure from another, allowing for the classification of figures based on their features.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● Figures on the coordinate plane ○ distance formula ○ midpoint formula ○ slope Formula

	○ perimeter ○ area ● Equations of circles in the coordinate plane ○ center ○ radius ● Quadrilaterals ● properties of parallelograms, rectangles, rhombi, squares, trapezoids, and kites ● diagonals of quadrilaterals ● special parallelograms **Skills:** (Students will be able to…) ● use algebra to find unknown angles, sides, and diagonals of parallelograms. ● use algebra and proportional reasoning to solve problems with trapezoids. ● use coordinate geometry to classify triangles and quadrilaterals on the coordinate plane. ● solve problems involving triangles and polygons on the coordinate plane. ● create an equation to represent a circle in the xy-plane given the center and radius of the circle. ● write the equation for a circle given the graph of the circle. ● describe how a change to the equation representing a circle affects the graph of the circle in the xy-plane or how a change to the graph of a circle affects the equation that represents the circle. ● understand that the ordered pairs that satisfy an equation of the form $(x - h)^2 + (y - k)^2 = r^2$ form a circle when plotted in the xy-plane. ● Use the distance formula in problems related to circles.

Unit Number and Title:	**Unit 5** - Circles
Duration:	~ 4 weeks
Resource(s):	enVision Geometry, College Board Pre-AP Geometry
Unit Overview:	Students start with an examination of arc length, sector area, segment area, and an introduction to radians as a unit of measure. Students then examine properties of tangents, chords, and inscribed angles. Students learn about the properties of angles, arcs, and segment lengths that are formed when two lines intersect inside or outside of a circle. They study relationships among segments on chords, secants, and tangents as an application of similarity.
Standards:	

Understand and apply theorems about circles.	
G-C.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.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	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.

Essential Question(s):	● When a line or lines intersect a circle, how are the figures formed related to the radius, circumference, and area of a circle? ● How do we find the area of a part (a sector) of a circle? ● Can you tell if a line is tangent to a circle by looking at it? ● How can we measure arcs of circles that are formed by the intersection of secants or chords without measuring tools? ● How can we use the arcs of circles to find the angles created by the intersection of secants and/or chords without measuring tools? ● How can we prove that a diameter bisects a chord?
Enduring Understanding(s):	● Arcs are classified as minor arcs or major arcs depending on whether they are smaller or larger than a semicircle. ● The area of the sector is related to the central angle and the length of the radius. ● There are relationships between intercepted arcs and the segments that form them. ● Measures of intercepted arcs depend on whether the segments that form them lie exterior to the circle or are inside the circle.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Arcs and sectors ○ major arc ○ minor arc ○ radian ○ intercepted arc ○ central angle ○ segment of a circle ○ arc of a sector ● Tangent lines to a circle

	○ point of tangency ● Chord ● Angles relationships in circles ○ inscribed angles ○ angles formed by intersecting secants ○ angle formed by secants or tangents outside the circle ○ distances of intersecting secants and/or tangents **Skills:** (Students will be able to…) ● use definitions, properties, and theorems relating to circles and parts of circles, such as radii, diameters, tangents, angles, arc lengths, chords, and sector areas, to solve problems. ● convert between angle measures in degrees and radians.

Unit Number and Title:	**Unit 6 -** Measurement in Two- and Three- Dimensions
Duration:	~ 3 weeks
Resource(s):	enVision Geometry, College Board Pre-AP Geometry
Unit Overview:	Students' experience with two-dimensional and three-dimensional objects is extended to include informal explanations of circumference, area, and volume formulas. Additionally, students apply their knowledge of two-dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line. They reason abstractly and quantitatively to model problems using volume formulas. Students also compare the effect of a scale factor on length, area, and volume for various shapes. Students visualize, with the aid of appropriate software tools, changes to a three-dimensional model by exploring the consequences of varying parameters in the model
Standards	

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.
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).
Essential Question(s):	● How do geometric relationships and measurements help us to solve problems and make sense of our world? ● How do the calculations and concepts of area and volume relate to two and three-dimensional objects? ● How does changing the scale factor of a figure affect the surface area and volume of the figure?
Enduring Understanding(s):	● The area of a figure depends on its height and its cross-sectional widths. ● The volume of a solid depends on its height and its cross-sectional areas. ● The geometry of a sphere is completely determined by its radius ● Changing by a scale factor of k changes all lengths by a factor of k, changes all areas by a factor of k^2, and changes all volumes by a factor of k^3 .
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Cavalieri's Principle ● cross sections ● volume of prisms, cylinders, cones, pyramids, spheres, similar solids, and composite solids ● surface area of prisms, cylinders, cones, pyramids, spheres, similar solids, and composite solids **Skills:** (Students will be able to…) ● solve real-world and mathematical problems about the surface area or volume of a geometric figure or an object that can be modeled by a geometric figure using given information such as

	length, area, surface area, or volume. ● visualize cross-sections to understand area and volume. ● calculate the area, surface area, and/or volume of a solid that has been affected by a scale factor. ● demonstrate procedural fluency by selecting the correct: ○ area formula and correctly calculating a specified value. ○ surface area or volume formula, and correctly calculating a specified value.

Unit Number and Title:	**Unit 7** - Probability
Duration:	~3 weeks
Resource(s):	enVision Geometry College Board Pre-AP Geometry
	In this unit, students create theoretical and probability models. They compute and interpret probabilities for compound events, mutually exclusive events, independent events, and conditional probability. They engage in calculations and probabilistic reasoning as methods of analysis to make sense of data and draw inferences about populations. This unit prepares students for the course as they create mathematical probability models to understand and explain authentic scenarios, engage in mathematical arguments utilizing analysis to support their thinking, and make connections across multiple representations. Students create theoretical and experimental probability models following the modeling cycle. They compute and interpret probabilities from those models for compound events, attending to mutually exclusive events, independent events, and conditional probability.
Learning Goals	
Standard(s):	

Understand and evaluate random processes underlying statistical experiments.	
S-IC.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*
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 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, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.
Essential Question(s):	● How do we make predictions and informed decisions based on current numerical information?
Enduring Understanding(s):	● Probabilistic reasoning allows us to anticipate patterns in data.
. Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know:) ● Probability events ○ Independent events ○ mutually exclusive events ○ union of events (A or B) ○ intersection of two independent events (A AND B) ○ compound events ○ outcome ○ sample space ○ P(A or B)= P(A)+ P(B) - P (A AND B) ○ fundamental counting principle ● Conditional probability ○ A given B ○ independence in terms of conditional probability ○ relative frequencies ○ joint frequencies ○ marginal frequencies ○ two-way frequency table ○ venn diagram

	○ $P(A\|B) = \frac{P(A\ AND\ B)}{P(B)}$ **Skills:** (Students will be able to…) ● determine the probability of an event. ● calculate relative frequencies, joint frequencies, marginal frequencies, or conditional probabilities for a categorical data set. ● determine if two events are independent. ● use one- and two-way tables, area models, and other representations to find relative frequency, probabilities, and conditional probabilities. ● calculate, express, or interpret the probability or conditional probability of an event using a data display showing frequencies for a single variable, a two-way table, an area model, or a description of a situation.