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Geometry

Timeline	Unit/theme	Standard	Student Focused Objective	Resources/ Suggested Activities
	Unit 1: Foundations: points, lines, and planes	6. Derive the equation of a circle of given center and radius using the Pythagorean Theorem. b. Derive the distance formula from the Pythagorean Theorem. 29. Find patterns and relationships in figures including lines, ~~triangles, quadrilaterals, and circles,~~ using technology and other tools. a. Construct figures, using technology and other tools, in order to make and test conjectures about their properties. b. Identify different sets of properties necessary	○ Identify and model points, lines, and planes ○ Identify intersecting lines and planes ○ Use correct mathematical terminology to describe geometric figures ○ Use Segment Addition Postulate ○ Name angles with correct terminology ○ Define types of angles and angle relationships ○ Explain how to determine the type of angles being used in a problem ○ Draw a model of described angle relationship ○ Solve problems using angle relationships ○ Copy a segment and an angle ○ Bisect a segment	All resources are embedded within the A+ College Ready Curriculum which is the basis of this course. Additional resources include: IXL online math (access thru https://www.clever.com/ with school email account) Delta Math https://www.deltamath.com/ Maneuvering the Middle math resources https://www.maneuveringthe middle.com/

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			○ Bisect an angle	

		to define and construct figures. 30. Develop and use precise definitions of figures such as angle, circle, perpendicular lines, parallel lines, and line segment, based on the undefined notions of point, line, distance along a line, and ~~distance around a circular arc.~~ 31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, ~~including flow chart, two-column, and paragraph formats.~~ a. Investigate, prove	○ Construct the perpendicular bisector of a line segment ○ Use a variety of tools to perform construction of angle relationships ○ Explain how the constructions result in the desired object ○ Use non-formal proof to justify constructions ○ Find the slope between points ○ Find the distance between two points on the coordinate plane ○ Find the midpoint of a segment on the coordinate plane ○ Use coordinate geometry to make geometric arguments on the coordinate plane	

		and apply theorems about lines and angles, including but not limited to:		

		vertical angles are congruent; ~~when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent;~~ the points on the perpendicular bisector of a line segment are those equidistant from the segment's endpoints. 32. Use coordinates to prove simple geometric theorems algebraically.		

	Unit 2: Proofs	31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, including flow chart, two-column, and paragraph formats.	o Identify the hypothesis and conclusion of a conditional statement. o Write a conditional statement given a hypothesis and conclusion. o Determine the truth value of a conditional statement. o Write the converse, inverse, and contrapositive of a given conditional statement.	

		a. Investigate, prove, and apply theorems about lines and angles, including but not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; the points on the perpendicular bisector of a line segment are those equidistant from the segment's endpoints.	o Provide a counterexample, if a statement is false. o State definitions, properties, theorems, and postulates commonly used in proofs. o State a corresponding reason given a statement. o Write a statement given a reason. o Solve multi-step algebraic equations. o Write a geometric proof involving algebra. o Use a diagram to conclude geometric statements (angle/segment relationships). o Sequence given statements and reasons to form a proof. o Write a proof given a geometric diagram. o Justify my solution using logical reasoning and correct sequencing of statements.	

	Unit 3: Parallel and Perpendicular Lines	29. Find patterns and relationships in figures including lines, triangles, quadrilaterals, and circles, using technology and other tools. a. Construct figures, using technology and other tools, in order to make and test conjectures about their properties.	o Identify angle pairs formed by parallel lines and transversals o Use theorems to determine the relationships between specific angles o Use algebra to find angle measurements for angles formed by a transversal and parallel lines o Prove geometric relationships using parallel line theorems in multiple formats	

		b. Identify different sets of properties necessary to define and construct figures. 30. Develop and use precise definitions of figures such as angle, circle, perpendicular lines, parallel lines, and line segment based on the undefined notions of point, line, distance along a line, and distance around a circular arc. 31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, including flow chart, two-column, and	including two-column and paragraph proofs o Investigate and determine the relationship of slopes with parallel and perpendicular lines o Find the slopes of lines given ordered pairs, graphs, or equations of lines o Compare the slopes of lines to determine if the lines are parallel, perpendicular, or intersecting o Write equations of lines with parallel or perpendicular slope	

		paragraph formats. a. Investigate, prove, and apply theorems about lines and angles, including but not limited to: vertical angles are congruent;		

		when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; the points on the perpendicular bisector of a line segment are those equidistant from the segment's endpoints. 33. Prove the slope criteria for parallel and perpendicular lines and use them to solve		

		geometric problems.		
	Unit 4: Transformatio ns	21. Represent transformations and compositions of transformations in the plane (coordinate and otherwise) using tools such as tracing paper and geometry software. a. Describe transformations and compositions of transformations as	o Draw Congruence Transformations: Reflections, Translations, Rotations o Draw reflections, translations, and rotations in the coordinate plane o Draw glide reflections (a reflection combined with a translation) and other compositions of isometries (rotations, translations, reflections, glides) in the coordinate plane	

		functions that take points in the plane as inputs and give other points as outputs, using informal and formal notation. b. Compare transformations which preserve distance and angle to those that do not. 22. Explore rotations, reflections, and translations using graph paper, tracing paper, and geometry software. a. Given a geometric figure and a rotation, reflection, or translation, draw the image of the transformed figure using graph paper, tracing paper, or geometry software.	o Write the coordinates of a new image once it has been transformed by translations, reflections, and rotations o Identify composite transformations o Create composite transformations given tools and/or technology o Graph translations and reflections in function notation Write transformational functions from verbal descriptions	

		b. Specify a sequence of rotations, reflections, or translations that		

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		will carry a given figure onto another. c. Draw figures with different types of symmetries and describe their attributes. 23. Develop definitions of rotation, reflection, and translation in terms of angles, circles, perpendicular lines, parallel lines, and line segments. 24. Define congruence of two figures in terms of rigid motions (a sequence of translations, rotations, and reflections); show that two figures are congruent by finding a sequence of rigid motions that maps one figure to the other.		

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	Unit 5: Similarity	19. Derive and apply the relationships between the lengths, perimeters,	o Discover the properties of similarity. o Write ratios	

		areas, and volumes of similar figures in relation to their scale factor. 26. Verify experimentally the properties of dilations given by a center and a scale factor. a. Verify that 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. Verify that the dilation of a line segment is longer or shorter in the ratio given by the scale factor. 27. Given two figures, determine whether they are similar by identifying a similarity transformation that maps	o Write and solve proportions o Connect the dilation of a figure to its scale factor o Identify the center of dilation and relate to parallel lines in similar triangles o Connect area to dilation and perimeter o Use proportions to identify similar polygons o Identify similar triangles using the AA Similarity Postulate and the SSS and SAS Similarity Theorems o Solve problems using the properties of similar polygons beyond triangles o Use proportional parts within triangles o Use proportion parts with parallel lines o Recognize and use proportional relationships of corresponding segments of similar triangles o Interpret scale models and use scale factor to solve problems.	

		one figure to the other. 28. Verify criteria for showing triangles are similar using		

		a similarity transformation (sequence of rigid motions and dilations) that maps one triangle to another. a. Verify that two triangles are similar if and only if corresponding pairs of sides are proportional and corresponding pairs of angles are congruent. b. Verify that two triangles are similar if (but not only if) two pairs of corresponding angles are congruent (AA), the corresponding sides are proportional (SSS), or two pairs of corresponding sides		

		are proportional, and the pair of included angles is congruent (SAS).		

		34. Use congruence and similarity criteria for triangles to solve problems in real-world contexts.		

	Unit 6: Congruent Triangles	3. Find the coordinates of the vertices of a polygon determined by a set of lines, given their equations, by setting their function rules equal and solving, or by using their graphs. 25. Verify criteria for showing triangles are congruent using a sequence of rigid motions that map one triangle to another. a. Verify that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. b. Verify that two triangles are congruent if (but not only if) the following groups of corresponding parts are congruent:	○ Identify the theorems for stating congruent triangles ○ Identify corresponding parts of congruent triangles ○ Identify the theorems for stating congruent triangles ○ Use theorems, postulates, and definitions to identify relationships among angles and sides of triangles ○ Justify why two triangles are congruent using a two-column proof ○ Justify why two triangles are congruent using a two-column or paragraph proof ○ Prove properties for angles and sides of a triangle including midsegments, isosceles triangles, equilateral triangles, and remote exterior angle theorems o Use the theorems for midsegment, isosceles triangles, equilateral triangles, and remote exterior angles to solve algebraic problems	

		angle-side-angle (ASA), side-angle-side (SAS),		

		side-side-side (SSS), and angle-angle-side (AAS). 29. Find patterns and relationships in figures including lines, triangles, quadrilaterals, and circles, using technology and other tools. 31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, including flow chart, two-column, and paragraph formats. b. Investigate, prove, and apply theorems about triangles, including but not limited to: the sum	o Graph linear equations to determine points of intersection o Use the distance formula to justify two triangles in the coordinate plane are congruent	

		of the measures of the interior angles of a triangle is 180˚; the base angles of isosceles triangles are congruent; the segment joining the midpoints of two sides of a		

		triangle is parallel to the third side and half the length; a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem using triangle similarity. 32. Use coordinates to prove simple geometric theorems algebraically. 34. Use congruence and similarity criteria for triangles to solve problems in real-world contexts.		

	Unit 7: Pythagorean Theorem Applications	1. Extend understanding of irrational and rational numbers by rewriting expressions involving radicals, including addition, subtraction, multiplication, and division, in order to recognize geometric patterns.	○I can rewrite a square root using its factors. ○I can determine the factors of a number. ○I can simplify a square root. ○ I can add an expression with radicals. ○ I can subtract an expression with radicals. ○ I can multiply an expression with radicals. ○ I can divide an expression with radicals.	

		31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, including flow chart, two-column, and paragraph formats. ~~a. Investigate, prove, and apply theorems about lines and angles, including but not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; the points on the perpendicular bisector of a line segment are~~	o I can prove the Pythagorean Theorem in multiple ways, including using similar triangles. ○ I can solve for the missing side length in a right triangle, using Pythagorean Theorem. ○ I can identify the legs and hypotenuse of a right triangle. ○ I can sketch an appropriate diagram for an application involving right triangles. ○ I can apply the Pythagorean Theorem to solve a real-world application. ○ I can state the required relationship to determine if a triangle is acute, right, or obtuse. ○ I can apply the Pythagorean Theorem to state if a triangle is acute, right, or obtuse.	

		~~those~~ ~~equidistant from~~ ~~the~~ ~~segment's endpoints.~~ b. Investigate, prove, and apply theorems about triangles, including but not limited to: ~~the sum of the~~ ~~measures of the interior~~		

		~~angles of a triangle is 180°; the base angles of isosceles triangles are congruent; the segment joining the midpoints of two sides of a triangle is parallel to the third side and half the length; a line parallel to one side of a triangle divides the other two proportionally, a~~nd conversely; the Pythagorean Theorem using triangle similarity. c. Investigate, prove, and apply theorems about parallelograms and other quadrilaterals, including but not limited to both necessary and sufficient conditions for parallelograms and other quadrilaterals, as well as relationships among kinds of quadrilaterals.		

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		35. Discover and apply relationships in similar right triangles.		

		a.Derive and apply the constant ratios of the sides in special right triangles (45°-45°-90° and 30°-60°-90°). b.Use similarity to explore and define basic trigonometric ratios, including sine ratio, cosine ratio, and tangent ratio. c.Explain and use the relationship between the sine and cosine of complementary angles. d.Demonstrate the converse of the Pythagorean Theorem. e.Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems, including finding areas of regular		

		~~polygons.~~ 36. Use geometric shapes, their measures, and their properties to model objects and use those models to solve problems.		

		38. Use the mathematical modeling cycle involving geometric methods to solve design problems.		

	Unit 8: Right Triangle Trigonometry	35. Discover and apply relationships in similar right triangles. a. Derive and apply the constant ratios of the sides in special right triangles (45, 45, 90) and (30, 60, 90) b. Use similarity to explore and define basic trigonometric ratios, including sine ratio, cosine ratio, and tangent ratio. c. Explain and use the relationship between the sine and cosine of complementary angles. d. Demonstrate the converse of the Pythagorean Theorem. e. Use the trigonometric ratios to solve right	o Develop the properties of special right triangles by finding unknown side lengths in an equilateral triangle and a right isosceles triangle o Use the properties of 45-45-90 triangles to solve problems o Use the properties of 30-60-90 triangles to solve problems o Develop definitions for trigonometric ratios o Relate trigonometric values of complementary angles o Write trigonometric values given a diagram or text o Find the side length of a triangle using trigonometry and special right triangles	

		triangles in applied problems. 36. Use geometric shapes, their measures, and their properties to model objects and use those models to solve problems.	o Find the angle measures of a right triangle using trigonometry and special right triangles o Sketch a diagram based on an application o Solve a right triangle using trigonometric ratios or special right triangles o Sketch a diagram based on an application involving a constant rate of movement o Solve a right triangle using trigonometric ratios or special right triangles involving a constant rate of movement	

	Unit 9: Quadrilaterals	3. Find the coordinates of the vertices of a polygon determined by a set of lines, given their equations, by setting their function rules equal and solving, or by using their graphs. 29. Find patterns and relationships in figures including lines, triangles, quadrilaterals, and circles, using technology and other tools.	o Determine the properties of a parallelogram, rectangle, rhombus, square, trapezoid, and kite o Prove theorems concerning properties of parallelograms o Recognize the minimum conditions required to classify a quadrilateral	

		a. Construct figures, using technology and other tools, in order to make and test conjectures about their properties. b. Identify different sets of properties necessary to define and construct figures. 31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, including flow chart, two-column, and paragraph formats. a. Investigate, prove, and	o Prove that a set of points forms a specific quadrilateral in the coordinate plane using slope or distance formula o Given a system of equations, find the coordinates of the vertices of the polygon formed by setting their function rules equal and solving or by using their graphs o Apply the properties of specific quadrilaterals to solve problems involving the sides, angles, and diagonals o Using the coordinate plane, prove theorems concerning quadrilaterals	

		apply theorems about lines and angles, including but not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and		

		corresponding angles are congruent; the points on the perpendicular bisector of a line segment are those equidistant from the segment's endpoints. ~~b. Investigate, prove, and apply theorems about triangles, including but not limited to: the sum of the measures of the interior angles of a triangle is 180°; the base angles of isosceles triangles are congruent; the segment joining the midpoints of two sides of a triangle is parallel to the third side and half the length; a line parallel to one side of a triangle divides the other two proportionally, and conversely; the~~		

		~~Pythagorean Theorem using triangle similarity. c. Investigate, prove, and apply theorems about parallelograms and other~~		

		~~quadrilaterals, including but not limited to both necessary and sufficient conditions for parallelograms and other quadrilaterals, as well as relationships among kinds of quadrilaterals.~~ 32. Use coordinates to prove simple geometric theorems algebraically.		

	Unit 10: Univariate Statistics	2. Use units as a way to understand problems and to guide the solution of multi-step problems. a. Choose and interpret units consistently in formulas. b. Choose and interpret the scale and the origin in graphs and data displays. c. Define appropriate quantities for the purpose of descriptive modeling. d. Choose a level of accuracy appropriate to limitations of measurements when reporting quantities. 7. Use mathematical and statistical reasoning with quantitative data,	○ Determine how statistics can be used to make informed decisions. ○ Relate distributional shape to measure of center. ○ Investigate appropriate ways to use measures of center for prediction. ○ Use technology to analyze large data sets. ○ Relate distributional shape to measure of center and variability. ○ Match graphs to variables ○ Use technology to analyze large data sets, create displays, and calculate sample statistics. ○ Relate measure of center to variability while taking into effect unusual points. ○ Compare distributions using multiple boxplots. ○ Calculate outliers using the 1.5 IQR Rule	

		both univariate (set of values) and ~~bivariate data (set of pairs of values) that suggests a linear association,~~ in order to draw conclusions and assess risk. 8. Use technology to organize data, including very large data sets, into a useful and manageable structure. 9. Represent the distribution of univariate quantitative data with plots on the real number line, choosing a format (dot plots, histograms, and box plots) most appropriate to the data set, ~~and represent the distribution of bivariate quantitative data with a scatterplot.~~ **Extend from simple cases by hand to more complex cases involving large data sets using technology**. 10. Use statistics appropriate to the shape of the data distribution to compare and contrast two or more data sets,	○ Interpret the effect an outlier has on a data set ○ Use technology to calculate sample statistics for a large data set ○ Explain the difference between mean absolute deviation and standard deviation ○ Calculate and learn to interpret the standard deviation of a data set using students' conceptual understanding of mean absolute deviation. ○ Use technology to determine the standard deviation. ○ Use the measures of center and spread to make decisions about factors in research. ○ Interpret the standard deviation of a data set and its effect when comparing two distributions. ○ Use technology to analyze and compare two quantitative data sets with statistical displays and statistics	

		utilizing the mean and median for center and the interquartile range and standard deviation for variability. a. Explain how standard deviation develops from mean absolute deviation.		

		b. Calculate the standard deviation for a data set, using technology where appropriate. 11. Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers) on mean and standard deviation.		

	Unit 11: Bivariate Statistics	5. Verify that the graph of a linear equation in two variables is the set of all its solutions plotted in the coordinate plane, which forms a line. 7. Use mathematical and statistical reasoning with quantitative data, ~~both univariate (set of values) and~~ bivariate data (set of pairs of values) that suggests a linear association, in order to draw conclusions and assess risk. 8. Use technology to organize data, including very large data sets, into a useful and manageable structure.	○ Construct a scatterplot with axes labeled correctly ○ Describe the relationship between the explanatory and response variables ○ Use technology to graph data and evaluate to find the best fit line ○ Make predictions based on the best fit line and analyze for extrapolation ○ Place and estimated line that "best fits" the data ○ Calculate residual ○ Determine the effect of outliers and influential points ○ Draw the residual and the squared residuals on a scatterplot ○ Use technology to calculate the regression equation and evaluate predicted values ○ Analyze a residual plot to determine if the data is linear	

		9. ~~Represent the distribution of univariate quantitative data with plots on the real number line, choosing a format (dot plots, histograms, and box plots) most appropriate to the data set,~~ and represent the distribution of bivariate quantitative data with a scatterplot. Extend from simple cases by hand to more complex cases involving ***large data sets using technology***. 12. Represent data of two quantitative variables on a scatter plot, and describe how the variables are related. a. Find a linear function for a scatter plot that suggests a linear association and informally assess its fit by plotting and analyzing residuals, including the squares of the residuals,	○ Calculate the quadrant count ratio by hand to attach a value to the relationship between the explanatory and response variables ○ Use technology to calculate the correlation coefficient ○ Describe the difference between the quadrant count ratio and the correlation coefficient ○ Plot ordered pairs based on data from a survey ○ Determine the association between the guessed and actual ages ○ Create a manual fit line ○ Write an equation to model the data without technology ○ Interpret the slope in the context of the situation ○ Create a bivariate regression when given univariate data ○ Use technology to produce a linear regression analysis of a large data set ○ Make a prediction for a winning ticket ○ Analyze residuals to determine the benefits of the model ○ Chose and gather bivariate data to analyze which response variable is the better predictor ○ Use technology to produce a	

		in order to improve its fit. b. Use technology to find the least-squares line of best fit for two quantitative variables.	linear regression analysis of a large data set ○ Analyze residuals to determine the benefits of the model ○ Produce a presentation to summarize research and analysis of bivariate data	

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		13. Compute (using technology) and interpret the correlation coefficient of a linear relationship. 14. Distinguish between correlation and causation 15. Evaluate possible solutions to real-life problems by developing linear models of contextual situations and using them to predict unknown values. a. Use the linear model to solve problems in the context of the given data. b. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the given data.		

	Unit 12: Circles	6. Derive the equation of a circle of given center and radius using the Pythagorean Theorem. a. Given the endpoints of the diameter of a circle, use the midpoint formula to find its center and	o Identify central angles, major arcs, minor arcs, and semicircles, and find their measures o Find arc lengths o Recognize and use relationships between arcs and chords	

		then use the Pythagorean Theorem to find its equation. b. ~~Derive the distance formula from the Pythagorean Theorem.~~ 29. Find patterns and relationships in figures including ~~lines, triangles, quadrilaterals,~~ and circles, using technology and other tools. a. Construct figures, using technology and other tools, in order to make and test conjectures about their properties. b. Identify different sets of properties necessary to define and construct figures. 30. Develop and use precise definitions of figures such as	o Recognize and use relations between arcs, chords, and diameters o Find measures of inscribed angles and arcs. o Find measures of angles formed by lines intersecting on or inside a circle. o Find measures of angles formed by lines intersecting outside the circle. o Use the relationships between angles and arcs to solve problems including but not limited to inscribed polygons. o Use the properties of chords, radii, tangent lines, and secant lines to solve problems. o Apply properties of central angles, inscribed angles, circumscribed angles, and right triangles to solve problems related to circles in the real world o Write the equation of a circle o Graph a circle in the coordinate plane o Relate the standard equation of a circle to transformations in the plane and the Pythagorean Theorem	

		~~angle,~~ circle, ~~perpendicular lines, parallel lines, and line segment, based on the undefined notions of point, line, distance along a line,~~	o Write equations of lines tangent to a circle	

		and distance around a circular arc. 32. Use coordinates to prove simple geometric theorems algebraically. 36. Use geometric shapes, their measures, and their properties to model objects and use those models to solve problems. 37. Investigate and apply relationships among inscribed angles, radii, and chords, including but not limited to: 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	o Find measures of segments that intersect in the interior of a circle o Find the measure of angles formed by the lines intersecting on or inside a circle o Relate tangent lines intersection to its perpendicular nature to radius at the same point of intersection	

		intersects the circle.		
	Unit 13: Area on the Coordinate Plane with Applications	3. Find the coordinates of the vertices of a polygon determined by a set of lines, given their	○ Use coordinates of vertices of a triangle to find the area of a triangle using multiple methods	

		equations, by setting their function rules equal and solving, or by using their graphs. 17. Model and solve problems using surface area and volume of solids, including composite solids and solids with portions removed. a. Give an informal argument for the formulas for the surface area and volume of a sphere, cylinder, pyramid, and cone using dissection arguments, Cavalieri's Principle, and informal limit arguments. b. Apply geometric concepts to find missing dimensions to solve surface area or	○Graph and find area on the coordinate plane ○Find area of bounded regions using axis and lines ○ Find area of rectangles, triangles, and trapezoids on the coordinate plane ○Determine the area of a bounded region formed by linear functions ○Approximate the area of a bounded region formed by non-linear functions using rectangles ○ Use composite shapes to determine the area of an irregular figure on the coordinate plane ○Use coordinates to compute the perimeter and area of shapes on the coordinate lane ○ Apply situations in context and model situations geometrically on the coordinate plane ○Find areas of regular polygons ○Find areas of composite figures ○Find the area of circles and	

		volume problems. 18. Given the coordinates of the vertices of a polygon, compute its perimeter	sectors ○Find areas of sectors of circles	

		and area using a variety of methods, including the distance formula and dynamic geometry software, and evaluate the accuracy of the results. 20. Derive and apply the formula for the length of an arc and the formula for the area of a sector. 22. Explore rotations, reflections, and translations using graph paper, tracing paper, and geometry software. a. Given a geometric figure and a rotation, reflection, or translation, draw the image of the transformed figure using graph paper, tracing paper, or geometry software.	○Find arc length for portions of a circumference ○Analyze attributes of a piecewise function ○Identify lines of symmetry ○Determine the area of a region bounded by a piecewise function and the x-axis ○Apply transformations to graphs of piecewise functions o Use properties of special right triangles in problem solving situations	

		~~b. Specify a sequence of rotations, reflections, or translations that~~		

		~~will carry a given figure onto another.~~ c. Draw figures with different types of symmetries and describe their attributes. 34. Use congruence and similarity criteria for triangles to solve problems in real-world contexts. ~~35 Discover and apply relationships in similar right triangles.~~ e. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems, including finding areas of regular polygons. 38. Use the mathematical modeling cycle involving geometric methods to		

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		solve design problems.		

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	Unit 14: Applications of Surface Area and Volume	2. Use units as a way to understand problems and to guide the solution of multi-step problems. a. Choose and interpret units consistently in formulas. b. Choose and interpret the scale and the origin in graphs and data displays. c. Define appropriate quantities for the purpose of descriptive modeling. d. Choose a level of accuracy appropriate to limitations of measurements when reporting quantities. 3. Find the coordinates of the vertices of a polygon determined by a set of lines, given their equations, by setting	○ I can derive surface area and volume formulas for prisms, cylinders, pyramids, and cones ○ I can explain the meaning of Cavalieri's Principle ○ I can find lateral area and surface area of prisms, cylinders, pyramids, cones, and composite figures ○ I can find volume in prisms, cylinders, pyramids, cones, and composite figures. ○ I can recall and apply geometric formulas for perimeter, circumference, area, and volume ○ I can solve literal equations by isolating a specific variable ○ I can graph equations that define a plane figure on a coordinate plane ○ I can determine the perimeter and area of that plane figure ○ I can draw and describe the solid formed by revolving the plane figure about a vertical or horizontal line ○ I can calculate the volume and surface area of the solid ○ I can compare the volumes	

		their function rules equal and solving, or by using their graphs.	determined when revolving about different axes ○ I can write the equations of the lines that define bounded regions	

		4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. 16. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	○ I can graph linear equations to define bounded regions ○ I can calculate the areas and perimeters of the regions ○ I can revolve the planar region about the horizontal and vertical lines to create solids ○ I can determine the volumes of geometric solids that result from revolving the regions about horizontal and vertical lines ○ I can use technology to create and revolve planar figures about horizontal and vertical lines ○ I can model the conceptual understanding using a real-world situation ○ I can use a cross section of a cube to form a pyramid and calculate surface area and volume. ○ I can use rotation of planar surfaces to create three dimensional figures and calculate volume and surface area. ○ I can work with embedded similar figures in word problems to calculate	

			areas and volumes using geometric relationships ○ I can solve word problems involving rates, areas, and volumes of figures and their related similar figures.	

		17. Model and solve problems using surface area and volume of solids, including composite solids and solids with portions removed. a. Give an informal argument for the formulas for the surface area and volume of a sphere, cylinder, pyramid, and cone using dissection arguments, Cavalieri's Principle, and informal limit arguments. b. Apply geometric concepts to find missing dimensions to solve surface area or volume problems. 19. Derive and apply the relationships between the lengths, perimeters,	○ I can find the area of similar figures given a scale factor. ○ I can find the volume of similar polyhedron given a scale factor. ○ I can find the scale factor given the volume or areas of two similar polyhedron or figures. ○ I can model real-world situations using geometric objects. ○ I can apply concepts of density based on area and volume to solve problems in geometry related to volume and area ○ I can design or apply geometry to solve a real-world problem that minimizes cost or materials and maximizes profit	

		areas, and volumes of similar figures in relation to their scale factor. 36. Use geometric shapes, their measures, and their		

		properties to model objects and use those models to solve problems. 38. Use the mathematical modeling cycle involving geometric methods to solve design problems.		