Geometry Year At A Glance 2018-2019

Year-at-a-Glance			
FIRST SEMESTER		SECOND SEMESTER	
Unit 1 **Foundations of Geometry**	**Unit 2** **Equations of Lines, Angle-Pairs, Congruence, and Triangles**	**Unit 3** **Similarity, Right Triangles, and Polygons**	**Unit 4** **Measurements, Dimension, and Transformations**
1st 9-weeks	2nd 9-weeks	3rd 9-weeks	4th 9- weeks

Lines and Angles
• Seg Add Post
• Angle Add Post
• Classify Angles
• Midpoint formula
• Distance formula
• Perimeter, Area, Circumf.
• Perpendicular lines
• Parallel lines
• Midpoint
Circles
• Equation of a Circle
• Arcs, Sectors, Angles
• Tangents, Secants, Chords
• Inscribed/Circumscribed Figures
• Radians
	Eq. of Lines & Angle Pair Rel.
	• Equations of lines
	• Informal Proofs(critical thinking)
	• // & ⊥ equations of lines
	• Vertical Angles
	• ∠ pairs with // lines
	• Basic Triangle Theorems
	  ○ Triangle Sum
	  ○ Polygon Sum
	  ○ Ext. Angle Th.
	Congruence
	• Congruence
	• Triangle Congruence Theorems
	Triangles
	• Isosceles Triangle Th.
	• Midsegments of a triangle
	• Triangle Inequalities
	• Identify medians, altitudes, perp.bisectors and angle bisectors
		Similarity
		• Scale Factor
		• Dilations - including circles, line segments
		• Ratios and Proportions
		• Similar Triangle
		• Similarity Theorems
		Right Triangles
		• Trigonometry - exp. sin/cos relationship of complementary <
		• Special Right Triangles
		• Pythagorean Theorem
		Polygons
		• Prop. of Quadrilaterals
		• Coordinate proofs
		• Coordinate perimeter/area computation
			Measurement & Dimension
			• Volume and effects of changing dimensions - cylinders, pyramids, cones, and prisms
			• Modify formulas for composite figures
			• Cross-sections of 3D objects
			• 3D objects created by rotations of 2D
			• Density based on Area and volume in modeling situations
			Transformations
			• Rigid motion/congruence
			• Translations
			• Rotations (using quad.)
			• Reflections

COLOR KEY:

BLUE - Power Standard
BLACK - Additional Skills
RED - Closing the Achievement Gap
Green - Familiarity Only

Unit 1

Unit 2

Unit 3

Unit 4

Unit 1	Foundations of Geometry	Grade Level	Geometry 10-12	Approx length	9 weeks

CPSD Power Standards with Student Learning Objectives

HSG.CO.C.9 3 Apply and prove theorems about lines and angles Note: Theorems include but are not limited to: 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. Note: Proofs are not an isolated topic and therefore should be integrated throughout the course.

Student-Friendly Objectives:

- I can recognize angle pairs.
- I can identify the relationships among various angle pairs.
- I can use the relationships among angle pairs to solve problems.
- I can recognize angle or segment bisectors, and use this to solve problems..
- I can use the distance and midpoint formulas to solve problems.

HSG.C.A.2 10 Identify, describe, and use relationships among angles, radii, segments, lines, arcs, and chords as related to circles Note: Examples include but are not limited to the following: the relationship between central, inscribed, and circumscribed angles and their intercepted arcs; angles inscribed in a semicircle are right angles; the radius of a circle is perpendicular to a tangent line of the circle at the point of tangency.

Student-Friendly Objectives:

- I can employ correct vocabulary for parts of circles in my work and explanations.
- I can name and classify arcs (minor, semicircle, major).
- I can calculate the measure of an arc given a central or an inscribed angle.
- I can calculate the length of an arc and express it in either terms of pi or as an approximated answer.
- I can use angle relationships of circles to find unknown angle measures.
- I can explain that inscribed angles have a measure that is half of its intercepted arc measure.
- I can explain that circumscribed angles have a measure that is half the difference of the two intercepted arcs.
- I can evaluate segment relationships of circles to find unknown segment lengths.
- I can determine if a segment is tangent to a circle by using the Pythagorean Theorem.

Learning Indicators of Power Standards

Students will know…	And be able to…
● The angle addition postulate ● The segment addition postulate ● The definition of a bisector ● The distance and midpoint formulas ● Area, perimeter, and circumference ● The parts of a circle: radius, diameter, chord, secant, and tangent ● The difference between central, inscribed, and circumscribed angles ● Naming conventions for classification of arcs ● All circles are similar ● Congruent circles have congruent radii ● That central angle measures are equivalent to their intercepted arc measure ● That inscribed angles are ½ the measure of their intercepted arc ● The difference in arc length and arc measure ● That arc length is a section/portion of the circumference of the circle ● That answers left in terms of π are exact ● That a tangent is always perpendicular to a radius at the point of tangency ● The standard form for the equation of a circle	● Use algebra to solve for missing angles, segments, or variables. ● Recognize and use bisectors to solve problems. ● Apply the distance and midpoint formula to solve problems. ● Find the area, perimeter, and circumference of basic geometric shapes. ● Identify segments related to circles: radius, diameter, chord, secant tangent. ● Identify angles related to circles: central, inscribed, circumscribed. ● Classify arcs as minor, semi-circle, or major. ● Name arcs using the correct naming conventions. ● Find the measure of an arc given the central angle measure. ● Find the length of an arc given the central angle measure and the measure of the radius, diameter, or circumference. ● Find angle measures given arc measures. ● Find arc measures given angle measures. ● Apply properties of circles in real life situations to solve for a given problem.

Additional Arkansas State Standards

- **HSG.CO.A.1.1** Based on the undefined notions of *point*, *line*, *plane*, distance along a line, and distance around a circular arc, define:
  - Angle
  - Line Segment
  - Circle
  - Perpendicular Lines

    - Parallel Lines
- **HSG.C.A.3.10** Prove properties of angles for a quadrilateral inscribed in a circle
- **HSG.C.B.5.11** Derive using similarity that the length of the *arc* intercepted by an angle is proportional to the *radius*
    - Derive and use the formula for the area of a *sector*
    - Understand the radian measure of the angle as a unit of measure
- **HSG.GPEA.1.12** Derive the equation of a circle of given center and radius using the Pythagorean Theorem. Note: Students should also be able to identify the center and radius when given the equation of a circle and write the equation given a center and radius.
- **HSG.GPE.B.6.13** Find the midpoint between two given points; ~~and find the endpoint of a line segment given the midpoint and one endpoint Note: An extension of this standard would be to find the point on a directed line segment between two given points that partitions the segment in a given ratio.~~
- **HSG.GPE.B.7.13** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles Note: Examples should include, but are not limited using the distance formula and area of composite figures.
- **HSG.GMD.A.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, ~~volume and surface area of a cylinder, pyramid, and cone For example: Use dissection arguments, Cavalieri's principle, and informal limit arguments~~.

Unit 2	Equations of Lines, Angle-Pairs, Congruence, and Triangles	Grade Level	Geometry 10-12	Approx Length	9 weeks

CPSD Power Standards with Student Learning Objectives

HSG.SRT.B.5.7 Use congruence (SSS, SAS, ASA, AAS, and HL) and similarity (AA~, SSS~, SAS~) criteria for triangles to solve problems • Use congruence and similarity criteria to prove relationships in geometric figures

Student-Friendly Objectives:

- I can prove two triangles are congruent using one of five methods: SSS, SAS, ASA, AAS, or HL.
- I can explain why the five methods for triangle congruence are shortcuts.
- I can explain how CPCTC allows us to solve for other parts of congruent triangles.

HSG.CO.C.10.3 Apply and prove *theorems* about triangles. Note: Theorems include but are not limited to: 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.~~ Note: Proofs are not an isolated topic and therefore should be integrated throughout the course.

Student-Friendly Objectives:

- I can find the measure of a missing angle in a triangle when I know the other two angle measures.
- I can use the base angles theorem to find the measure of a missing angle in an isosceles triangle.
- I can calculate the sum of the measures of the interior angles of a polygon.
- I can use what I know about interior and exterior angle measures in polygons to solve problems.
- I can identify a midsegment and use it to solve problems.
- I can describe, identify, and sketch a median, an altitude, a perpendicular bisector, and an angle bisector.
- I can order the sides of a triangle from shortest to longest given the angles measures.
- I can order the angles of a triangle from least to greatest given the lengths of the sides.
- I can determine if three side lengths can create a triangle.
- I can calculate all possible values for the missing side of a triangle when given two sides.

Learning Indicators of Power Standards

Students will know…	And be able to…
• There are 5 methods used to prove triangles are congruent (SSS, SAS, ASA, AAS, HL) • Congruence is associated with rigid transformations (rotations, reflections, translations) • Rigid transformations are isometries	• Prove congruence of triangles. • Employ CPCTC to solve problems. • Find the measure of a missing angle in a triangle when given the other two angle measures. • Apply the base angles theorem to find missing angle/s in an isosceles

● Corresponding parts of congruent triangles are congruent (CPCTC) ● Triangle Sum Theorem ● Isosceles Triangle Theorem ● Polygon Sum Theorem ● Exterior Angle Theorem ● Midsegment Theorem ● Definitions of median, altitude, perpendicular bisector and angle bisector ● Triangle Inequality Theorem ● The definitions of median, altitude, perpendicular bisector, and angle bisector	triangle. ● Calculate the sum of the measures of the interior angles of a polygon. ● Calculate a single interior angle of a regular polygon. ● Calculate a single exterior angle of a regular polygon. ● Utilize exterior angles of a polygon to calculate a missing interior angle of a triangle. ● Determine the measure of an exterior angle of a triangle given 2 interior angles. ● Identify a midsegment and utilize its properties to solve problems. ● Order the sides of a triangle from shortest to longest. ● Order the angles of a triangle from least to greatest. ● Determine if 3 side lengths can create a triangle. ● Calculate all possible values for side lengths of the 3rd side of a triangle when given 2 sides.

Additional Arkansas State Standards

- **HSG.GPE.B.5.13**
  - Prove the slope criteria for parallel and perpendicular lines
  - Use the slope criteria for parallel and perpendicular lines to solve geometric problems
  - Note: Examples should include but are not limited to finding the equation of a line parallel or perpendicular to a given line that passes through a given point.

Unit 3	Similarity, Right Triangles, and Polygons	Grade Level	Geometry 10-12	Approx Length	9-weeks

CPSD Power Standards with Student Learning Objectives

HSG.SRT.B.5.7 Use ~~congruence (SSS, SAS, ASA, AAS, and HL) and~~ similarity (AA~, SSS~, SAS~) criteria for triangles to solve problems • Use ~~congruence and~~ similarity criteria to prove relationships in geometric figures

Student-Friendly Objectives:

- I can use ratios and proportions to solve problems involving similar figures.
- I can use similarity and congruence theorems for triangles to solve real-world problems

HSG.SRT.C.8.8 Use trigonometric ratios, special right triangles, and the Pythagorean Theorem to find unknown measurements of right triangles in applied problems Note: Examples should Including, but are not limited to angles of elevation, angles of depression, navigation, and surveying.

Student-Friendly Objectives:

- I can employ the Pythagorean Theorem to solve real world problems.
- I can apply 30-60-90 right triangle ratios or 45-45-90 right triangle ratios to solve for missing sides in a right triangle.
- I can identify sides of a right triangle (given an angle) as opposite, adjacent, or hypotenuse.
- I can write sine, cosine, and tangent ratios for an angle in a right triangle.
- I can determine when to use a trig ratio or the trig inverse.
- I can solve for a missing value in a trig ratio problem.
- I can use technology appropriately to solve problems involving trig ratios.

HSG.CO.C.11.3 Apply and prove *theorems* about quadrilaterals. Note: Theorems include but are not limited to relationships among the sides, angles, and diagonals of quadrilaterals and the following theorems concerning *parallelograms*: opposite sides are congruent, opposite angles are congruent, the diagonals of a *parallelogram* bisect each other, and conversely, *rectangles are parallelograms* with congruent diagonals. Note: Proofs are not an isolated topic and therefore should be integrated throughout the course.

Student-Friendly Objectives:

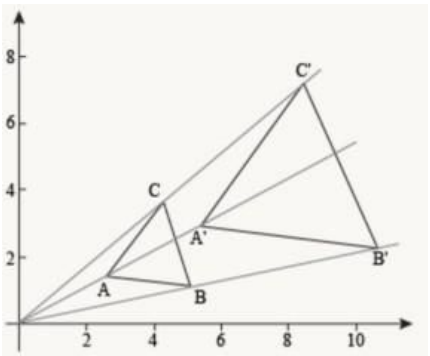
- I can classify quadrilaterals using deductive reasoning (proof using geometric strategies).
- I can calculate segment lengths or angle measures of quadrilaterals.
- I can use the properties of parallelograms, rectangles, rhombi, squares and trapezoids to model geometric situations and solve problems using algebraic properties.
- I can justify that a quadrilateral is/is not a parallelogram by citing evidence.

Learning Indicators of Power Standards

Students will know…	And be able to…
• There are 3 methods used to prove triangles are similar (SSS~, SAS~, AA~) • Similarity is associated with dilations, which are not rigid transformations • The Pythagorean Theorem • 30-60-90 right triangles have constant ratios of 1,2, $\sqrt{3}$ • 45-45-90 right triangles have constant ratios of 1,1, $\sqrt{2}$ • The sine of an angle represents the ratio of the measures of the opposite side to the hypotenuse • The cosine of an angle represents the ratio of the measures of the adjacent side to the hypotenuse • The tangent of an angle represents the ratio of the measures of the opposite side to the adjacent side • The five characteristics of parallelograms: opposite sides are congruent and parallel; opposite angles are congruent; consecutive angles are supplementary; diagonals bisect each other. • The characteristics of a rectangle include those of a parallelogram AND 4 right angles; diagonals are congruent • The characteristics of a rhombus include those of a parallelogram AND diagonals are perpendicular; 4 congruent sides • The characteristics of a square include ALL properties of a parallelogram, rectangle and rhombus • Base angles of an isosceles trapezoid are congruent • Legs of an isosceles trapezoid are congruent • Trapezoids have at least one pair of parallel sides	• Model geometric situations and solve problems using algebraic properties. • Solve real-world problems and prove relationships using similarity and congruence theorems of triangles. • Apply ratios and proportions to solve problems using the properties of similar figures (indirect measurement). • Identify parts of a right triangle (hypotenuse, adjacent side, opposite side) in reference to a given acute angle. • Use technology appropriately with respect to trigonometry. • Write each trig ratio for a given angle measure. • Solve for a missing value in a trig ratio problem including how and when to use the trig inverse. • Find the missing measures of right triangles. • Solve real-world problems involving right triangles using trigonometric ratios and the Pythagorean Theorem or properties of similar figures. • Classify a quadrilateral as a parallelogram, rectangle, rhombus, square, trapezoid, isosceles trapezoid, or none of these. • Prove theorems about quadrilaterals using distance formula, midpoint formula, and slope. • Apply the properties of parallelograms, rectangles, rhombi, squares and trapezoids to solve for missing values.

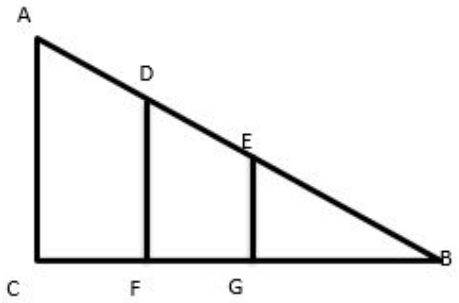
Additional Arkansas State Standards

- **HSG.SRT.A.1.6** Verify experimentally the properties of *dilations* given by a center and a *scale factor*
  - 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
  - The *dilation* of a *line segment* is longer or shorter in the ratio given by the *scale factor*



- **HSG.SRT.A.2.6** Given two figures:
  - Use the definition of *similarity* in terms of similarity transformations to determine 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
- **HSG.SRT.A.3.6** Use the properties of similarity transformations to establish the AA~, SAS~, SSS~ criteria for two triangles to be similar
- **HSG.SRT.C.6.8** 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

For example: Trigonometric ratios are related to the acute angles of a triangle, not the right angle. The values of the trigonometric ratio depend only on the angle. Consider the following three similar right triangles, why are they similar?



- **HSG.SRT.C.7.8** Explain and use the relationship between the sine and cosine of complementary angles

Unit 4	Measurements, Dimension, and Transformations	Grade Level	Geometry 10-12	Approx Length	9 Weeks

CPSD Power Standards with Student Learning Objectives

HSG.GMD.A.3.14 Use volume formulas for cylinders, pyramids, cones, spheres, and to solve problems which may involve composite figures • Compute the effect on volume of changing one or more dimension(s) For example: How is the volume affected by doubling, tripling, or halving a dimension?

Student-Friendly Objectives:

- I can determine the correct volume formula to use based on the shape(s).
- I can calculate the volume of solids with correct formulas.
- I can modify formulas for composite figures.
- I can compare the effect on the volume when a dimension is changed.
- I can use geometric concepts (such as Pythagorean Theorem, special right triangles, etc.) to determine volume of composite figures.
- I can model and solve geometric problems using reasoning and/or algebraic properties.

Learning Indicators of Power Standards

Students will know…

- Vocabulary that relates to 3-D shapes including the dimensions of each formula
- The effects on the volume of a shape by changing a dimension(doubling, tripling, or halving)
- Composite shapes can be decomposed into cylinders, pyramids, cones, and prisms.

And be able to…

- Identify which measurements should be used in a volume formula.
- Calculate the volume of a solid given its dimensions.
- Compare the volumes of different composite figures.
- Find a dimension given the volume of a figure.
- Determine what geometric figures are used to create a composite figure and then use the appropriate formulas to calculate volume of the composite.

Additional Arkansas State Standards

- **HSG.CO.A.2.1** Represent *transformations* in the *plane* (e.g., using transparencies, tracing paper, 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 *dilation*)
- **HSG.CO.A.7.2** 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*
- **HSG.CO.A.8.2** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of *rigid motions*
  Investigate congruence in terms of *rigid motion* to develop the criteria for triangle congruence (ASA, SAS, AAS, SSS, and HL)
  Note: The emphasis in this standard should be placed on investigation.
- **HSG.CO.A.3.1** Given a *rectangle, parallelogram, trapezoid*, or *regular polygon*, describe *the rotations* and *reflections* that carry it onto itself

- **HSG.CO.A.4.1** Develop definitions of *rotations, reflections*, and *translations* in terms of *angles, circles, perpendicular lines, parallel lines*, and *line segments*
- **HSG.CO.A.5.1** Given a geometric figure and a *rotation, reflection,* or *translation*, draw the transformed figure (e.g., using graph paper, tracing paper, miras, geometry software)
    - Specify a sequence of *transformations* that will carry a given figure onto another
- **HSG.CO.A.6.2** 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
- **HSG.GMD.B.4.15** Identify the shapes of two-dimensional *cross-sections* of three- dimensional objects; Identify three-dimensional objects generated by rotations of two-dimensional objects
- **HSG.MG.A.1.16** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder)
- **HSG.MG.A.2.16** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot)
- **HSG.MG.A.3.16** 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)