Southern York County School District

One Warrior at a Time

Course/Subject: Geometry   Grade Level: 8

Textbook(s) / Instructional Materials Used: Geometry Connections, Volume 2, ISBN: 978-1-931287-59-3, Version 3.1 edition, June, 2006.

Month(s): August	Unit 1

Algebra Review and Transformation

Big Idea	Eligible Content/ Standards	Essential Questions & Lesson Essential Question	Objectives	Vocabulary	Competencies
Students will understand: Interpreting linear equations. Concepts of transformations of shapes.	M08.B-E.2.1.3 Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. M08.B-E.3.1.1 Write and identify linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). M08.B-E.3.1.2 Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	How can I generate the equation of a line from a graph? How do I determine how many solutions there are to a linear equation? How do I solve linear equations? How do I determine the best method to solve a system of equations? What does the solution to the system of equations represent? What sequence of transformations were used to move a figure?	Students will know: How to recognize how algebra can be used in the study of geometry. Students will be able to: Flip, turn, and slide shapes, while learning about transformations and how to use these motions to build new shapes and describe symmetry.	Slope Linear Equations Variables Y-intercept Solutions Coefficients Systems of Equations Elimination Method Substitution Rotations Reflections Translations Transformations	Determine equation of a line from a graph. Graph a line from an equation. Solve a system of equation in 2 variables. Use rigid transformations to move figures on a graph.

	M08.B-E.3.1.3 Interpret solutions to a system of two linear equations in two variables as points of intersection of their graphs because points of intersection satisfy both equations simultaneously. M08.B-E.3.1.4 Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection. M08.B-E.3.1.5 Solve real-world and mathematical problems leading to two linear equations in two variables. M08.C-G.1.1.1 Identify and apply properties of rotations, reflections, and translations. M08.C-G.1.1.2 Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them.				

Month(s): September	Unit 2

Angle Relationships

Big Idea	Eligible Content/Standards	Essential Questions & Lesson Essential Question	Objectives	Vocabulary	Competencies

Students will understand . . . The relationships that exist between various angle pairs on the coordinate plane. Various methods to find the length of a line segment on the coordinate plane.	G.1.2.1.1 Identify and/or use properties of triangles. G.1.2.1.3 Identify and/or use properties of isosceles and equilateral triangles. G.2.1.1.1 Use the Pythagorean theorem to write and/or solve problems involving right triangles. G.2.1.2.2 Relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations). G.2.1.2.3 Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape. G.2.2.1.1 Use properties of angles formed by intersecting lines to find the measures of missing angles. G.2.2.1.2 Use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles. M08.B-E.1.1.2 Use square root and cube root symbols to represent solutions to equations of the form $x2 = p$ and	How do points, lines, and planes relate to one another? How do I label an angle? What is the relationship between the two angles? How do the angles in a triangle relate to one another? How do I find the missing side of a right triangle? How do I determine if a triangle is a right triangle, acute triangle, or obtuse triangle? How are the equations of lines related when the lines are parallel or perpendicular? What is the distance between two points on a graph? Where is the exact center of a line segment?	Students will know . . . When a transversal intersects parallel lines, corresponding angles are equal. The relationship between alternate interior angles and consecutive interior angles. The angles in a triangle add up to 180 degrees. How to use Pythagorean Theorem to find the missing side of a right triangle. The triangle inequality. Students will be able to: Use angle relationships to find missing measurements in figures.	Transversal Alternate Interior Angles Corresponding Angles Alternate Exterior Angles Consecutive Interior Angles Supplementary Angles Complementary Angles Vertical Angles Adjacent Angles Parallel Lines Perpendicular Lines Pythagorean Theorem Legs of Right Triangle Hypotenuse	Identify different angle relationships from a figure. Find the distance between 2 points on a graph. Determine algebraically if 2 lines are parallel or perpendicular. Find missing angles in figures. Use the Pythagorean theorem to find a missing side in a right triangle. Use the converse of the pythagorean theorem to determine if a triangle is right, obtuse, or acute.

			Find missing sides of right triangles.		
	x3 = p, where p is a positive rational number. Evaluate square roots of perfect squares (up to and including 122) and cube roots of perfect cubes (up to and including 53) without a calculator. M08.C-G.2.1.1 Apply the converse of the Pythagorean theorem to show a triangle is a right triangle. M08.C-G.2.1.2 Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (Figures provided for problems in three dimensions will be consistent with Eligible Content in grade 8 and below.) M08.C-G.2.1.3 Apply the Pythagorean theorem to find the distance between two points in a coordinate system.				

Month(s): October	Unit 3

Similar Figures

Big Idea	**Eligible Content/Standards**	**Essential Questions & Lesson Essential Question**	**Objectives**	**Vocabulary**	**Competencies**
Students will understand:	G.1.3.1.1 Identify and/or use properties of congruent and similar polygons or solids.	How do you dilate a figure on the coordinate plane?	Students will know . . .	Similar Figures Proportional Relationships Included Angle	Determine if 2 triangles are similar.

How to explore ways to determine if two figures are similar How to develop ways to use the information about one figure to learn more about another that has the same shape	G.1.3.1.2 Identify and/or use proportional relationships in similar figures. G.2.2.3.1 Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?) M08.A-N.1.1.1 Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths). M08.A-N.1.1.2 Convert a terminating or repeating decimal to a rational number (limit repeating decimals to thousandths). M08.A-N.1.1.3 Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). Example: $\sqrt{5}$ is between 2 and 3 but closer to 2. M08.A-N.1.1.4 Use rational approximations of irrational numbers to compare and order irrational numbers.	How can you determine if 2 triangles are similar? How can you find missing sides of similar figures? How do I determine if a number is rational? How do I convert a rational decimal to a fraction?	How to support a mathematical statement using flowcharts and conditional statements About the special relationships between shapes that are similar or congruent How to determine if triangles are similar or congruent Students will be able to: Through exploration generate similar figures Determine what common qualities similar shapes have Discover the conditions that cause triangles to be similar or congruent	Included Side Corresponding Parts SAS AA SSS Perimeter Area Dilation Rational Numbers Irrational Numbers Repeating Decimals Flow Chart	Find the missing side of a figure using scale. Determine if a number is rational or irrational. Use flowcharts to organize information providing support for proofs.

	M08.A-N.1.1.5 Locate/identify rational and irrational numbers at their approximate locations on a number line. M08.B-E.2.1.1 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. Example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. M08.B-E.2.1.2 Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. M08.C-G.1.1.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. M08.C-G.1.1.4 Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them.		Use a flowchart to organize facts and support their conclusions	

Month(s): November	**Unit 4**

Trigonometry

Big Idea	Eligible Content/Standards	Essential Questions & Lesson Essential Question	Objectives	Vocabulary	Competencies
Trig ratios as an extension of similar Triangles

Patterns in triangle (angles, sides) can lead to useful shortcuts

A number of tools are available to analyze triangles and solve for missing sides or angles. | G.2.1.1.2
Use trigonometric ratios to write and/or solve problems involving right triangles.

G.2.2.2.1
Estimate area, perimeter, or circumference of an irregular figure.

G.2.2.2.2
Find the measurement of a missing length, given the perimeter, circumference, or area.

M08.D-S.1.2.1
Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible associations between the two variables. Example: Given data on whether students have a curfew on school nights and whether they have assigned chores at home, is there evidence that those who have a curfew also tend to have chores? | How are the trig ratios related to similar triangles?

Which tool (of triangles and trigonometry) is appropriate to use in this problem?

When is it appropriate to use the inverse of a trigonometric function?

How can I use Trigonometric functions to find the area of a triangle?

How can I apply the Law of Sines to other triangles. | Students will know . . .

How the tangent ratio is connected to the slope of a line.

How to apply the inverse trig functions in certain situations

Shortcuts, like Pythagorean triples, 30-60-90 and 45-45-90 triangles

The formulas for Law of Sines

Students will be able to …

Use trig ratios to find missing sides of Right Triangles.

Use inverse trig ratios to find missing angles of right triangles | Sine
Cosine
Tangent
Law of Sines
Opposite Side
Adjacent Side | Find missing angles and sides in right triangles.

Find missing angles and sides in all triangles.

Apply trigonometric ratios in real world situations.

Find area of a triangle using Sine function.

Interpret a 2 way table. |

| | | | Recognize 30-60-90 and 45-45-90 triangles and use appropriate shortcuts

Recognize simpler Pythagorean triples and use them as shortcuts

Use the Law of Sines to find missing sides and/or angles of non-right triangles | | |
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Month(s): December/January		**Unit 5**			

Congruent Triangles					
Big Idea	**Eligible Content/Standards**	**Essential Questions & Lesson Essential Question**	**Objectives**	**Vocabulary**	**Competencies**
Students will understand . . .

How to explore ways to determine if two figures are congruent

How to use a flowchart to organize and | G.1.3.1.1 Identify and/or use properties of congruent and similar polygons or solids.

G.1.3.2.1 Write, analyze, complete, or identify formal proofs (e.g., direct and/or indirect proofs/proofs by contradiction). | How are the triangles related?

What information do I need?

What is the connection?

How can I justify that?

What do I need to show for triangles to be congruent? | Students will know . . .

How to support a mathematical statement using flowcharts and conditional statements

About the special | Two Column Proof CPCTC SSS SAS ASA AAS HL Reflexive Bisector Segment Addition | Determine if 2 triangles are congruent.

Create a formal 2 column proof showing triangles are congruent.

Apply theorems and postulates to proofs. |

create a formal 2 column proof.			relationships between shapes that are similar or congruent How to determine if triangles are similar or congruent How to create a formal 2 column proof Students will be able to: Through exploration generate congruent figures Determine what common qualities congruent shapes have Discover the conditions that cause triangles to be similar or congruent Use a flowchart to organize facts and	Postulate Angle Addition Postulate	Use deductive reasoning to prove a statement true.

		support their conclusions		

Month(s): January/February	Unit 6

Quadrilaterals

Big Idea	Eligible Content/Standards	Essential Questions & Lesson Essential Question	Objectives	Vocabulary	Competencies
Students will understand . . The relationships between various parts of quadrilaterals such as but not limited to, squares, rectangles, parallelograms, and trapezoids. What the midpoint of a line segment is and how to find it given two points.	G.1.2.1.2 Identify and/or use properties of quadrilaterals. G.2.1.2.1 Calculate the distance and/or midpoint between two points on a number line or on a coordinate plane. G.2.1.2.3 Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a two-dimensional shape. G.2.2.4.1 Use area models to find probabilities.	What is the connection between different quadrilaterals? How can I prove the properties of each quadrilateral?	Students will know . . . How to support a mathematical statement using proof? The special relationships that exist between different quadrilaterals. Students will be able to: Use coordinate geometry to investigate properties of quadrilaterals. Use 2 column proof to prove properties of different quadrilaterals.	Quadrilateral Parallelogram Rectangle Rhombus Square Trapezoid Isosceles Trapezoid Diagonal Midpoint Bisect	Recognize the relationships that exist between different quadrilaterals. Use coordinate geometry and properties of quadrilaterals to determine the type of quadrilateral. Use properties of quadrilaterals to determine missing parts of quadrilaterals. Use basic construction tools to construct different quadrilaterals.

Month(s): February/March		Unit 7			
Polygons					
Big Idea	**Eligible Content/Standards**	**Essential Questions & Lesson Essential Question**	**Objectives**	**Vocabulary**	**Competencies**
Students will understand . . The properties of polygons and use the properties to determine the area of the any given polygon.	G.1.2.1.3 Identify and/or use properties of isosceles and equilateral triangles. G.1.2.1.4 Identify and/or use properties of regular polygons. G.2.2.2.1 Estimate area, perimeter, or circumference of an irregular figure. G.2.2.2.2 Find the measurement of a missing length, given the perimeter, circumference, or area. G.2.2.2.3 Find the side lengths of a polygon with a given perimeter to maximize the area of the polygon. G.2.2.2.4 Develop and/or use strategies to estimate the area of a compound/composite figure.	What shapes are put together to build any given polygon? What properties of regular polygons can be used to help determine the area of the regular polygon?	Students will know . . . The sum of the interior and exterior angles of any polygon. The relationship that exist between similar figures and their perimeters and area. Students will be able to: Use various methods and properties of polygons to determine the area of any polygon. Maximize the lengths of sides for any regular polygon with a given area.	Pentagon Hexagon Octagon Decagon N-gon Exterior Angles Radius Apothem Isosceles Triangle	Find the area and perimeter of both regular and irregular polygons. Find measures of interior and exterior angles of a regular polygon.
Month(s): March/April		Unit 8			

3-Dimensional Solids

Big Idea	Eligible Content/Standards	Essential Questions & Lesson Essential Question	Objectives	Vocabulary	Competencies
Students will understand . . . How to find various measurements of 3-dimensional solids as well as different ways to represent those solids.	M08.C-G.3.1.1 Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. Formulas will be provided. G.1.1.1.4 Identify and/or use the properties of a sphere or cylinder. G.1.2.1.5 Identify and/or use properties of pyramids and prisms. G.2.3.1.1 Calculate the surface area of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet. G.2.3.1.2 Calculate the volume of prisms, cylinders, cones, pyramids, and/or spheres. Formulas are provided on a reference sheet. G.2.3.1.3 Find the measurement of a missing length given the surface area or volume. G.2.3.2.1 Describe how a change in the linear dimension of a figure	How can I find missing information for a 3 dimensional solid figure? What information do I need to find the volume and surface area of a 3 dimensional solid figure? How can I get the maximum volume from a given surface areas?	Students will know . . . How to find volume and surface area for 3-dimensional solids. The difference between lateral and total surface area. Students will be able to: Draw 3 dimensional figures using isometric dot paper. Find a missing measurement given the volume or surface area of a 3 dimensional solid.	Prism Cylinder Pyramid Cone Sphere Volume Surface Area Base of 3D figure Slant Height Lateral Surface Area	Find the volume of a 3 dimensional solid. Find the total surface area and lateral surface area of a 3 dimensional solid.

	affects its surface area or volume (e.g., How does changing the length of the edge of a cube affect the volume of the cube?).				

Month(s): April/May		**Unit 9**			

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<tr><td colspan="6" style="background:red; color:white;">Circles</td></tr>
<tr>
<td><u>Big Idea</u></td>
<td><u>Eligible Content/Standards</u></td>
<td><u>Essential Questions & Lesson Essential Question</u></td>
<td><u>Objectives</u></td>
<td><u>Vocabulary</u></td>
<td><u>Competencies</u></td>
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<tr>
<td>The relationships between angles, arcs, and line segments in a circle.</td>
<td>G.2.2.3.1
Describe how a change in the linear dimension of a figure affects its perimeter, circumference, and area (e.g., How does changing the length of the radius of a circle affect the circumference of the circle?).

G.2.2.2.5
Find the area of a sector of a circle.

G.1.1.1.1
Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle.

G.1.1.1.2
Identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle.

G.1.1.1.3
Use chords, tangents, and secants to find missing arc measures or missing segment</td>
<td>What is the relationship between arcs and angles in a circle?

What is the relationship between area of a circle and area of a sector?

What is the relationship between circumference of a circle and arc length?</td>
<td>Students will know . . .

How to apply the properties of a circle to real life situations.

Students will be able to…

Determine the arc measure from an inscribed or central angle.

Calculate the arc length of an arc given various measurements in the circle.

Calculate the area of a sector given various measurements</td>
<td>Circle
Radius
Diameter
Chord
Secant
Tangent
Major Arc
Minor Arc
Inscribed Angle
Central Angle
Circumference
Sector
ArcLength</td>
<td>Competencies
Find the area and circumference of a circle.

Find the arc length of an arc.

Find the area of a sector.

Calculate the measure of an inscribed and central angle in a circle.</td>
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	measures. M08.B-E.1.1.3 Estimate very large or very small quantities by using numbers expressed in the form of a single digit times an integer power of 10 and express how many times larger or smaller one number is than another. Example: Estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 and determine that the world population is more than 20 times larger than the United States' population. M08.B-E.1.1.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Express answers in scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology (e.g., interpret 4.7EE9 displayed on a calculator as 4.7×10^9).		in the circle.		