Wentzville School District
Unit 1: Introduction to Geometry
Stage 1 – Desired Results

Unit 1 - Introduction to Geometry
Unit Title: Introduction to Geometry Course: Honors Geometry Brief Summary of Unit: Students will be introduced to the terms and notation of geometry as well as the foundational properties of segments and angles. Students will calculate distances, midpoints, perimeters and areas of basic geometric shapes. Textbook Correlation: Glencoe Geometry 1.1- 1.6 Time Frame: 2 to 3 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies.

• When is estimating the best solution to a problem?	• Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... • use geometric properties to solve real-world problems (i.e. hang picture on a wall, mount tv)

Meaning	
Essential Questions	Understandings
• When and why do we use distance formula, midpoint formula, angle addition, and segment addition? • What is the importance of coordinate geometry? • Why do we have geometric notation? • How is notation used to effectively communicate geometric figures? • How is geometry used in the real world?	• Real world objects can be modeled by geometric shapes or combinations of geometric shapes. • In order to communicate effectively in geometry, students must be able to read and identify the language of geometry (i.e. its symbols and notations). • Most geometric theorems are built upon the foundational properties of angles and segments. • Coordinate geometry allows us to more precisely measure distances and angles. • Points, lines, and planes are the foundation of geometry even though they cannot be defined.

Acquisition	
Key Knowledge	Key Skills
• Formal definitions of: o angle o circle o perpendicular o line segment o ray o intersection o point, line, and plane (undefined terms) o congruent segments o segment bisector o congruent angles o angle bisector	• Name the intersection of points, lines, planes, segments, and rays • Use segment addition postulate (aka known as betweenness of points in the textbook) to solve problems. • Use the definition of congruent segments to solve problems. • Use the definition of midpoint to solve problems. • Use the definition of segment bisector to solve problems. • Use the midpoint formula to find the coordinates of the midpoint of a segment.

○ linear pair ○ supplementary ○ complementary ○ vertical angles ○ collinear points ○ coplanar ○ concave polygon ○ convex polygon • Distance formula • Midpoint formula • Perimeter • Segment Addition Postulate • Angle Addition Postulate • Area formulas (basic figures)	• Use the distance formula to find the length of a segment, including writing the answer in simplest radical form. (Note: Simplest radical form may or may not have been covered in previous math classes) • Use the angle addition postulate (the sum of the measures of two adjacent angles is equal to the measure of the angle formed by the non-common sides) to solve problems. • Use the definition of congruent angles to solve problems. • Use the definition of angle bisector to solve problems. • Solve problems involving linear pairs. • Solve problems involving vertical angles. • Solve problems involving complementary angles. • Solve problems involving supplementary angles. • Use the definition of perpendicular lines to solve problems. • Determine if a given polygon is concave or convex. • Classify polygons according to the number of sides. • Compute areas of triangles and rectangles given the coordinates of the vertices. • Find the perimeter of a polygon given the coordinates of the vertices.

Standards Alignment

MISSOURI LEARNING STANDARDS

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.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 2: Reasoning and Proof

Stage 1 – Desired Results

Unit 2 - Reasoning and Proof
Unit Title: Reasoning & Proof Course: Honors Geometry Brief Summary of Unit: Students will be able to use inductive reasoning to make reasonable conjectures and find counterexamples. In addition, students will use deductive reasoning to reach valid conclusions. Finally, students will write proofs involving segment and angle theorems. Textbook Correlation: Glencoe Geometry 2.1,2.3 (+2.3 lab),2.4, (2.5 optional) 2.6-2.8 Time Frame: 2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies.

• When is estimating the best solution to a problem?	• Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... logically justify their reasoning to construct a coherent argument.

Meaning	
Essential Questions	Understandings
• Why do we perform proofs? • How do we formally justify our reasoning? • Why use inductive reasoning? • Why use deductive reasoning? • How do we determine if a statement is valid?	• Postulates/axioms are assumed to be true, while theorems and corollaries are proven using postulates, axioms, definitions, and other theorems. • Inductive reasoning is a tool to develop conjectures. • Deductive reasoning is a way to formally construct a valid argument. • Using laws of logic aids in the process of determining the validity of a statement.

Acquisition	
Key Knowledge	Key Skills
• Vertical angles are congruent. • Angle Addition Postulate • Segment Addition Postulate • Reflexive, Symmetric, and Transitive Properties of Congruence • Linear pairs are supplementary • All right angles are congruent • Conditional statement • Algebraic Proof • conclusion • conjecture • contrapositive • converse	• Make conjectures using inductive reasoning • Provide counterexample(s) to prove a conjecture is false. • Write conditional statements in if-then form. • State the converse of a conditional statement. • State the inverse of a conditional statement. • State the contrapositive of a conditional statement. • Determine the truth value of the converse, inverse, and contrapositive of a conditional statement (it is not necessary to teach truth tables). • Assess whether a conditional statement and its converse can be written as a biconditional

• counterexample • deductive reasoning • hypothesis • if-then statement • inductive reasoning • inverse • negation • proof • statement • two-column proof	statement and write it when appropriate. • Determine the validity of a biconditional statement. • Use deductive reasoning to draw valid conclusions. • Complete a two-column algebra proof. • Complete two-column proofs involving theorems/properties of segments, including using the segment addition postulate. • Complete two-column proofs involving theorems/properties of angles, including using the angle addition postulate. • Prove that vertical angles are congruent.

Standards Alignment

MISSOURI LEARNING STANDARDS

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.

CCSS MP.1 Make sense of problems and persevere in solving them.

CCSS MP.2 Reason abstractly and quantitatively.

CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:

Math 1, 4, 5

Wentzville School District

Unit 3A: Parallel Lines

Stage 1 – Desired Results

Unit 3A - Parallel Lines
Unit Title: Parallel Lines Course: Honors Geometry Brief Summary of Unit: Students will solve problems and complete proofs involving special angle pairs formed when two parallel lines that are cut by a transversal. They will also prove lines are parallel given special angle pair relationships. Textbook Correlation: Glencoe Geometry 3.1, 3.2, 3.5 Time Frame: 2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving

• How accurate do I need to be? • When is estimating the best solution to a problem?	strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... use parallel lines and their properties to construct parallel objects (i.e. floor and ceiling, railroad tracks, fences)

Meaning	
Essential Questions	Understandings
• How can we determine if two lines are parallel? • What conclusions can be drawn if we know that two lines are parallel?	• Special angle pair measurements can be used to prove that two lines are parallel. • If we know the measure of one angle formed when a pair of parallel lines is cut by a transversal, then we can find the measures of the other angles.

Acquisition	
Key Knowledge	Key Skills

• Angle types formed by a transversal line
  ○ alternate interior angles
  ○ alternate exterior angles
  ○ consecutive interior angles
  ○ corresponding angles
  ○ consecutive exterior angles
• Perpendicular bisectors
• Difference between parallel and perpendicular lines
• Properties of special angle pairs formed by parallel lines are cut by a transversal (alternate exterior
	• Determine if lines are parallel, skew, or intersecting.
	• Identify angle pairs formed by two lines cut by a transversal.
	• Solve algebraic and numerical problems using the properties of angles formed when two parallel lines are cut by a transversal.
	• Prove that two lines cut by a transversal are parallel given either specific angle measurements or angle relationships.
	• Prove conjectures about angle relationships given two parallel lines cut by a transversal using parallel

angle theorem, alternate interior angle theorem, corresponding angle postulate, consecutive interior angle theorem) • Converse of parallel line theorems/postulate • skew lines	line theorems and postulates.

Standards Alignment

MISSOURI LEARNING STANDARDS

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.

CCSS MP.1 Make sense of problems and persevere in solving them.

CCSS MP.2 Reason abstractly and quantitatively.

CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 3B: Coordinate Properties of Parallel & Perpendicular Lines

Stage 1 – Desired Results

Unit 3B - Coordinate Properties of Parallel and Perpendicular Lines
Unit Title: Coordinate Properties of Parallel & Perpendicular Lines Course: Honors Geometry Brief Summary of Unit: Students will apply properties of parallel and perpendicular lines using coordinate geometry. Textbook Correlation: Glencoe Geometry 3.3, 3.4, 3.4 Lab Time Frame: 1-1.5 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies.

• When is estimating the best solution to a problem?	• Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... understand that the same principles used in Algebra can be used in Geometry to solve problems.

Meaning	
Essential Questions	Understandings
• What information can we gather about the relationship for two lines or line segments, given their equations?	• Given the equations of two lines, we can determine the relationship between them.

Acquisition	
Key Knowledge	Key Skills
• Perpendicular bisectors • Equidistant • Two lines are perpendicular if and only if the product of their slopes is -1. • Two lines are parallel if and only if their slopes are equal.	• Find the equation of a line that is parallel or perpendicular to a line with a given equation through a given point. (NOTE: In transition, it may be necessary to review finding the slope between two points and writing the equation of a line) • Determine the equation of a line that is a perpendicular bisector of a given line segment. • Given the equations of two lines (or two points on each line), determine if they are parallel, perpendicular, or neither.

Standards Alignment

MISSOURI LEARNING STANDARDS

G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and uses 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).

CCSS MP.1 Make sense of problems and persevere in solving them.

CCSS MP.2 Reason abstractly and quantitatively.

CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District
Unit 4: Properties of Triangles and Triangle Congruency
Stage 1 – Desired Results

Unit 4 - Properties of Triangles and Triangle Congruency
Unit Title: Properties of Triangles & Triangle Congruency Course: Honors Geometry Brief Summary of Unit: Students will apply properties of triangles, including the special properties for isosceles and equilateral triangles. In addition, students will write proofs using triangle congruency theorems. Textbook Correlation: Glencoe Geometry 4.1, 4.2, 5.5, 4.3-4.6 Time Frame: 2-3 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies.

• When is estimating the best solution to a problem?	• Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... use knowledge about one figure to describe a second figure if they are congruent.

Meaning	
Essential Questions	Understandings
• What are the minimum requirements for proving triangles congruent? • Are there restrictions on the measures of angles or the lengths of sides for a triangle? • How much information is required to solve a triangle? • Why is there no SSA or AAA?	• Geometric properties allow us to develop shortcuts to proving triangles congruent. • Congruent triangles are used as the basis for proofs in more advanced geometric shapes. • Missing side lengths and angle measures in triangles can be found using properties of triangles.

Acquisition	
Key Knowledge	Key Skills
• Triangle Angle Sum Theorem • Exterior Angle Theorem • Properties of isosceles and equilateral triangles • Base Angles • Vertex Angle • Triangle Inequality Theorem • Definition of congruent figures • Triangle congruence shortcuts (SSS, SAS, ASA, AAS, HL) • (CPCTC) Corresponding parts of congruent triangles are congruent (definition of congruent triangles)	• Classify a triangle as scalene, isosceles, or equilateral given the coordinates of its vertices. • Find missing angle measures and side lengths of triangles (including numerical problems and algebraic problems) using theorems about triangles such as the triangle angle sum theorem, exterior angle theorem, etc. • Apply the isosceles triangle theorem • Identify corresponding parts of congruent polygons and use corresponding parts of congruent polygons to solve problems. • Use SAS, ASA, HL, AAS and SSS to prove triangles

• included side • included angle • remote interior angles	• Prove corresponding parts of two congruent triangles are congruent (apply CPCTC) • Use properties of isosceles and equilateral triangles to solve numerical and algebraic problems • Determine if segments with given lengths can form a triangle. (Apply the triangle inequality theorem)

Standards Alignment

MISSOURI LEARNING STANDARDS

G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180 degrees, 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.SRT.5 use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 5: Relationships in Triangles

Stage 1 – Desired Results

Unit 5 - Relationships in Triangles
Unit Title: Relationships in Triangles Course: Honors Geometry Brief Summary of Unit: Students will relate congruency to rigid transformations. In addition, students will use coordinate proof to prove geometric properties. Finally, students will also apply properties of the centers of triangles (incenter, circumcenter, orthocenter, and centroid) to solve problems. Textbook Correlation: 4.7,4.8, 5.1, 5.2 Time Frame: 1.5-2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving

• How accurate do I need to be? • When is estimating the best solution to a problem?	strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... reflect, rotate, and translate objects while preserving shape and size.

Meaning	
Essential Questions	Understandings
• How do I confirm that a transformation is a rigid transformation? • What is the best "center" of a triangle? • How can I strategically place a geometric figure on the coordinate plane to reduce the complexity of a coordinate proof?	• Rigid transformations maintain the shape and size of an object, therefore creating a congruent figure. • Coordinate Geometry can be used to prove geometric properties that are otherwise difficult to prove. • Centers of triangles are the points of concurrency between special segments in a triangle and have unique properties that allow us to solve problems.

Acquisition	
Key Knowledge	Key Skills
• Transformation • preimage • image • congruence transformation • isometry/rigid transformation • reflection • translation • rotation • coordinate proof • Definitions and properties of: medians, midsegments, altitudes	• Identify reflections, translations, and rotations • Verify congruence after a congruence transformation. • Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. • Position and label triangles for coordinate proofs. • Write and complete coordinate proofs for triangles. • Identify and use perpendicular bisectors in triangles (numerically and algebraically)

• centroid • incenter • circumcenter • orthocenter • Angle bisectors • Properties of bisectors • Perpendicular bisectors • Altitude	• Identify and use angle bisectors in triangles (numerically and algebraically) • Identify and use medians in triangles. (numerically and algebraically) • Identify and use altitudes in triangles. (numerically and algebraically) • Locate the centroid, incenter, circumcenter, and centroid in a triangle (by hand and with technology) and apply their properties. • Prove points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

Standards Alignment

MISSOURI LEARNING STANDARDS

G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180 degrees, 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.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.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.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.

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 6: Quadrilaterals

Stage 1 – Desired Results

Unit 6 - Quadrilaterals
Unit Title: Quadrilaterals Course: Honors Geometry Brief Summary of Unit: In this unit, students will learn the relationships and properties of different types of quadrilateral, and then use these relationships and properties to prove additional properties about quadrilaterals. Students will use these properties to solve problems, both numerical and algebraic, about quadrilaterals. Textbook Correlation: Glencoe Geometry Chapter 6 Time Frame: 2.5 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving

• How accurate do I need to be? • When is estimating the best solution to a problem?	strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... apply properties of quadrilaterals to solve real-world problems that can be modeled using quadrilaterals.

Meaning	
Essential Questions	Understandings
• What characteristics distinguish special types of quadrilaterals from each other? • How can we use congruent triangles to prove properties of parallelograms? • How can coordinate proof be used to verify geometric properties?	• There is a hierarchy among quadrilaterals, with parallelograms being more general and rectangles, squares, and rhombi more specific. • Coordinate proof is an efficient method to determine quadrilateral type. • The properties of parallelograms can be applied to rectangles, squares and rhombi. • The triangle sum theorem can be used to determine the sum of the interior angles of a polygon.

Acquisition	
Key Knowledge	Key Skills

• Interior Angle Sum Theorem
• Exterior Angle Sum Theorem
• Parallelogram
• Rectangle
• Square
• Rhombi
• Trapezoid
• Isosceles trapezoid
• Midsegment of a trapezoid
	• Solve problems involving the sum of the measures of the interior angles of a polygon.
	• Solve problems involving the sum of the measures of the exterior angles of a polygon.
	• Apply properties of parallelograms to solve problems.
	• Given a quadrilateral is a parallelogram, prove:
	  ○ both pairs of opposite angles congruent
	  ○ both pairs of opposite sides congruent
	  ○ diagonals bisect each other

• Kite • Properties of all parallelograms (opposite sides and angles congruent, diagonals bisect each other, consecutive angles supplementary). • Classify types and properties of specific quadrilaterals (rectangles, rhombi, squares, trapezoids, isosceles trapezoids, and kites) • Coordinate geometry as a method of proof	• Given any of the properties listed above, or given that one pair of opposite sides are both parallel and congruent, prove that the quadrilateral is a parallelogram. • Compare and distinguish special types of parallelograms • Prove rectangles are parallelograms that have congruent diagonals. • Use coordinate proof (slopes and distances) to classify quadrilaterals drawn on a coordinate plane. • Apply properties of rectangles to solve problems. • Apply properties of rhombi to solve problems. • Apply properties of squares to solve problems. • Apply properties of trapezoids to solve problems. • Apply properties of kites to solve problems. • Solve problems involving the midsegment of a trapezoid.

Standards Alignment

MISSOURI LEARNING STANDARDS

G.MG.1 Use geometric shapes, their measures, and their properties to describe objects

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.

G. GPE 4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0,2).

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District
Unit 7: Similarity
Stage 1 – Desired Results

Unit 7 - Similarity
Unit Title: Similarity Course: Honors Geometry Brief Summary of Unit: At the end of this unit, students will be able to: show polygons are similar; prove triangles congruent using AA~, SSS~, and SAS~ theorems: apply properties of parallel segments within a triangle; and use geometry mean to find missing segments. Textbook Correlation: Glencoe Geometry (7.1 optional review) 7.2-7.4, 7.6, 8.1 Time Frame: 1.5-2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving

• How accurate do I need to be? • When is estimating the best solution to a problem?	strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... use the properties of similar figures to create reductions and enlargements in the real-world.

Meaning	
Essential Questions	Understandings
• How can we prove triangles similar? • How is similarity used to prove other properties and theorems? • What information can we gather from similar figures? • How do you verify that similarity transformations produce similar figures?	• The angles of a triangle determine its shape, but not its size. • Identifying two figures as similar allows us to use proportions to find missing side lengths. • An altitude drawn to the hypotenuse of a right triangle forms 3 similar triangles. • Dilations are similarity transformations that can be enlargements or reductions of an original figure.

Acquisition	
Key Knowledge	Key Skills
• Scale factor • Triangle Proportionality Theorem • definition of similar polygons • statement of proportionality (similarity proportion) • similarity transformation • enlargement • reduction	• Use scale factor to enlarge and reduce figures • Determine whether or not two figures are similar by definition. • Solve problems involving similar polygons (i.e. finding missing side lengths using proportions and missing angles) • Use inductive reasoning (by drawing two or more triangles that have the same angle measurements)

• dilation • Geometric Mean • If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other. (Thm 8.1)	to illustrate the AA postulate. • Determine if two triangles are similar using AA similarity, SAS similarity, and SSS similarity • Use the triangle proportionality theorem to find missing segment lengths and angle measurements. • Use proportions to find missing segment lengths when three or more parallel lines are cut by two transversals. • Identify similarity transformations. • Verify similarity after a similarity transformation. • Calculate the geometric mean of two numbers. • Write similarity statement of three triangles given a triangle with an altitude drawn. • Prove Pythagorean Theorem using geometric mean • Find missing segments of a triangle with an altitude using geometric mean

Standards Alignment

MISSOURI LEARNING STANDARDS

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.

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

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.

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 8A: Right Triangles

Stage 1 – Desired Results

Unit 8 - Right Triangles
Unit Title: Right Triangles Course: Honors Geometry Brief Summary of Unit: Students will review the Pythagorean theorem and then use its converse to classify triangles. Students will write sine, cosine, and tangent ratios and then use these ratios to solve problems . They will find missing side lengths and angle measures using regular and inverse trigonometric ratios as well as theorems for 30-60-90 and 45-45-90 triangles. Finally, students will use their knowledge of right triangles to solve real-world problems such as finding an unknown length when finding the length using measurement tools would be impractical. Textbook Correlation: Glencoe Geometry 8.2-8.4, 8.4lab, 8.5 Time Frame: 2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation.

• How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be? • When is estimating the best solution to a problem?	• Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... find missing sides and angles of triangles in the real-world without using a ruler or protractor.

Meaning	
Essential Questions	Understandings
• What is the best method for finding the missing side lengths or missing angles in a right triangle? • How can we find a missing side length of a triangle when only given one side length and an angle? • How can we find angles of a triangle given two side lengths? • What is the least amount of information we need in order to solve a right triangle? • How are similar triangles and trigonometric ratios related? • How can we solve triangles that are not right triangles?	• Trigonometric ratios and the rules for 45-45-90 and 30-60-90 triangles allow us to find missing sides and angles of a triangle that we could not find before only using Pythagorean Theorem. • Right triangles are commonly used to model and solve real-world problems and contexts. • Sine, Cosine, and Tangent ratios are derived using properties of similar triangles.

Acquisition	
Key Knowledge	Key Skills
• Trigonometric ratios (sine, cosine, tangent, cosecant, secant, cotangent) • Inverse Trigonometric ratios (inverse sine, inverse cosine, inverse tangent) • Converse of Pythagorean Theorem • Pythagorean Inequality Theorems • 45-45-90 Triangle Theorem	• Use the Converse of the Pythagorean Theorem and Pythagorean Inequality theorem to classify a triangle as acute, right, or obtuse, given side lengths and given the coordinates of the vertices • Find the length of a missing side of a right triangle using Pythagorean Theorem • Solve real world problems using the Pythagorean

• 30-60-90 Triangle Theorem • Angle of elevation • Angle of depression	Theorem • Find the exact lengths, in simplest radical form, of missing sides of 45-45-90 triangles and 30-60-90 triangles • Given the three sides of a right triangle, state the value of $\sin\theta$, $\cos\theta$, $\tan\theta$, $\csc\theta$, $\sec\theta$, $\cot\theta$ • Use sine, cosine, and tangent to find the missing sides of a right triangle • Use inverse sine, inverse cosine, and inverse tangent to find the measures of the acute angles in a right triangle • Model and solve real world situations, including problems involving angles of elevation and depression, using trigonometric ratios • Explain and use the relationship between sine and cosine of complementary angles

Standards Alignment
MISSOURI LEARNING STANDARDS
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.
CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 8B: Special Right Triangle Trigonometry

Stage 1 – Desired Results

Unit 8 - Special Right Triangle Trigonometry
Unit Title: Special Right Triangle Trigonometry Course: Honors Geometry Brief Summary of Unit: Students will use law of sines and cosines to find missing sides and angles of non-right triangles. Students will find exact trigonometric ratio values using special right triangles drawn in all four quadrants. Textbook Correlation: Glencoe Geometry 8.6, (8.6 Lab) (Algebra II book: 12.2,12.3 *degrees only*) Time Frame: 1-1.5 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies.

• When is estimating the best solution to a problem?	• Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... find missing sides and angles of triangles in the real-world without using a ruler or protractor.

Meaning	
Essential Questions	Understandings
• How can we solve triangles that are not right triangles? • How do the trigonometric ratios change when the angle is greater than 90 degrees?	• The Law of Sines and Law of Cosines can be used to find missing side lengths and angle measures in non-right triangles. • Values of trig ratios for angles beyond 90 degrees can be found using right triangles drawn in the 2nd, 3rd, or 4th quadrant on the coordinate plane.

Acquisition	Acquisition
Key Knowledge	Key Skills
• Law of Sines • Law of Cosines • The Ambiguous Case of Law of Sines • Reference triangle • Reference angle • Terminal side	• Use Law of Sines and Law of Cosines to find missing sides and angles measures of right and non-right triangles. • Use the Law of Sines to find the area of a given triangle. • Find exact values of sine, cosine, tangent, cosecant, secant, and cotangent for special angles (multiples of 30 and 45) between 0 degrees and 360 degrees (YOU DO NOT NEED TO USE RADIANS EVEN THOUGH THE ALGEBRA 2 BOOK USES THEM)

Standards Alignment

MISSOURI LEARNING STANDARDS

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.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 Laws 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 measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

CCSS MP.1 Make sense of problems and persevere in solving them.

CCSS MP.2 Reason abstractly and quantitatively.

CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District
Unit 9: Transformations
Stage 1 – Desired Results

Unit 9 - Transformations
Unit Title: Transformations Course: Honors Geometry Brief Summary of Unit: At the end of this unit, students will be able to describe rigid motion transformations including translations, rotations, and reflections. In addition, students will perform transformations and dilations using tools such as graph paper, tracing paper, and geometric software. Finally, students will be able to analyze properties of images and pre-images using the coordinate plane. Textbook Correlation: Glencoe Geometry 4.7; 9.1-9.4; 9.6 (9.5 optional) Time Frame: 1.5-2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation.

• How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be? • When is estimating the best solution to a problem?	• Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... Recognize and adequately describe the real-world applications of translations, reflections, and rotations.

Meaning	
Essential Questions	Understandings
• How are isometries and congruency related? • How can rigid transformations be used to prove congruency? • What patterns do transformations exhibit on a coordinate plane? • Why is using the coordinate plane effective in describing transformations?	• Reflections, translations, and rotations preserve side length and angle measure. • Dilations, both reductions and enlargements, produce similar figures to the original figure. • There are generalized rules that can simplify transformations on the coordinate plane.

Acquisition	
Key Knowledge	Key Skills
• Transformations • Translation, reflection, rotation, dilation • Line of reflection • Center of rotation • Angle of rotation • Center of dilation • Scale factor • Directed line segment is what is drawn in a picture to represent a vector (it looks like a ray, but the length of it depicts the magnitude of the vector it represents)	• Describe rotations and reflections of rectangle, parallelogram, trapezoid, or regular polygon. • Describe rotational symmetry. • Use technology to compare transformations and discover isometries. • Perform transformations using such tools as graph paper, tracing paper, compass/protractor/ruler, or geometry software. • Develop the definitions of transformations by observing examples and relating the motions to line segments, angle measures, and circular arcs.

• Translation vector • Definition of scale factor • Properties of dilations • Isometry (congruence transformation) • Coordinate definition (formulas) for reflection, translation, rotation, and dilation	• Describe rotations and reflections that transform a geometric object onto itself. • Specify a series of transformations that will carry one object onto another. • Relate rigid motion transformations to congruent figures • Use scale factor to enlarge and reduce figures • Perform reflections, translations, rotations, and dilations on the coordinate plane

Standards Alignment

MISSOURI LEARNING STANDARDS

G.CO.2 Represent transformations in the plane using, e.g. transparencies and geometry software; describe transformations as functions that take points in the place 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 segments.

G.CO.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using e.g. graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

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.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 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.

CCSS MP.1 Make sense of problems and persevere in solving them.

CCSS MP.2 Reason abstractly and quantitatively.

CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 10: Properties of Circles

Stage 1 – Desired Results

Unit 10 - Properties of Circles
Unit Title: Properties of Circles Course: Honors Geometry Brief Summary of Unit: Students will begin by exploring the parts of a circle, and then use the relationships that exist between and among those parts to find missing measurements related to circles. Students will find and solve problems involving the circumference and area of circles and sectors. Students will develop an understanding of the relationship between arc length, degree measure, and radian measure. Textbook Correlation: Glencoe Geometry Chapter 10 - Sections 1 - 6 & Chapter 11 - Section 3 Time Frame:2-2.5 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can

relationships through mathematical notation? • How accurate do I need to be? • When is estimating the best solution to a problem?	help discover more efficient problem solving strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... know that the properties of circles and their relationships with other geometric objects can be used to model and solve problems within real-world contexts.

Meaning	
Essential Questions	Understandings
• What are the relationships between chords, secants and tangents in a circle? • How does the location of the vertex of an angle affect its relationship to the arc it intercepts? • How are circumference and area of circle related? • How are radians and degrees related? • When is it most beneficial to use degrees? • When is it most beneficial to use radians?	• When lines intersect inside a circle, on a circle, and outside a circle, relationships exist between their intercepted arcs, angles formed, and lengths of segments on the line. • The relationship between angles and arcs is dependent upon the location of the vertex of the angle. • Arc length and the circumference of a circle are proportional. • The formula for area of a circle is dependent upon the circumference of a circle. • Both radians and degree measure angles. Degrees measure the rotation whereas the radian is the distance covered by that rotation.

Acquisition	
Key Knowledge	Key Skills
• Radii/Diameters/Chords • The ratio of the radii is equal to the ratio of the circumferences • Inscribed polygon • Inscribed angle • Properties of inscribed angles	• Identify and use key features of circles, including radius, diameter, chord, tangent, secant, inscribed angles, circumscribed angles • Prove all circles are similar using inductive reasoning to show the ratio of the radii is equal to the ratio of the circumferences

• Minor and Major Arcs, Semicircles • Properties of arcs • Properties of chords • Circumscribed angles • Properties of circumscribed angles • Central angles • Properties of central angles • Tangents • Point of Tangency • Properties of Tangents • Secants • Properties of secants • Constant of proportionality • Area of a Sector • Radian Measure • Radians are a unit of measure that represents the arc length of a sector in a circle with radius=1	• Find the measure of the intercepted arc, given the measure of the central angle. • Find the measure of the central angle given the measure of the intercepted arc. • Find the length of an arc of a circle. • Use properties of chords and their related arcs to solve problems. • Find the measure of the intercepted arc, given the measure of the inscribed angle • Find the measure of the inscribed angle, given the measure of the intercepted arc. • Use properties of inscribed polygons to find missing angles and solve problems. • Use properties of tangents to find missing measurements in circles and solve problems. • Find the measure of the circumscribed angle, given the measure of the intercepted arcs. • Use the measure of the circumscribed angle to find missing arc measurements. • Find measures of angles formed by lines intersecting on or inside a circle • Find measures of angles formed by lines intersecting outside a circle • Compare and contrast area and circumference of a circle • Give an informal argument for the area and circumference formulas of a circle. • Derive the formula for area of a sector • Find the area of a sector of a circle. • Find the area of a circle given the area of a sector in the circle. • Write and use a proportion relating the ratio of radii to the ratio of arc lengths • Convert from degrees to radians. • Convert from radians to degrees.

Standards Alignment

MISSOURI LEARNING STANDARDS

G.C.1 Prove that all circles are similar.

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.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.

G.MGD.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 principles, and informal limit arguments.*

CCSS MP.1 Make sense of problems and persevere in solving them.

CCSS MP.2 Reason abstractly and quantitatively.

CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District
Unit 11: Volume
Stage 1 – Desired Results

Unit 11: Volume
Unit Title: Volume Course: Honors Geometry Brief Summary of Unit: Students will explore the properties of 3D shapes using cross-sections and rotations. In addition, students will use the volume formulas for prisms, cylinders, pyramids, cones and spheres to solve problems. Students will generate informal arguments to verify the formulas for volume. Students will also solve problems involving the surface area of spheres. Students will also explore real-world applications for volume such as density and design problems. Textbook Correlation: Glencoe Geometry 12.1,(both 12.1 labs) 12.4, 12.5,12.6 (12.6 enrichment worksheet: spheres and density), 9.3 Geometry Lab Solids of Revolution Time Frame: 2 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the

tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be? • When is estimating the best solution to a problem?	context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... calculate volume of real-world objects to solve problems, such as how much water is needed to fill a swimming pool or how much dirt is need to fill a hole.

Meaning	
Essential Questions	Understandings
• What is the benefit of using cross-sections? • How can volume be described using rotation of a 2D object? • How can we calculate volume by dissecting a 3D object? • How are volume formulas generated? • What is the most efficient way to calculate volume? • How are volume and density related? • How can volume be used to solve real-world problems?	• Three-dimensional shapes can be created by rotating two-dimensional shapes. • Breaking apart 3D shapes into smaller more manageable pieces can be used to develop the formulas for volume. • Formulas are an efficient way to find volume. • There is a positive correlation between density and volume of a fixed mass. • There are a variety of applications of volume in the real-world.

Acquisition	
Key Knowledge	Key Skills
• Cross-section • Volume • Surface area formula for a sphere	• Identify shapes of two-dimensional cross-sections of three-dimensional objects • Identify three-dimensional objects generated by

• Volume formulas-Prisms, Cylinders, Pyramids, Cones, Spheres • Dissection arguments (Cavalieri's Principle) • Density	rotations of two-dimensional objects. **(Use 9 - 3 Geometry Lab Solids of Revolution)** • Use volume formulas to solve problems (prisms, pyramids, cylinders, cones, spheres) • Solve problems involving the surface area of a sphere. • Give an informal argument (compare/contrast) for volume formulas-Cylinders, Pyramids, Cones, Spheres, and Area and Circumference of a circle • Use accurate units • Use the relationship between volume and density to solve problems. (***outlined in the 12-6 Enrichment Worksheet)*** • Solve design problems (designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)

Standards Alignment
MISSOURI LEARNING STANDARDS G.MGD.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 principles, and informal limit arguments.* G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. 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 G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).* G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).* G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).* CCSS MP.1 Make sense of problems and persevere in solving them. CCSS MP.2 Reason abstractly and quantitatively. CCSS MP.3 Construct viable arguments and critique the reasoning of others.

CCSS MP.4 Model with mathematics.

CCSS MP.5 Use appropriate tools strategically.

CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.

CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 12: Introduction to Conic Sections

Stage 1 – Desired Results

Unit 12: Introduction to Conic Sections
Unit Title: Introduction to Conic Sections Course: Honors Geometry Brief Summary of Unit: Students will work with geometric objects formed by the intersection of a plane and a cone. In addition, students will write equations of circles and parabolas. Students will also graph circles and parabolas. Textbook Correlation: Glencoe Geometry 10. 8 and 10.8 lab (p. 762#41) (Parabolas will need to be supplemented with resources from Algebra II section 9.2) Time Frame: 1 week

WSD Overarching Essential Question	**WSD Overarching Enduring Understandings**
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem? • How do I effectively represent quantities and relationships through mathematical notation?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation. • Using prior knowledge of mathematical ideas can help discover more efficient problem solving

• How accurate do I need to be? • When is estimating the best solution to a problem?	strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... understand that when solving complex problems, often changing perspectives allows them to identify key information.

Meaning	
Essential Questions	Understandings
• What information can be gathered from the equation of a circle or parabola? • How do I determine the center and radius given an equation of a circle? • How can I use the equation of a circle or parabola to determine if a point lies on the graph? • What role does the focus play in determining the shape of the parabola? • How does the orientation of the parabola affect the equation of the parabola?	• Circles and Parabolas are formed by the intersection of a cone and a plane. • Different forms of equations provide different information about key characteristics of the conic sections. • The equation of a parabola depends upon the vertex, focus, and directrix.

Acquisition	
Key Knowledge	Key Skills
• Conic Section • Standard form for the equation of a circle: $(x - h)^2 + (y - k)^2 = r^2$ with center (h, k) and radius r • Completing the square for an expression with 2 variables • Coordinate geometry as a method of proof • Vertex of a parabola • Axis of symmetry • Directrix • Focus • Standard Form for the equation of a parabola o $y = (x - h)^2 + k$ is a parabola with vertex (h,	• Derive the standard form for the equation of a circle using the fact that a circle is the set of all points equidistant from the center (distance formula/ Pythagorean theorem where the center is (h,k); the radius is r; any point on the circle is (x,y). $(x-h)^2+(y-k)^2=r^2$. • Rewrite general form to standard form of an equation of a circle by completing the square. • Identify the center and radius of a circle given its equation. • Graph a circle given its equation. • Determine if a given point is on a circle • Determine if a given point is on a parabola

k) and a vertical axis of symmetry ○ $x = (y - h)^2 + k$ is a parabola with vertex (h, k) with a horizontal axis of symmetry	• Determine if a parabola has a vertical or horizontal axis of symmetry (the orientation of the parabola) • Identify the coordinates of the vertex of a parabola • Find the value of "p" (distance between vertex and focus or vertex and directrix) • Sketch the graph of a parabola with a given equation • Derive the standard form for the equation of a parabola.

Standards Alignment

MISSOURI LEARNING STANDARDS

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.

G. GPE 4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0,2).

G.GPE.2 Derive the equation of a parabola.

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District

Unit 13: Probability Rules

Stage 1 – Desired Results

Unit 13 - Probability Rules
Unit Title: Probability Rules Course: Honors Geometry Brief Summary of Unit: Students will use sample spaces, the fundamental counting principle, the addition rule, and the multiplication rule to calculate probabilities of events. Students will use combinations and permutations to find probabilities of outcomes. These events can be represented in paragraph form, Venn diagrams, and/or two way contingency tables. Textbook Correlation: Glencoe Geometry 13.1, 13.2, 13.5, 13.5 lab, 13.6 Time Frame: 1.5 weeks

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation.

• How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be? • When is estimating the best solution to a problem?	• Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... use probability and statistics to make educated predictions on future outcomes in the real world.

Meaning	
Essential Questions	Understandings
• How do we calculate probability of two events occurring? • What affects probability of different events? • How do we describe subsets of outcomes? • How do we determine if two events are independent? • How does one outcome affect future outcomes? • How do your actions now affect the future? • What is the most efficient way to count? • How can combinations and permutations be used to simplify the counting process?	• Prior outcomes/additional criteria can change probability if the events are not independent. • Outcomes of independent events (winning the lottery) have no effect on subsequent trial outcomes. • There are multiple applications for probability in the real world. • There are mathematical rules for counting that can simplify probability calculations from large sample spaces. • Probability is used to determine the likelihood of an event occurring.

Acquisition	
Key Knowledge	Key Skills
• subset • sample space • outcomes	• Use lists, tables, and tree diagrams to represent sample spaces.

• event • union • intersection • complement • addition rule of probability • mutually exclusive outcomes • independent events • conditional probability • general multiplication rule • multiplication rule for independent events • combinations • permutations • factorial!	• Use the fundamental counting principle to count outcomes • Apply the general addition rule given a contingency (two-way) table. • Calculate the probability of A and B if A and B are independent using the multiplication rule. • Use the formula to calculate the probability of A and B if A and B are not independent (calculating conditional probabilities) • Describe real-world examples of independent and dependent events. • Determine if two events are independent using probabilities from a contingency table • Determine if two events are independent by evaluating P(A) and P(A given B) and comparing to see if they are the same value • Calculate conditional probabilities by evaluating the sample space. (in a contingency table/two-way frequency table) • Determine if two events are mutually exclusive by determining if P(A and B)=0. • Apply the general addition rule given Venn diagram. • Apply the general addition rule given probabilities in paragraph form. • Given three of the four probabilities of the general addition equation, find the missing probability. • Given the probability of an event, find the probability of the complementary event. • Given the probability of two events, A and B, find the probability of A and B (intersection) and the probability of A or B (union) • Symbolically represent "and", "or", and "not" • Verbally describe unions, intersections, and complements of events • Solve counting problems using factorials, combinations and permutations. • Calculate the probability of an outcome using combinations and permutations.

Standards Alignment
MISSOURI LEARNING STANDARDS
G.SCP 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").

G. SCP 7 Apply the Addition Rule, P(A or B) = P(A)+P(B)-P(A and B), and interpret the answer in terms of the model.

G.SCP 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 the characterization to determine if they are independent.

G.SCP 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 and 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.

G.SCP 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.

G.SCP 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.

G. SCP 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.

G.SCP.9 Use permutations and combinations to compute probabilities of compound events and solve problems.

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.
CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5

Wentzville School District
Unit 14: Constructions
Stage 1 – Desired Results

Unit 14 - Constructions
Unit Title: Constructions Course: Honors Geometry Brief Summary of Unit: Students will use a compass and straightedge to perform basic constructions and inscribe polygons in a circle. Students will also use dynamic computer software to perform those same basic constructions. Textbook Correlation: Glencoe Geometry 1.2, 1.3, 1.4, 1.5, 3.5, 3.6, 4.4,4.5, 5.1 lab, Time Frame: (Can be taught any time after Unit 5) 1 week Note: In this unit, use of tools must include compass and straightedge; and computer software. Other methods for performing constructions can be utilized at the teacher's discretion.

WSD Overarching Essential Question	WSD Overarching Enduring Understandings
Students will consider... • How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • How does the math I am learning in the classroom relate to the real-world? • What does a good problem solver do? • What should I do if I get stuck solving a problem? • How do I effectively communicate about math with others in verbal form? In written form? • How do I explain my thinking to others, in written form? In verbal form? • How do I construct an effective (mathematical) argument? • How reliable are predictions? • Why are patterns important to discover, use, and generalize in math? • How do I create a mathematical model? • How do I decide which is the best mathematical tool to use to solve a problem?	*Students will understand that...* • Mathematical skills and understandings are used to solve real-world problems. • Problem solvers examine and critique arguments of others to determine validity. • Mathematical models can be used to interpret and predict the behavior of real world phenomena. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Varieties of mathematical tools are used to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps predict and evaluate the reasonableness of a solution. • Clear and precise notation and mathematical vocabulary enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation.

• How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be? • When is estimating the best solution to a problem?	• Using prior knowledge of mathematical ideas can help discover more efficient problem solving strategies. • Concrete understandings in math lead to more abstract understanding of math.

Transfer
Students will be able to independently use their learning to... know what geometric tools are most appropriate to use when solving problems.

Meaning	
Essential Questions	Understandings
• How do I use the tools provided to construct a particular shape? • What is the best way to make a construction? • What tools do I need to make a particular shape? • Why are constructions important in geometry? • What are real-world applications to geometric constructions?	• There are tools to use to design shapes with specific characteristics • Constructions are performed using geometric properties. • Geometric constructions are used in a variety of real-world contexts. (Computer-aided design, art, etc.) • Constructions are a method used to guarantee precision in geometric drawings when a coordinate plane is not available or practical. • Geometric constructions have been used historically to develop the fundamental theorems in geometry.

Acquisition	
Key Knowledge	Key Skills

• Geometry software, a protractor, a compass, a straightedge, and paper folds are tools used to create geometric constructions	• How to use geometry software, a protractor, a compass, a straightedge, and paper folds • Construct a copy of line segment. • Construct a copy of an angle. • Construct a bisector of an angle. • Bisect a line segment. • Construct perpendicular lines, including the perpendicular bisector of a line segment • Construct the incenter • Construct a line parallel to a given line through a point not on a line • Construction: inscribe a circle inside of a triangle • Make geometric constructions using a variety of tools including technology and compass/straightedge constructions. • Construct an equilateral triangle, square, and regular hexagon, inscribed in a circle • Construct a tangent line to a circle through a point outside of the circle.

Standards Alignment

MISSOURI LEARNING STANDARDS

G.C.3 Construct the inscribed and circumscribed circles of a triangle and prove properties of angles for a quadrilateral inscribed in a circle.

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 a line.

G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

G.C.4 (+) Construct a tangent line from a point outside a given circle to the circle.

CCSS MP.1 Make sense of problems and persevere in solving them.
CCSS MP.2 Reason abstractly and quantitatively.
CCSS MP.3 Construct viable arguments and critique the reasoning of others.
CCSS MP.4 Model with mathematics.
CCSS MP.5 Use appropriate tools strategically.
CCSS MP.6 Attend to precision.

CCSS MP.7 Look for and make use of structure.
CCSS MP.8 Look for and express regularity in repeated reasoning.

SHOW-ME STANDARDS

Goals:
1.1, 1.4, 1.5, 1.6, 1.7, 1.8
2.2, 2.3, 2.7
3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8
4.1, 4.4, 4.5, 4.6

Performance:
Math 1, 2, 4, 5