

GEOMETRY CURRICULUM

Renewed 8/2006

LEARNING OUTCOME

Language and Symbols of Geometry

Identifies, describes and defines ... through connections with Algebra

- 1- point
- 2- line
- 3- ray
- 4- segment

Recognizes and applies relationships between

- 1- points
- 2- lines/subsets of lines
- 3- planes

Describes properties of planes using

- 1- diagrams
- 2- models

Logic and Reasoning

Identifies the negation of statements

Identifies the hypothesis and conclusion of a conditional statement

Uses the appropriate symbols for the converse, inverse and contrapositive of a conditional statement

Solves real world problems using ... reasoning

- 1- inductive
- 2- deductive

Completes a proof by contradiction using an indirect proof

Applies deductive reasoning using

- 1- law of syllogism
- 2- law of detachment

Determines the validity of statements using truth tables

Lines and Angles

Identifies, describes, estimates and applies knowledge of ... angles

- 1- adjacent
- 2- vertical
- 3- acute
- 4- right
- 5- obtuse
- 6- supplementary
- 7- complementary
- 8- linear pairs

Solves problems using

- 1- angles
- 2- angle bisectors
- 3- perpendicular bisectors

4- congruent angles
Recognizes properties of ... lines 1- intersecting 2- horizontal 3- vertical 4- parallel 5- perpendicular 6- skew
Identifies properties of angles and lines using inductive and deductive arguments
Identifies and applies properties and relationships of parallelism and perpendicularity in 2 and 3 dimensions using inductive reasoning to solve problems
Proves properties and relationships using deductive reasoning
Congruence
Classifies triangles by their sides and angles 1- right 2- isosceles 3- scalene 4- equilateral
Identifies congruent figures and corresponding parts
Proves triangles are congruent using 1- corresponding sides and angles 2- Side-Side-Side (SSS) Congruence postulate 3- Side-Angle-Side (SAS) Congruence postulate 4- Angle-Side-Angle (ASA) Congruence postulate 5- Angle-Angle-Side (AAS) Congruence theorem 6- Hypotenuse-Leg (HL) theorem
Solves problems and proves solutions by applying properties of congruent figures
Transformations and Tessellations
Constructs meaning for: 1- rigid 2- isometry 3- preimage 4- image 5- center of rotation 6- angle of rotation 7- tessellation
Identifies rigid transformations 1- reflection 2- rotation 3- translation 4- dilation
Describes geometric patterns using the above rigid transformations
Explains and illustrates transformations in writing, diagrams and graphs
Identifies line of symmetry if a figure can be mapped onto itself by a reflection in the line
Identifies rotational symmetry if a figure can be mapped onto itself by a rotation of

180° or less
Uses transformations to <ol style="list-style-type: none"> 1- deduce properties of figures 2- determine congruent and similar figures
Creates tessellations using regular and non-regular polygons
Recognizes the presence of fractal geometry in the natural world
Inequalities in Triangles
Recognizes and applies the properties of inequalities to the measures of segments and angles in one triangle <ol style="list-style-type: none"> 1- Exterior Angle Inequality 2- Triangle Inequality
Recognizes and applies the properties of inequalities to the measures of segments and angles in two triangles <ol style="list-style-type: none"> 3- Hinge theorem 4- Converse of Hinge theorem
Similarity
Describes properties of similar figures <ol style="list-style-type: none"> 1- corresponding angles are congruent 2- lengths of corresponding sides are proportional
Identifies the corresponding sides of similar figures
Calculates an unknown side length using the proportional relationship between the sides of similar figures
Solves problems and proves solutions using properties of similarity
Proves similarity in triangles using <ol style="list-style-type: none"> 1- definition of similarity 2- Angle-Angle (AA) Similarity postulate 3- Side-Side-Side (SSS) Similarity theorem 4- Side-Angle-Side (SAS) Similarity theorem
Compares the linear measures, area and volume of similar solids
Right Triangles
Recognizes the relationship between the sides of a right triangle <ol style="list-style-type: none"> 1- Pythagorean theorem 2- Converse of the Pythagorean theorem
Identifies situations requiring the Pythagorean theorem and analyzes how and why the theorem is used
Uses the converse of the Pythagorean theorem to determine whether a triangle is acute, obtuse or right
Uses ... to solve real-life problems involving right triangles <ol style="list-style-type: none"> 1- the Pythagorean theorem 2- the converse of the Pythagorean theorem 3- special right triangles
Recognizes special right triangles and identifies their properties <ol style="list-style-type: none"> 1- 45°-45°-90° Triangle theorem 2- 30°-60°-90° Triangle theorem
Uses geometric mean theorems to solve problems involving right triangles

Trigonometry
Constructs meaning for: <ol style="list-style-type: none"> 1- trigonometric ratio 2- sine 3- cosine 4- tangent
Solves problems using the law of sines and law of cosines
Uses trigonometric ratios to <ol style="list-style-type: none"> 1- calculate the measure of each unknown side of a right triangle 2- solve real world problems including angle of elevation/depression
Polygons and Circles
Identifies and describes properties of <ol style="list-style-type: none"> 1- triangles 2- quadrilaterals 3- polygons
Calculates the interior and exterior angles of a polygon <ol style="list-style-type: none"> 1- Polygon interior angles theorem 2- Polygon exterior angles theorem
Identifies, defines and determines properties of circles and their parts ... by inductively and deductively formulating and applying logical arguments <ol style="list-style-type: none"> 1- radius 2- diameter 3- chord 4- tangent 5- secant 6- arc 7- angles
Demonstrates spatial sense by comparing and classifying geometric figures
Identifies points of concurrency in triangles and applies them to real world situations
Recognizes the use of networks in real world applications
Area and Perimeter
Calculates the area and perimeter/circumference of a <ol style="list-style-type: none"> 1- triangle 2- quadrilateral 3- regular polygon 4- portion of a figure 5- circle 6- sector of a circle
Solves problems involving geometric probability using area
Uses perimeter and area to solve multi-step word problems
Surface Area and Volume
Calculates the surface area and volume of a ... <ol style="list-style-type: none"> 1- cylinder 2- prism 3- pyramid

4- cone
Estimates and calculates the surface area and volume of spheres
Solves real-world problems involving surface area and volume
Coordinate Geometry
Calculate the distance between points using the distance formula
Calculates the midpoint between two coordinate points using the midpoint formula
Calculates slope of a line given <ol style="list-style-type: none"> 1- a graph: rise over run 2- two points: $\frac{y_2 - y_1}{x_2 - x_1}$ 3- an equation
Writes an equation of a line given ... in slope-intercept and standard forms <ol style="list-style-type: none"> 1- a graph 2- slope and one point 3- two points
Proves theorems through the use of the distance, midpoint and slope formulas within the coordinate plane
Constructs a polygon on the coordinate plane and assigns correct coordinates
Makes conclusions about a geometric figure when given its coordinate points (e.g. Are there parallel sides? Do the coordinate relationships create a pattern?)
Identifies the equation of a circle given its graph
Identifies the graph of a circle given its equation
Connects algebra to geometry by solving systems of equations through graphing or algebraic methods
Vectors
Recognizes that a vector is a quantity that has both magnitude and direction
Identifies the magnitude of a vector as the distance from the initial point to the terminal point of a vector <ol style="list-style-type: none"> 1- the Distance Formula
Identifies the direction of a vector as determined by the angle it makes with a horizontal line
Recognizes vectors are equal if they have the same magnitude and direction
Recognizes vectors are parallel if they have the same or opposite directions
Performs operations with vectors <ol style="list-style-type: none"> 1- addition 2- dot products 3- scalar multiplication 4- division
Mathematics Process:
Learns geometry through <ol style="list-style-type: none"> 1- problem solving 2- inquiry 3- discovery
Solves problems of various types and difficulty level <ol style="list-style-type: none"> 1- open-ended

<ul style="list-style-type: none"> 2- non-routine 3- multiple solutions 4- multiple problem solving strategies
<p>Selects and applies a variety of problem-solving strategies:</p> <ul style="list-style-type: none"> 1- try a simpler problem 2- make a diagram 3- work backwards 4- use a chart 5- write an equation
<p>Reflects on their problem solving process</p>
<p>Organizes, clarifies and clearly communicates mathematical thinking through</p> <ul style="list-style-type: none"> 1- reading and writing 2- discussion 3- listening 4- questioning
<p>Analyzes and evaluates the mathematical thinking and strategies of others</p>
<p>Uses the language of mathematics to express mathematical ideas</p>
<p>Recognizes recurring themes across mathematical domains (e.g. patterns in number, algebra and geometry)</p>
<p>Uses connections among mathematical ideas to explain concepts (e.g. 2 linear equations have a unique solution because the lines they represent intersect at a single point)</p>
<p>Recognizes the larger context of mathematics and applies mathematics accordingly</p>
<p>Makes connections between mathematical ideas and builds on one another</p>
<p>Traces the development of mathematical concepts over time and across cultures (world languages and social studies standards)</p>
<p>Recognizes that mathematical facts, procedures and claims must be justified</p>
<p>Uses various types of reasoning and methods of proof to support their mathematical conclusions and problem solutions</p>
<p>Uses reasoning, rather than answer keys, teachers or peers, to check the correctness of their solutions</p>
<p>Evaluates mathematical reasoning and determines validity</p>
<p>Makes and investigates mathematical conjectures</p> <ul style="list-style-type: none"> 1- Counterexamples as a means of disproving conjectures 2- Verifying conjectures using informal reasoning or proofs
<p>Uses representations to organize, record and communicate mathematical ideas</p> <ul style="list-style-type: none"> 1- Concrete representations (e.g. base-ten blocks or algebra tiles) 2- Pictorial representations (e.g. diagrams, charts or tables) 3- Symbolic representations (e.g. a formula) 4- Graphical representations (e.g. a line graph)
<p>Selects, applies and translates among mathematical representations to solve problems and to model and interpret physical, social and mathematical phenomena</p>
<p>Uses technology to gather, analyze and communicate mathematical information</p>
<p>Uses computer spreadsheets, software and graphing utilities to organize and display quantitative information</p>
<p>Uses graphing calculators and computer software to investigate properties of</p>

functions and their graphs
Uses calculators as problem-solving tools (e.g. to explore patterns, to validate solutions)
Uses computer software to make and verify conjectures about geometric objects
Uses computer-based laboratory technology for mathematical applications in the sciences