

Mathematics: Geometry

<p><b>Content Standard #4</b> Students will have demonstrated proficiency in mathematics by solving problems requiring number sense, accurate computation, accurate measurement, collection of data and statistics, algebraic methods and geometry.</p>
<p><b>#4A</b> Number sense, properties, and operations</p>
<p><b>#4B</b> Patterns, functions, and algebraic structures</p>
<p><b>#4C</b> Data analysis, statistics, and probability</p>
<p><b>#4D</b> Shape, dimension, and geometric relationships</p>

**Description**

**This course focuses on two areas. One area is the real-world application of geometric principles. The second area is the geometric logic structures including formal proof. Concepts of three-dimensional geometry are integrated into plane geometry. Topics will include trigonometry, area, volume, coordinate geometry, and non-Euclidean geometry. Concepts are supplemented using the graphing calculator and Geometer’s Sketchpad.**

**Time Allocation**  
Ninety minutes daily for one smear

**Texts/References**  
Focus on Geometry, Addison Wesley, 1998  
CPM Geometry Connections, 2004  
Math Mates, Educational Advantage, Pty.Ltd.

**Assessments**  
**Formative**  
 Quizzes  
 Activities  
**Summative**  
 Tests  
 Midterm and final exams

**Grades and Achievement Levels**  
 Grades are based on completion of assignments and quality of work.

## Essential Concepts: Mathematics Geometry

<b>Standard #4A</b> <b>Number sense, properties, and operations</b>	<b>Standard #4B</b> <b>Patterns, functions, and algebraic structures</b>	<b>Standard #4C</b> <b>Data analysis, statistics, and probability</b>	<b>Standard #4D</b> <b>Shape, dimension, and geometric relationships</b>
<ul style="list-style-type: none"> <li>• The complex number system includes real numbers and imaginary numbers</li> <li>• Formulating, representing, and using algorithms with real numbers flexibly, accurately, and efficiently</li> <li>• Systematic counting techniques are used to describe and solve problems</li> </ul>	<ul style="list-style-type: none"> <li>• Functions model situations where on quantity determines another and can be represented algebraically, graphically, and using tables</li> <li>• Graphs and tables are used to describe the qualitative behavior of common types of functions</li> <li>• Parameters influence the shape of the graphs of functions</li> <li>• Expressions, equations, and inequalities can be expressed in multiple, equivalent forms</li> <li>• Solutions to equations, inequalities and systems of equations are found using a variety of tools</li> <li>• Quantitative relationships in the real world can be modeled and solved using functions</li> </ul>	<ul style="list-style-type: none"> <li>• Statistical methods take variability into account, supporting informed decision-making through quantitative studies designed to answer specific questions</li> <li>• The design of an experiment or sample survey is of critical importance to analyzing the data and drawing conclusions</li> <li>• Visual displays and summary statistics condense the information in data sets into usable knowledge</li> <li>• Randomness is the foundation for using statistics to draw conclusions when testing a claim or estimating plausible values for a population characteristics</li> <li>• Probability models outcomes for situations in which there is inherent randomness, quantifying the degree of certainty in terms of relative frequency of occurrence</li> </ul>	<ul style="list-style-type: none"> <li>• Attributes of two- and three-dimensional objects are measurable and can be quantified</li> <li>• Objects in the plane and their parts, attributes, and measurements can be analyzed deductively</li> <li>• Objects in the plane can be transformed, and those transformations can be described and analyzed mathematically</li> <li>• Right triangles are central to geometry and its applications</li> </ul>

## Expectations: Mathematics Geometry

<b>Standard #4A</b> <b>Number sense, properties, and operations</b>	<b>Standard #4B</b> <b>Patterns, functions, and algebraic structures</b>	<b>Standard #4C</b> <b>Data analysis, statistics, and probability</b>	<b>Standard #4D</b> <b>Shape, dimension, and geometric relationships</b>
<ol style="list-style-type: none"> <li>1. Recognized and used equivalent representations of real numbers in a variety of forms including scientific notation, radicals, and other irrational numbers such as pi</li> <li>2. Developed and tested conjectures about the properties of the real number system and common subsets of the real number system</li> <li>3. Verified and applied exponential properties</li> <li>4. Converted from one set of units to another</li> <li>5. Determined when estimation is an appropriate method to solve a problem and described the error that may result from estimation</li> <li>6. Applied appropriate computational methods to solve multi-step problems involving all types of numbers from the real number system</li> <li>7. Showed that between any two rational numbers there are an infinite number of rational numbers, and that between any two irrational numbers there are also an infinite number of irrational numbers</li> <li>8. Used appropriate computation methods that encompass estimation and calculation</li> </ol>	<ol style="list-style-type: none"> <li>1. Demonstrated the relationship between all representations of linear functions using point-slope, slope-intercept, and standard form of a line</li> <li>2. Represented linear, quadratic, and absolute value functions in a table, graph, and equation and converted from one representation to another</li> <li>3. Evaluated a function at a given point in its domain given an equation, a table, and a graph</li> <li>4. Identified the domain and range of a function given an equation, a table, and a graph</li> <li>5. Identified intercepts, zeros, maxima, minima, and intervals of increase and decrease of a function given an equation, a table, and a graph</li> <li>6. Made qualitative statements about the rate of change of a function, based on its graph or table</li> <li>7. Applied transformations to a parent function and interpreted the results verbally, graphically, and symbolically</li> <li>8. Described geometric relationships algebraically</li> <li>9. Recognized when a relation is a function</li> </ol>	<ol style="list-style-type: none"> <li>1. Selected and used an appropriate display to represent and describe a set of data (for example, scatter plot, line graph and histogram)</li> <li>2. Fit curves to scatter plots using informal methods or appropriate technology to determine the type (positive, negative, or non-existent) of relationship between two data sets</li> <li>3. Determined, analyzed, and used measures of central tendency (such as mean, median, and mode) and measures of variability (such as range and quartiles) in problem-solving situations</li> <li>4. Evaluated and interpreted probabilities using a normal distribution</li> <li>5. Developed simulations that demonstrated probability as a long-run relative frequency</li> <li>6. Applied and solved problems using the concepts of independence and conditional probabilities</li> <li>7. Solved real-world problems with informal use of combinations and permutations</li> <li>8. Graphed data sets, created a scatter plot, and identified the control (independent) variable and dependent variable</li> </ol>	<ol style="list-style-type: none"> <li>1. Calculated the perimeter and area of a two-dimensional irregular shape</li> <li>2. Justified, interpreted, and applied the use of formulas for the surface area, and volume of cones, pyramids, and spheres including real-world situations</li> <li>3. Solved for unknown quantities in relationships involving perimeter, area, surface area, and volume</li> <li>4. Applied the effect of dimensional change, utilizing appropriate units and scales in problem-solving situations involving perimeter, area, and volume</li> <li>5. Classified polygons according to their similarities and differences.</li> <li>6. Solved for unknown attributes of geometric shapes based on their congruence, similarity, or symmetry</li> <li>7. Applied properties of angles including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve problems</li> </ol>

Expectations: Mathematics Geometry continued

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<ul style="list-style-type: none"> <li>9. Used technology to perform operations on numbers written in scientific notation</li> <li>10. Described factors affecting take home pay and calculated the impact (PFL)</li> <li>11. Designed and used a budget, including income and expenses to demonstrate how living within your means is essential for a secure financial future (PFL)</li> <li>12. Used combinatorics (Fundamental Counting Principle, permutations and combinations) to solve problems in real-world contexts</li> <li>13. Used number sense to estimate and justify the reasonableness of solutions</li> </ul>	<ul style="list-style-type: none"> <li>10. Represented functional relationships using written explanations, tables, equations, and graphs, and described the connections among these representations</li> <li>11. Interpreted a graphical representation of a real-world situation</li> <li>12. Solved problems involving functions and relations using calculators, graphs, tables, and algebraic methods</li> <li>13. Solved equations with more than one variable for a given variable (for example, solve for <math>p</math> in <math>I=prt</math> or for <math>r</math> in <math>C=2pr</math>)</li> <li>14. Performed and justified steps in generating equivalent expressions by identifying properties using the commutative, associative, inverse, and identity properties</li> <li>15. Used appropriate measurements to solve problems indirectly (for example, find the height of a flagpole using similar triangles)</li> <li>16. Solved equations for one variable in terms of the others</li> </ul>	<ul style="list-style-type: none"> <li>9. Determined a line of best fit from a scatter plot using visual techniques</li> <li>10. Showed how extrapolation may lead to faulty conclusions</li> <li>11. Used Person's correlation coefficient as a measure of strength and interpreted the slope and y-intercept in the context of the problem</li> <li>12. Explained the role of p-values in determining statistical significance</li> <li>13. Determined the margin of error associated with an estimate of a population characteristic</li> <li>14. Analyzed the cost of insurance as a method to offset the risk of a situation (PFL)</li> <li>15. Formulated appropriate research questions that can be answered with statistical analysis</li> <li>16. Determined appropriate data collection methods to answer a research question</li> <li>17. Explained how data might be analyzed to provide answers to a research question</li> <li>18. Identified the characteristics of a well-designed and well-conducted survey</li> </ul>	<ul style="list-style-type: none"> <li>8. Made conjectures involving two-dimensional objects represented with Cartesian coordinates. Justified these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations</li> <li>9. Represented transformations using Cartesian coordinates</li> <li>10. Developed arguments to establish what remains invariant and what changes after a transformation</li> <li>11. Used construction tools, including technology, made conjectures among properties of shapes in the plane including those formed through transformation. Justified these conjectures using proof</li> <li>12. Applied right triangle trigonometry to find indirect measures of lengths and angles</li> <li>13. Applied the Pythagorean Theorem and its converse to solve real-world problems</li> <li>14. Determined the midpoint of a line segment and the distance between two points in the Cartesian coordinate plane</li> </ul>

Expectations: Mathematics Geometry continued

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	<ul style="list-style-type: none"> <li>17. Found solutions to quadratic equations and inequalities by using appropriate algebraic methods such as factoring, completing the square, graphing or using the quadratic formula</li> <li>18. Solved systems of linear equations and inequalities with two variables</li> <li>19. Represented, solved, and interpreted problems in various contexts using linear and quadratic functions</li> <li>20. Analyzed the impact of interest rates on a personal financial plan</li> <li>21. Analyzed various lending sources, services, and financial institutions</li> <li>22. Interpreted the results of transformations verbally, graphically, and symbolically</li> </ul>	<ul style="list-style-type: none"> <li>19. Identified the characteristics of a well-designed and well-conducted experiment</li> <li>20. Differentiate between the inferences that can be drawn in experiments versus observational studies</li> <li>21. Identified and chose appropriate ways to summarize numerical or categorical data using tables, graphical displays, and numerical summary statistics and accounting for outliers when appropriate</li> <li>22. Described the relationship between two categorical variables using percents</li> </ul>	