

## Math Topics (#9240)

**Description** This course provides a survey of relevant mathematical topics. Realistic problems will be solved using mathematical modeling, the selection of appropriate tools, and mathematical perseverance. Problems are approached arithmetically, investigated geometrically with graphic representation, and represented by the writing and solving of equations.

**Credits** 1

**Prerequisites** Geometry

**Textbooks/Resources** TBD

**Required Assessments** District-wide, standards-based assessments

**Board Approved** August 2015

**Revised**

### AASD Mathematics Goals for K-12 Students

- *Become mathematical problem solvers.*
- *Learn to reason mathematically.*
- *Learn to communicate mathematically.*
- *Make mathematical connections.*
- *Develop conceptual understanding of mathematics.*
- *Develop procedural fluency.*
- *Learn to use technology appropriately.*

## AASD Mathematics Standards for Students in Algebra

### Mathematical Practice Standards

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

## AASD Mathematics Standards for Grades 9-12 Students

- |                                       |  |
|---------------------------------------|--|
| I. Mathematical Processes             | <ul style="list-style-type: none"> <li>A. Use of mathematical knowledge, skills and strategies to solve mathematical, real-world and non-routine problems: reasoning</li> <li>B. Use of mathematical knowledge, skills and strategies to solve mathematical, real-world and non-routine problems: oral and written communication</li> <li>C. Use of mathematical knowledge, skills and strategies to solve mathematical, real-world and non-routine problems: use of appropriate technology</li> </ul> |
| II. Number Operations & Relationships | <ul style="list-style-type: none"> <li>A. Use numbers effectively for counting</li> <li>B. Use numbers effectively for measuring</li> <li>C. Use numbers effectively for estimating</li> <li>D. Use numbers effectively for problem solving</li> </ul>   |
| III. Geometry                         | <ul style="list-style-type: none"> <li>A. Use geometric concepts to interpret, represent and solve problems</li> <li>B. Use geometric relationships to interpret, represent and solve problems</li> <li>C. Use geometric procedures to interpret, represent and solve problems</li> </ul>  |
| IV. Measurement                       | <ul style="list-style-type: none"> <li>A. Select and use appropriate tools and techniques to measure to a specified degree of accuracy</li> <li>B. Use measurements in problem-solving situations</li> </ul>   |

V. Statistics & Probability

- A. Use data collection and analysis
- B. Use statistics in problem-solving situations
- C. Use probability in problem-solving situations

VI Algebraic Relationships

- A. Discover, describe and generalize simple and complex patterns and relationships
- B. Use algebraic techniques to define and describe real-world problems to determine and justify appropriate solutions

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>1. Develop deep conceptual understanding of mathematics by engaging in age-appropriate mathematical habits.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>makes sense of problems and perseveres in solving them.</li> <li>reasons abstractly and quantitatively.</li> <li>constructs viable arguments and critiques the reasoning of others.</li> <li>models with mathematics.</li> <li>uses appropriate tools strategically.</li> <li>attends to precision.</li> <li>looks for and makes use of structure.</li> <li>looks for and expresses regularity in repeated reasoning.</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the Mathematical Practice Standards.</b></p>		
<p><b>2. Analyze proportional relationships and use them to solve real-world and mathematical problems.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>computes unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks <math>\frac{1}{2}</math> mile in each <math>\frac{1}{4}</math> hour, compute the unit rate as the complex fraction <math>\frac{1/2}{1/4}</math> miles per hour, equivalently 2 miles per hour.</li> <li>recognizes and represents proportional relationships between quantities. <ol style="list-style-type: none"> <li>decides whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.</li> </ol> </li> <li>uses proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b></p> <p>II. Number Operations &amp; Relationships</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>3. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <p>a. solves multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Applies properties of operations to calculate with numbers in any form; converts between forms as appropriate; and assesses the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional <math>\frac{1}{10}</math> of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar <math>9\frac{3}{4}</math> inches long in the center of a door that is <math>27\frac{1}{2}</math> inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</p>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships</p>		
<p><b>4. Draw, construct, and describe geometrical figures and describe the relationships between them.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <p>a. solves problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.</p> <p>b. draws (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focuses on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.</p> <p>c. describes the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections or right rectangular prisms and right rectangular pyramids.</p>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> III. Geometry; IV. Measurement</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>5. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ul style="list-style-type: none"> <li>a. knows the formulas for the area and circumference of a circle and use them to solve problems; gives an informal derivation of the relationship between the circumference and area of a circle.</li> <li>b. uses facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.</li> <li>c. solves real-world and mathematical problems involving area, volume and surface area of two- and three- dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.</li> </ul>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b>                      III. Geometry; IV. Measurement</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>6. Analyze and solve linear equations and pairs of simultaneous linear equations.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <p>a. solves linear equations in one variable.</p> <ol style="list-style-type: none"> <li>1. Gives examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Shows which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form <math>x = a</math>, <math>a = a</math>, or <math>a = b</math> results (where <math>a</math> and <math>b</math> are different numbers).</li> <li>2. Solves linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.</li> </ol> <p>b. analyzes and solves pairs of simultaneous linear equations.</p> <ol style="list-style-type: none"> <li>1. Understands that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.</li> <li>2. Solves systems of two linear equations in two variables algebraically, and estimates solutions by graphing the equations. Solves simple cases by inspection. For example, <math>3x + 2y = 5</math> and <math>3x + 2y = 6</math> have no solution because <math>3x + 2y</math> cannot simultaneously be 5 and 6.</li> <li>3. Solves real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</li> </ol>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>7. Define, evaluate, and compare functions.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>understands that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.</li> <li>compares properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</li> <li>interprets the equation <math>y = mx + b</math> as defining a linear function, whose graph is a straight line; gives examples of functions that are not linear. For example, the function <math>A = s^2</math> giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9) which are not on a straight line.</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>8. Use functions to model relationships between quantities.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <p>a. constructs a function to model a linear relationship between two quantities. Determines the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interprets the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>b. describes qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketches a graph that exhibits the qualitative features of a function that has been described verbally.</p>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships</p>		
<p><b>9. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <p>a. knows the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.</p>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> III. Geometry</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<b>10. Understand and apply the Pythagorean Theorem</b>	<b>Performance will be satisfactory when the student:</b> a. applies the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. b. applies the Pythagorean Theorem to find the distance between two points in a coordinate system.	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<b>Objectives are linked to the following AASD Mathematics Domains:</b> III. Geometry		
<b>11. Solve equations and inequalities in one variable, understanding it as a process of reasoning and explaining that reasoning.</b>	<b>Performance will be satisfactory when the student:</b> a. explains each step in solving a simple equation as following from the quality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Constructs a viable argument to justify a solution method. (A.REI.1) b. solves linear equations and inequalities in one variable, including equations with coefficients represented by letters. (A.REI.3)	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>12. Create equations that describe numbers or relationships.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>creates equations and inequalities in one variable and uses them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. (A.CED.1)</li> <li>creates equations in two or more variables to represent relationships between quantities; graphs equations on coordinate axes with labels and scales. (A.CED.2)</li> <li>represents constraints by equations or inequalities, and by systems of equations and/or inequalities, and interprets solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. (A.CED.3)</li> <li>rearranges formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law <math>V = IR</math> to highlight resistance <math>R</math>. (A.CED.4)</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships</p>		
<p><b>13. Define trigonometric ratios and solve problems involving right triangles.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>understands 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.6)</li> <li>explains and uses the relationship between the sine and cosine of complementary angles. (G.SRT.7)</li> <li>uses trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. (G.SRT.8)</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> III. Geometry</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>14. Visualize relationships between two-dimensional and three-dimensional objects to explain volume formulas and use them to solve problems.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>uses volume formulas for cylinders, pyramids, cones and spheres to solve problems. (G.GMD.3)</li> <li>identifies the shapes of two-dimensional cross-sections of three-dimensional objects, and identifies three-dimensional objects generated by rotations of two-dimensional objects. (G.GMD.4)</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> III. Geometry</p>		
<p><b>15. Apply geometric concepts in modeling situations.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ol style="list-style-type: none"> <li>uses 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.1)</li> <li>applies concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTU's per cubic foot). (G.MG.2)</li> <li>applies geometric methods to solve design problem (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). (G.MG.3)</li> </ol>	<ul style="list-style-type: none"> <li>Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> III. Geometry</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>16. Write and compare equations (linear, quadratic, exponential) in order to solve problems</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ul style="list-style-type: none"> <li>a. creates equations and inequalities in one variable and uses them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. (A.CED.1)</li> <li>b. creates equations in two or more variables to represent relationships between quantities; graphs equations on coordinate axes with labels and scales. (A.CED.2)</li> <li>c. represents constraints by equations or inequalities, and by systems of equations and/or inequalities and interprets solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. (A.CED.3)</li> <li>d. rearranges formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law <math>V = IR</math> to highlight resistance <math>R</math>. (A.CED.4)</li> </ul>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> VI. Algebraic Relationships</p>		
<p><b>17. Apply percentage concepts in business application problems.</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ul style="list-style-type: none"> <li>a. applies concepts of percent in solving discount, markdown, and markup problems.</li> <li>b. understands when to use simple or compound interest.</li> <li>c. applies knowledge of inflation and depreciation to solve real-world problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> II. Number Operations &amp; Relationships</p>		

Essential Learning Objectives	Performance Indicators	Classroom Assessments
<p><b>18. Understand and apply topics associated with measurement</b></p>	<p><b>Performance will be satisfactory when the student:</b></p> <ul style="list-style-type: none"> <li>a. utilizes devices to accurately measure objects in both metric and US-Customary units.</li> <li>b. utilizes devices to accurately measure time and temperature.</li> <li>c. converts metric to US-Customary and UW-Customary to metric units.</li> </ul>	<ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
<p><b>Objectives are linked to the following AASD Mathematics Domains:</b> IV. Measurement</p>		

**Resources and learning activities that address course objectives:**