Resource Guide to the Arkansas Curriculum Framework for Students with Disabilities for Ninth Grade Mathematics

Summer 2005
Amended 2009

Purpose and Process

The Individuals with Disabilities Education Act and No Child Left Behind mandate that schools provide access to the general education curriculum for all students receiving special education services. In recognizing the challenge of providing opportunities for students with disabilities to access general education curriculum, it is the desire of the Arkansas Department of Education to assist educators with this process. The goal is to assist school personnel who serve children with disabilities in conceptualizing, planning, and implementing activities that are aligned to the Arkansas Curriculum Framework.

The following document contains ideas for linking activities to the same mathematics framework used for the general education curriculum. When selecting appropriate activities, decisions must be based on individual student needs and abilities. Collaboration with math personnel will provide assistance in linking math curriculum with the state framework. The Arkansas Alternate Portfolio Assessment must align to the Arkansas Curriculum Framework. Specifically, the Ninth Grade Math Portfolio Assessment for Students with Disabilities must align with the same content standards used by other ninth grade students, which are Algebra I and Geometry. The Ninth Grade Math Portfolio Assessment must contain one entry from each strand in Algebra I and Geometry listed below.

Mathematics Curriculum Framework

Algebra I Strands
- Language of Algebra
- Solving Equations and Inequalities
- Linear Functions
- Non-linear Functions
- Data Interpretation and Probability

Geometry Strands
- Language of Geometry
- Triangles
- Measurement
- Relationships between two and three dimensions
- Coordinate Geometry and Transformations

In June 2005, the Arkansas Department of Education convened a task force of general education mathematics teachers, teachers of students with disabilities, and administrators to collaborate and develop the following resource guide to be used to help with the process of developing a ninth grade portfolio assessment for students with disabilities not accessing Algebra I or Geometry or any equivalent course.

The committee identified which student learning expectations (SLEs) from the Arkansas Mathematics Curriculum Framework for Algebra I and Geometry would be appropriate to include in this resource guide. Each SLE was evaluated by the committee to determine the essence of learning. Using the essence of the SLE, different levels of complexity of learning were written and organized within a matrix from least complex to most complex. This allows students to have access to the same content standards. Ideas for corresponding sample activities were also included. Each individual student's abilities must first be considered when selecting ideas from this guide. Augmentative communication equipment and/or other adaptations should be used to make accommodations for students who require them to meet the SLE. Teachers will need to use creativity in adapting the suggested activities to meet students' individual needs.

Although this publication is not intended for generating specific test item activities for the Arkansas Alternate Portfolio System for Students with Disabilities, its purpose is to provide Arkansas educators with a process for determining alignment between models of education that have been to some extent separate. Using the activities as idea starters, the educators can then individualize and develop specific activities that align with the education program, demonstrate performance of skills, and document educational opportunities. The members of the committee do not intend this publication to be used as a checklist, as a menu of alternate assessment "test activities or items," or as Individualized Education Plan (IEP) goals and objectives.

COMMITTEE MEMBERS

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Algebra I Section

Strand	Content Standard
Language of Algebra	
	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
Solving Equations and Inequalities	
	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities and systems of equations and solve with fluency.
Linear Functions	
	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
Non-linear Functions	
	4. Students will compare the properties in the family of functions.
Data Interpretation and Probability	
	5. Students will compare various methods of reporting data to make inferences or predictions.

*Items have been amended due to recommendations of the Linkage Study committee required by USDOE recommendations.

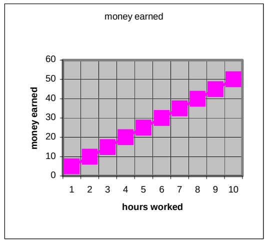
Language of Algebra	**Content Standard 1:** **Students will develop the language of algebra including specialized vocabulary, symbols, and operations.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
LA.1.AI.1 Evaluate *algebraic expressions*, including radicals, by applying the order of operations	*Combine things, numbers or manipulatives to get a desired result by the teacher setting up a situation or problem to show that using a different order of operations may give a different result	Follow a sequence of tasks or directions Examples: Follow steps in a recipe or schedule; use a vending machine, laundry skills, hand washing, etc.	Evaluate simple algebraic expressions using one type of operation (add, subtract, multiply, divide) Examples: Add a grocery list; make change, purchase a multiple item, create a budget	Evaluate simple algebraic expressions using one type of operation Examples: Calculate perimeter, circumference, area, distance, gross pay, price per pound	Evaluate simple algebraic expressions involving two or more operations Examples: Calculate length of a fence to surround a pool, amount of carpet needed for a room, pay in a pay period, renting a car, hiring a plumber
LA.1.AI.2 Translate word phrases and sentences into *expressions, equations*, and *inequalities*, and vice versa	Take real-world problems and state them in a mathematical problem	*Recognize equivalent measures that can be used in problem solving Examples: *24 hours in a day, 12 inches in a foot, 4 quarters in a dollar, a cup of flour, days of the week,	*Recognize operational symbols and how they can be represented by common words Examples: * "Is" means =; "altogether" means +; "take away" means -	Use words to express the problem using real-world situations Example: *3 pair of jeans at $20.00 each = total cost	Write a real-world problem using symbols Examples: 3 • 20= C • = multiply 4x = 120

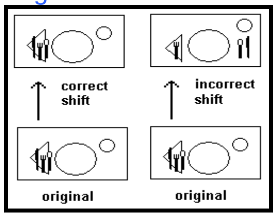
Language of Algebra	**Content Standard 1:** **Students will develop the language of algebra including specialized vocabulary, symbols, and operations.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex → More Complex***			
LA.1.AI.4 Solve problems involving *scientific notation,* including multiplication and division*	*Solve problems using numbers expressed as powers of 10	Demonstrate an understanding of powers of ten using manipulatives Examples: Use sets of pencils, base ten blocks; collate papers; stack money	Compare powers of 10 using manipulative (10s versus 100s) Examples: Use base ten blocks, money, aluminum cans	Recognize scientific notation numbers Examples: ($1x10^3 = 1000$) ($2.3x10^2 = 230$)	Convert between scientific notation and standard form using technology.

Solving Equations and Inequalities	**Content Standard 2: Students will write, with and without appropriate technology, equivalent forms of equations, inequalities and systems of equations and solve with fluency.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
SEI.2.AI.1 Solve multi-step equations and inequalities with rational *coefficients* • numerically (from a table or guess and check) • algebraically (including the use of manipulatives) • graphically • technologically	*Find the value of the variable and solve the problem.	Recognize that more of something is needed to complete a task Examples: Decide how many more napkins needed to set a table for six, how much detergent needed, or how much more money needed; use guess and check (substitution)	*Determine the steps needed to solve the equation	*Solve equations using manipulatives and guess and check (substitution) Example: Use pictures to solve equations (draw pictures of the manipulatives)	Solve equations Examples: (X + 2= 14) (X/2 - 4= 10)
SEI.2.AI.5 Solve real-world problems that involve a combination of rates, *proportions* and percents	*Solve real-world problems involving comparisons of two things or two or more quantities using proportional reasoning skills	*Compare two amounts Examples: *Compare forks to spoons, boys to girls	Write or show a ratio or percent using manipulatives Examples: Use counters, candies, etc., (e.g., three blue to two red, 3:2, 3 out of 4 is 75%)	Reduce fractions to find ratios, or find a percent given a fraction or decimal Example: Express 20% off an item as a decimal and/ or a fraction	Solve problems using rates, proportions, and percents Examples: Calculate miles per gallon, miles per hour, calories per serving, part to whole- [percent], discounts, sales tax

Solving Equations and Inequalities	**Content Standard 2: Students will write, with and without appropriate technology, equivalent forms of equations, inequalities and systems of equations and solve with fluency.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
SEI.2.AI.7 Use coordinate geometry to represent and/or solve problems (midpoint, length of a line segment, and *Pythagorean Theorem*)	Find locations and distances between locations	Locate items Examples: *Find items in the classroom/campus; follow directions (e.g., student follows oral and/or visual directions with prompts such as "3 right, 2 up")	Find the distance from one place to another using customary or non-customary units Find midpoint using physical objects Examples: Fold washcloths to find the midpoint; count steps from classroom to bathroom, etc.	Count the distance from place to place using a grid and/or map Examples: Count distance using a number line, tile floor, graph paper, etc.	Locate longitude and latitude Compute the distance from place to place using a grid and/or map using ordered pairs Examples: (x,y) -- ordered pair (3,2)
SEI.2.AI.8 Communicate real world problems graphically, algebraically, numerically and verbally	Use graphs, charts, numbers, and words to express equations	Recognize that a request generates a result Examples: Use choice boards, job chart, kitchen chart, recreation/leisure chart, using PEC symbols to make a request	Represent a simple problem in various forms Examples: Add or subtract on a number line; draw a pictorial representation	Construct a chart or table from a problem Examples: Make an entry and calculate a balance in a checkbook; create a table converting F^{o} to C^{o}	Interpret the problem to write, to chart, and to graph life-skill activities Example: Student works 15 hours and the student will receive $10.00 an hour

Linear Functions	**Content Standard 3:** **Students will analyze functions by investigating rates of change, intercepts, and zeros.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
LF.3.AI.1 Distinguish between *functions* and non-functions/ *relations* by inspecting graphs, ordered pairs, *mapping diagrams* and/or *tables* of data	*Recognize that a function has one output for each input	Recognize an input and an output *Examples: Recognize that putting money in soda machine (input) will give a soda (output), activate switch (input) will turn on the music (output)	Recognize an input generates exactly one output (function) Examples: Recognize that 1 coin gets 1 gumball, 1 push on dispenser gets 1 squirt of soap, completing 3 activities gets 1 reward	Recognize an input generates multiple outputs. (non function) Examples: Recognize that 50 cents gets your choice of soda, juice, or water	Distinguish between functions and non-functions. Example: Combine examples from function and non-function boxes
LF.3.AI.4 Identify *independent variables* and *dependent variables* in various representational modes: words, symbols, and/or graphs	*Determine the input (independent) and the output (dependent)	Recognize the independent variables--what is needed to obtain the desired result (e.g., key is needed for a lock) Examples: Match to sample coins for a vending machine, using objects or picture symbols to request an item; use a switch activity	Recognize the dependent variable--the desired result (e.g., the opened lock) Examples: Recognize the dependent variable is the final product of any activity: a cooked pizza or prepared snack, folded laundry, a clean table, collated papers, water coming from fountain, item retrieved from a vending machine, a sharpened pencil, etc.	Provide input (independent variables) to obtain output (dependent variable) This is a combination of level one and two Complete an activity to get a result Examples: Recognize that a powdered drink mix (independent variable) makes a drink (dependent variable), attendance yields a paycheck, appropriate behavior yields reward	Recognize the dependent and independent variables from a variety of activities Examples: *Recognize that 50 cents is put into a machine independent variable) to get a drink (dependent variable), number of people determines gate receipts, amount of food determines number of calories, weight of package determines costs to mail

Linear Functions	**Content Standard 3: Students will analyze functions by investigating rates of change, intercepts, and zeros.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
LF.3.AI.5 Interpret the rate of change/*slope* and intercepts within the context of everyday life (Ex. telephone charges based on base rate (*y-intercept*) plus rate per minute (slope))	*Interpret a constant rate of change within the context of everyday life	Recognize concepts of more and less, increasing, decreasing, and constant Examples: Comparing groups of objects such as two piles of laundry, amount of popcorn in two different bowls, double burger versus a single burger, etc.; use number line activities	Find the rate of change Example: Earns $8.00 per hour, works 5 hours	Express the meaning of the rate of change. Examples: *Find cost per minute on cell phone minutes, service calls	Graph suitable units when describing rate of change. Example: 

Non-linear Functions	**Content Standard 4: Students will compare the properties in the family of functions.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
NLF.4.AI.2 Determine *minimum, maximum, vertex*, and *zeros*, given the graph	*Recognize characteristics of graphs such as highest and lowest points, where things are not changing at a constant rate	Show the lowest and highest point of the graph, using manipulatives/ concrete objects Example: Line students up and ask who is the shortest or tallest	Identify the lowest and highest point of the graph using paper models Examples: Find coldest/warmest, most/least, top/bottom	Given one coordinate, find the other coordinate. *Examples: Given daily temperature chart, find high and low points; given a weekly temperature chart, find warmest and coldest days	Interpret points on a graph. *Example: Given a graph of speed, find the maximum and minimum speed
NLF.4.AI.4 Recognize function families and their connections including *vertical shift* and *reflection* over the *x-axis* • quadratics *(with rational coefficients) • *absolute value* • *exponential functions*	*Determine reflections and shifts of quadratic functions (U-shaped), or absolute value functions (V-shaped), using objects or graphs	Demonstrate a vertical shift (change) using manipulatives with a grid Examples: Use a place setting template, move plate or cup forward or back; demonstrate with teenage games on a checkerboard, P.E. games, etc.	Choose the visual model that shows the vertical shift and/or reflection Example: Given two choices, identify the picture that shows a shift and/or reflection of the original  (Shift is the placement on the table, NOT the place setting)	*Given two functions on a graph, recognize the graphs are reflections (mirror image) Example: Using a visual model, arrange the room or an area according to the model, stacking books by one shelf up or down	*Determine the vertical change given two figures on a graph *Examples: Look at a graph for Day One and a graph for Day Two and observe differences in temperature for a given time in each; determine gas price changes from week to week using graphs from each week

<table>
<tr><td>Data Interpretation and Probability</td><td colspan="5">Content Standard 5:
Students will compare various methods of reporting data to make inferences or predictions.</td></tr>
<tr><td>Student Learning Expectation</td><td>Essence of Student Learning Expectation</td><td colspan="4">Less Complex → More Complex</td></tr>
<tr><td>DIP.5.A1.3 Construct simple matrices for real-life situations</td><td>*Organize information in a table with rows and columns</td><td>Choose activities/ objects from a choice board or communication board/ device

Example:
Set up choice board in rows and columns</td><td>Sort materials by category

Example:
Sort collections, hobbies, kitchen materials versus bathroom materials, library books on shelves</td><td>*Use a model to complete missing information in the matrix

*Example:
hours worked | money earned
1 | $ 5.00
2 | $10.00
? | $15.00
4 | $20.00
5 | $25.00
6 | $30.00
7 | ?
8 | $40.00
9 | $45.00
10 | $50.00</td><td>*Construct a matrix</td></tr>
<tr><td>DIP.5.AI.4 Determine the effects of changes in the data set on the measures of central tendency</td><td>*Describe the way that measures of central tendency (mean, median, mode) are affected by adding or removing data</td><td>Identify the central tendency of median and mode

Examples:
Identify middle of the line ranked from shortest to tallest[median], more girls or boys in class [mode]</td><td>Calculate the central tendency for mean, median, or mode

Examples:
Calculate basketball scores, grades, bowling scores, etc.</td><td>Calculate the central tendency for mean, median, and mode

Examples:
Calculate basketball scores, grades, bowling scores, etc.</td><td>Adjust the number of pieces of data and recalculate the central tendency
*Examples:
Remove a test score and recalculate the average; add a score to a team average and recalculate, such as team free throw average</td></tr>
</table>

Data Interpretation and Probability	Content Standard 5: Students will compare various methods of reporting data to make inferences or predictions.				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex → More Complex***			
DIP.5.AI.9 Recognize patterns using *explicitly* defined and *recursively* defined linear functions	Recognize numerical patterns using an equation (explicitly) or skip counting (recursively)	Engage in completing a pattern given attributes of size, number, color, and/or letter	Supply the missing element in a pattern Example: Find the missing element in 2, __, 6, 8, etc.	Extend the pattern Examples: Use skip counting or monetary units	Construct an input/output table and explain the pattern of a given equation Example: * Given a rule, y = x + 2, create a t-table with values for x and y

Algebra I Glossary

Absolute value	A number's distance from zero on a number line (The absolute value of –4 is 4; the absolute value of 4 is 4.)
Absolute value equation	Equation whose graph forms a V that opens up or down.
Absolute value inequality	Inequalities involving absolute value
Additive inverse	The opposite of a number (The additive inverse of 3 is –3. The sum of a number and its additive inverse is zero.)
Algebra	A generalization of arithmetic in which symbols represent members of a specified set of numbers and are related by operations that hold for all numbers in the set
Algebraic expression	An expression that contains a variable Ex. X – 2
Algebraic fraction	A fraction that contains a variable
Algorithms	A mechanical procedure for performing a given calculation or solving a problem through step-by-step procedures such as those used in long division
Array	A rectangular arrangement of objects in rows and columns
Associative Property	If three are more numbers are added or multiplied, the numbers can be regrouped without changing the results. Ex. 4 + (6 + 5) = (4 + 6) + 5
Axis	Either of two number lines used to form a coordinate grid
Bar graph	A graph in which horizontal or vertical bars represent data
Binomial	An expression consisting of two terms connected by a plus or minus sign, such as 4a + 6
Box-and-whisker plot	A graphic method for showing a summary of data using median, quartiles, and extremes of data (A box-and-whisker plot makes it easy to see where the data are spread out and where they are concentrated. The longer the box, the more the data are spread out.)
Central tendencies	A single number that is used to describe a set of numbers (Ex. mean, median, mode, etc.)
Chance	The probability of an outcome in an uncertain event (Ex. In tossing a coin, there is an equal chance of getting heads or tails.)
Coefficient	The numerical factor when a term has a variable (Ex. In the expression 3x + 2y = 16, 2 and 3 are coefficients.)
Commutative Property	If two numbers are added or multiplied, the operations can be done in any order. Ex. 4 x 5 = 5 x 4
Composite number	Any integer that is not a prime number (evenly divisible by numbers other than one and itself)
Consecutive	Following one another in an uninterrupted order (Ex. 6, 7, 8, and 9 are consecutive numbers.)
Constant	In an algebraic expression, the number without the variable (Ex. In the expression 2x + 5, 5 is the constant.)
Coordinate	A set of numbers that locates the position of a point usually represented by (x, y) values
Coordinate system/Cartesian Plane	A method of locating points in the plane or in space by means of numbers (A point in a plane can be located by its distances from both a horizontal and a vertical line called the axes. The horizontal line is called the x-axis. The vertical line is called the y-axis. The pairs of numbers are called ordered pairs. The first number, called the x-coordinate, designates the distance along the horizontal axis. The second number, called the y-coordinate, designates the distance along the vertical axis. The point at which the two axes intersect has the coordinates (0, 0) and is called the origin.)
Data	Information gathered by observation, questioning, or measurement
Dependent variable	A variable that provides the output values of a function
Difference	The result of subtraction

Direct variation	A linear function of the form y = kx, where k is the constant of variation and k is not equal to zero
Distributive Property	A property that relates two operations on numbers, usually multiplication and addition, or multiplication and subtraction Ex. a(x + y) = ax + ay
Domain	The set of all first coordinates from the ordered pairs of a relation
Equation	A mathematical sentence containing an equal sign
Explicit equation	An equation that relates the inputs to the outputs
Exponent	A number showing how many times the base is used as a factor Ex. $3^2 = 3 \times 3$ or 9
Exponential Function	A function in the form of $f(x) = a^x$, where x is a real number, and a is positive and not 1
Expression	A mathematical statement that does not contain an equal sign
Extrapolate	To extend and estimate data based on given information
Factor	Any numbers multiplied by another number to produce a product
Factoring	A method used to solve a quadratic equation that requires using the zero product property (Factoring is a process of rewriting a number or expression as product of two or more numbers or expressions.)
Formulas	Specific equations giving rules for relationships between quantities
Function	A relation in which each member of the domain is paired with one, and only one, member of the range
Function Notation	To write a rule in function notation, you use the symbol f(x) in place of y. (Ex. f(x) = 3x – 8 is in functional notation.)
Graph of a function	A pictorial way to display a function
Histogram	A graphic representation of the frequency distribution of a continuous variable (Rectangles are drawn in such a way that their bars lie on a linear scale representing different intervals (bin width), and their heights are proportional to the frequencies of the values within each of the intervals.)
Independent variable	A variable that provides the input values of a function
Inequality	A mathematical statement that one quantity is less than (<) or greater than (>) another
Inference	Reasoning from data, premises, graphs, and incomplete and inconsistent sources to from sensible conclusions
Integers	The set of whole numbers and their opposites
Interest	Amount paid for the use of money
Interpolate	To interpret and estimate data between given values
Irrational numbers	Real numbers that cannot be expressed in the form a/b (a fraction) where a and b are integers
Inverse variation	A function that can be written in the form xy = k or y = k/x (The product of the quantities remains constant, so as one quantity increases, the other decreases.)
Linear function	A function that has a constant rate of change and can be modeled by a straight line
Line graph	A means of displaying statistical information by connecting graphs of ordered pairs to show changes in quantities
Line of best fit	The most accurate trend line on a scatter plot showing the relationship between two sets of data
Lines	A set of points (x, y) that satisfy the equation ax + by + c = 0 where a and b are not both zero
Literal equation	An equation involving two or more variables
Mapping diagram	A diagram that maps an input value to an output value to determine whether a relation is a function (See diagram)
Matrices	Ordered tables or listings of numerical data
Maximum	The greatest value of the function if is has such an extreme value
Mean	The sum of a set of numbers divided by the number of numbers in that set

Median	In a list of data ordered from least to greatest or greatest to least, the middle number or the average of the middle two numbers
Minimum	The least value of the function if is has such an extreme value
Mode	In a list of data, the number or item occurring most frequently
Monomial	An expression that is a number, a variable, or a product of a number and variable (Ex. 7, x and 8xy are all monomials.)
Natural Numbers	One of the numbers 1, 2, 3, 4… also called counting numbers
Number sense	The ability of the learner to make logical connections between new information and previously acquired knowledge to understand the meanings, relationships, and magnitudes of numbers and common measurements
Number Theory	Concepts of numbers such as prime, composite, squares, factors and multiples
Parabola	The graph of a quadratic function
Patterns	Repeated sequences
Perfect Square Trinomial	Any trinomial in the form $a^2 + 2ab + b^2$
Point slope form	A linear equation of a non-vertical line written as $y - y_1 = m(x - x_1)$
Polynomial	In algebra, an n expression consisting of two or more terms (Ex. $x^2 - 2xy + y^2$)
Powers	Numbers that can be expressed using exponents
Prime Numbers	A whole number greater than one having exactly two distinct factors, one and itself
Probability	How likely it is that an event will occur (Written formally as P(event))
Proportion	An equation that states that two ratios are equal
Pythagorean Theorem	In a right triangle, the sum of the squares of the length of the legs is equal to the square of the length of the hypotenuse. Ex. $a^2 + b^2 = c^2$
Quadratic formula	The solutions of a quadratic equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$ are given by the quadratic formula which is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Quadratic function	A function that has an equation of the form $y = Ax^2 + Bx + C$ where 'A' does not equal 0
Radicals	A radical symbol ($\sqrt{}$) and its radicand
Radical Equation	An equation that has a variable in a radicand
Radical expression	An expression with a radical in it
Radicand	An expression under the radical sign
Range	The set of all the second coordinates from the set of ordered pairs of a relation
Range (statistics)	The difference between the greatest and least numbers in a set of numerical data
Ratio	A comparison of two numbers, represented in one of the following ways: 2 to 5, 2 out of 5, 2:5, or 2/5
Rational Numbers	A number in the form of an a/b, where a and b are integers and b is not equal to zero
Real Roots	The zeros of an equation that occur at x-intercepts of the graph of the related function
Recursive function	A recursive formula has two parts: the value(s) of the first term(s), and a recursion equation that shows how to find each term from the term(s) before it
Reflection	Mirror image of a figure (Objects remain the same shape, but their positions change through a flip.)
Regression	Statistical technique that predicts the equation that best fits the data
Relation	A set of ordered pairs of data

Scale	The numeric ratio used to produce an enlarged or reduced drawing of a picture or an object
Scalar multiplication	Multiplication of a matrix by a constant (scalar)
Scatter plot	A graph of the points representing a collection of data
Scientific Notation	A means of expressing a number as a product of a number between one and ten and a power of ten Ex. $1100 = 1.1 \times 10^3$
Simultaneous (Systems) Equations	Pair of equations of the first degree upon which two different conditions are put on the same variables at the same time (Ex. Find two numbers whose sum is 7 and whose difference is 1. $x + y = 7$ and $x – y = 1$.)
Slope	The ratio of the vertical change to the horizontal change
Slope-intercept form	A linear equation in the form $y = mx + b$, where m is the slope of the graph of the equation and b is the y-intercept
Square root	That number which, when multiplied by itself, produces the given number (Ex. 5 is the square root of 25, because 5x5=25.)
Standard form of a linear equation	The form of a linear equation $Ax + By = C$ where A, B, and C are real numbers and A and C are not both zero (Ex. $6x – y = 12$)
Standard form of a polynomial	The form of a polynomial in which the degree of the terms decreases from left to right (descending order)
Stem-and-leaf display	A means of organizing data in which certain digits are uses as stems, and the remaining digits are leaves
Table	A display of data, usually arranged in rows and columns
Term	A number, variable, or the product or quotient of a number and one or more variables
Theoretical probabilities	Probabilities determined without performing an experiment
Unit rates	Any fixed amount, quantity, etc., used as a standard
Trinomial	An expression containing three terms connected by a plus or minus sign (Ex. $5x^2 + 3x – 6$)
Units of measure	Inches, meters, pounds, grams, etc.
Variable	A letter that can assume different values
Vertex	The maximum or minimum value of a parabola
Vertical Line Test	A method used to determine if a relation is a function or not (If a vertical line passes through a graph more than once, the graph is not the graph of a function.)
Vertical Shift	Movement of a graph up or down the y-axis
Whole numbers	The set of natural numbers and zero
X-axis	The horizontal axis of a coordinate plane
X-coordinate	The location on the x-axis of a point on the coordinate plane
X-intercept	The x-coordinate of the point where a line crosses the x-axis
Y-axis	The vertical axis of a coordinate plane
Y-coordinate	The location on the y-axis of a point on the coordinate plane
Y-intercept	The y-coordinate of the point where the line crosses the y-axis
Zeros	The x-intercepts of a quadratic equation that crosses the x-axis

Geometry Section

Strand	Content Standard
Language of Geometry	
	1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.
Triangles	
	2. Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real world situations.
Measurement	
	3. Students will measure and compare, while using appropriate formulas, tools, and technology to solve problems dealing with length, perimeter, area and volume.
Relationships between two and three dimensions	
	4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
Coordinate Geometry and Transformations	
	5. Students will specify locations, apply transformations and describe relationships using coordinate geometry.

Language of Geometry	Content Standard 1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex → More Complex***			
LG.1.G.1 Define, compare and contrast *inductive reasoning* and *deductive reasoning* for making predictions based on real-world situations • *Venn diagrams* • *matrix logic* • *conditional statements* (statement, *inverse, converse*, and *contrapositive*) • **figural patterns*	Recognize how items or situations are alike or different and how they categorize or overlap	Separate items by characteristics Examples: Separate items by color, size, shape, texture, pattern, etc.	Organize information by using Venn diagrams and matrix logic	Participate in activities involving conditional statements	Define, compare and contrast *inductive reasoning* and *deductive reasoning* for making predictions based on real-world situations (e.g., *Venn diagrams, matrix logic, conditional statements,* (statement, *inverse, converse*, and *contrapositive*))
LG.1.G.3 Describe relationships derived from geometric figures or figural patterns	Recognize and/or continue a pattern	Match items to a pattern	Given a model, repeat a pattern	Use a model to determine what comes next in a pattern	Describe relationships derived from geometric figures or figural patterns

Language of Geometry	**Content Standard 1. Students will develop the language of geometry including specialized vocabulary, reasoning, and application of theorems, properties, and postulates.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex → More Complex***			
LG.1.G.4 Apply, with and without appropriate technology, definitions, *theorems*, properties, and *postulates* related to such topics as *complementary, supplementary, vertical angles*, *linear pairs*, and angles formed by *perpendicular* lines	*Identify pairs of angles such as complementary, supplementary, vertical angles and angles formed by perpendicular lines	Represent the definition by participating in activities using concrete models Examples: Cut a cake, square brownie, candy bar, or pizza	Identify definitions by matching real-life pictures and objects to definitions	Demonstrate understanding of definitions by sketching examples of terms *Example: Fold patty paper	Apply, with and without appropriate technology, definitions, *theorems*, properties, and *postulates* related to such topics as *complementary, supplementary, vertical angles*, *linear pairs*, and angles formed by *perpendicular* lines

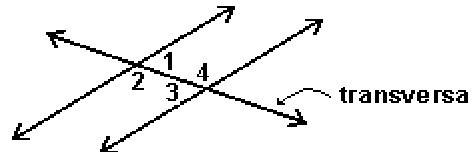
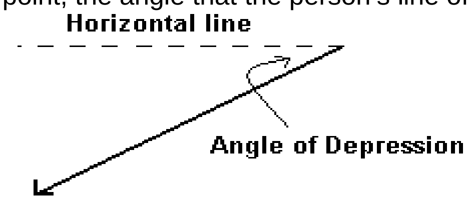
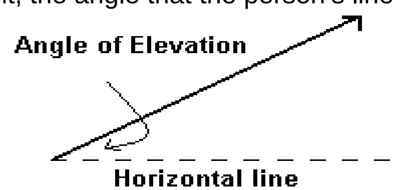
Triangles	**Content Standard 2.** **Students will identify and describe types of triangles and their special segments. They will use logic to apply the properties of congruence, similarity, and inequalities. The students will apply the Pythagorean Theorem and trigonometric ratios to solve problems in real-world situations.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
T.2.G.2 Investigate the measures of segments to determine the existence of triangles (*triangle inequality theorem*)	*Use segments of different lengths to determine the existence of a triangle using trial and error	Recreate a triangle by following a model	Create a triangle by using manipulatives Examples: Create a triangle using string, yarn, toothpicks, straws, etc.	Determine if a triangle exists when given three segment measures	Investigate the measures of segments to determine the existence of triangles (*triangle inequality theorem*)
T.2.G.3 Identify and use the special segments of triangles (*altitude*, *median*, angle *bisector*, *perpendicular bisector*, and midsegment) to solve problems	*Identify special segments of a given triangle	Demonstrate the special segments by engaging in paper folding activity	Demonstrate the special segments using triangle models	Draw or sketch examples of special segments by hand or with computer software	Participate in hands-on activities Examples: Produce projects in art class, agriculture class; find examples during field trips, etc.
T.2.G.4 Apply the *Pythagorean Theorem* and its converse in solving practical problems	Find the length of the sides of a right triangle by using the Pythagorean Theorem	Distinguish between a right triangle and other types of triangles	Explore right triangle relationships using physical models	Verify that the Pythagorean Theorem holds true for a given right triangle	Solve practical problems by applying the Pythagorean Theorem Examples: Use a baseball or softball diamond to solve a problem using the Pythagorean Theorem

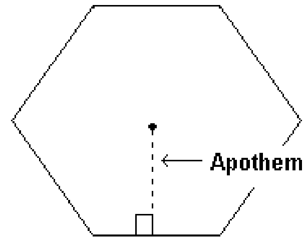
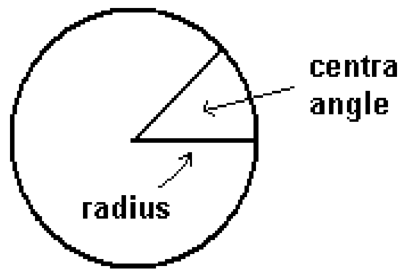
Measurement	**Content Standard 3.** **Students will measure and compare, while using appropriate formulas, tools, and technology to solve problems dealing with length, perimeter, area and volume.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
M.3.G.1 Calculate probabilities arising in geometric contexts (Ex. Find the probability of hitting a particular ring on a dartboard.)	*Recognize there is a greater probability of hitting an object of larger area than an object of smaller area	*Recognize differences in given examples such as different-sized areas on a dart board and different-sized sectors on a spinner	*Determine the relative probability (higher or lower) of hitting a part of a target with a greater area compared to a part of a target with a smaller area	Demonstrate probabilities in a fractional form	Convert probabilities to a decimal and then to a percent, with or without appropriate technology
M.3.G.2 Apply, using appropriate units, appropriate formulas (*area, perimeter, surface area*, *volume*) to solve application problems involving *polygons*, *prisms, pyramids, cones, cylinders, spheres* as well as composite figures, expressing solutions in both exact and approximate forms	*Solve problems involving perimeter, area, and volume	*Compare perimeter of objects *Example: Find the perimeter of a room and compare to the perimeter of a picture frame	*Compare areas of objects *Example: Find the area of a room and compare to the area of a piece of paper, or areas of a book	*Compare volumes of objects *Example: Compare volumes of similar boxes or cans	Apply given measurements to formulas and simplify formulas, with or without technology
M.3.G.3 Relate changes in the measurement of one *attribute* of an object to changes in other attributes (Ex. How does changing the *radius* or height of a cylinder affect its surface area or volume?)	Relate changes in the measurement of one attribute of an object to changes in other attributes	Choose appropriately sized item for activity or task Examples: Choose correct item for a specific task: face towel vs. bath towel, small can vs. large can, ruler vs. yard stick	*Compare two objects that have bases which are the same area but have different heights	*Compare two objects that have the same surface areas but different volumes	Solve problems involving ratios and proportions, with or without technology

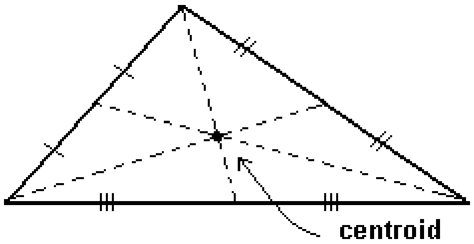
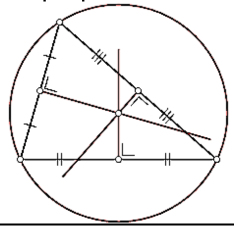
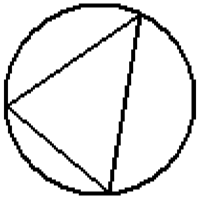
Relationships between two and three dimensions	**Content Standard 4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
R.4.G.1 Explore and verify the properties of *quadrilaterals*	Explore and verify the properties of quadrilaterals	Recognize objects with four sides as a quadrilateral Examples: Recognize table, brick in wall, football field, floor and ceiling tile, window pane	Identify quadrilaterals from assorted shapes	Classify special quadrilaterals *Examples: Classify according to special properties other that only having 4 sides: kite has 2 pair of adjacent sides congruent, trapezoid has parallel bases, parallelogram has opposite sides parallel and congruent, rhombus has 4 sides with opposites sides parallel, rectangle is a parallelogram with 4 right angles, square is a rectangle with 4 congruent sides	Show that diagonals of a quadrilateral are congruent or not congruent by using manipulatives or by sketching

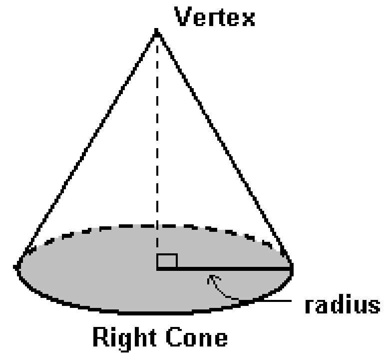
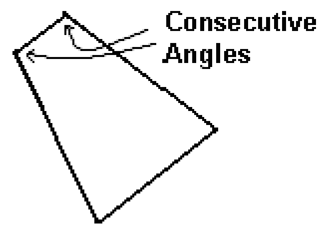
Relationships between two and three dimensions	Content Standard 4. Students will analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
R.4.G.2 Solve problems using properties of polygons: • sum of the measures of the *interior angles of a polygon* • interior and *exterior angle measure of a regular polygon* or *irregular polygon* • number of sides or angles of a polygon	*Solve problems using properties of polygons	Identify polygons by definition Example: Identify that a rectangle is a polygon, circle is not	Differentiate between polygons, using the number of sides Examples: Use a triangle, square, pentagon, hexagon, etc.	*Find the number of triangles formed by drawing diagonals from one vertex of a polygon *Examples: Two triangles can be formed by drawing diagonals from one vertex of a rectangle; four triangles can be formed by drawing diagonals from one vertex of a hexagon	*Find the sum of the interior angles of a polygon using the number of triangles formed by drawing diagonals from one vertex of the polygon to all the other vertices and multiplying the number of triangles formed by 180 (the sum of the interior angles of a triangle is 180 degrees)
R.4.G.3 Identify and explain why figures *tessellate*	*Recognize or demonstrate repeating patterns of shapes that tessellate	Use manipulatives to form patterns Example: Form tessellations using polygons	Recognize repeating geometric patterns as tessellations Examples: Use floor covering, ceiling tiles, wall paper, quilt blocks, etc.	Assemble tessellations using manipulatives	Create a tessellation
R.4.G.4 Identify the attributes of the five *Platonic Solids*	*Investigate attributes of a Platonic Solid	Recognize the shape of the faces of a Platonic Solid	Assemble the net (two-dimensional pattern) of a three-dimensional figure	Identify a net (two-dimensional pattern) of a three-dimensional figure	Construct and/or identify the five Platonic Solids

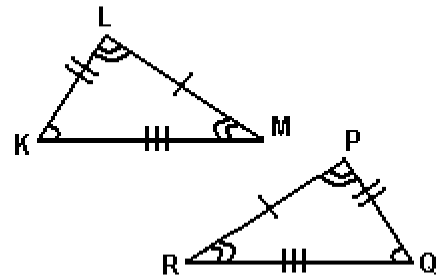
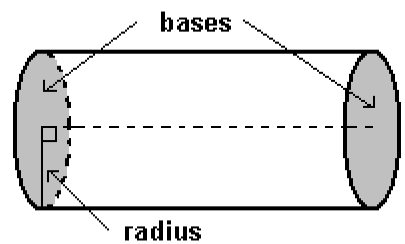
Coordinate Geometry and Transformations	**Content Standard 5.** **Students will specify locations, apply transformations, and describe relationships using coordinate geometry.**				
Student Learning Expectation	***Essence of Student Learning Expectation***	***Less Complex*** →			***More Complex***
CGT.5.G.1Use *coordinate geometry* to find the distance between two points, the *midpoint of a segment*, and the *slopes* of parallel, perpendicular, horizontal, and vertical lines	*Use coordinate geometry (grid) to find the length and midpoint of a segment	Recognize the given endpoints (horizontal or vertical) on a grid	Indicate the distance between the given endpoints (horizontal or vertical) on a grid	Identify the beginning, middle, and ending points of a given segment on a grid	Apply the distance and midpoint formulas to find the distance between two points and to find the midpoint
*CGT.5.G.5 Determine, given a set of points, the type of figure based on its properties (*parallelogram, isosceles triangle,* trapezoid)	Identify the figure drawn from a given set of points	Match a like figure to a figure on a grid	Connect the points on a grid *Example: Use dot to dot problems to identify polygons	Identify the figure with the appropriate term *Examples: Match a figure to its appropriate term	Identify appropriate figure with the parallel sides and slopes given
CGT.5.G.7 Draw and interpret the results of transformations and successive *transformations* on figures in the coordinate plane • *translations* • *reflections* • *rotations* (90˚, 180˚, clockwise and counterclockwise about the origin) • *dilations* (scale factor)	Identify and complete simple change in the position of a figure	Recognize movement of an object from place to place	Demonstrate movement of objects or figures on coordinate plane Examples: Slide, flip, or turn an object or figure	Recognize the different types of transformations	Draw or sketch a transformation on a coordinate plane, with or without technology

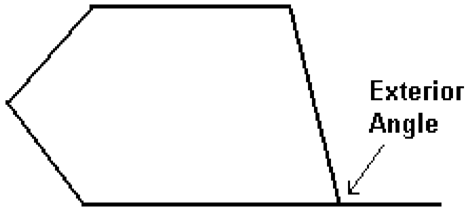
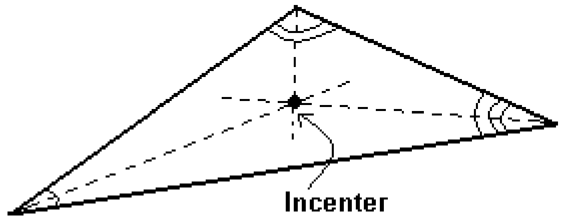
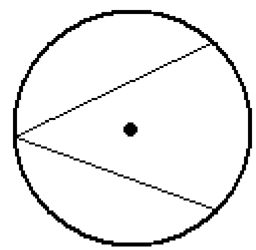
Adjacent angles	Two coplanar angles that share a vertex and a side but do not overlap
Alternate interior angles	Two nonadjacent angles that lie on opposite sides of a transversal between two lines that the transversal intersects 
Altitude of a triangle	A perpendicular segment from a vertex of a triangle to the line that contains the opposite side
Angle	Two non-collinear rays having the same vertex
Angle of depression	When a point is viewed from a higher point, the angle that the person's line of sight makes with the horizontal 
Angle of elevation	When a point is viewed from a lower point, the angle that the person's line of sight makes with the horizontal 

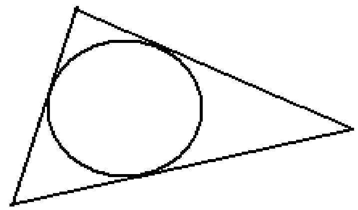
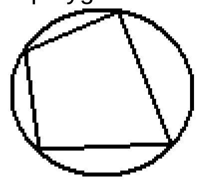
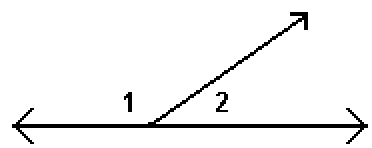
Apothem	The distance from the center of a regular polygon to a side 
Arcs	An unbroken part of a circle
Area	The amount of space in square units needed to cover a surface
Attributes	A quality, property, or characteristic that describes an item or a person (Ex. color, size, etc.)
Biconditional	A statement that contains the words “if and only if” (This single statement is equivalent to writing both “if p, then q” and its converse “if q then p.)”
Bisector	A segment, ray or line that divides into two congruent parts
Center of a circle	The point equal distance from all points on the circle
Central angle	An angle whose vertex is the center of a circle (Its measure is equal to the measure of its intercepted arc.) 

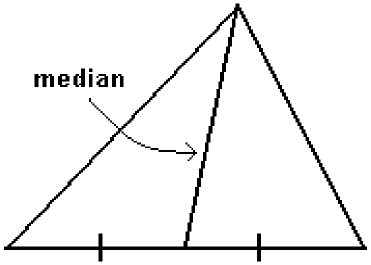
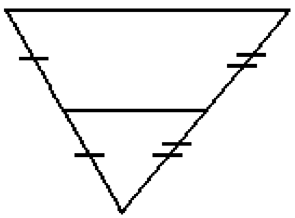
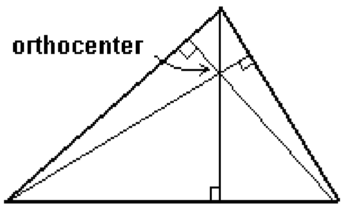
Centroid	The centroid of the triangle is the point of concurrency of the medians of the triangle. 
Chords	A segment whose endpoints lie on the circle
Circle	The set of all points in a plane that are an equal distance (radius) from a given point (the center) which is also in the plane
Circumcenter	A circumcenter is the point of concurrency of the perpendicular bisectors of a triangle. 
Circumference	The distance around a circle
Circumscribed	A circle is circumscribed about a polygon when each vertex of the polygon lies on the circle. (The polygon is I inscribed in the circle.) 
Collinear points	Points in the same plane that lie on the same line
Complementary angles	Two angles whose measures add up to 90 degrees
Concentric circles	Concentric circles lie in the same plane and have the same center

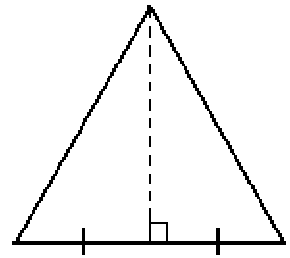
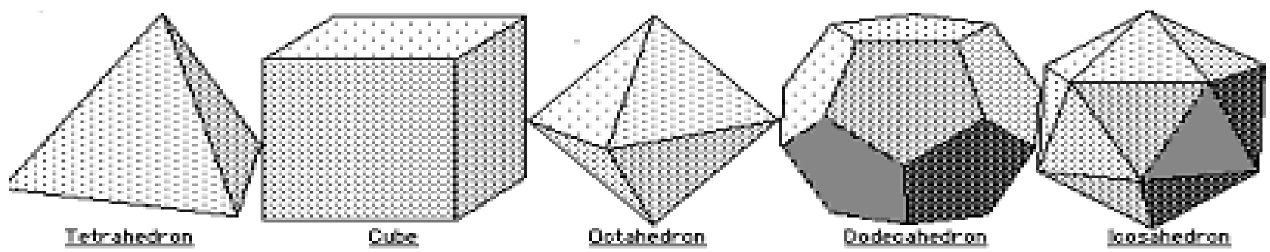
Conditional statements	A statement that can be written in the form “if p, then q” (Statement p is the hypothesis and statement q is the conclusion.)
Cone	A three dimensional figure with one circle base and a vertex 
Congruent	Having the same measure
Conjecture	Something believed to be true but not yet proven (an educated guess)
Consecutive angles	In a polygon, two angles that share a side 
Consecutive sides	In a polygon, two sides that share a vertex
Contrapositive	The statement formed when you negate the hypothesis and conclusion of the converse of a conditional statement (“if p, then q” is the statement “if not q, then not p”)
Converse	The converse of the conditional statement interchanges the hypothesis and conclusion (“if p, then q, becomes “if q, then p”)
Convex polygon	A polygon in which no segment that connects two vertices can be drawn outside the polygon
Coordinate geometry	Geometry based on the coordinate system

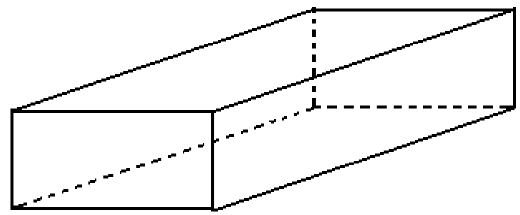
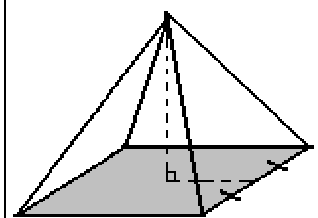
Coordinate plane	A coordinate plane is formed by two real number lines that intersect at a right angle at the origin. The horizontal axis is the x-axis and the vertical axis is the y-axis (The axes divided the plane into 4 equal quadrants.)
Coplanar points	Points that lie in the same plane
Corollary	A corollary of a theorem is a statement that can easily be proven by using the theorem.
Corresponding parts	A side (or angle) of a polygon that is matched up with a side (or angle) of a congruent or similar polygon 
Cosine	In a right triangle, the ratio of the length of the leg adjacent to the angle to the length of the hypotenuse
Cross-section	A cross-section is the intersection of a solid and a plane.
Cylinder	A space figure whose bases are circles of the same size 
Deductive reasoning	Using facts, definitions, and accepted properties in a logical order to reach a conclusion or to show that a conjecture is always true
Dilations	Transformations producing similar but not necessarily congruent figures

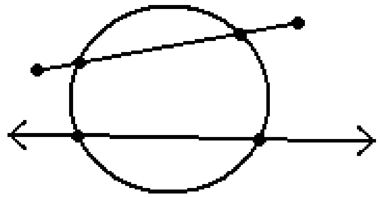
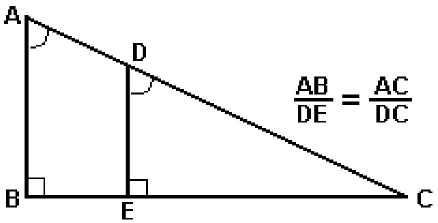
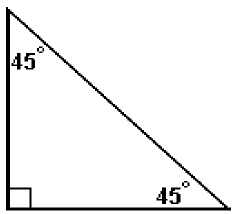
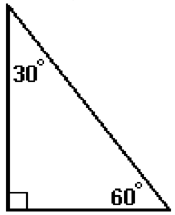
Exterior angle of a polygon	An angle formed when one side of the polygon is extended (The angle is adjacent to an interior angle of the polygon.) 
Geometric mean	If a, b, and x are positive numbers, and a/x = x/b, then x is the geometric mean of a and b.
Incenter	The incenter of a triangle is the point of concurrency of the angle bisectors of the triangle. 
Inductive reasoning	A type of reasoning in which a prediction or conclusion is based on an observed pattern
Inscribed angle	An angle whose vertex is on a circle and whose sides are chords of the circle 

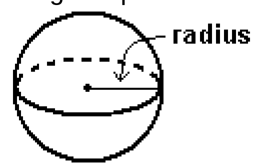
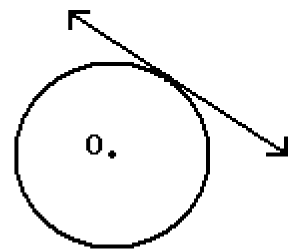
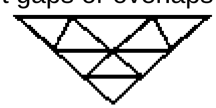
Inscribed circle	A circle is inscribed in a polygon if the sides of the polygon are tangent to the circle. 
Inscribed polygon	A polygon is inscribed in a circle if the vertices of the polygon are on the circle. 
Interior angles of a polygon	The inside angle of a polygon formed by two adjacent sides
Inverse statement	The statement formed when you negate the hypothesis and conclusion of a conditional statement ("if p, then q" is the statement "if not p, then not q")
Irregular polygon	A polygon where all sides and angles are not congruent
Isometric drawings	Drawings on isometric dot paper used to show 3-dimensional objects
Isosceles triangle	A triangle with at least two sides congruent
Line of symmetry	A line that a figure in the plane has if the figure can be mapped onto itself by a reflection in the line
Linear pair of angles	Two adjacent angles form a linear pair if their non-shared rays form a straight angle. 
Matrix logic	Using a matrix to solve logic problems

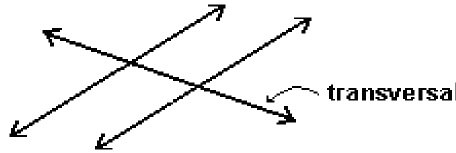
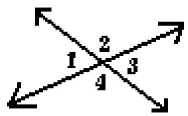
Median of a triangle	A segment that has as its endpoints a vertex of the triangle and the midpoint of the opposite side 
Midpoint of a segment	The point that divides a segment into two congruent segments
Midsegment	A segment whose endpoints are the midpoints of two sides of a polygon 
Orthocenter	The orthocenter is the point of concurrency of the altitudes of a triangle. 
Orthographic drawings	An orthographic drawing is a two-dimensional drawing that shows the top view, front view and right side view of a three-dimensional figure.
Parallel lines	Lines in a plane that never intersect
Parallelogram	A quadrilateral with both pairs of opposite sides parallel

Perimeter	The distance around a polygon
Perpendicular bisector	The perpendicular bisector of a segment is a line, segment or ray that is perpendicular to the segment at its midpoint. 
Perpendicular	Two lines, segments, rays, or planes that intersect to form right angles
Planes	A flat surface having no boundaries
Platonic solid	A polyhedron all of whose faces are congruent regular polygons, and where the same number of faces meet at every vertex 
Point	A specific location in space
Polygon	A closed plane figure whose sides are segments that intersect only at their endpoints with each segment intersecting exactly two other segments
Postulates	A mathematical statement that is accepted without proof

Prism	A three-dimensional figure--with two congruent faces called bases--that lies in parallel planes (The other faces called lateral faces are rectangles that connect corresponding vertices of the bases.) 
Pyramid	A three-dimensional figure with one base that is a polygon (The other faces, called lateral faces, are triangles that connect the base to the vertex.) 
Quadrilateral	A four-sided polygon
Radius	A line segment having one endpoint at the center of the circle and the other endpoint on the circle
Reflections	Mirror images of a figure (Objects stay the same size and shape, but their positions change through a flip.)
Regular octagon	An octagon with all sides and angles congruent
Regular polygon	A polygon with all sides and angles congruent
Rotations	A transformation in which every point moves along a circular path around a fixed point called the center of rotation
Scale drawings	Pictures that show relative sizes of real objects

Secants	A line, ray or segment that intersects a circle at two points 
Similarity	The property of being similar
Similar polygons	Two polygons are similar if corresponding angles are congruent and the lengths of corresponding sides are in proportion. 
Sine	In a right triangle, the ratio of the length of the leg opposite the angle to the length of the hypotenuse
Slope	The ratio of the vertical change to the horizontal change
Slope-intercept form	A linear equation in the form y = *m*x + b, where *m* is the slope of the graph of the equation and b is the y intercept
Special right triangles	A triangle whose angles are either 30-60-90 degrees or 45-45-90 degrees  

Spheres	The set of all points in space equal distance from a given point 
Standard form of a linear equation	The form of a linear equation Ax + By = C where A, B, and C are real numbers and A and C are not both zero Ex. 6x + 2y = 10
Supplementary angles	Two angles whose measures add up to 180 degrees
Surface area	The area of a net for a three-dimensional figure
Tangent	In a right triangle, the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle
Tangent to a circle	A line in the plane of the circle that intersects the circle in only one point 
Tessellate	A pattern of polygons that covers a plane without gaps or overlaps 
Theorems	A conjecture that can be proven to be true
Transformation	A change made to the size or position of a figure
Translation	A transformation that slides each point of a figure the same distance in the same direction

Transversal	A line that intersects two or more other lines in the same plane at different points 
Triangle Inequality Theorem	The sum of the lengths of any two sides of a triangle is greater than the length of the third side.
Trigonometric ratios	The sine, cosine and tangent ratios
Venn diagram	A display that pictures unions and intersections of sets
Vertical angles	Non-adjacent, non-overlapping congruent angles formed by two intersecting lines (They share a common vertex.)  $\angle 1$ and $\angle 3$ are vertical angles. $\angle 2$ and $\angle 4$ are vertical angles.
Volume	The number of cubic units needed to fill a space

MANIPULATIVES TO CONCEPTS

The following is a listing of SOME of the concepts that can effectively be taught using the given manipulatives.

Manipulative	Concepts
Algebra Tiles	Integers, equations, inequalities, polynomials, similar terms, factoring, estimation
Attribute Blocks	Sorting, classification, investigation of size, shape, color, logical reasoning, sequencing, patterns, symmetry, similarity, congruence, thinking skills, geometry, organization of data
Balance Scale	Weight, mass, equality, inequality, equations, operations on whole numbers, estimation, measurement
Base-Ten blocks	Place value, operations on whole numbers, decimals, decimal-fractional-percent equivalencies, comparing, ordering, classifications, sorting, number concepts, square and cubic numbers, area, perimeter, metric measurement, polynomial
Calculators	Problems with large numbers, problem solving, interdisciplinary problems, real-life problems, patterns, counting, number concepts, estimation, equality, inequality, fact *strategies*, operations on whole numbers, decimals, fractions
Capacity Containers	Measurement, capacity, volume, estimation
Clocks	Time, multiplication, fractions, modular arithmetic, measurement
Color Tiles	Color, shape, patterns, estimation, counting, number concepts, equality, inequality, operations on whole numbers and fractions, probability, measurement, area, perimeter, surface area, even and odd numbers, prime and composite numbers, ratio, proportion, percent, integers, square and cubic numbers, spatial visualization
Compasses	Constructions, angle measurement
Cubes	Number concepts, counting, place value, fact *strategies* – especially turnaround facts, classification, sorting, colors, patterns, square and cubic numbers, equality, inequalities, averages, ratio, proportion, percent, symmetry, spatial visualization, area, perimeter, volume, surface area, transformational geometry, operations on whole numbers and fractions, even and odd numbers, prime and composite numbers, probability
Cuisenaire Rods	Classification, sorting, ordering, counting, number concepts, comparisons, fractions, ratio, proportion, place value, patterns, even and odd numbers, prime and composite numbers, logical reasoning, estimation, operations on whole numbers
Decimal Squares	Decimals – place value, comparing, ordering, operations, classification, sorting, number concepts, equality, inequality, percent, perimeter, area
Dominoes	Counting, number concepts, fact *strategies*, classification, sorting, patterns, logical reasoning, equality, inequality, mental math, operations on whole numbers

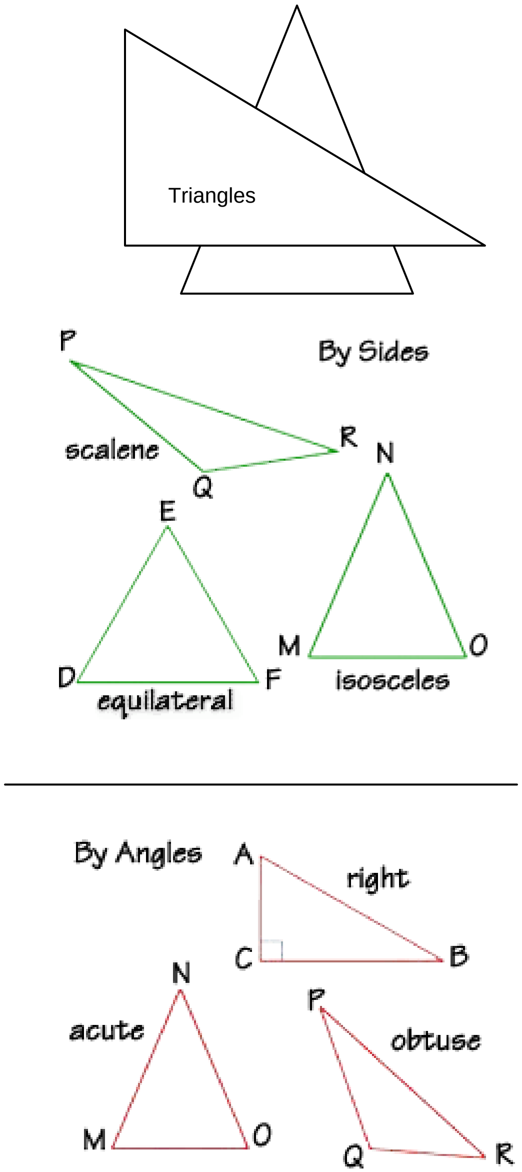
Fraction Models	Fractions – meaning, recognition, classification, sorting comparing, ordering, number concepts, equivalence, operations, perimeter, area, percent, probability
Geoboards	Size, shape, counting, area, perimeter, circumference, symmetry, fractions, coordinate geometry, slopes, angles, Pythagorean Theorem, estimation, percent, similarity, congruence, rotations, reflections, translations, classification, sorting, square numbers, polygons, spatial visualization, logical reasoning
Geometric Solids	Shape, size, relationships between area and volume, volume, classification, sorting, measurement, spatial visualization
Math Balance Invicta, number	Equality, inequality, operations on whole numbers, open sentences, equations, place value, fact *strategies*, measurement, logical reasoning
Miras	Symmetry, similarity, congruence, reflections, rotations, translations, angles, parallel and perpendicular lines, constructions
Money	Money, change, comparisons, counting, classifications, sorting, equality, inequality, operations on whole numbers, decimals, fractions, probability, fact *strategies*, number concepts
Number Cubes	Counting, number concepts, fact *strategies*, mental math, operations on whole numbers, fractions, decimals, probability, generation of problems, logical reasoning
Numeral Cards	Counting, classification, sorting, comparisons, equality, inequality, order, fact *strategies*, number concepts, operations on whole numbers, fractions, decimals, logical reasoning, patterns, odd and even numbers, prime and composite numbers
Pattern blocks	Patterns, one-to-one correspondence, sorting, classification, size, shape, color, geometric relationships, symmetry, similarity, congruence, area, perimeter, reflections, rotation, translations, problem solving, logical reasoning, fractions, spatial visualization, tessellations, angles, ratio, proportions
Polyhedra Models	Shape, size, classification, sorting, polyhedra, spatial visualization
Protractors	Constructions, angle measurement
Rulers Tape Measures	Measurement, area, perimeter, constructions, estimation, operations on whole numbers, volume
Spinners	Counting, number concepts, operations on whole numbers, decimals, fractions, fact *strategies*, mental math, logical reasoning, probability, generation of problems
Tangrams	Geometric concepts, spatial visualization, logical reasoning, fractions, similarity, congruence, area, perimeter, ratio, proportion, angles, classification, sorting, patterns, symmetry, reflections, translations, rotations
Ten-frames	Fact *strategies*, mental math, number concepts, counting, equality, inequality, place value, patterns, operations on whole numbers
Thermometers	Temperature, integers, measurement
Two-Color Counters	Counting, comparing, sorting, classification, number concepts, fact *strategies*, even and odd numbers, equality, inequality, operations, ratio, proportions, probability, integers

CONCEPTS TO MANIPULATIVES

The following is a listing of SOME of the manipulatives that can effectively be used to teach the given concept.

Concepts	Manipulative
Angles	Protractors, compasses, geoboards, miras, rulers, tangrams, pattern blocks
Area	Geoboards, color tiles, base-ten blocks, decimal squares, cubes, tangrams, pattern blocks, rulers, fraction models
Classification, sorting	Attribute blocks, cubes, pattern blocks, tangrams, 2-color counters, Cuisenaire rods, dominoes, geometric solids, money, numeral cards, base-ten materials, polyhedra models, geoboards, decimal squares, fraction models
Coordinate Geometry	geoboards
Constructions	Compasses, protractors, rulers, miras
Counting	Cubes, 2-color counters, color tiles, Cuisenaire rods, dominoes, numeral cards, spinners, 10-frames, number cubes, money calculators
Decimals	Decimal squares, base-ten blocks, money, calculators, number cubes, numeral cards, spinners
Equations/inequalities Equality/inequality Equivalence	Algebra tiles, math balance, calculators, 10-frames, balance scale, color tiles, dominoes, money, numeral cards, 2-color counters, cubes, Cuisenaire rods, decimal squares, fraction models
Estimation	Color tiles, geoboards, balance scale, capacity containers, rulers, Cuisenaire rods, calculators
Factoring	Algebra tiles
Fact Strategies	10-frames, 2-color counters, dominoes, cubes, numeral cards, spinners, number cubes, money, math balance, calculators
Fractions	Fraction models, pattern blocks, base-ten materials, geoboards, clocks, color tiles, cubes, Cuisenaire rods, money, tangrams, calculators, number cubes, spinners, 2-color counters, decimal squares, numeral cards
Integers	2-color counters, algebra tiles, thermometers, color tile
Logical reasoning	Attribute blocks, Cuisenaire rods, dominoes, pattern blocks, tangrams, number cubes, spinners, geoboards
Mental Math	10-frames, dominoes, number cubes, spinners
Money	Money
Number Concepts	Cubes, 2-color counters, spinners, number cubes, calculators, dominoes, numeral cards, base-ten materials, Cuisenaire rods, fraction models, decimal squares, color tiles, 10-frames, money
Odd, Even, Prime, Composite	Color tiles, cubes, Cuisenaire rods, numeral cards, 2-cold counters
Patterns	Pattern blocks, attribute blocks, tangrams, calculators, cubes, color tiles, Cuisenaire rods, dominoes,

	numeral cards, 10-frames
Percent	Base-ten materials, decimal squares, color tiles, cubes, geoboards, fraction models
Perimeter/Circumference	Geoboards, color tiles, tangrams, pattern blocks, rulers, base-ten materials, cubes, fraction circles, decimal squares
Place Value	Base-ten materials, decimal squares, 10-frames, Cuisenaire rods, math balance, cubes, 2-color counters
Polynomials	Algebra tiles, base-ten materials
Pythagorean Theorem	Geoboards
Ratio/Proportion	Color tiles, cubes, Cuisenaire rods, tangrams, pattern blocks, 2-color counters
Similarity/Congruence	Geoboards, attribute blocks, pattern blocks, tangrams, miras
Size/Shape/color	Attribute blocks, cubes, color tiles, geoboards, geometric solids, pattern blocks, tangrams, polyhedra models
Spatial Visualization	Tangrams, pattern blocks, geoboards, geometric solids, polyhedra models, cubes, color tiles
Square/Cubic numbers	Color tiles, cubes, base-ten materials, geoboards
Surface area	Color tiles, cubes
Symmetry	Geoboards, pattern blocks, tangrams, miras, cubes, attribute blocks
Tessellations	Pattern blocks, attribute blocks
Transformational geometry, translations, rotations, reflections	Geoboards, cubes, miras, pattern blocks, tangrams
Volume	Capacity containers, cubes, geometric solids, rulers
Whole Numbers	Base-ten materials, balance scale, number cubes, spinners, color tiles, cubes, math balance, money, numeral cards, dominoes, rulers, calculators, 10-frames, Cuisenaire rods, clocks, 2-color counters


Triangles
By Sides
P
R
Q
scalene
E
N
M
O
D
F
equilateral
isosceles
By Angles
A
right
C
B
N
acute
P
obtuse
M
O
Q
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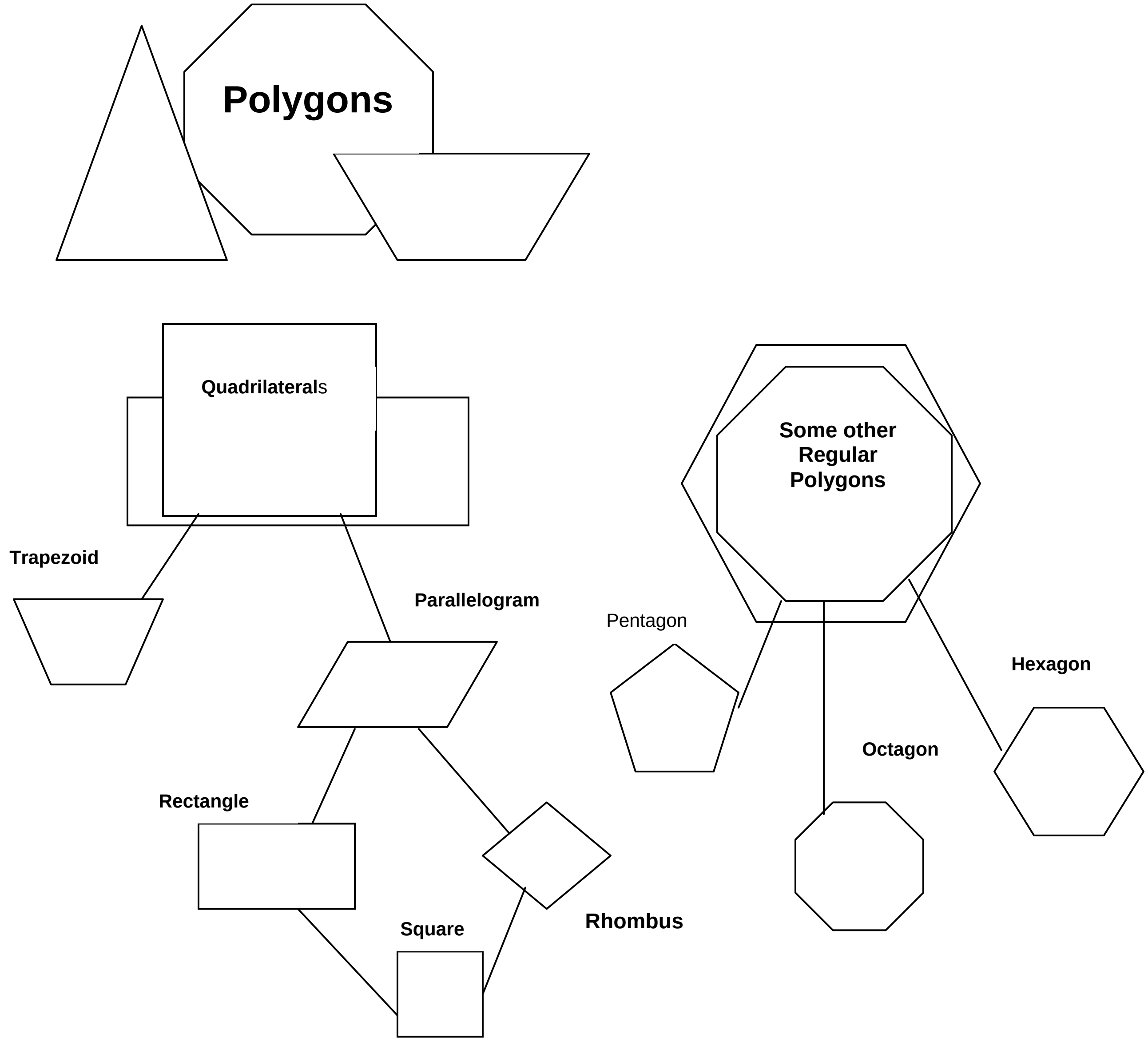
Polygons
Quadrilaterals
Some other Regular Polygons
Trapezoid
Parallelogram
Pentagon
Hexagon
Octagon
Rectangle
Square
Rhombus