SECONDARY MATHEMATICS CURRICULUM STANDARDS 9 – 12

Catholic Schools Office

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SECONDARY MATHEMATICS CURRICULUM STANDARDS 9-12

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The Catholic Schools Office of the Diocese of Phoenix expresses gratitude to the Secondary Mathematics Curriculum Committee for its work in reviewing, revising, and updating the Mathematics Curriculum Standards for grades 9-12 in the Diocese of Phoenix.

Mathematics is recognized as a great example of God's gift of the human mind and its capacity in understanding creation for the betterment of all mankind.

Mathematics is basic to our daily lives. Mathematical truths and methods can be used to solve problems in the real world. It provides tools for research, enables the analysis of economic trends to make informed decisions in health care, weather forecasting, space exploration, and foreign policies, to name a few, along with the vast myriad of ordinary day-to-day life decisions.

Teachers are expected to be creative as they teach their students how to correctly use new mathematical tools, communication media, and technology to solve cross-curricular problems and integration.

It is our hope that these standards assist our high schools and teachers in developing in our students an interest, curiosity, and mastery in Mathematics as they recognize the integration of Catholic values in the skills and concepts for critical thinking so necessary for moral responsibility.

Gratefully,

Ms. MaryBeth Mueller
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SECONDARY MATHEMATICS
DIOCESAN CURRICULUM STANDARDS

PHILOSOPHY

The philosophy of the Secondary Mathematics Curriculum Standards of the Diocese of Phoenix is to provide students with the mathematical skills necessary for functioning and contributing to society in the 21st Century. Students need mathematics for daily living; understanding numbers and spatial concepts; and thinking logically. In addition students through the study of Mathematics learn more about the Creation of which they are a part and the God Who is responsible for that Creation.

As Catholic educators in today's global society, we are challenged to fully understand and expand mathematical accomplishments to assure a peaceful, productive, and more equitable world. These Standards take into consideration the uniqueness of individual students. Students are encouraged to learn proper mathematical terminology and uniform problem solving techniques. The students are led to raise questions, to think critically and creatively, to apply mathematical skills, concepts, and technology, and to participate in discussions. The curriculum standards are focused on preparing student for a world that is heavily technological and where Mathematics is crucial for future success.

In the process of mastering mathematics, many opportunities for interacting and exhibiting Catholic virtues and values exist. There opportunities present themselves in the student's struggle and quest to assimilate the tremendous body of mathematical knowledge and the application of mathematical principles.

GOALS

The goals of the Secondary Mathematics Diocesan Curriculum Standards are that all students will:

- Develop, through the study of algebra with increasing levels of difficulty, the mathematical skills of solving equations, graphing, applications, and critical thinking.

- Make connections between geometric concepts and their real-world application by utilizing logical arguments and algebraic and spatial concepts.

- Quantify events found in modern society so that the events can be studied closely both as regards their origin and their future.

- Statistical tools are the instruments by which a rigorous analysis of events can be made for both understanding and prediction.

- Extend the understanding and use of mathematical concepts as they are applied to business, the sciences, and advanced mathematical applications.

- Be prepared as graduates for the rigors of higher education, career opportunities, and the mathematical applications needed to be successful.

- Apply the study of mathematics in an ethical manner consistent with the ideals of Catholic virtues and values.

Academic Excellence:

The United States Conference of Catholic Bishops affirms the message of the Congregation on Catholic Education that intellectual development of the person and growth as a Christian go forward hand in hand. Rooted in the mission of the Church, the Catholic school brings faith, culture and life together in harmony. In 2005, the bishops noted that "young people of the third millennium must be a source of energy and leadership in our church and our nation. And, therefore, we must provide young people with an academically rigorous and doctrinally sound program of education" *(Renewing Our Commitment to Catholic Elementary and Secondary School is in the Third Millennium, 2005).*

The essential elements of "an academically rigorous and doctrinally sound program" mandate curricular experiences-including co-curricular and extra-curricular activities-which are rigorous, relevant, research-based, and infused with Catholic faith and traditions. The following essential elements provide a framework for the design, implementation, and assessment of authentic academic excellence in Catholic school education from pre-kindergarten through secondary school.

Standard 7: An excellent Catholic school has a clearly articulated, rigorous curriculum aligned with relevant standards, 21st century skills, and Gospel values, implemented through effective instruction. ***BENCHMARKS:***

7.1	The curriculum adheres to appropriate, delineated standards, and is vertically aligned to ensure that every student successfully completes a rigorous and coherent sequence of academic courses based on the standards and rooted in Catholic values.
7.2	Standards are adopted across the curriculum, and include integration of the religious, spiritual, moral, and ethical dimensions of learning in all subjects.
7.3	Curriculum and instruction for the 21st century learning provide students with the knowledge, understanding and skills to become creative, reflective, literate, critical, and moral evaluators, problem solvers, decision makers, and socially responsible global citizens.
7.4	Curriculum and instruction for 21st century learning prepares students to become expert users of technology, able to create, publish, and critique digital products that reflect their understanding of the content and their technological skills.
7.5	Classroom instruction is designed to intentionally address the effective dimensions of learning, such as intellectual and social dispositions, relationship building, and habits of mind.
7.6	Classroom instruction is designed to engage and motivate all students, addressing the diverse needs and capabilities of each student, and accommodating students with special needs as fully as possible.
7.7	Faculty collaborate in professional learning communities to develop, implement and continuously improve the effectiveness of the curriculum and instruction to result in high levels of student achievement.
7.8	The faculty and professional support staff meet (arch) diocesan, state, and/or national requirements for academic preparation and licensing to ensure their capacity to provide effective curriculum and instruction.
7.9	Faculty and professional support staff demonstrate and continuously improve knowledge and skills necessary for effective instruction, cultural sensitivity, and modeling of Gospel values.
7.10	Faculty and staff engage in high quality professional development, including religious formation, and are accountable for implementation that supports student learning.

Standard 8: An excellent Catholic school uses school-wide assessment methods and practices to document student learning and program effectiveness, to make student performances transparent, and to inform the continuous review of curriculum and the improvement of instructional practices. ***BENCHMARKS:***

8.1	School-wide and student data generated by a variety of tools are used to monitor, review, and evaluate the curriculum and co-curricular programs; to plan for continued and sustained student growth; and to monitor and assess faculty performance.
8.2	School-wide and aggregated student data are normed to appropriate populations and are shared with all stakeholders.
8.3	Faculty use a variety of curriculum-based assessments aligned with learning outcomes and instructional practices to access student learning, including formative, summative, authentic performance, and student self-assessment.
8.4	Criteria used to evaluate student work and the reporting mechanisms are valid, consistent, transparent, and justly administered.
8.5	Faculty collaborate in professional learning communities to monitor individual and class-wide student learning through methods such as common assessments and rubics.

Standard 9 An excellent Catholic school provides programs and services aligned with the mission to enrich the academic program and support the development of student and family life. ***BENCHMARKS:***

9.1	School-wide programs for parents/guardians provide opportunities for parents/guardians to partner with school leaders, faculty, and other parents/guardians to enhance the educational experiences for the school community.
9.2	Guidance services, wellness programs, behavior management programs, and ancillary services provide the necessary support for students to successfully complete the school program.
9.3	Co-curricular and extra-curricular activities provide opportunities outside the classroom for students to further identify and develop their gifts and talents and to enhance their creative, aesthetic, social/emotional, physical, and spiritual capabilities.

In High School, to accommodate the variation among states, the standards are arranged in *conceptual categories*, such as Algebra or Functions. In each conceptual category there are *domains*, such as Creating Equations and Interpreting Functions.

Conceptual Category	Number & Quantity	Algebra	Functions	Geometry	Statistics & Probability	Contemporary Mathematics (AZ Addition)
Domains	The Real Number System	Seeing Structure in Expressions	Interpreting Functions	Congruence	Interpreting Categorical & Quantitative Data	
	Quantities	Arithmetic with Polynomials & Rational Expressions	Building Functions	Similarity, Right Triangles, & Trigonometry	Making Inferences & Justifying Conclusions	
	The Complex Number System	Creating Equations	Linear, Quadratic, & Exponential Models	Expressing Geometric Properties with Equations	Conditional Probability & the Rules of Probability	
	Vector & Matrix Quantities	Reasoning with Equations & Inequalitites	Trigonometric Functions	Geometric Measurement & Dimension	Using Probability to Make Decisions	Discrete Mathematics

The Standards for Mathematical Practice describe characteristics and traits that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedure flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

Overarching Habits of Mind of a Productive Mathematical Thinker	
MP.1 Make sense of problems and persevere in solving them. MP.6 Attend to precision.	***Reasoning and Explaining*** MP. 2 Reason abstractly and quantitatively. MP. 3 Construct viable arguments and critique the reasoning of others.
	Modeling and Using Tools MP. 4 Model with mathematics. MP. 5 Use appropriate tools strategically.
	Seeing Structure and Generalizing MP. 7 Look for and make use of structure. MP. 8 Look for and express regularity in repeated reasoning.

21st Century Instructional Shifts for Mathematics

Focus — The goal is to focus strongly where the standards focus. The curriculum significantly narrows and deepens the way time and energy are spent in the mathematics classroom. The standards focus deeply on the major work of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the mathematics they know to solve problems inside and outside the mathematics classroom.

Coherence — Coherence is connecting ideas across grades, and linking to major topics within grades. The standards are designed around coherent progressions from grade to grade. Students build new understanding onto foundations built in previous years. Each standard is not a new event, but an extension of previous learning. Instead of allowing additional or supporting topics to detract from the focus of the grade, these topics can serve the grade-level focus.

Rigor — In major topics, conceptual understanding, procedural skill and fluency, and application are pursued with equal intensity.

- Emphasis is placed on conceptual understanding of key concepts, such as place value and ratios. Teachers support students' ability to access concepts from a number of perspectives so that students are able to see math as more than a set of mnemonics or discrete procedures.
- Students build speed and accuracy in calculation. Teachers structure class time and/or homework time for students to practice core functions, such as single-digit multiplication, so that they have access to more complex concepts and procedures.
- Students use math flexibly for applications. Teachers provide opportunities for students to apply math in context. Teachers in content areas outside of math, particularly science, ensure that students are using math to make meaning of and access content.

MATHEMATICS STRAND 1: Foundations of Algebra

CONCEPT 1: NUMBER SYSTEMS

Students will:

PO #	Performance Objective
DPO 1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers and to represent addition and subtraction on a horizontal or vertical number line diagram.
	a. Describe situations in which opposite quantities combine to make 0.
	b. Understand $p + q$ as the number located an absolute value distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative.
	c. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
	d. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$.
	e. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
	f. Apply property of operations as strategies to add and subtract rational numbers.
DPO 2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
	a. Understand that multiplication of rational numbers continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
	b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. Interpret quotients of rational numbers by describing real-world contexts.
	c. Apply properties of operations as strategies to multiply and divide rational numbers.
	d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
DPO 3	Solve real-world and mathematical problems involving the four operations with rational numbers.

PO #	Performance Objective
DPO 4	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
DPO 5	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).

CONCEPT 2: EXPRESSIONS AND EQUATIONS
Students will:

PO #	Performance Objective
DPO 1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
DPO 2	Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
DPO 3	Use scientific notations to estimate very large or very small quantities, and to express how many times as much one is than the other.
DPO 4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.
DPO 5	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
DPO 6	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
DPO 7	Solve 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.
DPO 8	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
	a. Solve word problems leading to equations of the form $px+q=r$ and $p(x+q)=r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently.
	b. Solve word problems leading to inequalities of the form $px+q>r$ or $px+q<r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

PO #	Performance Objective
DPO 9	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
DPO 10	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
DPO 11	Solve linear equations in one variable.
	a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions.
	b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
DPO 12	Analyze and solve pairs of simultaneous linear equations.
	a. Understand 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.
	b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations.
	c. Solve real-world and mathematical problems leading to two linear equations in two variables.
DPO 13	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
DPO 14	Recognize and represent proportional relationships between quantities.
	a. Decide 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.
	b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
	c. Represent proportional relationships by equations.
	d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.
DPO 15	Use 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.

CONCEPT 3: FUNCTIONS
Students will:

PO #	Performance Objective
DPO 1	Understand that a function is a rule that assigns to each input exactly one output. (Function notation is not required.)
DPO 2	Compare the properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by a verbal description).
DPO 3	Interpret the equation y = mx + b as a linear function whose graph is a straight line; give examples of functions that are not linear.
DPO 4	Construct a function to model a linear relationship between two quantities.
	a. Determine 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 graph.
	b. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph or a table of values.
DPO 5	Describe qualitatively the functional relationship by analyzing a graph (eg. Function is increasing or decreasing, linear or nonlinear). Sketch a graph that shows the qualitative features of a function that has been described verbally.

CONCEPT 4: GEOMETRY

Students will:

PO #	Performance Objective
DPO 1	Solve problems involving scale drawings of geometric figures.
DPO 2	Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus 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.
DPO 3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
DPO 4	Know the formulas for the area and circumference of a circle and solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
DPO 5	Use 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.
DPO 6	Solve 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.
DPO 7	Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.
DPO 8	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
DPO 9	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

CONCEPT 5: STATISTICS AND PROBABILITY
Students will:

PO #	Performance Objective
DPO 1	Understand that statistics can be used to gain information about a population by examining a sample of the population and that generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
DPO 2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
DPO 3	Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
DPO 4	Use range and measures of central tendency (mean, median, mode) for numerical data from random samples to draw informal comparative inferences about two populations.
DPO 5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood.
DPO 6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
DPO 7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
DPO 10	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
DPO 11	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.
DPO 12	Explain a proof of the Pythagorean Theorem and its converse.

PO #	Performance Objective
DPO 13	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
DPO 14	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
DPO 15	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Snapshot: Algebra I/Honors Algebra

What should move to lower grade

- Classify numbers as members of sets.
- Recognize and apply the properties of real numbers
- Identify and compare whether a given set of numbers is finite or infinite.
- Understand the rules for order of operations.
- Add, subtract, multiply and divide expressions containing integers
- Evaluate algebraic expressions using substitution.
- Define absolute value as the distance from the origin and evaluate numerical and algebraic absolute value expressions
- Solve real world distance problems using absolute value.
- Use the appropriate form of a real number to express a real world situation.
- Know and use order of operations to solve linear equations and inequalities in one variable involving one step, two steps, and multiple steps. Create a linear equation from a table of values.
- Graph equations of lines in the coordinate plane by using slopes and intercepts.
- Find the square root of a whole number and approximate values of irrational numbers using tables and calculators.
- Know the basic laws regarding exponents including multiplication, division and raising a power to a power.

What's Still There

- Add, subtract, and multiply polynomials (linear and quadratic)
- Factoring
- Linear, quadratic and exponential models; interpret in context
- Solve one variable equations and inequalities – linear; exponential with integer inputs
- Solve quadratic equations with real solutions – using square roots, factoring
- Functions –linear, exponential; function notation
- Arithmetic and geometric sequences
- Applications of systems of linear equations and inequalities
- Systems of linear inequalities
- Graph linear, exponential and quadratic functions

New to Algebra I

- More emphasis on key features of functions
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- Rational exponents
- Properties of irrational numbers
- Solve quadratic equations with real solutions by completing the square and the quadratic formula
- Systems of linear and quadratic equations
- Complete the square to find the vertex of a quadratic function
- Rewrite exponential expressions to find a rate of growth and decay
- Interpreting categorical and quantitative data
- Making inferences and justifying conclusions

MATHEMATICS STRAND 2: Algebra I/ Honors Algebra I

CONCEPT 1: THE REAL NUMBER SYSTEM
Students will:

PO #	Performance Objective
DPO 1	Explain why the sum or product of two rational numbers are rational; that the sum of a rational number and an irrational is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

CONCEPT 2: SEEING STRUCTURE IN EXPRESSIONS
Students will:

PO #	Performance Objective
DPO 1	Interpret expressions that represent a quantity in terms of its context:
	a. Interpret parts of an expression, such as terms, factor, and coefficients.
	b. Interpret complicated expressions by viewing one or more of their parts as a single entity.
DPO 2	Use the structure of an expression to identify ways to rewrite it.
DPO 3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines:
	a. Factor a quadratic expression to reveal the zeros of the function it defines.
	b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

CONCEPT 3: ARITHMETIC WITH POLYNOMIALS AND RATIONAL EXPRESSIONS
Students will:

PO #	Performance Objective
DPO 1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
DPO 2	Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

CONCEPT 4: CREATING EQUATIONS
Students will:

PO #	Performance Objective
DPO 1	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
DPO 2	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.

CONCEPT 5: REASONING WITH EQUATIONS AND INEQUALITIES
Students will:

PO #	Performance Objective
DPO 1	Solve simple rational and radical equations in one variable and give examples showing how extraneous solutions may arise.
DPO 2	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
DPO 3	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
DPO 4	Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables.
DPO 5	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

PO #	Performance Objective
DPO 6	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

CONCEPT 6: INTERPRETING FUNCTIONS
Students will:

PO #	Performance Objective
DPO 1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of the equation $y = f(x)$.
DPO 2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
DPO 3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
DPO 4	Relate the domain of a function to its graph and, where applicable to the quantitative relationship it describes.
DPO 5	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
DPO 6	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

CONCEPT 7: BUILDING FUNCTIONS
Students will:

PO #	Performance Objective
DPO 1	Write a function that describes a relationship between two quantities.
	a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
DPO 2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

CONCEPT 8: INTERPRETING CATEGORICAL AND QUANTITATIVE DATA
Students will:

PO #	Performance Objective
DPO 1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
DPO 2	Interpret difference in shape, center, and spread in the context other data sets, accounting for possible effects of extreme data points (outliers).
DPO 3	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
DPO 4	Distinguish between correlation and causation.

CONCEPT 9: MAKING INFERENCES AND JUSTIFYING CONCLUSIONS
Students will:

PO #	Performance Objective
DPO 1	Decide if a specified model is consistent with results from a given data-generating process.
DPO 2	Evaluate results based on data.

NOTE: Honors Algebra I includes an enrichment of additional materials and an acceleration of materials. Extensive work is also done on factoring and the study of functions.

Geometry Snapshot

What's Still There

- Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
- Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
- Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
- Explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions.
- Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
- Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
- Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
- Prove theorems about triangles. Theorems include a line parallel to one side of a triangle divides the other two sides proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
- Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- Explain and use the relationship between the sine and cosine of complementary angles.
- Prove that all circles are similar.
- Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
- Construct a tangent line from a point outside a given circle to the circle.
- Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
- Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
- Use geometric shapes, their measures, and their properties to describe object (e.g., modeling a tree trunk or a human torso as a cylinder).
- Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
- Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

What's New to Geometry:

- Use matrices to represent and manipulate data.
- Multiply matrices by scalars to produce new matrices.
- Add, subtract, and multiply matrices of appropriate dimensions.
- Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but satisfies the associative and distributive properties.
- Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
- Verify experimentally the properties of dilations given by a center and a scale factor:
    a) A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
    b) The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
- Derive the formula A= ½ ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

What's Moved to 4th Year Math:

- Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v,|v|, ||v||,v)
- Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
- Solve problems involving velocity and other quantities that can be represented by vectors.
- Add vectors. Add vectors end to end, component-wise and by the parallelogram rule.

MATHEMATICS STRAND 3: Geometry/Honors Geometry

CONCEPT 1: CONGRUENCE
Students will:

PO #	Performance Objective
DPO 1	Recognize that definitions of line segments, angles, circles, perpendicular lines and parallel lines are based on the undefined terms of point, line, and distance.
DPO 2	Recognize mathematical patterns in order to interpret and solve word problems.
DPO 3	Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
DPO 4	Use the definition of congruence to show that triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
DPO 6	Explain how the criteria for triangle congruence (SSS,SAS,ASA) follow from the definition of congruence.
DPO 7	Prove theorems about triangles (Triangle Sum Theorem, Base Angles,Theorem [isosceles triangles], Midsegment Thoerem, Median, and Bisectors.)
DPO 8	Prove theorems about properties of parallelograms.
DPO 9	Use congruence criteria for triangles to solve problems and to prove relationships in geometric figures.

CONCEPT 2: TRANSFORMATIONS
Students will:

PO #	Performance Objective
DPO 1	Represent transformations in the plane visually.
DPO 2	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
DPO 3	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
DPO 4	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
DPO 5	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure

CONCEPT 3: MATRICES
Students will:

PO #	Performance Objective
DPO 1	Use matrices to represent and manipulate data.
DPO 2	Multiply matrices by scalars to produce new matrices, e.g., dilations.
DPO 3	Add, subtract, and multiply matrices of appropriate dimensions, using a calculator where appropriate.
DPO 4	Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.

CONCEPT 4: ANGLES
Students will:

PO #	Performance Objective
DPO 1	Classify and use angle pairs such as complementary, supplementary, vertical and linear pairs.
DPO 2	Prove theorems about angles related to parallel lines and recognize their relationships.
DPO 3	Apply theorems about angles to solve problems.

CONCEPT 5: GEOMETRIC CONSTRUCTIONS
Students will:

PO #	Performance Objective
DPO 1	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).
DPO 2	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

CONCEPT 6: SIMILARITY
Students will:

PO #	Performance Objective
DPO 1	Verify experimentally the properties of dilations given by a center and a scale factor:
	a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
	b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
DPO 2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar.
DPO 3	Explain, using similarity transformations, the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
DPO 4	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
DPO 5	Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely.*
DPO 6	Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

CONCEPT 7: TRIGONOMETRIC RATIOS AND RIGHT TRIANGLES
Students will:

PO #	Performance Objective
DPO 1	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
DPO 2	Explain and use the relationship between the sine and cosine of complementary angles.
DPO 3	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

CONCEPT 8: CIRCLES
Students will:

PO #	Performance Objective
DPO 1	Prove that all circles are similar.
DPO 2	Identify and describe relationships among inscribed angles, radii, and chords.
DPO 3	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

CONCEPT 9: COORDINATE GEOMETRY
Students will:

PO #	Performance Objective
DPO 1	Use coordinates to prove simple geometric theorems algebraically.
DPO 2	Find the equation of a line parallel or perpendicular to a given line that passes through a given point.
DPO 3	Find the point on a directed line segment between two given points that partitions the segment in a given ratio. (midpoint, etc.)
DPO 4	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

CONCEPT 10: VOLUME
Students will:

PO #	Performance Objective
DPO 1	Give an informal argument using Cavalieri's principle for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.
DPO 2	Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
DPO 3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
DPO 4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

CONCEPT 11: GEOMETRIC MODELING
Students will:

PO #	Performance Objective
DPO 1	Use geometric shapes, their measures, and their properties to describe objects.
DPO 2	Apply concepts of density based on area and volume in modeling situations.
DPO 3	Apply geometric methods to solve design problems.

***CONCEPT 12: LOCUS (OPTIONAL)**
Students will:

DPO 1	Understand the concept of locus of points.
DPO 2	Use constructions to solve locus problems.

***CONCEPT 13: GEOMETRY AS A MEANS OF LOGICAL REASONING**
Students will:

DPO 1	Understand the techniques of writing a valid proof.
DPO 2	Distinguish between hypothesis and conclusion of a conditional statement.
DPO 3	Understand inductive and deductive reasoning.
DPO 4	Understand, recognize and write the converse, inverse, contrapositive and biconditional of a conditional statement.
DPO 5	Understand, recognize and write direct proofs.

NOTE: Honors Geometry includes an enrichment of additional material and an acceleration of materials, including concepts listed with an asterisk (*) above. Extensive work is also done on proofs in honors geometry. Some optional topics listed may have been used in previous concepts to help clarify a given objective.

Snapshot: Algebra II/Honors Algebra II

Moving to a lower grade, but should be reinforced in Algebra II

- Extend elementary skills of solving equations and inequalities.
- Solve linear equations and inequalities.
- Apply the solutions of equations and inequalities to practical every day scientific and business problems.
- Recognize and simplify polynomial expressions.
- Add, subtract, and multiply polynomials.
- Determine if a function is one-to-one and state its domain and range.
- Define relation and function.
- Recognize linear and quadratic functions.
- Find the value of a function.
- Graph linear and quadratic functions.
- Define and use the six trigonometric functions.
- Identify the measure of angles in a coordinate plane.
- Solve right triangles and problems using trigonometry.
- Perform operations on matrices.

Moving to 4th year

- Graph the translation and reflection of relations.
- Solve exponential and logarithmic functions.
- Recognize parabolas, circles, ellipses and hyperbolas though definitions, examples and formulas.
- Graph conic sections.
- Write the equation of a conic section given certain conditions.
- Solve systems of quadratic equations algebraically and graphically.
- Define what is meant by the radian measure of an angle in pi.
- Change the radian measure to degree and vice versa.
- Graph the sine, cosine, and tangent functions with variations of amplitude, period and phase shifts.
- Graph the reciprocal functions: secant, cosecant and cotangent.
- Derive the fundamental identities, including the Pythagorean identities.
- Prove basic trigonometric identities.
- Develop and use the sum and difference identities.
- Use the double angle and half angle identities.
- Recognize and graph the arcsine, arccosine and arctangent.
- Solve equations using trigonometric functions.
- Apply the relationship between polar coordinates and rectangular coordinates.
- Change rectangular coordinates to polar coordinates and vice versa.
- Recognize and graph polar equations.
- Change rectangular equations to polar equations and vice versa.
- Apply curve fitting to make predictions from given data.
- Solving exponential equations.

What's still there

- Solve systems of equations I two variables graphically and algebraically.
- Solve systems of equations in three variables by algebraic means.
- Solve quadratic equations by factoring, completing the square and using the quadratic formula.
- Solve equations containing radicals.
- Solve polynomial equations.
- Find the inverse and composition of functions.
- Use functions in practical applications.
- Determine the probability of specific events.
- Represent and analyze relationships using written and verbal explanations, tables, equations, graphs, and matrices and describe the connections among those representations.
- Divide polynomials.
- Recognize and evaluate sequences and series.
- Simplify, add, subtract, multiply and divide rational expressions.
- Solve real-world problems by using combinations and permutations.
- Simplifying complex numbers.

New to Algebra II

- Representing complex numbers graphically using vectors.
- Performing operations on complex numbers using vectors.
- Using properties of matrices and determinants.
- Deriving the formula to find the sum of a finite series.
- Using the binomial theorem.
- Solving linear systems using matrices.
- Graphing piecewise and step functions.
- Modeling rates of change using linear, quadratic and exponential functions.
- Constructing linear and exponential functions given a graph, table or description.
- Proving the law of sines and law of cosines.
- Identifying cross-sections of three-dimensional shapes.
- Understanding conditional probability.
- Constructing frequency tables.

MATHEMATICS STRAND 4: Algebra II/Honors Algebra II

CONCEPT 1: THE REAL NUMBER SYSTEM
Students will:

PO #	Performance Objective
DPO 1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
DPO 2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.

CONCEPT 2: THE COMPLEX NUMBER SYSTEM
Students will:

PO #	Performance Objective
DPO 1	Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real.
DPO 2	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
DPO 3	Find the conjugate of a complex number; use conjugates to find absolute values (moduli) and quotients of complex numbers.
DPO 4	Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
DPO 5	Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.
DPO 6	Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.
DPO 7	Solve quadratic equations with real coefficients that have complex solutions.
DPO 8	Extend polynomial identities to the complex numbers.
DPO 9	Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

CONCEPT 3: VECTOR AND MATRIX QUANTITIES
Students will:

PO #	Performance Objective
DPO 1	Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.

CONCEPT 4: SEEING STRUCTURE IN EXPRESSIONS
Students will:

PO #	Performance Objective
DPO 1	Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

CONCEPT 5: ARITHMETIC WITH POLYNOMIALS AND RATIONAL EXPRESSIONS
Students will:

PO #	Performance Objective
DPO 1	Identify zeros of a polynomial when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
DPO 2	Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer *n*, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
DPO 3	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or for the more complicated examples, a computer algebra system.

CONCEPT 6: Creating Equations
Students will:

PO #	Performance Objective
DPO 1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational exponential functions.

CONCEPT 7: Reasoning with Equations and Inequalities
Students will:

PO #	Performance Objective
DPO 1	Solve quadratic equations in one variable by factoring, completing the square and using the quadratic formula.

CONCEPT 8: REASONING WITH EQUATIONS AND INEQUALITIES
Students will:

PO #	Performance Objective
DPO 1	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
DPO 2	Represent a system of linear equations as a single matrix equation in a vector variable.
DPO 3	Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimensions 3X3 or greater).

CONCEPT 9: INTERPRETING FUNCTIONS
Students will:

PO #	Performance Objective
DPO 1	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
DPO 2	Graph linear and quadratic functions and show intercepts, maxima and minima.
DPO 3	Graph square root, cube root and piecewise defined functions, including step functions and absolute value functions.
DPO 4	Graph polynomial functions, identifying zeros when suitable factorizations are available and showing ending behavior.
DPO 5	Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
DPO 6	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
DPO 7	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of context.
DPO 8	Use the properties of exponents to interpret expressions for exponential functions.

CONCEPT 10: BUILDING FUNCTIONS
Students will:

PO #	Performance Objective
DPO 1	Determine an explicit expression, a recursive process, or steps for calculation from a context.
DPO 2	Compose functions.

CONCEPT 11: LINEAR, QUADRATIC, AND EXPONENTIAL MODELS
Students will:

PO #	Performance Objective
DPO 1	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
DPO 2	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
DPO 3	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
DPO 4	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
DPO 5	Observe using graphs and tables that a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
DPO 6	Interpret the parameters in a linear or exponential function in terms of a context.

CONCEPT 12: SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY
Students will:

PO #	Performance Objective
DPO 1	Derive the formula $A = \frac{1}{2} ab \sin(c)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
DPO 2	Prove the Laws of Sines and Cosines and use them to solve problems.
DPO 3	Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.

CONCEPT 13: EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS
Students will:

PO #	Performance Objective
DPO 1	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
DPO 2	Use coordinates to prove simple geometric theorems algebraically.

CONCEPT 14: GEOMETRIC MEASUREMENT AND DIMENSION
Students will:

PO #	Performance Objective
DPO 1	Identify the shapes of two-dimensional cross-sections of three dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

CONCEPT 15: MODELING WITH GEOMETRY
Students will:

PO #	Performance Objective
DPO 1	Apply concepts of density based on area and volume in modeling situations.
DPO 2	Apply geometric methods to solve design problems.

CONCEPT 16: INTERPRETING CATEGORICAL AND QUANTITATIVE DATA
Students will:

PO #	Performance Objective
DPO 1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

CONCEPT 17: INTERPRETING CATEGORICAL AND QUANTITATIVE DATA
Students will:

PO #	Performance Objective
DPO 1	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
DPO 2	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in data.
DPO 3	Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
DPO 4	Informally assess the fit of a function by plotting and analyzing residuals.
DPO 5	Fit a linear function for a scatter plot that suggests a linear association.
DPO 6	Compute (using technology) and interpret the correlation coefficient of a linear fit.

CONCEPT 18: Conditional Probability and the Rules of Probability
Students will:

PO #	Performance Objective
DPO 1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events.
DPO 2	Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
DPO 3	Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
DPO 4	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
DPO 5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

PO #	Performance Objective
DPO 6	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of a model.
DPO 7	Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.
DPO 8	Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B/A) = P(B)P(A/B), and interpret the answer in a model.
DPO 9	Use permutations and combinations to compute probabilities of compound events and solve problems.

CONCEPT 19: USING PROBABILITY TO MAKE DECISIONS
Students will:

PO #	Performance Objective
DPO 1	Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
DPO 2	Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
DPO 3	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
DPO 4	Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
DPO 5	Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. Find the expected payoff for a game of chance. Evaluate and compare strategies on the basis of expected values.
DPO 6	Analyze decisions and strategies using probability concepts.

NOTE: Honors Algebra II will include an enrichment of additional materials and an acceleration of materials.

Snapshot: Fourth Year Mathematics

What should move to fourth year

- Trigonometry (similarity, right triangles and Law of Sines and Law of Cosines still at 3rd year
- Logarithms
- Conic Sections
- Statistics; normal distribution and standard deviation, frequency tables, linear regression, (mean, median, mode still at 3rd year)
- Vector operations and polar coordinates

New to fourth year:

- Using matrices to transform vectors and perform reflections, rotations, and dilations
- Discrete mathematics; paths, circuits, spanning trees, vertex coloring, and adjacency matrices

What stays at fourth year:

- Determined by course syllabi, Dual Enrollment, and AP Standards
- Some topics previously in fourth year may be moved to lower level

MATHEMATICS STRAND 5: Fourth Year Mathematics

CONCEPT 1: VECTORS AND MATRICES
Students will:

DPO #	Performance Objective
DPO 1	Define vectors with magnitude and direction utilizing appropriate symbols.
DPO 2	Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
DPO 3	Solve problems involving velocity and other quantities that can be represented by vectors.
DPO 4	Add and subtract vectors.
	a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of vectors is typically not the sum of the magnitudes.
	b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
	c. Understand vector subtraction $v - w$ as $v + (-w)$, where $-w$ is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.
DPO 5	Multiply a vector by a scalar.
	a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise.
	b. Compute the magnitude of a scalar multiple cv using $\lVert cv \rVert = \lvert c \rvert v$. Compute the direction of cv knowing that when $\lvert c \rvert v \neq 0$, the direction of cv is either along v (for $c > 0$) or against v for $c < 0$.
DPO 6	Use matrices to represent and manipulate data representing relations or incidence.
DPO 7	Utilize matrices as transformations of vectors.
DPO 8	Use matrices to perform reflections, rotations dilations area of a parallelogram.

CONCEPT 2: EXPONENTS
Students will:

DPO #	Performance Objective
DPO 1	Simplifying mathematical expressions with exponents.
DPO 2	Simplifying polynomials with exponents.
DPO 3	Simplifying exponential functions.

CONCEPT 3: POLYNOMIAL AND RATIONAL EXPRESSIONS
Students will:

DPO #	Performance Objective
DPO 1	Apply the Remainder Theorem.
DPO 2	Utilize polynomial identities.

CONCEPT 4: EQUATIONS AND INEQUALITIES
Students will:

DPO #	Performance Objective
DPO 1	Determine points of intersection with/without graphing calculator.
	a. Linear
	b. Polynomial
	c. Rational
	d. Absolute value
	e. Exponential and Logarithmic.
DPO 2	Identify linear, exponential and step functions.

CONCEPT 5: FUNCTIONS
Students will:

DPO #	Performance Objective
DPO 1	Graph functions by hand and with graphing calculator, noting key features:
	a. square root
	b. cube root
	c. piecewise
	d. step
	e. absolute value.
DPO 2	Write a function that describes a relationship between 2 quantities.
DPO 3	Combine standard function types using arithmetic operations.
DPO 4	State the composition of two functions.
DPO 5	Transformation of functions.
DPO 6	Find inverse functions:
	a. Verify by composition that one function is the inverse of another.
	b. Read values of an inverse function from a table or graph.
	c. Find the inverse of a function that is not one-to-one by first restricting the domain.

CONCEPT 6: LINEAR, QUADRATIC AND EXPONENTIAL MODELS
Students will:

DPO #	Performance Objective
DPO 1	Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
DPO 2	Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
DPO 3	Distinguish between situations that can be modeled with linear and with exponential functions:
	a. Recognize step functions.
	b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
	c. Recognize situation in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
DPO 4	Construction linear and exponential functions given a graph, description of a relationship, or table of values.
DPO 5	Solve exponential functions by utilizing logarithms.
DPO 6	Interpret the variables in a linear or exponential function.

CONCEPT 7: STATISTICS AND PROBABILITY
Students will:

DPO #	Performance Objective
DPO 1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (inter-quartile range, standard deviation) of two or more different data sets.
DPO 2	Use the mean and standard deviation of a data set to fit a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve.
DPO 3	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, conditional relative frequencies). Recognize possible associations and trends in data.
DPO 4	Represent data on two quantitative variables on a scatter plot and describe how the variables are related:
	a. Fit a function to the data.
	b. Informally assess the fit of a function by plotting and analyzing residuals.
	c. Fit a linear function for a scatter plot that suggests a linear association.

CONCEPT 8: CONICS +
Students will:

DPO #	Performance Objective
DPO 1	Derive the equation of a parabola given a focus and directrix.
DPO 2	Derive the equations of ellipses and hyperbolas given the foci.

CONCEPT 9: DISCRETE MATHEMATICS +
Students will:

DPO #	Performance Objective
DPO 1	Study the following topics related to vertex-edge graphs: Euler circuits, Hamilton circuits, the Traveling Salesperson Problem (TSP), minimum weight spanning trees, shortest paths, vertex coloring, and adjacency matrices.
DPO 2	Understand, analyze, and apply vertex-edge graphs to model and solve problems related to paths, circuits, networks, and relationships among a finite number of elements, in real-world and abstract settings.

DPO #	Performance Objective
DPO 3	Devise, analyze, and apply algorithms for solving vertex-edge graph problems.
DPO 4	Extend work with adjacency matrices for graphs, such as interpreting row sums and using the nth power of the adjacency matrix to count paths of length n in a graph.

CONCEPT 10: TRIGONOMETRIC FUNCTIONS *

Students will:

DPO #	Performance Objective
DPO 1	Understand radian measure as the length of an arc on the unit circle.
DPO 2	Expand understanding of angles in all quadrants.
DPO 3	Derive the formula for the area of a sector.
DPO 4	Using the special triangles of 30-60-90 and 45-45-90 to determine the 6 trig functions of angles in all quadrants.
DPO 5	Use the unit circle to explain symmetry (odd and even).
	a. Determine if the function is even or odd.
	b. Explain the period of each trig function.
DPO 6	Graph the trig functions with amplitude, period and midline.
DPO 7	Develop the restriction on a trig function in order to find the inverse.
DPO 8	Use inverse functions to solve trig equations in modeling problems, utilize the graphing calculator.
DPO 9	Prove the Pythagorean identity and use the Pythagorean identity to find the other trig functions of an angle.
DPO 10	Prove the addition and subtraction of angles identities and utilize those identities to solve problems.
DPO 11	Derive the formula A = ½ ab sin (C) for the area of a triangle.
DPO 12	Prove the Law of Sines and Cosines.
DPO 13	Use the Laws of Sines and Cosines to solve problems.
DPO 14	Find the length of an arc and area of a sector.

+ Intermediate Algebra/College Math courses include problems of a less rigorous nature; these problems would be optional for these courses, but required for College Algebra

* Pre-Calculus and Honors includes trigonometry, an enrichment of additional materials and an acceleration of materials.

MATHEMATICS STRAND 6: Statistics and Probability

CONCEPT 1: INTERPRETING CATEGORICAL AND QUANTITATIVE DATA

Students will:

DPO #	Performance Objective
DPO 1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (inter-quartile range, standard deviation) of two or more different data sets.
DPO 2	Use the mean and standard deviation of a data set to fit a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve.
DPO 3	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, conditional relative frequencies). Recognize possible associations and trends in data.
DPO 4	Represent data on two quantitative variables on a scatter plot and describe how the variables are related:
	a. Fit a function to the data.
	b. Informally assess the fit of a function by plotting and analyzing residuals.
	c. Fit a linear function for a scatter plot that suggests a linear association.

CONCEPT 2: MAKING INFERENCES AND JUSTIFYING CONCLUSIONS

Students will:

DPO #	Performance Objective
DPO 1	Understand statistics as a process for making inferences to be made about population parameters based on a random sample from that population.
DPO 2	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
DPO 3	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
DPO 4	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

CONCEPT 3: USING PROBABILITY TO MAKE DECISIONS
Students will:

DPO #	**Performance Objective**
DPO 1	Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
DPO 2	Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
DPO 3	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
DPO 4	Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
DPO 5	Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values:
	a. Find the expected pay for a game of chance.
	b. Evaluate and compare strategies on the basis of expected values.
DPO 6	Use probabilities to make fair decision (e.g. drawing by lots, random number generator).
DPO 7	Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

MATHEMATICS STRAND 7: AP Calculus AB/BC

CONCEPT 1: Analysis of Functions
Students will:

PO #	Performance Objective
DPO 1	Analyze properties of functions graphically, numerically, analytically and/or verbally,
DPO 2	Recognize the connections between the various representations.
DPO 3	Understand asymptotes in terms of graphical behavior.
DPO 4	Compare relative magnitudes of functions and their rates of change. (For example, contrasting exponential growth, polynomial growth, and logarithmic growth.)

CONCEPT 2: Limits of Functions and Continuity
Students will:

PO #	Performance Objective
DPO 1	Calculate limits (including one-sided limits) using algebraic techniques.
DPO 2	Estimate limits from graphs or tables of data.
DPO 3	Describe asymptotic behavior in terms of limits involving infinity.
DPO 4	Compare relative magnitudes of functions and their rates of change.
DPO 5	Determine if a function is continuous at a point using limits.
DPO 6	Use the Intermediate Value Theorem and Extreme Value Theorem to show continuity.

CONCEPT 3: Concept of the Derivative
Students will:

PO #	Performance Objective
DPO 1	Define a derivative as the limit of the difference quotient.
DPO 2	Find the line tangent to a curve.
DPO 3	Use the limit of the average rate of change to calculate the derivative at a point and as a function.
DPO 4	Approximate the rate of change from graphs and tables.
DPO 5	Sketch the graph of the derivative from the function.
DPO 6	Determine behavior of a function (increasing or decreasing), concavity, and inflection points using the first and second derivatives.
DPO 7	Find the derivatives of power, exponential, logarithmic, and trigonometric functions.
DPO 8	Use basic rules to find the derivative of sums, products, and quotients of functions.
DPO 9	Use implicit differentiation and the chain rule to find a derivative.
DPO 10+	Find the derivative of parametric, polar, and vector functions.

CONCEPT4: Applications of Derivatives
Students will:

PO #	Performance Objective
DPO 1	Use first and second derivatives to analyze curves.
DPO 2	Optimize both absolute (global) and relative (local) extrema.
DPO 3	Model rates of change, including related rates problems.
DPO 4	Use implicit differentiation to find the derivative of an inverse function.
DPO 5	Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
DPO 6	Use slope fields to interpret differential equations.
DPO 7	Relate slope fields to the solution curves for differential equations.

PO #	Performance Objective
DPO 8+	Find numerical solutions of differential equations using Euler's method.
DPO 9+	Apply L'Hôpital's Rule to determine limits.

CONCEPT 5: Integrals and Antiderivatives
Students will:

PO #	Performance Objective
DPO 1	Use Reimann sums (left, right, and midpoint) and trapezoid sums to approximate definite integral of functions represented algebraically, graphically, or numerically.
DPO 2	Find the definite integral using the average value over the interval.
DPO 3	Use basic properties of definite integrals.
DPO 4	Use the Fundamental Theorem of Calculus to evaluate definite integrals.
DPO 5	Find the indefinite integral as the antiderivative of a function.
DPO 6	Find the indefinite integral of power, exponential, logarithmic, and trigonometric functions.
DPO 7	Use integration techniques including substitution.
DPO 8	Use the Fundamental Theorem of Calculus to represent a particular antiderivative.

PO #	Performance Objective
DPO 9+	Find antiderivatives by substitution of variables (including change of limits for definite integrals).
DPO 10+	Find improper integral as limits of definite integrals.

CONCEPT 6: Applications of Integrals and Antiderivatives
Students will:

PO #	Performance Objective
DPO 1	Find the area between two curves.
DPO 2	Find the volume of a solid using the disk method, washer method, and cross sections.
DPO 3	Find where the instantaneous rate of change equals the average rate of change for a function.
DPO 4	Find specific antiderivatives using initial conditions, including applications to motion along a line.
DPO 5	Solve separable differential equations, using the equation $y' = ky$ and exponential growth.
DPO6+	Find the length of a curve (including a curve in parametric form).
DPO7+	Solve logistic differential equations.

CONCEPT 7: Polynomial Approximations and Series +
Students will:

PO #	Performance Objective
DPO 1+	Define a series and convergence.
DPO 2+	Solve real world problems that can be modeled with a geometric series.
DPO 3+	Apply the geometric series test, the harmonic series test, the alternating series test, the p-series test, and the integral test.
DPO 4+	Use the ratio test to determine convergence or divergence.
DPO 5+	Compare series to test for convergence or divergence.
DPO 6+	Use Taylor Series expansion to find power series for elementary functions.

PO #	Performance Objective
DPO 7+	Identify the general Taylor series centered at $x = a$.
DPO 8+	Generate a Maclaurin series for the functions e^x, $\sin x$, $\cos x$, and $\frac{1}{1-x}$.
DPO 9+	Use substitution, differentiation, anti-differentiation, and operations to form new series.
DPO 10+	Find functions that can be defined by a power series.
DPO 11+	Find the radius and interval of convergence or a power series.
DPO 12+	Find the Lagrange error bound for a Taylor polynomial.

+ indicates Calculus BC objectives

MATHEMATICS STRAND 8: AP Statistics

CONCEPT 1: Exploring Univariate Data
Students will:

PO #	Performance Objective
DPO 1	Construct and interpret graphical displays of distributions of univariate data, including dot plots, stem plots, histograms and cumulative frequency plots.
DPO 2	Interpret the meaning of center and spread, clusters and gaps, and shape of graphical displays.
DPO 3	Identify outliers and other unusual features of a graphical display.
DPO 4	Find measures of central tendency: mean, median, and mode.
DPO 5	Find measures of spread: range, interquartile range, standard deviation.
DPO 6	Find measures of position: quartiles, percentiles, standardized scores (z-scores).
DPO 7	Construct box plots to display distributions of univariate data.
DPO 8	Determine the effect of changing units on summary measures.
DPO 9	Compare distribution of center and spread (within group, between groups.)

CONCEPT 2: Exploring Bivariate Data
Students will:

PO #	Performance Objective
DPO 1	Analyze patterns in scatter plots.
DPO 2	Find correlation and linearity.
DPO 3	Use the least-squares method to find regression lines.
DPO 4	Analyze residual plots, outliers and influential points.
DPO 5	Use logarithmic and power transformations to achieve linearity.

CONCEPT 3: Exploring Categorical Data
Students will:

PO #	Performance Objective
DPO 1	Construct and interpret frequency tables and bar charts.
DPO 2	Calculate marginal and joint frequencies for two-way tables.

PO #	Performance Objective
DPO 3	Interpret relative frequencies and association.
DPO 4	Compare distributions using bar charts.

CONCEPT 4: Sampling and Experimentation
Students will:

PO #	Performance Objective
DPO 1	Determine the appropriate methods of data collection; census, sample, survey, experiment, or observational study.
DPO 2	Design and conduct surveys using appropriate populations, samples.
DPO 3	Identify sources of bias in sampling and surveys.
DPO 4	Use a variety of sampling methods, including simple random sampling, stratified random sampling and cluster sampling.
DPO 5	Design and conduct experiments.
DPO 6	Determine appropriate treatments, control groups, experimental units, and replication.
DPO 7	Identify sources of bias, including placebo effect and blinding.
DPO 8	Use a variety of methods including completely randomized design, randomized block design, matched pairs design.
DPO 9	Generalize results and conclusions that can be drawn from observational studies, experiments, and surveys.

CONCEPT 5: Probability
Students will:

PO #	Performance Objective
DPO 1	Determine probability, including long-run relative frequency and the "Law of Large Numbers."
DPO 2	Find multi-stage and conditional probabilities.
DPO 3	Define discrete random variables.
DPO 4	Determine if events are dependent or independent.
DPO 5	Simulate random behavior to develop probability distributions.

PO #	Performance Objective
DPO 6	Find the mean (expected value) and standard deviation of a random variable or the linear transformation of a random variable.
DPO 7	Find the mean and standard deviation of sums and differences of independent random variables.

CONCEPT 6: Probability Distributions
Students will:

PO #	Performance Objective
DPO 1	Use properties or tables of the normal distribution to graph normal distribution curves.
DPO 2	Use the normal distribution as a model for measurements.
DPO 3	Find binomial and geometric distributions.

CONCEPT 7: Sampling Distributions
Students will:

PO #	Performance Objective
DPO 1	Find sample proportions and the difference between two independent proportions.
DPO 2	Find sample means and the difference between two independent means.
DPO 3	Use the Central Limit Theorem to find sample means.
DPO 4	Conduct simulations of sampling distributions.
DPO 5	Calculate a *t*-distribution.
DPO 6	Calculate a chi-square distribution.

CONCEPT 8: Estimation
Students will:

PO #	Performance Objective
DPO 1	Estimate population parameters and margins of error.
DPO 2	Use properties of unbiasedness and variability in estimation.
DPO 3	Calculate confidence intervals and understand their properties.

PO #	Performance Objective
DPO 4	Find confidence intervals for a proportion.
DPO 5	Compare two proportions.
DPO 6	Find the confidence interval for a mean.
DPO 7	Compare two means.
DPO 8	Find the confidence interval for the slope of a least-squares regression line.

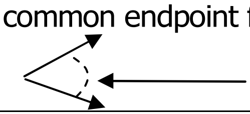
CONCEPT 9: Tests of Significance
Students will:

PO #	Performance Objective
DPO 1	Use significance testing.
	a. Identify null or alternate hypotheses.
	b. Calculate p-values.
	c. Use one- and two-sided tests.
	d. Use the concept of power.
DPO 2	Use the large sample test for a proportion.
DPO 3	Use the large sample test to compare proportions.
DPO 4	Test for a mean.
DPO 5	Test for the difference between two means (paired and unpaired.)
DPO 6	Test for the slope of a least-squares regression line.

CONCEPT 10: Chi-square procedures
Students will:

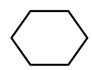
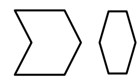
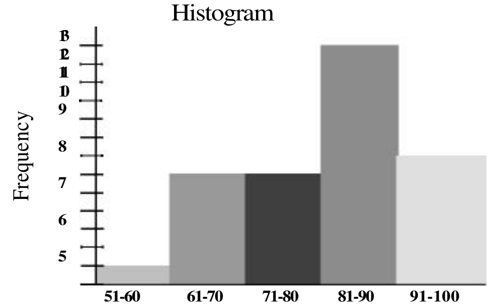
PO #	Performance Objective
DPO 1	Use the chi-square test for goodness of fit.
DPO 2	Use the chi-square test for homogeneity of proportions.
DPO 3	Use the chi-square test for one and two-way tables.

MATHEMATICS 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.
Addends	Numbers to be added. 584 +401 These are addends. 985
Adjacency Matrix	The arrangement of rows and columns labeled by graph vertices, with a 1 or 0 in position (v_i, v_j) according to whether or not v_i and v_j are adjacent. For a simple graph with no self-loops, the adjacency matrix must have zeros on the diagonal while the adjacency matrix for an undirected graph is symmetrical.
Algebra	A mathematical language that uses letters along with numbers. The letters stand for numbers that are unknown. $x - 3 = 17$ is an example of an algebra problem.
Algebraic Methods	The use of symbols to represent quantities and signs to represent their relationships.
Algebraic Sentence	A general term for equations and inequalities.
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.
Analog Time	Time displayed on a timepiece having hour and minutes hands.
Angle	Two rays with a common endpoint form an angle. 
Angle Measure	The measure of the space between two lines that meet in a point. Angles are measured in degrees or radians.
Area	The number of square units needed to cover a surface like a wall, floor or other two-dimensional shape
Array	Arrangement of a series of items according to the values of the items, e.g., largest to smallest.
Associative Property	$a+(b+c)=(a+b)+c$ or $a\sim(b\sim c)=(a\sim b)\sim c$ Changing the order in which you group numbers when adding or multiplying does not change the answer.
Axiomatic Systems	Systems that include self-evident truths; truths without proof and from which further statements, or theorems, can be derived
Binomial	In algebra, 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 plot shows where the data are spread out and where they are concentrated.

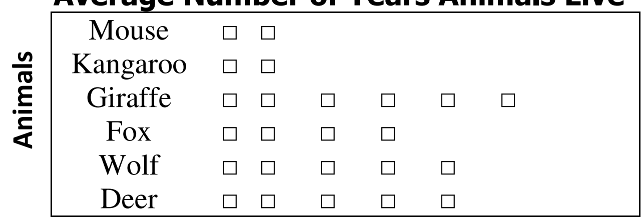
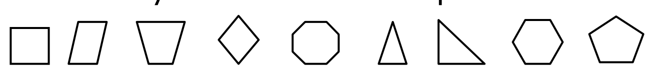
Capacity	The volume of a container given in units of liquid measure.
Cardinality (of a set)	The number of elements in a set. Example: $A=\{4, 6, -9, 12\}$ $n(A)=4$ (because there are 4 elements in set A)
Census	The count of a population.
Circuit	A path in a graph that starts and ends at the same vertex.
Closed Interval	An interval which includes both endpoints. a b $a \leq x \leq b$
Combinations	Subsets of a larger number of items (e.g., the number of different teams of three that can be chosen from a group of 21).
Common Factor	A number that is a factor of two or more numbers. Common factors of 2 and 8 are 1 and 2.
Common Multiple	Multiple that two or more numbers share. Some multiples of 2 are 2, 4, 6, 8, 10, 12. Some multiples of 3 are 3, 6, 9, 12. The first two common multiples of 2 and 3 are 6 and 12.
Communative Property	$a \sim b = b \sim a$ or $a+b=b+a$ Changing the order of the numbers when multiplying or adding numbers does not change the answer.
Composite Numbers	Any positive integer exactly divisible by one or more positive integers other than itself and 1. Numbers that have 3 or more factors.
Computational Techniques	Operations or tools such as use of number lines, calculators.
Complex Numbers	Numbers that have the form $a + bi$ where a and b are real numbers and i is an imaginary number.
Congruency	The state of having the same size and shape.
Conjecture	An inference drawn from observed patterns in several examples.
Constant	Monomials that contain no variables.
Contextual Situation	Relating mathematical problems to real, modeled or illustrated circumstance.
Coordinate System	Any set of two or more magnitudes used to locate points, lines or curves. Commonly placed by using a horizontal axis (x-axis) and vertical axis (y-axis).
Correlation Coefficient	A statistical measure that relates how well a set of data points can be modeled by a line.
Cosine	The trigonometric function that is defined as the ratio of the leg adjacent to an angle to the hypotenuse of its right triangle.
Counterexample	An example of a conditional statement in which the hypothesis is true and the conclusion is false.
Curve Fitting	Plotting data and observing the pattern to predict trends.

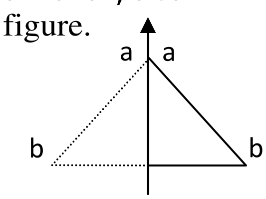
Customary System	A system of weights and measures frequently used in the United States. The basic unit of weight is the pound; the basic unit of capacity is the quart.
Deductive Reasoning	A series of logical steps in which a conclusion is drawn directly from a set of statements that are known or assumed to be true.
Diameter	The distance across a circle through its center.
Dilation	A transformation that either enlarges or reduces a geometric figure proportionately.
Direct Proof	A conclusion proved through deductive reasoning.
Direct Variation	When two variables are so related that their ratio remains constant, one of them is said to vary directly as the other.
Discrete Math	The study of mathematical properties of sets and systems that have only a specific number of elements. For example, the results of tossing dice form a discrete set of events, since a die has to land on one of its six faces.
Disjoint Sets	Sets with no elements in common. If sets A and B are disjoint, then $A \cap B = \emptyset$, the empty set.
Distributive Property	$a(b + c) = ab + ac$ The multiplication "is distributed" over the addition.
Domain	The set of all possible replacements for the placeholder in an open sentence.
Empirical	Relating to the collection of actual data.
Equation	A statement of equality between two mathematical expressions. (e.g., $x + 5 = y - 2$). A number sentence with an equal sign, $5 \text{ x } 4 = 20$.
Equivalent Forms	Different forms of numbers that name the same number; e.g., fraction, decimal, percent as 1/2, .5, 50%.
Euclidean Transformations	In geometry, the process of changing one configuration into another, including slides, rotations and reflections.
Exponent	A numeral used to tell how many times a number or variable is used as a factor (e.g., a^2, 2^n, y^x) and seen as the superscript.
Exponential Function	A function whose general equation is $y = a \times b^x$ or $y = a \times bk^x$, where a, b and k stand for constants.
Expression	A mathematical phrase with no equal sign, such as $3x$, 6, $2n + 3m$.
Faces	Sides on a 3-D Polygon.
Factorial	The expression $n!$ (n factorial) is the product of all the numbers from 1 to n for any positive integer n.
Factors	Any of two or more quantities that are multiplied together.
Finite Graph	A structure consisting of vertices and edges, where the edges indicate a mapping among the vertices (e.g., the vertices may represent players in a tournament, and the edges indicate who plays whom).
Flip	A transformation, also called a reflection, which produces a mirror image of a geometric figure.

Fractal	An algebraically generated complex geometric shape having the property of being endlessly self-similar under magnification. Some computer screen savers utilize fractals.
Function	A dependent relationship between two sets of numbers in which a value in the first set has only one defined element in the second
Geoboard	A board with pegs aligned in grid fashion which permits rubber bands to be wrapped around pegs to form geometric figures.
Graphing Calculator	A calculator that will store and draw the graph of several functions at once.
Greatest Common Factor	The largest number that is a factor of two or more indicated numbers.
Hexagon	A polygon with six sides.  Regular Hexagon  Non-Regular Hexagon
Histogram	A special kind of bar graph that displays the frequency of data that has been organized into equal number groupings. The number groupings cover all possible values of data, therefore there are no spaces between the bars. 
Identify	To state, match, select, write.
Identity Property of one	Property which states that the product of 1 and any factor is that factor.
Identity Property of Zero (addition)	Property which states that the sum of any number and zero is that number.
Imaginary Numbers	The square root of a negative number usually expressed using i, e.g., $(\sqrt{-9}) = 3i$.
Independent Events	Events such that the outcome of the first event has no effect on the probabilities of the outcome of the second event. (e.g., two tosses of the same coin are independent events).
Indirect Proof	A deductive proof using contradiction or elimination to rule out all except the desired conclusion.
Inductive Reasoning	A form of reasoning from individual cases to general ones or from observed instances to unobserved ones.
Inequalities	Statements indicating that two quantities are not equal, utilizing symbols > (greater than) or < (less than) and **≠**.
Integers	A set of numbers consisting of the whole numbers and their opposites $\{...-2, -1, 0, 1, 2...\}$.

Inverse	A related but opposite process or number such as multiplication being the inverse of division and 2/1 being the inverse of 1/2.
Inverse Operations	Operations that undo each other. (e.g., addition and subtraction are inverse operations, multiplication and division are inverse operations)
Inverse Variation	When the ratio of one variable to the reciprocal of the other is constant, one of them is said to vary inversely as the other.
Irrational Numbers	A set of numbers that cannot be represented as an exact ratio of two integers. For example, the square root of 2.
Iterative Processes	In discrete math, a method of calculating an amount by using an initial value and applying a function repeatedly.
Least Common Denominator	Of two or more fractions, a denominator that is the least common multiple of the denominators of the fractions
Least Common Multiple	The smallest number that is a common multiple of two or more given numbers.
Limit	A number to which the terms of a sequence get closer so that beyond a certain term all terms are as close as desired to that number.
Line of Best Fit	The line that fits a set of data points with the smallest value for the sum of the squares of the errors (vertical distances) from the data points to the line. Also called the regression line.
Linear Function	A function that has a constant rate of change and can be modeled by a straight line.
Linear Measurement	Measurement in a straight line.
Logarithm	The exponent indicating the power to which a fixed number, the base, must be raised to produce a given number. For example, if $n^x = a$, the logarithm of a, with n as the base, is x; symbolically, $log_n a = x$. If the base is 10, the log of 100 is 2 or 10^2.
Logic	A system of reasoning used to validate arguments.
Magnitude	Size or quantity.
Manipulatives	A wide variety of physical materials and supplies that students use to foster the learning of abstract ideas in mathematics.
Mathematica l Induction	A formal method of proving that a statement about a positive integer n is true for all positive integers n, by: 1) proving that the statement is true for the first integer, then, 2) proving that if the statement is true for n, it must be true for $(n-1)$.
Matrix	A rectangular array of numbers or letters arranged in rows and columns.
Mean	In statistics, the average obtained by dividing the sum of two or more quantities by the number of these quantities.

Measures of Central Tendency	Numbers that communicate the "center" or " middle" of a set of data. The mean, median and mode are statistical measures of central tendency.
Median	In statistics, the quantity designating the middle value in a set of numbers.
Metric System	A system of measurement used throughout the world based on factors of 10. It includes measures of length, weight and capacity.
Missing Addend	A member of an addition number sentence in which that term is missing. (e.g., $5 + \_\_ = 8$).
Mode	In statistics, the value that occurs most frequently in a given series of numbers.
Model (noun)	A display of concrete materials, objects or drawings.
Model (verb)	Use of concrete materials, symbolic.
Monomial	In algebra, an expression consisting of a single term such as $5y$.
Multiple	A number into which another number may be divided with no remainder.
Negative Integers	Whole numbers less than zero; found to the left of zero on the number line (without decimals or fractions), example $-2, -7$, but not -2.5, or $-21/2$.
Network	A network or vertex-edge graph consists of a collection of vertices and edges where each edge connects two of the vertices.
Nonstandard Measurement	Measurement expressed in terms of objects such as paper clips, sticks of gum, shoes, etc.
Normal Curve	In statistics, the distribution of data along a bell-shaped curve that reaches its maximum height at the mean.
One-to-One Correspondence	When one and only one element of a second set is assigned to an element of a first set, all elements of the second set are assigned, and every element of the first set has an assignment, the mapping is called one-to-one. (e.g., in the set Bill Clinton, George Bush, Ronald Reagan, Jimmy Carter, Hillary Clinton, Barbara Bush, Nancy Reagan, and Rosalyn Carter, there is a one-to-one correspondence between the pairs.)
Open Sentence	A statement that contains at least one unknown. For example, $6 + x = 14$
Order of Operations	Rules for evaluating an expression: work first within parentheses: then calculate all powers from left to right; then do multiplications or divisions, from left to right; then do additions and subtractions, from left to right.
Parallelism	The state of being parallel, not intersecting.
Parameter	A quantity whose value varies with the circumstances of its application, such as the radius of a group of circles.

Patterns	Regularities in situations such as those in nature, events, shapes, designs and sets of numbers (for example: spirals on pineapples, geometric designs in quilts, the number sequence 3, 6, 9, 12...).
Path	A connected sequence of edges that starts at one vertex and ends at another vertex in a vertex-edge graph or network.
Permutations	Ordered arrangements of a given number of items in a set.
Perpendicular Lines	Two lines which intersect to form right angles. e.g.,  or 
Pictographs	A kind of graph that uses pictures or symbols where each symbol or picture represents a certain number of something. **Average Number of Years Animals Live**  **Each symbol □ stands for 3 years**
Plotting Points	Locating points by means of coordinates, or a curve by plotted points, and to represent an equation by means of a curve so constructed.
Polygon	A union of segments connected end to end, such that each segment intersects exactlytwo others at its endpoints. 
Polynomial	In algebra, an expression consisting of two or more terms such as $x^2 - 2xy + y^2$.
Powers	A number expressed using an exponent. The number 5^3 is read five to the third power or five cubed.
Primes	Counting numbers that can only be evenly divided by two numbers which are the number itself and 1. For example, the numbers 2, 3, 5, 7.
Probability	A number from 0 to 1 that indicates how likely something is to
Problem Solving	Finding ways to reach a goal when no routine path is apparent.
Proof by Contradiction	A proof in which, if *s* is to be proven, one reasons from not *s* until a contradiction is deduced; from this it is concluded that not *s* is false, which means that *s* is true.
Proportion	An equality between ratios. For example, 2/6 = 3/9.
Quadratic Function	A function that has an equation of the form $y = Ax^2 + Bx + C$ where A does not equal 0.
Quadrilateral	A polygon (2-dimensional figure) with four sides.
Quartiles	The size of the central angle of a circle when the arc length equals the radius.

Radian	The size of the central angle of a circle when the arc length equals the radius.
Radius	Distance from the center of the circle to any point on the circle.
Random Variable	A quantity that can take any one of a number of unpredicted
Range	In statistics, the difference between the greatest and smallest values in a set of data.
Rate of Change	The limit of the ratio of an increment of the function value at the point to that of the independent variable as the increment of the variable approaches zero.
Ratio	A comparison expressed as indicated division. For example, there is a ratio of three boys to two girls in our class *3/2, 3:2*).
Rational Numbers	Numbers that can be expressed as an exact ratio of two integers.
Real Numbers	All rational and irrational numbers.
Reasonableness	Quality of a solution such that it is not extreme or excessive.
Reciprocal	The fractional number that results from dividing one by the number.
Rectangular Array	An organized arrangement of square units (tiles).
Rectangular Prism	A three-dimensional figure whose sides are all rectangles, (eg., a box).
Recurrence Relations	In discrete mathematics, a value in a series is derived by applying a formula to the previous value.
Recursive Sequence	In discrete mathematics, a series of numbers in which values are derived by applying a formula to the previous value.
Reflection	In geometry, a transformation, also called a flip, that produces a mirror image of a geometric figure. 
Regression	The line that represents the least deviation from the points in a scatter plot of data.
Regular Polygon	A polygon in which all sides have the same measure and all angles have the same measure.
Relation	A set of ordered pairs.
Reliability	The extent to which a measuring procedure yields the same results on repeated trials.
Repeated Addition	A model for multiplication. (e.g., 2 + 2 + 2 = 3 x 2).
Rotation	In geometry, a transformation that turns a figure about a point.
Sample	A part of the total population. Used in statistics to make predictions about the characteristics of the entire group.
Scatter Plots	A graph of the points representing a collection of data.

Scientific Calculator	A calculator which represents very large or very small numbers in scientific notation and with the powering, factorial, square root, negative, and reciprocal keys.
Scientific Notation	A shorthand way of writing very large or very small numbers. A number expressed in scientific notation is expressed as a decimal number between 1 and 10 multiplied by a power of 10.
Sequence	A set of ordered quantities. (e.g., positive integers).
Series	The indicated sum of the terms of a sequence.
Similarity	In geometry, objects or figures that are the same shape but not necessarily the same size.
Simple Event	An event whose probability can be obtained from consideration of a single occurrence (e.g., the tossing of a coin in a simple event).
Simulation	Modeling a real event without actually observing the event.
Sine	A trigonometric function that is defined as the ratio of the leg opposite the angle to the hypotenuse of its right triangle.
Skip Counting	Counting by equal intervals.
Slides	In geometry, a transformation where a figure moves in a given direction.
Slope	The slope of a line is the ratio of the change in y to the corresponding change in x. (The constant m in the linear function equation.)(Rise/run.) $y = mx+b$
Spanning Tree	A subgraph of a vertex-edge graph that is a tree and includes every vertex of the graph
Square Root	Two equal factors of a number. For example, 4 is the square root of 16.
Standard Deviation	A statistic that measures the dispersion of a sample.
Stem-and-Leaf Plot	A table utilizing digit(s) of a number as stems and the other digit(s) as leaves. For example, 5 | 7, 8 shows 57 and 58.
Survey	Interview, questionnaire and/or polling.
Symmetry	A correspondence in size, form and arrangement of parts on opposite sides of a plane, line or point. For example, a figure that has line symmetry has two halves that coincide if folded along its line of symmetry.
Synthetic Representation	The geometric form as opposed to the algebraic representation of a figure.
Systems of Equations	Two or more equations that are conditions imposed simultaneously on all the variables, but may or may not have common solutions. (e.g., $x + y = 2$, and $3x + 2y = 5$).
T-test	A statistical test done to test the difference of means of two samples.
Tangent	A trigonometric function of an angle which is defined as the ratio of the lengths of the leg opposite to the leg adjacent to an angle in its right triangle. Also a line having one point in common with a curve.
Tessellations	A Mosaic formed by repetitions of a single shape.

Theoretical (mathematical)	Relating to the probability of a given event, using mathematical relationships (e.g., the chance of a red side coming up on the flip of a two-colored counter is one in two or 1/2).
Transformation	A geometric process for changing one figure into another.
Translations	A transformation that moves a geometric figure by sliding each of the points the same distance in the same direction.
Tree Diagram	A diagram used to show the total number of possible outcomes in a probability experiment.
Trigonometric Functions	A function (sine, cosine, tangent, cotangent, secant, cosecant) whose independent variable is an angle measure, usually in degrees or radians.
Trigonometric Ratios	The ratios of the lengths of pairs of sides in a right triangle, i.e., sine, cosine and tangent.
Trigonometry	The branch of mathematics involving triangles that combines arithmetic, algebra and geometry. Trigonometry is used in surveying, navigation and physics.
Valid Argument	An argument with the property no matter what statements are substituted in the premises, the truth value of the form is true. If the premises are true, then the conclusion is true.
Validity	An argument that is correctly inferred or deduced from a premise.
Variability	Numbers that describe how spread out a set of data is (e.g., range and quartile).
Variable	A place holder in algebraic expressions. In $3x + y = 23$, x and y are variables.
Variance	In a data set, the sum of the squared deviations divided by one less than the number of elements in the set (sample variance s^2) or by the number of elements in the set (population variance).
Vector	Quantity that has magnitude (length) and direction. It may be represented as a directed line segment (→).
Venn Diagram	A display that pictures unions and intersections of sets.
Vertex-edge graph	A graph or network that consists of a collection of vertices and edges where each edge connects two of the vertices.
Volume	The amount of space enclosed in a space (3-dimensional) figure, measured in cubic units, (how many small cubes would fit inside the figure.)
Whole Numbers	The counting numbers and zero $\{0,1,2,3...\}$
X Intercept	The x-intercept of a line is the x-coordinate of the point at which the graph of an equation crosses the y-axis.
Y-Intercept	The y-intercept of a line is the y-coordinate of the point at which the graph of an equation crosses the y-axis.
π	pi, the ratio of the circumference of a circle to its diameter: about 3.1415926535.

Course: **Semester 1**

Unit/ Timeline	Essential Questions (*Why learn this?*)	Concepts (*What will students learn?*)	Skills (*What will students do?*)	Assessments (*How will students show what they know?*)
	•	• •	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐ Student Observation ☐ Homework ☐ Quizzes ☐ Performance Tasks ☐ Writing Assignments ☐ ☐ **Summative:** ☐ Unit Test ☐ Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐ Student Observation ☐ Homework ☐ Quizzes ☐ Performance Tasks ☐ Writing Assignments ☐ ☐ **Summative:** ☐ Unit Test ☐ Semester Exam ☐

Unit/ Timeline	**Essential Questions** (*Why learn this?*)	**Concepts** (*What will students learn?*)	**Skills** (*What will students do?*)	**Assessments** (*How will students show what they know?*)
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	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐

Unit/ Timeline	Essential Questions (*Why learn this?*)	Concepts (*What will students learn?*)	Skills (*What will students do?*)	Assessments (*How will students show what they know?*)
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐

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Unit/ Timeline	Essential Questions (*Why learn this?*)	Concepts (*What will students learn?*)	Skills (*What will students do?*)	Assessments (*How will students show what they know?*)
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐

Course: **Semester 2**

Unit/ Timeline	Essential Questions (*Why learn this?*)	Concepts (*What will students learn?*)	Skills (*What will students do?*)	Assessments (*How will students show what they know?*)
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐ Student Observation ☐ Homework ☐ Quizzes ☐ Performance Tasks ☐ Writing Assignments ☐ ☐ **Summative:** ☐ Unit Test ☐ Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐ Student Observation ☐ Homework ☐ Quizzes ☐ Performance Tasks ☐ Writing Assignments ☐ ☐ **Summative:** ☐ Unit Test ☐ Semester Exam ☐

Unit/ Timeline	**Essential Questions** (*Why learn this?*)	**Concepts** (*What will students learn?*)	**Skills** (*What will students do?*)	**Assessments** (*How will students show what they know?*)
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐ Student Observation ☐ Homework ☐ Quizzes ☐ Performance Tasks ☐ Writing Assignments ☐ ☐ **Summative:** ☐ Unit Test ☐ Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐ Student Observation ☐ Homework ☐ Quizzes ☐ Performance Tasks ☐ Writing Assignments ☐ ☐ **Summative:** ☐ Unit Test ☐ Semester Exam ☐

Unit/ Timeline	**Essential Questions** (*Why learn this?*)	**Concepts** (*What will students learn?*)	**Skills** (*What will students do?*)	**Assessments** (*How will students show what they know?*)
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐

Unit/ Timeline	**Essential Questions** (*Why learn this?*)	**Concepts** (*What will students learn?*)	**Skills** (*What will students do?*)	**Assessments** (*How will students show what they know?*)
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐
	•	•	**Essential:** • **Important:** • **Nice to Know:** •	**Formative:** ☐Student Observation ☐Homework ☐Quizzes ☐Performance Tasks ☐Writing Assignments ☐ ☐ **Summative:** ☐Unit Test ☐Semester Exam ☐

Unit/ Timeline	**Essential Questions** (*Why learn this?*)	**Concepts** (*What will students learn?*)	**Skills** (*What will students do?*)	**Assessments** (*How will students show what they know?*)
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SECONDARY MATHEMATICS

CURRICULUM RESOURCES

Standards:

http://www.cccii-online.org/

http://educationnorthwest.org/resource/1800

http://educore.ascd.org/

Indiana Department of Education
http://www.doe.in.gov/achievement/curriculum/resources-implementing-indianas-common-core-standards

Ohio Department of Education http://www.ode.state.oh.us

ftp://ftp.ode.state.oh.us/ODEMediaWeb/curriculum_toolkit/Awareness%20Analysis%20Alignment2.wmv

Instructional Resources:

Inside Mathematics http://insidemathematics.org/

NCTM – National Council of Teachers of Mathematics
http://www.nctm.org/resources/

American Achieves http://commoncore.americaachieves.org

The Teaching Channel Videos https://www.teachingchannel.org/

Tech & Learning - Apps for Common Core http://www.techlearning.com/index

NSDL – National Science Digital Library http://nsdl.org/commcore/math

California Mathematics Project CACCSSM
http://caccssm.cmpso.org/
http://caccssm.cmpso.org/high-school-modeling-task-force

YUUreka Mathematics www.yureka.com/resources-1/common-core

IXL www.IXL.com/math

Teacher prepared resources www.livebinder.com

This website rates programs – http://www.bestevidence.org/
http://www.bestevidence.org/math/mhs/mhs_math.htm

MathBits.com is devoted to offering fun, yet challenging, lessons and activities in secondary (and college level) mathematics and computer programming for students and teachers.

MLP– mathematics leadership program-Assessments, projects, samples
http://www.mathleadership.org/

Walch Education http://walch.com/common-core-resources/ Station activities for common core math

http://blog.algebra1teachers.com/ This blog for algebra 1 includes Common Core, lesson plans, and assessments to make life easier for any teachers.

EngagingEducators.com http://www.engagingeducators.com/blog/
This site has Weekly blogs

Instructional Resources:

PARCC Partnership for Assessment of Readiness for College and Careers
http://www.parcconline.org/

Smarter Balanced Assessment Consortium
http://www.smarterbalanced.org/

Instructional Resources:

Arizona Department of Education http://www.azed.gov/azcommoncore/pd/

Indiana Department of Education
http://media.doe.in.gov/commoncore/2011-05-10-StandforMath.html