Haddon Township High School
Course Overview

Subject Area: Math
Course Name: Math IV

Summary: This course is designed for those students interested in receiving an introduction to various branches of mathematics. It will help prepare those students not interested in the Science fields for college math courses for the required courses for freshman students in Liberal Arts, Education, and other non-technical majors. Topics covered will include Set Theory and Logic, Algebra, graphs and functions, systems of linear equations, Simple and Compound Interest, and an introduction to elementary probability and statistics.

Unit Title	Student Learning Target	Standards	Resources	Assessment
Chapter 1 Problem Solving	**Unit Learning Targets** *Students will be able to* • explain the two types of mathematics • explain the difference between inductive and deductive reasoning • state the steps for the basic problem solving procedure • solve problems using the basic problem solving procedure solve problems using estimation	Standards - **Reason quantitatively and use units to solve problems.** • N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. • N-Q.2. Define appropriate quantities for the purpose of descriptive modeling. • N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

Chapter 2 Sets	**Unit Learning Targets** *Students will be able to* • define set, element, and null set • designate sets in three different ways • classify sets as finite or infinite • identify equal sets, equivalent sets • find subsets and proper subsets of a set • find the union and intersection of two sets • find the complement of a set draw Venn diagrams for set operations	**Standards** **There are no standards for Set Theory; however, it is covered on SAT's.**	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter
Chapter 3 Logic	**Unit Learning Targets** *Students will be able to* • determine whether or not a sentence is a statement • classify statements		Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software,	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

	as simple or compound • write compound statements in symbols using the four basic connectives • write symbolic statements in words • determine whether or not two statements are logically equivalent • determine if one statement is a negation of the another statement write the converse, inverse, and contrapositive of a statement		quizzes, tests, worksheets	
Chapter 5 The Real Number System	**Unit Learning Targets** *Students will be able to* • Distinguish between a prime number and a composite number • Find the factors of a number • Find the prime factorization of a number	**Standards** **Know that there are numbers that are not rational, and approximate them by rational numbers.** • 8.NS.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer • Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

	• Find the greatest common factor of two or more numbers • Find the multiples of a number and find the least common multiple of two or more numbers • Add, subtract, multiply, and divide integers, rational numbers and irrational numbers • Use the order of operations to simplify expressions • Change fractions to decimals and decimals to fractions • Identify properties of real numbers • Simplify expressions using properties of exponents • Convert large and small numbers into scientific notation and back again • Perform multiplication and division with	the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. • 8.NS.2. 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). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* **Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** • 7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.		

	numbers written in scientific notation • Write the terms of an arithmetic or geometric sequences Find the specific terms of an arithmetic or geometric sequence	○ Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.* ○ Understand $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. 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. ○ Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. 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. ○ Apply properties of operations as strategies to add and subtract rational numbers. • 7.NS.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. ○ Understand that multiplication is extended from fractions to rational numbers by requiring that operations 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. ○ 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. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts. ○ Apply properties of operations as strategies to multiply and divide rational numbers. ○ 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. • 7.NS.3. Solve real-world and mathematical problems involving the four operations with rational numbers.[1] **Extend the properties of exponents to rational exponents.** • N-RN.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. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.* • N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. **Use properties of rational and irrational numbers.** • N-RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. A-APR.7. (+) 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. F-LE.2. 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).		
Chapter 7 Topics in Algebra	**Unit Learning Targets** *Students will be able to* • Simplify algebraic expressions by combining like terms and using the distributive property • Evaluate algebraic expressions and formulas • Solve linear equations in one variable • Identify equations that have no solutions or infinitely many	**Standards** **Understand solving equations as a process of reasoning and explain the reasoning.** • A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. • A-REI.2. Solve simple rational and radical equations in one variable, and give examples	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

	solutions • Translate verbal expressions into mathematical symbols • Solve real-world problems using linear equations, inequalities and proportions • Solve linear inequalities and graph the solutions on the number line • Write ratios as fractions, and simplify • Solve proportions • Solve quadratic equations using factoring or the quadratic formula	showing how extraneous solutions may arise. **Solve equations and inequalities in one variable.** • A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. • A-REI.4. Solve quadratic equations in one variable. ○ Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. ○ Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex		

		solutions and write them as $a \pm bi$ for real numbers a and b. **Create equations that describe numbers or relationships.** • A-CED.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 and exponential functions.* • A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • A-CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* • A-CED.4. Rearrange formulas		

		to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.* **Perform arithmetic operations on polynomials.** • A-APR.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. **Understand the relationship between zeros and factors of polynomials.** • A-APR.2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$. • A-APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to		

		construct a rough graph of the function defined by the polynomial. **Write expressions in equivalent forms to solve problems.** • A-SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.		
Chapter 8 Additional Topics in Algebra	**Unit Learning Targets** *Students will be able to* • Graph points and lines on the Cartesian plane • Find the slope of a line given two points • Write an equation of a line in slope intercept form and identify the slope and intercepts • Solve a linear	**Standards** **Represent and solve equations and inequalities graphically.** • A-REI.10. 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). • A-REI.11. Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y =$	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

	system of equations in two variables by three methods: graphing, substitution, and elimination • Solve real world problems involving a system of linear equations and using quadratic or exponential functions • Determine domain and range of a relation • Determine the vertex, axis, and intercepts of a parabola • Graph an exponential function	$g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. • A-REI.12. 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. **Understand the concept of a function and use function notation.** • F-IF.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 f is the graph of the equation $y = f(x)$. • F-IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **Interpret functions that arise in applications in terms of the context.** • F-IF.4. 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*. • F-IF.5. Relate the domain of		

		a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* **Analyze functions using different representations.** • F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ○ a. Graph linear and quadratic functions and show intercepts, maxima, and minima.		
Chapter 9 Consumer Mathematics	**Unit Learning Targets** *Students will be able to* • Convert percents to	**Standards** **Reason quantitatively and use units to solve problems.**	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the

	fractions and decimals and reverse • Solve three types of percent problems • Solve word problems that use percents • Find simple interest on a loan or savings • Find the principal or rate or time given the simple interest and the other two variables • Find the compound interest and maturity value for a savings account • Find the mark up on cost and selling price for an item sold at a retail store • Find the mark up on the selling price on an item sold at a retail store • Find the mark up rate on an item sold at a retail store Find the selling price when an item is marked down.	• N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. • N-Q.2. Define appropriate quantities for the purpose of descriptive modeling. • N-Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	Teacher Resources: smartboard software, quizzes, tests, worksheets	completion of the chapter

Chapter 10 Geometry	**Unit Learning Targets** *Students will be able to* • Identify the basic geometric figures such as a line, ray, etc. • Name an angle in 4 different ways • Classify angles as acute, right, obtuse, and straight • Find the measures of complements and supplements of angles • Find the measures of angles formed by parallel lines and transversals • Classify triangles according to the measures of their sides or angles • Given the measures of the two angles of a triangle, find the measure of the third angle • Solve problems using Pythagorean Theorem	**Standards** **Experiment with transformations in the plane** • G.CO.1. 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. • G-CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). • G-CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. • G-CO.4. Develop definitions of rotations, reflections, and translations in terms of	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

	• Solve problems involving similar triangles • Name polygons according to the number of sides • Identify the different types of quadrilaterals • Find the perimeter of polygons • Find the area of polygons • Find the circumference and area of circles • Find the surface area and volume of solids Determine whether or not a a given network is traverable	angles, circles, perpendicular lines, parallel lines, and line segments. • G-CO.5. 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. **Understand congruence in terms of rigid motions** • G-CO.6. 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. • G-CO.7. 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. • G-CO.8. Explain how the criteria for triangle		

		congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
		
		Understand similarity in terms of similarity transformations
		
		• G-SRT.1. Verify experimentally the properties of dilations given by a center and a scale factor:
		  ○ 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.
		  ○ The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
		• G-SRT.2. 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. **Define trigonometric ratios and solve problems involving right triangles** • G-SRT.6. 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. • G-SRT.7. Explain and use the relationship between the sine and cosine of complementary angles. • G-SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. **Understand and apply theorems about circles** • G-C.1. Prove that all circles are similar. • G-C.2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a*		

		diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. **Explain volume formulas and use them to solve problems** • G-GMD.1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.* • G-GMD.2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. • G-GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. **Apply geometric concepts in modeling situations** • G-MG.1. Use geometric shapes, their measures, and their properties to describe		

		objects (e.g., modeling a tree trunk or a human torso as a cylinder). • G-MG.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).		
Chapter 11 Probability and Counting Techniques	**Unit Learning Targets** *Students will be able to* • Determine sample spaces and find the probability of an event using classical probability • Use a tree diagram or table, find the sample space for a sequence of events, then find the probability of various events • Given the probability of an event, find the odds of the event • Given the odds for an event, find the probability of the event	**Standards** **Summarize, represent, and interpret data on a single count or measurement variable** • S-ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). • S-ID.2. 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. • S-ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	Equipment needed: Textbook, notebook, graphing calculator, smartboard, computer Teacher Resources: smartboard software, quizzes, tests, worksheets	• Quizzes to be given every 2-3 lessons • Chapter Test to be given at the completion of the chapter

	• Find the probability of two or more events using the addition rule and the multiplication rule • Use the permutation rule and combination rule to determine the number of different ways r objects can be selected from n objects (when order is/is not important) Use the counting rule, the permutation rule and the combination rule to find the number of outcomes in a sample space, then determine the probabilities of various events of the sample space	• S-ID.4. 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. **Understand independence and conditional probability and use them to interpret data** • S-CP.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 ("or," "and," "not"). • S-CP.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. • S-CP.3. Understand the conditional probability of *A*		

		given B as $P(A \text{ and } B)/P(B)$, and interpret independence of A and B as 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. • S-CP.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. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* • S-CP.5. Recognize and explain the concepts of conditional probability and		

		independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* **Use the rules of probability to compute probabilities of compound events in a uniform probability model** • S-CP.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 the model. • S-CP.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. • S-CP.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 terms of the model. • S-CP.9. (+) Use permutations and combinations to compute probabilities of compound		

		events and solve problems.		