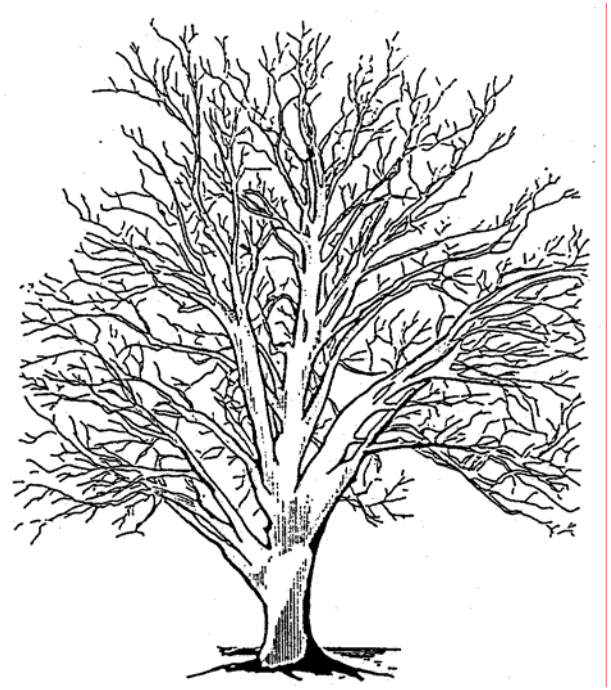
Monroe Township Schools



Curriculum Management System

MTHS Summer Study Program

Introduction to Algebra II

Grade 11

July 2006

*** For adoption by all regular education programs as specified and for adoption or adaptation by all Special Education Programs in accordance with Board of Education Policy # 2220.**

Board Approved: June 28, 2006

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Monroe Township Schools

Mission and Goals

Mission

The mission of the Monroe Township School District, a unique multi-generational community, is to collaboratively develop and facilitate programs that pursue educational excellence and foster character, responsibility, and life-long learning in a safe, stimulating, and challenging environment to empower all individuals to become productive citizens of a dynamic, global society.

Goals

To have an environment that is conducive to learning for all individuals.

To have learning opportunities that are challenging and comprehensive in order to stimulate the intellectual, physical, social and emotional development of the learner.

To procure and manage a variety of resources to meet the needs of all learners.

To have inviting up-to-date, multifunctional facilities that both accommodate the community and are utilized to maximum potential.

To have a system of communication that will effectively connect all facets of the community with the Monroe Township School District.

To have a staff that is highly qualified, motivated, and stable and that is held accountable to deliver a safe, outstanding, and superior education to all individuals.

INTRODUCTION, PHILOSOPHY OF EDUCATION, AND EDUCATIONAL GOALS

Philosophy

Monroe Township Schools are committed to providing all students with a quality education resulting in life-long learners who can succeed in a global society. The mathematics program, grades K-12, is predicted on that belief and is guided by the following six principals as stated by the National Council of Teachers of Mathematics (NCTM) in the *Principles and Standards for School Mathematics, 2000.* First, a mathematics education requires equity. All students will be given worthwhile opportunities and strong support to meet high mathematical expectations. Second, a coherent mathematics curriculum will effectively organize, integrate, and articulate important mathematical ideas across the grades. Third, effective mathematics teaching requires the following: a) knowing and understanding mathematics, students as learners, and pedagogical strategies, b) having a challenging and supportive classroom environment and c) continually reflecting on and refining instructional practice. Fourth, students must learn mathematics with understanding. A student's prior experiences and knowledge will actively build new knowledge. Fifth, assessment should support the learning of important mathematics and provide useful information to both teachers and students. Lastly, technology enhances mathematics learning, supports effective mathematics teaching, and influences what mathematics is taught.

As students begin their mathematics education in Monroe Township, classroom instruction will reflect the best thinking of the day. Children will engage in a wide variety of learning activities designed to develop their ability to reason and solve complex problems. Calculators, computers, manipulatives, technology, and the Internet will be used as tools to enhance learning and assist in problem solving. Group work, projects, literature, and interdisciplinary activities will make mathematics more meaningful and aid understanding. Classroom instruction will be designed to meet the learning needs of all children and will reflect a variety of learning styles.

In this changing world those who have a good understanding of mathematics will have many opportunities and doors open to them throughout their lives. Mathematics is not for the select few but rather is for everyone. Monroe township Schools are committed to providing all students with the opportunity and the support necessary to learn significant mathematics with depth and understanding. This curriculum guide is designed to be a resource for staff members and to provide guidance in the planning, delivery, and assessment of mathematics instruction.

Educational Goals

Introduction to Algebra II is an MTHS Summer Study option to help students obtain a head-start on required course-work in the fall by gaining experience in skills and concepts necessary for success in Algebra II. This summer study class will focus on topics generally covered in the first quarter of the school year in Algebra II. Student growth will be charted through a pre-test in the beginning of the course and a post-test at the end. Credit is not awarded for this course, however, students will receive a Certificate of Participation. More importantly, students will receive exposure to skills needed to be successful during the school year. Topics included are: real numbers, algebraic expressions, constant, linear, and quadratic functions, and systems of equations and inequalities.

New Jersey State Department of Education
Core Curriculum Content Standards

A note about Mathematics Standards and Cumulative Progress Indicators.

The New Jersey Core Curriculum Content Standards for Mathematics were revised in 2002. The Cumulative Progress Indicators (CPI's) referenced in this curriculum guide refer to these new standards and may be found in the Curriculum folder on the district servers. A complete copy of the new Core Curriculum Content Standards for Mathematics may also be found at:

http://www.nj.gov/njded/cccs/s4_math.htm

MTHS Summer Study Program

Grade 11/Introduction to Algebra II

Scope and Sequence

Week 1	
I. Introduction and Pre-test	II. Real numbers and Algebraic Expressions a. Algebraic expressions. b. Variables in an equations or inequalities. c. Absolute value equations or inequalities.
Week 2	
III. Functions a. Constant , Linear, and Quadratic Functions b. Functions as ordered pairs, table of values or a rule. c. Function notation and a specific domain	

Week 3	
IV. Systems of equations. a. Linear equations with two unknowns. b. Solving a system of linear equations by graphing. c. Solving a system of linear inequalities.	
Week 4	
V. Systems of equations. d. Solving a system in three variables. e. Linear programming.	V. Post -test

Suggested days of Instruction	Curriculum Management System Grade Level/Subject: **Grade 11/Introduction to Algebra II**	**Topic: Number and Computation** **Goal 1: The student will be able to demonstrate number sense for real numbers and algebraic expressions in a variety of situations.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**
7 Days	1.1 Know, explain, and use equivalent representations for real numbers and algebraic expressions including integers, fractions, decimals, percents, ratios; rational numbers written in scientific notation; absolute value; time, money. CPI-4.1.12.A.1	• Will 3n +2 always, sometimes, or never be larger than 3n? The student might respond with $(5n)^2$ is smaller than 5n, if 0< n < 1 or that the square root of 5 is between 2 and 3. Ex: A math classroom needs 30 books and 15 calculators. If B represents the cost of a book and C represents the cost of a calculator, generate two different expressions to represent the cost of 9 math classrooms. Ex: A store sells CDs for $12.99 each. Knowing that the sales tax is 7%, Marie estimates the cost of a CD plus tax to be $14.30. She selects nine CDs. The clerk tells Marie her bill is $157.18. How can Marie explain to the clerk she has been overcharges?	• **Applications:** Prentice Hall Mathematics; Algebra II, p13; Real-World Connections; elections. • **Project ideas:** Mc Dougal Littell Algebra 2, © 2001, Chapter 1 Resource Book, 1.5 Application Lesson Opener; Real life application using data tables and algebraic models related to changes in a persons height. • **Test Prep:** Mc Dougal Littell Algebra 2, © 2001 Teacher Edition. P 17 open ended-Algebraic Expressions and Models, p 32 writing, open ended-Rewriting Equations and Formulas. P 56 writing-Solving Absolute Value Equations and Inequalities. • **Preparing for the NJ HSPA:** Cluster 1 p1, Real Numbers. **ASSESSMENT MODEL:** Assessment questions should be open ended and should follow the general format illustrated in the Essential Questions/Sample Conceptual Understandings section.
	1.2 Manipulate variable quantities within an equation or inequality. CPI-4.1.12.B.1	• How are two equations that look different really the same? 5x-3y=20 could be written as 5x-20=3y or 5x(2x+3)=8 could be written as 8/(5x)=2x+3	
	1.3 Equations and inequalities with absolute value quantities containing one variable with a special emphasis on using a number line and the concept of absolute value. CPI-4.3.12.C.1	• What is an Absolute value equation? If $x \geq 0$, then $\lvert x \rvert = x$ If $x < 0$, then $\lvert x \rvert = -x$ Ex: An absolute value such as $\lvert 2x - 4 \rvert = 12$ has two solutions, since the expression 2x - 4 can equal 12 or -12. To solve $\lvert 2x - 14 \rvert = 12$ set up as; $2x - 4 = 12$ or $2x - 4 = -12$ $x = 8$ $x = -4$	

Suggested days of Instruction	Curriculum Management System Grade Level/Subject: **Grade 11/Introduction to Algebra II**	**Topic: Number and Computation** **Goal 1: The student will be able to demonstrate number sense for real numbers and algebraic expressions in a variety of situations.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**

Suggested days of Instruction	Curriculum Management System Grade Level/Subject: **Grade 11/Introduction to Algebra II**	**Topic: Functions** **Goal 2: The student will be able to evaluate and analyze functions using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**
7 Days	2.1 Match equations with the graphs of constant, linear functions, and quadratic functions. CPI-4.3.12.B.2 2.2 Determine whether a graph, list of ordered pairs, table of values, or rule represents a function. CPI-4.3.12.B.1	• Which equation is a constant, a line with a positive slope and a quadratic? $y = 2$; $y = 3x+4$; $y = x^2 + 4x = 7$ • How can a graph be represented in a real life situation? A graph represents a tank full of water being emptied. What does the y-intercept represent? What does the x-intercept represent? What does the point (2,25) re0resent in this situation? What does the point (2,30) represent in this situation? • What is a function? A function is a correspondence between two sets, we will call one set D and one set R. Each member in D is assigned to *exactly one* member of R. Ex: D $\to$ *R* $2 \to 4$ $1 \to 2$ $0 \to 0$ $-1 \to -2$ $-2 \to -4$ D is the domain (x-values), R is the range (y-values) • When is a list of ordered pairs not a function? When there are multiple x-values. ex: {(1,2),(2,0),(1,1)}	• **Applications:** Mc Dougal Littell Algebra 2, © 2001, Chapter 2 Resource Book, 2.1 Interdisciplinary Application-This application makes a connection between nutrition and graphing functions. • **Project Ideas**: Exploring Algebra, Precalculus and Statistics with the TI-83 Graphing Calculator; Graphing Calculator Lab, chapter 3, p77-84. • **Test Prep:** p 74 writing, open ended-Functions and their graphs Preparing for the New Jersey HSPA text, p192-216. **ASSESSMENT MODEL:** Assessment questions should be open ended and should follow the general format illustrated in the Essential Questions/Sample Conceptual Understandings section.

Suggested days of Instruction	**Curriculum Management System** **Grade Level/Subject:** **Grade 11/Introduction to Algebra II**	**Topic: Functions** **Goal 2: The student will be able to evaluate and analyze functions using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**
	2.3 Use function notation and evaluate function(s) given a specific domain. CPI-4.3.12.B.2	• How do we recognize a function? Function notation- $f(x)$; read "f of x", $f: x \to 3$; read as "f, the function that assigns to x the number 3". • What is a domain and range of a function? The domain of a function is the x-values given to that function. The range of a function is the y-values given to that function. ex: $f: x \to 4x - x^2$ with domain D ={1,2,3,4,5} The range of the function will be; $4(1)\text{-}1^2 = 3$; $4(2) - 2^2 = 4 \ldots \{3, 4, 3, 0, -5\}$	

Suggested days of Instruction	**Curriculum Management System** **Grade Level/Subject:** **Grade 11/Introduction to Algebra II**	**Topic: System of equations-equalities/inequalities** **Goal 3: The student will be able to explain the relationship between the solution(s) to systems of equations/inequalities in two unknowns and their corresponding graphs.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**
6 Days	3.1 Model systems of linear equations with two unknowns using integer coefficients and constants. CPI-4.3.12.C.1 3.2 Solve systems of linear equations with two unknowns by graphing. CPI-4.3.12.B.1 3.3 Solve linear inequalities in two variables. CPI-4.3.12.C.1	• When would a linear system be used to solve a problem? Ex: When comparing two cellular telephone plans, Plan A costs $10 per month and $.10 per minute and Plan B costs $12 per month and $.07 per minute. The problem is represented by Plan A=.10x+10 and Plan B=.07x+12 where x is the number of minutes. • What is a system of linear equation in two variables? A set of linear equation in the *same* two variables. ex: $\begin{cases} x - 2y = 5 \\ 4x + 3y = 9 \end{cases}$ graphs as intersecting lines $\begin{cases} x + 2y = 1 \\ -\frac{1}{2}x + 4 = y \end{cases}$ graphs as parallel lines $\begin{cases} -3x + 5y = -6 \\ 6x - 10y = 12 \end{cases}$ graphs as coinciding lines • What is a linear inequality? When the equal sign is replaced by one of the symbols: $<, >, \leq, \geq$ Graph each inequality on a graphing calculator; shade each and explain that the double-shaded areas are the solutions for both inequalities. Explain solid line for $\leq, \geq$ and dotted line for $>, <$. Ex: $y > 2x + 1$, $2x - 3y < 12$, $y \geq x$	• **Applications:** Prentice Hall Mathematics; Algebra II • **Project ideas:** Exploring Algebra, Precalculus, and Statistics with the TI-83 Graphing Calculator Chapter 3, p 51. • **Test Prep:** Prentice Hall Mathematics; Algebra II, p161 Reading comprehension • **Preparing for the NJ HSPA:** Prentice Hall NJ HSPA Mathematics Comprehensive Review. Chapter 4 p78,82. **ASSESSMENT MODEL:** Assessment questions should be open ended and should follow the general format illustrated in the Essential Questions/Sample Conceptual Understandings section.

Suggested days of Instruction	**Curriculum Management System** **Grade Level/Subject:** **Grade 11/Introduction to Algebra II**	**Topic: System of equations-equalities/inequalities** **Goal 3: The student will be able to explain the relationship between the solution(s) to systems of equations/inequalities in two unknowns and their corresponding graphs.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**
	3.4 Solve systems of linear equations in three variables using the triangular-system method and substitution method. To describe the geometric interpretation of a system of three linear equations having one solution, no solutions, and infinitely many solutions. CPI-4.3.12.C.1	• What is a system of linear equations? Any equation of the form Ax +By +Cz =D, where A, B, C, and D are real numbers with A, B, and C are not all zeros. Ex: Solve: $\begin{cases} x+y-2z=7 \\ 5y+z=9 \\ -5y+6z=-16 \end{cases}$ Solution: add the 1st equation to the 2nd equation. Then multiply the 1st equation by -2 and add the result to the 3rd equation. Add the 2nd and 3rd equations together. The results are: x = 3, y = 2, and z = -1.	
	3.5 Use linear programming to maximize of minimize a linear function subject to a set of linear constraints. CPI-4.3.12.B.2	• When do we need to use linear programming? When we have a problem of maximizing (or minimizing) a linear function subject to a set of linear constraints. Ex: A farmer wants to maximize the revenue resulting from the production and harvesting of corn and wheat. For every 100 bushels of corn he produces he receives $265 and for every 100 bushels of wheat he produces he receives $365. However, his production is restricted by the availability of land, capital, and labor. For example, he needs one acre to produce 100 bushels of corn and three acres to produce 100 bushels of wheat, and he can plant a total of 100 acres with these crops. The following table shows the availability of resources and the restrictions placed upon them.	

Suggested days of Instruction	Curriculum Management System **Grade Level/Subject:** **Grade 11/Introduction to Algebra II**	**Topic: System of equations-equalities/inequalities** **Goal 3: The student will be able to explain the relationship between the solution(s) to systems of equations/inequalities in two unknowns and their corresponding graphs.**	
	Objectives / Cluster Concepts / Cumulative Progress Indicators (CPI's) **The student will be able to:**	**Essential Questions** **Sample Conceptual Understandings**	**Instructional Tools / Materials / Technology / Resources / Learning Activities / Interdisciplinary Activities / Assessment Model**

	corn	wheat	Available material
Land	1	3	100
Capital	120	90	9000
Aug. labor	1	2	200
Sept. labor	1	6	160
output of 100 bushels (	265	365	

The farmer wants to maximize R = 265x+365y subject to;

$x+3y \le 100; 120x+90y \le 9000; x+2y \le 200;$

$x+6y \le 160; x \ge 0; y \le 0$

MTHS Summer Study Program

Introduction to Algebra II

COURSE BENCHMARKS

1. The student will be able to demonstrate number sense for real numbers and algebraic expressions in a variety of situations.

2. The student will be able to evaluate and analyze functions using various methods including mental math, paper and pencil, concrete objects, and graphing utilities or other appropriate technology.

3. The student will be able to explain the relationship between the solution(s) to systems of equations/inequalities in two unknowns and their corresponding graphs.