

## PRE-ALGEBRA

### Course Description:

This one-year course focuses upon the basic skills in mathematics and their applications. An introduction to algebra is included. The course is intended for students who have much difficulty with mathematics and are not yet ready for Algebra I. At the completion of this course, the algebra teacher will recommend the student for Algebra IA or Algebra I.

Recommended for/prerequisite: grades 9-12/permission needed for enrollment.

### Sequence / organization of standards

	State Mathematics Standards		
1. Number sense			
A. Order of operations		a1	a4
B. Expressions & substitution	a3	n1	n2
C. Basic properties (distributive)		n3	
D. Introduction to equations			
E. Single step equations			
2. Integers			
A. Integers and absolute value		a1	a4
B. Addition		n1	n2
C. Subtraction			
D. Multiplication		n2	
E. Division			
3. Rational numbers			
A. Addition of rational/decimals		a1	a4
B. Subtraction		n1	n2
C. Multiplication			n3
D. Division			
E. Solving rational/decimal equations			
4. Factors			
A. Factors and monomials		a1	a4
B. Powers and exponents			
C. Prime factorization			
5. Equations (Introduction)			
A. Single step equations		a1	a4
B. Multiple step equations		n3	n1
			n3
		g1	
6. Inequalities (Introduction)			
A. Single step		a1	a4
B. Multiple step		a3	n1
C. Compound statements		g1a	g1
			g1a
			n2
7. Equations (Continued) More advanced single variable			
A. Multiple step equations		a1	a4
B. Equations with the variable on each side		n1	n2
			a3

	n3		g1	
8. Inequalities (Continued) More advanced single variable				
A. Multiple step	a1	a4	g1a	
B. Variables on both sides	a3	n1	n2	
	n3	g1		
9. Graphing equations				
A. Equations and the number line	a4	a3	g1a	
B. Equations with two variables (lines)	a4			
C. Systems of two equations (two lines)	a4	a3		
D. Slope/intercept and graphing lines	n2	n3		
E. Graphing inequalities in two variables				
10. Sequences				
A. Arithmetic sequence	a4	a3		
B. Geometric sequences	a3			
C. Sequences which are neither				
11. Statistics				
A. Gathering data	s1			
B. Measures of central tendency	s2			
C. Stem and leaf plot				
D. Measures of variation				
E. Box and whisker plots				
F. Scatter plots				
G. Statistics as a predictor				
12. Probability				
A. The fundamental counting theorem		s2		
B. Permutations and combinations				
C. Basic probability				
13. Proportion and percent				
A. Ratios and rates	a1	a4		
B. Proportions	a3	n2	n1	
C. Percentage work		n3		
D. Percentage equations	g2..3	m2		
		m1		
14. Polynomials				
A. Adding and subtracting	a1	a4		
B. Multiplying and monomials	n2			
C. Powers of monomials				
D. Multiplying polynomials				

## **PRE-ALGEBRA**

This topic outline is intended to indicate the scope of the course, but not necessarily the order in which the topics are to be taught.

### **The Language of Algebra**

- Order of operations
- Expressions
- Variables
- Inequalities

### **Integers**

- Absolute value and ordering
- Addition, multiplication, subtraction, & division

### **Factors, Fractions & Exponents**

- Monomial factors
- Working with exponents
- GCF and LCM
- Common denominators and comparing fractions
- Negative and zero exponents
- Scientific notation

### **Rational Numbers**

- Decimals as fractions
- Solving equations
- Patterns, sequences and arithmetic sequences
- Products and quotient of a rational
- Patterns and geometric sequences

### **Solving Equations and Inequalities**

- Two step equations
- Equations with the variable on each side
- Multiple step equation
- Multiple step inequalities

### **Graphing Equations and Inequalities**

- Graphing in one variable
- Ordered pairs and plotting points
- Equations in two variables
- Slope, intercepts, and graphing equations of a line
- Graphing linear inequalities

### **Proportion, Percent & Probability**

- Ratios and rates
- Using proportions and percents
- Percents, estimation, discount, & interest
- Probability and odds and counting principle
- Combinations and permutations

### **Statistics and Graphs**

- Gathering and recording data
- Measures of central tendency
- Stem and leaf plots, box and whisker plots, & scatter plots
- Using statistics to make predictions

**Polynomials**

- Adding and subtracting polynomials
- Multiplying monomials
- Multiplying polynomials

**Linear Functions**

- Slope of a line
- Intercepts
- Slope intercept form
- Write linear equations
- Solve system of linear equations
- Graph linear equations

**Real Numbers & Right Triangles**

- Square root
- Simplify square roots
- Pythagorean Theorem
- Distance and midpoint
- Right triangles, tangent ratios, sine & cosine ratio

**Assessment Methods / Tools**

- Daily work
- Projects
- Daily applied problems
- Quizzes and exams
- Applied problem sets

**Instructional Deliver**

- Direct lecture
- Discovery method
- Cooperative group work
- Technology (TI 82, 83 graphing calculator and CD ROM computer software)

**Instructional Materials**

- Textbook
- Technology (graphing calculator & computer software)
- Outside articles / information

# Pre Algebra

This topic outline is intended to indicate the scope of the course, but not necessarily the order in which the topics are to be taught.

## **The Language of Algebra**

- Order of operations
- Expressions
- Variables
- Inequalities

## **Integers**

- Absolute value and ordering
- Addition, multiplication, subtraction, & division

## **Factors, Fractions & Exponents**

- Monomial factors
- Working with exponents
- GCF and LCM
- Common denominators and comparing fractions
- Negative and zero exponents
- Scientific notation

## **Rational Numbers**

- Decimals as fractions
- Solving equations
- Patterns, sequences and arithmetic sequences
- Products and quotient of a rational
- Patterns and geometric sequences

## **Solving Equations and Inequalities**

- Two step equations
- Equations with the variable on each side
- Multiple step equation
- Multiple step inequalities

## **Graphing Equations and Inequalities**

- Graphing in one variable
- Ordered pairs and plotting points
- Equations in two variables
- Slope, intercepts, and graphing equations of a line
- Graphing linear inequalities

## **Proportion, Percent & Probability**

- Ratios and rates
- Using proportions and percents
- Percents, estimation, discount, & interest
- Probability and odds and counting principle
- Combinations and permutations

**Statistics and Graphs**

- Gathering and recording data
- Measures of central tendency
- Stem and leaf plots, box and whisker plots, & scatter plots
- Using statistics to make predictions

**Graphing Equations and Inequalities**

- Graphing in one variable
- Ordered pairs and plotting points
- Equations in two variables
- Slope, intercepts, and graphing equations of a line
- Graphing linear inequalities

**Proportion, Percent & Probability**

- Rations and rates
- Using proportions and percents
- Percents, estimation, discount, & interest
- Probability and odds and counting principle
- Combinations and permutations

**Statistics and Graphs**

- Gathering and recording data
- Measures of central tendency
- Stem and leaf plots, box and whisker plots, & scatter plots
- Using statistics to make predictions

**Polynomials**

- Adding and subtracting polynomials
- Multiplying monomials
- Multiplying polynomials

**Linear Functions**

- Slope of a line
- Intercepts
- Slope intercept form
- Write linear equations
- Solve system of linear equations
- Graph linear equations

**Real Numbers & Right Triangles**

- Square root
- Simplify square roots
- Pythagorean Theorem
- Distance and midpoint
- Right triangles, tangent ratios, sine & cosine ratio

## ALGEBRA IA

### Course Description:

The course content covers practical applications of the fundamental principles of algebra. The full-year algebra IA course provides the mathematical background needed for advanced algebra, geometry, pre-calculus, chemistry, and physics. The solving and graphing of linear equations will be studied. A hands-on approach will be emphasized. Recommended for/prerequisite: grades 9-12/permission needed for enrollment.

### Sequence / organization of standards

1. Integers and Vectors	<b>State Mathematics Standards</b>		
A. Identifying integers	n2	n13	n1
B. Absolute value	a4 n2	n1 n13	n2
C. Adding integers	a4 n2	m1 n3	n1
D. Subtracting integers	a4 n2	m1 n3	n1
E. Multiplying and dividing integers	a4  p1	m1  n2	n1  n3
F. Identifying vectors	a3 g2.1a n1 n3	g2.2 m2 n2 a3	m1
G. Using vectors	a3 g2.2 m1 n2	g2 g2.1a 1 n3	m2  a3
2. Scientific Notation			
A. Powers of ten	n3	n1	
B. Powers of ten notation	n3	n1	
C. Scientific notation	m2 n3	m1 n1	
D. Using scientific notation	m2 n3	m1	
E. Metric measurement	m2 m1	m3 n2	n3

	n1	a4	
3. Using Formulas			
A. Variables and expressions	a1 n1	a3 n2	a4 n3
B. Equations and formulas	a1 g1a g1 m2 n2	a3 g3 m3 n1	m1 n3
C. Circles	a4 g1.a g1 m3 n1	a1 g1.1a g3 n2	a3 m1 n3
	m2		
D. Volume	a4 g1a g1.1a m3 n 3	a1 a4 m1 n2	a3 m2 n1
E. Interest	a1 m2 m1 n1	a4 m3 n2 n3	a3
2. Solving Linear Equations			
A. Solving multiplication problems	a4 m2	a3 n1	n
B. Multiplication property of equality	a4 m2	a3 n1	g1 n3
C. Solving proportions and percent equations	a4 m1 n1	a3 m2 n3	g2.3 m3
D. The addition property of equality	a4 m2	a3 n1	g1 n3
E. Solving multi-step equations	a1 m1 n1	a4 m2 n2	a3 m3 n3
F. Solving equations with variables on both sides	a1 m2 m1 n3	a3 m3 n2	a4 n1



G. Equations on the job	a1 m1 n3	a4 m2 n2	a3 m3 n1
3. Graphing Linear Equations			
A. Coordinates and graphs	n1		
B. Graphing points and lines	n1 a3	a1 a4	
C. The slope of a line	a4 a1 m2	n1 a3	
D. Graphing linear equations	a4 a1	n1 a3	
E. The intercepts of a line	a4 a1	n1 a3	
F. Linear functions	a4 a3	n1	
6. Statistics and Probability			
A. Measures of central tendency	a1 n1 s1	a4 n2	n3
B. Frequency distribution	a1 n2	a4 n1	a3 n3
C. Scatter plots	a1	s1	
D. Probability	a4 n2 s2	a3 n3	n1
E. Experimental probability	n1 n3	n2 s2	
F. The addition principle of counting	a4 n3	n1 s2	n2
G. The fundamental counting principle	a4 n3	n1 s2	n2
H. Independent and dependent events	a4 n3	n1 s2	n2

## 7. Systems of Equations

A. Solving a linear system by graphing		a3 a1	a2 a4	n2
B. Solving a linear system by addition/subtraction method	n3	a4	a2	n2
C. Solving a linear system by substitution	n3	a4	a2	n2
H. Polynomials and Factors				
A. Polynomials		a4	n1	n2
B. Factors and primes		a4 n2	a1 n3	
C. Monomials factors		a4 n2	a1 n3	n1
D. Exponents		a4 n1	a1 n2	n3
E. Adding rational expressions		a4 a3	a1 n2	n3
F. Multiplying binomials		a4 n1	a1 n2	a3 n3
G. Factoring trinomials		a4 n1	a1 n2	a3 n3

### Assessment Methods / Tools

- daily participation
- daily work (worksheets, problems)
- projects
- oral presentations
- tests (units, quiz, semester)
- journals
- informal teacher assessment (observation, etc.)

### Instructional Delivery

- cooperative groups
- problem solving processes
- activities
- board work
- lecture
- technology integration (videos, graphing calculator, overhead projector, etc.)

### Instructional Materials

- textbook
- lab equipment
- technology (videos, graphing calculator, etc.)

## **Algebra IA**

This list of topics is intended to indicate the scope of the course, but it is not necessarily the order in which the topics are to be taught.

Variables in Algebra  
Exponents and Powers  
Order of Operations  
Equations and Inequalities  
Translating Words into Mathematical Symbols  
Problem Solving Plan  
Tables and Graphs  
Introduction to Functions  
Real Number Line  
Absolute Value  
Adding Real Numbers  
Subtracting Real Numbers  
Multiplying Real Numbers  
Distributive Property  
Combining Like Terms  
Dividing Real Numbers  
Solving Equations Using Addition and Subtraction  
Solving Equations Using Multiplication and Division  
Solving Multi-Step Equations  
Solving Equations with Variable on Both Sides  
More on Linear Equations  
Solving Decimal Equations  
Formulas  
Ratios and Rates  
Percents  
The Coordinate Plane  
Graphing Linear Equations  
Graphing Horizontal and Vertical Lines  
Graphing Lines using Intercepts  
The Slope of a Line  
Direct Variation  
Graphing Lines Using Slope-Intercept Form  
Functions and Relations  
Slope-Intercept Form  
Writing Linear Equations Given Two Points  
Standard Form  
Modeling with Linear Equations  
Perpendicular Lines  
Solving Inequalities Using Addition or Subtraction  
Solving Inequalities Using Multiplication or Division  
Solving Multi-Step Inequalities  
Solving Compound Inequalities

Solving Absolute-Value Equations  
Graphing Linear Inequalities in Two Variables  
Graphing Linear Systems  
Solving Linear Systems by Substitution  
Solving Linear Systems by Linear Combinations  
Linear Systems and Problem Solving  
Special Types of Linear Systems  
Systems of Linear Inequalities  
Multiplication Properties of Exponents  
Zero and Negative Exponents  
Graphs of Exponential Functions  
Division Properties of Exponents  
Scientific Notations  
Exponential Growth Functions  
Exponential Decay Functions  
Square Roots  
Solving Quadratic Equations by Finding Square Roots  
Simplifying Radicals  
Graphing Quadratic Functions  
Solving Quadratic Equations by Graphing  
Solving Quadratic Equations by the Quadratic Formula  
Using the Discriminant  
Graphing Quadratic Inequalities  
Adding and Subtracting Polynomials  
Multiplying Polynomials  
Special Products of Polynomials  
Solving Quadratic Equations in Factored Form  
Factoring  $x^2 + bx + c$   
Factoring  $ax^2 + bx + c$   
Factoring Special Products  
Factoring Cubic Polynomials  
Proportions  
Direct and Inverse Variation  
Simplifying Rational Expressions  
Multiplying and Dividing Rational Expressions  
Adding and Subtracting with Like Denominators  
Adding and Subtracting with Unlike Denominators  
Rational Equations  
Functions Involving square Roots  
Operations with Radical Expressions  
Solving Radical Equations  
Rational Exponents  
Completing the Square  
The Pythagorean Theorem and Its Converse  
The Distance Formula  
Logical Reasoning: P

# ALGEBRA I

## Course Description:

This full-year course provides the mathematical background needed for advanced algebra, geometry, pre-calculus, advanced mathematics, chemistry, and physics. The course content covers factoring, solving linear equations, graphing linear equations, solving systems of linear equations, and practical applications of algebra. Recommended for: grades 9-12 as a college preparatory course.

## Sequence / organization of standards

1. Variables and equations		<b>State Mathematics Standards</b>			
A. Variables			a1 n1	a4 n2	a3 n3
B. Number line			n1	n2	n3
C. Absolute value and opposites			a1 n2 n3	a4	n1
2. Real Numbers					
A. Addition			n1	a3 n2	a1 n3 a4
B. Subtraction			n1	a3 n2	a1 n3 a4
C. Multiplication/division			m1 n3	a3 n1	a1 n2 a4
3. Transforming Equation					
A. Solving equations with addition			m2	a3 n1	a4 n3 g1
B. Solving equations with multiplication			m2	a3 n1	a4 n3 g1
C. Solving multi-step equations			n1	a1 n2	a3 n3 a4
D. Solving equations with variables on both sides			n1	m2 n2	a2 m3 n3 a4 m1
E. Formulas involving perimeter, area, cost, income, and value			n1	m1 m2 n2 n3	a1 a2 a3 g1.1a g1.a m3

4. Polynomials

A. Exponents

n1 a1 a3 a4  
n2 n3

B. Adding/subtracting monomials/polynomials

n1 a1 a3 a4  
n2 n3

C. Multiplication of monomials/polynomials

n1 a1 a3 a4  
n2 n3

D. Transforming formulas

n1 m1 g1.1a g1.1 a3 a4  
n2 n3 m2 m3

5. Factoring

A. Dividing monomials

n1 a1 a3 a4  
n2

B. Areas of specific forms

g1a a1 a3 a4  
g1.1 g1.1a  
m1 m3  
n1 n3

C. Dividing monomials

n1 a1 a3 a4  
n2 n3

D. Factoring trinomials

m1 g1 a4 a1 a2 a3  
m2 m3

6. Fractions

A. Adding fractions

n1 a1 a3 a4  
n2 n3

B. Subtracting fractions

m1 a1 a3 a4  
n1 n2 n3

C. Multiplying /dividing fractions

n1 a1 a3 a4  
n2 n3

7. Ratios and proportions

A. Ratio/proportion

n1 m1 a3 a4 g2.3  
n3 m2 m3

B. Metric measurement		m1 n1	m2 n2 n3	m3
C. Percent problems	n1	m1 n2	a3 m2 n3	a4 m3 g2.3
D. Negative exponents		n1	a1 n2	a4 n3
E. Scientific notation		m1	a1 m2	a2 n1 a4
8. Using two variables and functions				
A. Points lines and graphs		a1	n1 a3	a4
B. Slope of a line		a4	a1	m2 n1
C. Graphing linear equations		m2	a1 m3	a3 n3 a4
D. Intercepts of a line		n1	a3 m2	a4 a1
E. Functions linear and quadratic		n2	a1 n3	a3 a4
9. Systems of linear equations				
A. Solve by graphing			a1 a4	a2 n2 a3
B. Solve by substitution		n2	a1 n3	a2 a4
C. Solve by addition/subtraction			a1 n2	a2 n3 a4
D. Solve by multiplication with addition/subtraction		n2	a1 n3	a2 a4

#### Assessment methods/tools

- Daily participation
- Daily work (worksheets, problems)
- Tests (quiz, chapter, semester)

#### Instructional Delivery

- Problem solving process
- Cooperative groups
- Lecture
- Board work
- Activities
- Technology integration: graphing, calculator, overhead projector, etc.

#### Instructional materials

- Textbook – Algebra 1; McDougal Littell (2005)
- Logic problems
- Graphing calculators
- Contemporary worksheets

# Algebra I

This outline of topics is intended to indicate the scope of the course, but it is not necessarily the order in which the topics are to be taught.

## Introduction to Algebra

- Order of operations
- Expressions
- Variables
- Inequalities & equations

## Real Numbers

- Real number line
- Addition, subtraction, multiplication, & division of real numbers
- Adding and subtracting matrices
- Distributive property

## Linear Equations

- Solve equations using addition, subtraction, multiplication and division
- Solve multi-step problems and variables on both sides
- Solve decimal equations
- Use formulas

## Rational Numbers & Expressions

- Simplify, add, subtract, multiply, and divide rational expressions
- Solve rational equations & functions
- Patterns, sequences and arithmetic sequences
- Patterns & geometric sequences

## Solving Equations

- Two step equations
- Equations with the variable on each side
- Multiple step equation
- Multiple step inequalities

## Graphing Equations and Functions

- Graphing in one variable
- Ordered pairs and plotting points
- Use coordinate plane and scatter plots
- Solve linear equations using graphs
- Slope, intercepts, point slope form, standard form and graphing equations of a line
- Line of best fit



**Inequalities**

- Graphing linear inequalities
- Solve one step-multi-step and compound inequalities
- Solve absolute value equations and inequalities

**Proportion, Percent, & Probability**

- Ratio and rates
- Using proportions and percents
- Percents, estimation, discount, & interest
- Probability & odds & counting principle

**Statistics and Graphs**

- Gathering and recording data
- Measures of central tendency (mean, media, mode)
- Stem and leaf plots, box and whisker plots, & scatter plots
- Using statistics to make predictions

**Polynomials**

- Add, subtract, multiply & divide polynomials
- Factor polynomials

**Linear Functions**

- Write linear equations
- Solve system of linear equations by graphing, substitution, & combination

**Exponents and Exponential Functions**

- Properties of exponents – multiplication, division, zero & negative
- Scientific notation
- Exponential growth and decay function

**Quadratic Equations and Functions**

- Solve equation by finding the square roots
- Simplify radicals
- Graph quadratics
- Solve quadratics by graphing and the quadratic formula
- Find the discriminate

**Radicals**

- Functions involving square roots
- Operation on radical expression & solving radical expression
- Completing the square
- Pythagorean Theorem and its inverse
- Distance and midpoint formulas
- Trigonometric ratios

## ALGEBRA II

### Course Description:

This is an advanced, full-year course in a study sequence, which includes a review of skills from first-year algebra. It puts emphasis on equation solving and its applications to the solution of word problems. This course is intended to help the student to understand algebra as a study of structures of the systems of real and complex numbers. The course will emphasize the role of deductive reasoning in algebra. Students will learn the need for precision of language. This is primarily a college prep course but may also be very useful in development of reasoning ability in problem solving. Recommended for students who plan on taking pre-calculus at the high school level. Recommended for prerequisite: grades 10-12 passed Algebra I.

### Sequence / organization of standards

Goal 1. <u>Number Sense</u> : To develop an understanding of numbers and the relationship between numbers	<b>State Mathematics Standards</b>	
The student will:		
▪ develop an understanding of real numbers and expressions, operations with real numbers, and basic problem solving skills involving equations with real numbers		a1
▪ use basic equation solving skills, with some modification, to solve inequalities to include conjunction, disjunction, and absolute value		a4
Goal 2. <u>Estimation</u> : To develop the skill of estimation		
The student will:		
▪ use the laws of exponents to develop an understanding of exponential, composite, and inverse functions which will lead them to the definition of a logarithmic functions with laws of logarithms and applications being stressed		a3
Goal 3. To develop skills in measurement		
The student will:		
▪ discover the distance and midpoint formulas which lead into algebraic and geometric definitions of circles, parabolas, ellipses, and hyperbolas and their equations and graphs		a4
▪ identify arithmetic and geometric sequences and series, use sigma notation, and find sums of arithmetic and geometric, both finite and infinite, series along with developing an understanding of the binomial theorem and expansion		a3
▪ study histograms, stem and leaf plots, and box and whisker plots as well as measures of central tendency and dispersion to analyze data and solve problems involving counting, combinations and permutations	a2	a3
▪ do arithmetic operations on matrices and use properties of matrices to solve equations, evaluate determinants, and solve application type problems	a3	a4
Goal 4: <u>Computation</u> : To develop the skills for using calculators and computers appropriately		
The student will:		
▪ simplify, add, subtract, multiply and divide rational expressions and solve equations with fractional coefficients and fractional equations	a1	a4
▪ learn to use various properties to simplify, add, subtract, multiply and divide radical expressions, solve radical equations, find roots of negative numbers, and simplify complex numbers		a1

- develop and understanding of real numbers and expressions, operations with real numbers, and basic problem solving skills involving equations with real numbers a1

Goal 5: Calculators and Computers: To develop the ability to relate mathematics to everyday life situations through problem solving and critical thinking

The student will:

- develop and understanding of real numbers and expressions, operations with real numbers, and basic problem solving skills involving equations real number a3 a1 a2 a4 with
- use basic equation solving skills, with some modification, to solve inequalities to include conjunction, disjunction, and absolute value a2 a4
- solve equations and inequalities in two variables along with an understanding of the coordinate plane, graphing methods, methods of finding slope, writing equations of lines and solving systems of equations a3
- develop an understanding of polynomials to include laws of exponents, to find factors of polynomials to find greatest common factors and least common multiples, and to solve application type problems using factoring a2
- simplify, add, subtract, multiply, and divide rational expressions and solve equations with fractional coefficients and fractional equations a1
- learn to use various properties to simplify, add, subtract, multiply, and divide radical expressions, solve radical equations, find roots of negative numbers, and simplify complex numbers a1
- learn methods of solving quadratic equations, determine the nature of the roots, analyze quadratic functions and their graphs, and write quadratic equations and functions a2 a3
- solve, direct, inverse, and joint variations problems along with developing an understanding of polynomial equations theory to include synthetic division, factor and remainder theorem, and DeCartes' Rule a2 a3
- discover the distance and midpoint formulas which lead into algebraic and geometric definitions of circles, parabolas, ellipses, and hyperbolas and their equations and graphs a3
- use the laws of exponents to develop an understanding of exponential, composite, and inverse functions which will lead them to the definition of logarithmic functions with laws of logarithms and applications being stressed a3
- identify arithmetic and geometric sequences and series, use sigma notation, and find sums of arithmetic and geometric, both finite and infinite, series along with developing an understanding of the binomial theorem and expansion a3
- study histograms, stem and leaf plots, and box and whisker plots as well as measures of central tendency and dispersion to analyze data and solve problems involving counting, combinations and permutations a3
- do arithmetic operations on matrices and use properties of matrices to solve equations, evaluate determinants, and solve application type problems a3

Goal 6: Problem Solving and Critical Thinking: To develop the ability to relate mathematics to everyday life situations through problems solving and critical thinking

The student will:

- develop an understanding of real numbers and expressions, operations with real numbers, and basic problem solving skills involving equations with real numbers a1 a4
- use basic equations solving skills, with some modification, to solve inequalities to include conjunctions, disjunction, and absolute value a4

- solve equations and inequalities in two variables along with an understanding of the coordinate plane, graphing methods, methods of finding slope, writing equations of lines and solving systems of equations a3 a2
- develop an understanding of polynomials to include laws of exponents, to find factors of polynomials to find greatest common factors and least common multiples, and to solve application type problems using factoring a4
- simplify, add, subtract, multiply, and divide rational expressions and solve equations with fractional coefficients and fractional equations
- learn to use various properties to simplify, add, subtract, multiply, and divide radical expressions, solve radical equations, find roots of negative numbers, and simplify complex numbers a1
- learn methods of solving quadratic equations, determine the nature of the roots, analyze quadratic functions and their graphs, and write quadratic equations and functions a2 a16
- solve, direct, inverse, and joint variation problems along with developing an understanding of polynomial equation theory to include synthetic division, factor and remainder theorem, and DeCartes' Rule a2 a3
- discover the distance and midpoint formulas which lead into algebraic and geometric definitions of circles, parabolas, ellipses, and hyperbolas and their equations and graphs a2.1 a2 a1.1
- use the laws of exponents to develop an understanding of exponential, composite, and inverse functions which will lead them to the definition of logarithmic functions with laws of logarithms and applications being stressed a3
- identify arithmetic and geometric sequences and series, use sigma notation, and find sums of arithmetic and geometric, both finite and infinite, series along with developing an understanding of the binomial theorem and expansion a3
- study histograms, stem and leaf plots, and box and whisker plots as well as measures of central tendency and dispersion to analyze data and solve problems involving counting, combinations and permutations a3
- do arithmetic operations on matrices and use properties of matrices to solve equations, evaluate determinants, and solve application type problems a4 a2 a3  
a18
- perform basic operations on vectors to include scalar multiplication, dot products, as well as using parametric equations to define motion a3
- if time permits, be introduced to one or more of the following topics:
  - sequences and series
  - statistics and probability
  - matrices and determinants

Goal 7: Probability and Statistics: To develop skills in probability and statistics

The student will:

- study histograms, stem and leaf plots, and box and whisker plots as well as measures of central tendency and dispersion to analyze data and solve problems involving counting, combinations and permutations a3 a18

Goal 8: Algebraic Skills and Concepts: To develop algebraic skills and concepts

The student will:

- develop an understanding of real numbers and expressions, operations with real numbers, and basic problem solving skills involving equations with real numbers a4
- use basic equations solving skills, with some modification, to solve inequalities to include conjunctions, disjunction, and absolute value a2
- solve equations and inequalities in two variables along with an understanding of the coordinate plane, graphing methods, methods of finding slope, writing equations of lines and solving systems of equations a2
- develop an understanding of polynomials to include laws of exponents, to find factors of polynomials to find greatest common factors and least common multiples, and to solve application type problems using factoring a2
- simplify, add, subtract, multiply, and divide rational expressions and solve equations with fractional coefficients and fractional equations a1
- learn to use various properties to simplify, add, subtract, multiply, and divide radical expressions, solve radical equations, find roots of negative numbers, and simplify complex numbers a1 a4
- learn methods of solving quadratic equations, determine the nature of the roots, analyze quadratic functions and their graphs, and write quadratic equations and functions a2
- solve, direct, inverse, and joint variation problems along with developing an understanding of polynomial equation theory to include synthetic division, factor and remainder theorem, and DeCartes' Rule a3
- discover the distance and midpoint formulas which lead into algebraic and geometric definitions of circles, parabolas, ellipses, and hyperbolas and their equations and graphs a3
- use the laws of exponents to develop an understanding of exponential, composite, and inverse functions which will lead them to the definition of logarithmic functions with laws of logarithms and applications being stressed a4

Goal 9: Geometric Skills: To develop geometric skills and concepts

The student will:

- solve equations and inequalities in two variables along with an understanding of the coordinate plane, graphing methods, methods of finding slope, writing equations of lines and solving systems of equations a2.1a
- discover the distance and midpoint formulas which lead into algebraic and geometric definitions of circles, parabolas, ellipses, and hyperbolas and their equations and graphs a3
- use geometric models in defining trigonometric functions, solving triangles, and graphing of trigonometric functions and their inverses a3.21 a4.4a

**Assessment:** The means for measuring student progress and ability will be determined by the following assessments:

- Daily problems that pertain to:
  - past material taught in class
  - authentic life problems
  - thinking skill problems
- Daily textbook assignments:
  - graded upon completion
  - graded upon correctness

- Authentic task applications:
  - use of content in authentic applications
  - writing correctly in mathematics
- Tests and quizzes:
  - content
  - thinking skills
  - application of mathematics

**Methods of Delivery:** The methods of delivery include:

- lecture
- cooperative groups
  - in class
  - out of class authentic task projects
- discovery
- use of technology
  - graphing calculator
  - computer
    - mathematics software
    - writing and corrective software
- open discussion
  - question and answer
  - probing questions

**Instructional Materials:**

Text - Algebra 2; McDougal Littell (2005)

Supplementary text - College Algebra; Rosenback, Whitman, Meserve, Whitman; Ginn (1958)

Supplementary text: The Language of Functions and Graphs; Shell Centre for Mathematical Education; University of Nottingham (1985)

NCTM monthly magazine; ; Shell Centre for Mathematical Education; University of Nottingham (1985)

NCTM monthly magazine; The Mathematics Teacher

Calculators:

- Graphing Sharp EL9300C, TI82, TI83, TI86

Computer Software:

- Zap-A-Graph
- Microsoft Words
- Microsoft Excel
- Learning 2000 by Gateway computers
- Accessories - paint
- QM for Windows
- Mastering Calculus
- Macnumerics

## Algebra II

This outline of topics is intended to indicate the scope of the course, but it is not necessarily the order in which the topics are to be taught.

### Operations With Signed Numbers (Basic Review) (Alternate Resources)

- Adding
- Subtracting
- Multiplying
- Dividing

### Operations With Rational Numbers (Basic Review) (Alternate Resources)

- Adding
- Subtracting
- Multiplying
- Dividing

### Equations & Inequalities

- Types of Numbers & Operations
- Expressions & Modeling
- Solving Basic Linear Equations
- Manipulating Equations & Formulas
- Problem Solving Using Modeling
- Solving Linear Inequalities

### Linear Equations & Functions

- Functions & Their Graphs
- Slope: Rate of Change
- Graphing Using Slope-Intercept
- Finding The Equation of a Line
- Best-Fitting Lines: Modeling
- Linear Inequalities in Two Variables

### Systems of Linear Equations & Inequalities

- Solving Linear Systems by Graphing
- Solving Linear Systems Algebraically

### Matrices & Determinants

- Matrix Operations
- Multiplying Matrices

### Sequence & Series (Alternate Resources)

- Arithmetic, Geometric, & Neither Sequences
- Arithmetic, Geometric, & Neither Series

#### Probability (Alternate Resources)

- Basic Probability

#### Factoring (Alternate Resources)

- Simple Factoring (GCF)
- Special Patterns
- Finding the Pattern

#### Quadratic Functions

- Graphing Quadratic Functions
- Solving Quadratic Functions by Graphing
- Complex Numbers
- Completing the Square
- The Quadratic Formula & the Discriminant
- Modeling With Quadratic Functions

#### Polynomial Functions (Time Permitting)

- Using Properties of Exponents
- Evaluating & Graphing Polynomial Equations?
- Adding, Subtracting, & Multiplying Polynomials
- Factoring & Solving Polynomial Equations

#### Rational Equations & Functions

- Inverse & Joint Variation



## Advanced Algebra II

### Equations & Inequalities

- Types of Numbers & Operations
- Expressions & Modeling
- Solving Basic Linear Equations
- Manipulating Equations & Formulas
- Problem Solving Using Modeling
- Solving Linear Inequalities
- Equations & Inequalities Involving Absolute Value

### Linear Equations & Functions

- Functions & Their Graphs
- Slope: Rate of Change
- Graphing Using Slope-Intercept
- Finding The Equation of a Line
- Best-Fitting Lines: Modeling
- Linear inequalities in Two Variables
- Piecewise Functions
- Absolute Value Functions

### Systems of Linear Equations & Inequalities

- Solving Linear Systems by Graphing
- Solving Linear Systems Algebraically
- Graphic Solutions to Systems of Inequalities
- Solving Systems in Three Variables

### Matrices & Determinants

- Matrix Operations
- Multiplying Matrices

### Quadratic Functions

- Graphing Quadratic Functions
- Solving Quadratic Functions by Graphing
- Complex Numbers
- Completing the Square
- The Quadratic Formula & the Discriminant
- Graphing & Solving Quadratic Inequalities
- Modeling With Quadratic Functions

### Polynomial Functions

- Using Properties of Exponents
- Evaluating & Graphing Polynomial Equations
- Adding, Subtracting, & Multiplying Polynomials

- Factoring & Solving Polynomial Equations
- The Remainder & Factor Theorems
- Rational Zeros
- Using the Fundamental Theorem of Algebra
- Analyzing Graphs of Polynomial Functions
- Modeling with Polynomial Functions

#### Powers, Roots, & Radicals

- Nth Roots & Rational Exponents
- Properties of Rational Exponents
- Power Functions & Function operations
- Inverse Functions
- Graphing Square Root & Cube Root Functions
- Solving Radical equations
- Statistics & Statistical Graphs

#### Exponential & Logarithmic Functions (*Time Permitting*)

- Exponential Growth
- Exponential Decay

#### Rational Equations & Functions

- Inverse & Joint Variation

#### Quadratic Relations & the Conic Sections (Time?)

- The Distance & Midpoint Formulas
- Parabolas
- Circles
- Ellipses
- Hyperbolas
- Graphing & Classifying the Conics
- Solving Quadratic Systems

#### Sequence, Series, Probability, & Statistics:

Addressed throughout the course through daily problems and specific lectures.

## APPLIED GEOMETRY

### Course Description:

Geometry IA is a one-year course in plane and solid geometry. Emphasis will be on developing problem-solving skills. A hands-on approach will be emphasized. Recommended for prerequisite: grades 9-12\passed Algebra I or Algebra IA and permission needed for enrollment.

### Sequence/Organization of Standards

### State Mathematics Standards

1. Learning Problem-solving techniques			
A. Develop a plan for solving real life problems	a3	a4	s1
B. Practice the plan develop in A	m1	n3	
C. Review calculator skills necessary for arithmetic computations	m1	n3	
2. Working with Lines and Angles			
A. Name and recognize line, angles, and circles	g1.1a	g1.1	
B. Draw and measure lines, angles, and circles	g1.1	g2.1	
C. Draw lines and angles to produce parallel and perpendicular lines	g1.1		
3. Working with Shapes in Two Dimensions			
A. Identify common figures (such as rectangles, squares, triangles, parallelograms, trapezoids, and circles) within objects	g1.1	m3	
B. Calculate the perimeter and area of common figures	g1 m3	g1.1 n3	m1
C. Calculate the circumference and area of a circle	g1 n1	m1	n3
4. Working with Shapes in Three Dimensions			
A. Identify cylinders, rectangular solids, cones, and spheres	g1.1	m3	
B. Calculate surface area and volume for cylinders, rectangular solids, cones, and spheres	g1 m1 n1	g1.1 m3 n3	g1.4a
5. Using Ratios and Proportions			
A. Learn the skills to read and to interpret ratios	a3	a4	
B. Compare ratios	m1	n1	
C. Identify and write proportions	a4	g1.1	m1
D. Solve proportions	g1.1 m1 n3.2	g2.3 n2	m2 n3

6.	Working with Scale Drawing				
	A. Read and use the scale of a drawing		n1		
	B. Find the dimensions of an object from a scale drawing		g1.1	g2.3	m1
	C. Find distances and directions on land maps		g2.3	m1	
	D. Make simple scale drawings		a3	g1.2	g2.3
		m1			
7.	Using Signed Numbers and Vectors				
	A. Learn the skills to identify signed numbers		n1		
	B. Discover the meaning of absolute value		a4	n1	n2
		n3			
	C. Combine signed numbers		a4	n1	n2
		n3			
	D. Identifying vectors (magnitude and direction)		a4	g2.2	n2
	E. Combining vectors		a4	g2.2	
		m1	m2	n1	
			n2	n3	
8.	Using right-triangle relationships				
	A. Name the parts of a right triangle		g1.1a	g2.1	
	B. Use the Pythagorean formula to find a side of a right triangle		g1.1a	g1.1	g1.2
		g2.1	n1	n3	
	C. Use the characteristics of special right triangles to solve practical problems		g1.1	g2.1	m1
			n1	n2	
	D. Use the ratios for the sine, cosine, and tangent of an angle to solve problems that involve triangles		a3	g1.1a	g1.1
		m1	g2.1		
			n1	n2	
	E. Use the calculator as you solve problems that involve right triangles		g1.1a	g1.1	g1.2a
		g2.1	n1	n2	
9.	Geometry in the Workplace				
	A. Apply solid geometry to problems that involve the volumes and surface areas of geometric figures		g1	g1.1	g1.4a
			m3		
		m1			
		n1	n3		
	B. Apply solid geometry principles to solve problems normally encountered in the work place		g1	g1.1	g1.4a
			m1	m3n1	n3

C.	Draw auxiliary diagrams to help solve for an unknown dimension or unknown angle				
		m1	g1	g1.1	g1.4a
		n1	m3		
		n3			
D.	Solve solid geometry problems on your calculator that involve a series of steps		g1	g1.1	m1
		m3	n1	n3	
10.	Spatial Visualization				
A.	Determine point, line, and plane symmetry of geometric figures		g1.1		
B.	Use orthographic drawing techniques		g1.4a		
C.	Draw basic geometric views using isometric and one- and two-point perspective drawing techniques		g1.1		
11.	Coordinate Geometry				
A.	Determine the locus of points		g1.1a	g1.1	
B.	Determine if lines are perpendicular or parallel		g1.1a	g1.1	
C.	Find length and midpoint of segments		g1.1	m1	n2
		n3			
D.	Use an equation of a circle		a4	g1.1a	g2.1a
12.	Logic				
A.	Inductive and deductive reasoning		g1.1a		
B.	Apply language and symbols of logic to occupational situation		g1.1a	g1.1	
C.	Geometric constructions		g1.1a	g1.1	g1.4a
D.	Use postulates and theorems to build geometric proofs		g1.1a	g1.1	
E.	Solve problem using logical reasoning and theorems		g1.1a	g1.1	
13.	Transformations				
A.	Construct congruent geometric figures using reflections, translations, and rotations		g1.1	g2.2	

#### Assessment Methods/Tools

- Daily participation (observation)
- Daily work (assignments, worksheets)
- Projects
- Tests and quizzes
- Presentations

#### Instructional Delivery

- Lecture
- Cooperative groups
- Problem solving processes
- Activities
- Technology Integration (videos, graphing calculators, overhead)

**Instructional Materials:**

- Textbook
- Worksheets
- Lab equipment
- Technology (videos, graphing calculators, etc.)
- Games

## Geometry IA – Applied Geometry

This topic list is intended to indicate the content of this course, but it is not necessarily the order in which the topics are to be taught.

Finding and Describing Patterns  
Inductive Reasoning  
Points, Lines, and Planes  
Sketching Intersections  
Segments and Their Measures  
Angles and Their Measures  
Segment Bisectors  
Angle Bisectors  
Complementary and Supplementary Angles  
Vertical Angles  
If-Then Statements and Deductive Reasoning  
Properties of Equality and Congruence  
Relationships Between Lines  
Theorems About Perpendicular Lines  
Angles Formed by Transversals  
Parallel Lines and Transversals  
Showing Lines are Parallel  
Using Perpendicular and Parallel Lines  
Translations  
Classifying Triangles  
Angle Measures of Triangles  
Isosceles and Equilateral Triangles  
The Pythagorean Theorem and the Distance Formula  
The Converse of the Pythagorean Theorem  
Medians of a Triangle  
Triangle Inequalities  
Congruence and Triangles  
Proving Triangles are Congruent  
Using Congruent Triangles  
Angle Bisectors and Perpendicular Bisectors  
Reflections and Symmetry  
Polygons  
Properties of Parallelograms  
Showing Quadrilaterals are Parallelograms  
Rhombuses, Rectangles, and Squares  
Trapezoids  
Reasoning About Special Quadrilaterals  
Ratio and Proportion  
Similar Polygons  
Showing Triangles are Similar

Proportions and Similar Triangles

Dilations

Classifying Polygons

Angles In Polygons

Areas of Squares, Rectangles, Triangles, Parallelograms, and Trapezoids

Circumference and Area of Circles

Solid Figures

Surface Area of Prisms, Cylinders, Pyramids, Cones, and Spheres

Volume of Prisms, Cylinders, Pyramids, Cones, and Spheres

Simplifying Square Roots

45-45-90 Triangles and 30-60-90 Triangles

Tangent Ratio

Sine and Cosine Ratios

Solving Right Triangles

Parts of a Circle

Properties of Tangents

Arcs and Central Angles

Arcs and Chords

Inscribed Angles and Polygons

Properties of Chords

Equations of Circles

Rotations



# GEOMETRY

## Course Description

Recommended as a college preparatory course intended for students who have successfully completed Algebra IA or Algebra I. Geometry is a one-year course in plane and solid geometry. Proofs will be used to help develop deductive logic and problem solving skills. Recommended for/prerequisite: Grades 9-12 \passed Algebra IA or Algebra I.

## Sequence / organization of standards

## State Mathematics Standards

### 1. Points, Lines, Planes, and Angles

A. Points, lines, and planes

g1.1a g1.1

B. Segments, rays and distance

g1.1a g1.1 m1.3

C. Angles

g1.1a g1.1

### 2. Deductive Reasoning

A. Conditional statements and algebraic properties

g1.1a a4

B. Proving theorems

g1.1a

C. Special pairs of angles

g1.1a g1.1

D. Perpendicular lines

g1.1a g1.1

E. Planning a proof

g1.1a

### 3. Parallel Lines and Planes

A. Properties of parallel lines

g1.1a g1.1

B. Proving lines parallel

g1.1a g1.1

C. Angles of a triangle

a4 g1.2 n2 n3  
a2.1 g1.1

D. Angles of polygons

g1.1a g1.1 n3

### 4. Congruent Triangles

A. Proving triangles congruent

g1.1a g1.1 n3

B. Using congruent triangles		g1.1a n3	g1.1 a4	g1.2
C. Isosceles triangles	n3	g1.1a a2.1	g1.1	g1.2
D. Medians, altitudes and perpendicular bisectors			g1.1a	g1.1
5. Quadrilaterals				
A. Properties of parallelograms		g1.1a	g1.1	n3
B. Proving quadrilaterals are parallelograms		g1.1a	g1.1	n3
C. Special quadrilaterals	n3	g1.1a	g1.1	n2
6. Similar Polygons				
A. Ratio and proportion		g2.3 g1.1	n3	a2.1
B. Similar polygons	g2.3	g1.1 a2.1	g1.1a	g1.2
C. Proportional lengths	g2.3	g1.1a n2	g1.1	g1.2
7. Right Triangles				
A. Similarity in right triangles	g2.3	g1.1a	g1.1	g1.2
B. Pythagorean theorem	n1	g1.1 n2	g1.1a a2.1	g1.2
C. Converse of the Pythagorean theorem		g1.1a	g1.1	g2.1
D. Special right triangles	n1	g1.1a	g1.1	g1.2
E. Sine, cosine, and tangent ratios	g1.2	g1.1a n1	g1.1 a2.1	g1.2a

8. Circles

A. Tangents	g1.1	g1.3a		
B. Arcs and angles	g1.1	g1.3a	n2	
C. Chords and segments	g1.1 a2.1	g1.3a	n2	

9. Constructions

A. Basic constructions	g1.1a	g1.1		
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10. Areas of Plane Figures

A. Areas of polygons	g1.2	g1a m3 a2.1	g1 n3	g1.1
B. Circumference and area of circles		g1 n3	m1.1	n1
C. Arc lengths and areas of sectors	n3	g1 n3	g1.1 a2.1	n1
D. Ratios of areas	n3	g1	g1.1	m3

11. Areas and Volumes of Solids

A. Prisms and pyramids	m3	g1 m1.1	g1.1	g2.1
B. Cones and cylinders		g1 m1.1	g1.1 m3	g2.1
C. Spheres	m1	g1 m3	g1.1	g2.1

12. Coordinate Geometry

A. Distance and midpoint formulas	n2	n3	g2.1a	
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B. Slope	g2.1a	m2	n3	n2
C. Graphing linear equations	g2.1a	a3.2	a4.1	a2
D. Writing linear equations		a3.2	g2.1a	a4.1
E. Equations of circles	g2.1a			

### 13. Transformations

A. Glide transformations		g1.1	g2.2	
B. Reflections		g1.1	g2.2	
C. Rotations		g1.1	g2.2	

### Assessments

- Daily work
- Homework
- Projects
- Tests
- Rubrics

### Instructional Delivery

- Cooperative groups
- Technology integration
- Critical thinking
- Authentic tasks
- Student presentations
- Large and small group discussion
- Process writing

### Materials

- Textbooks
- Technology
- Lab equipment

## Geometry

This list of topics is intended to indicate the scope of the course, but it is not necessarily the order in which the topics are to be taught.

Patterns and inductive reasoning  
Points, Lines and planes  
Segments and their measures  
Angles and their measures  
Segment and angle bisectors  
Angle pair relationships  
Introduction to perimeter, circumference and area  
Conditional statements  
Definitions and biconditional statements  
Deductive reasoning  
Reasoning with properties from Algebra  
Proving statements about segments  
Proving statements about angles  
Lines and angles  
Proof and perpendicular lines  
Parallel lines and transversals  
Proving lines are parallel  
Using properties of parallel lines  
Parallel lines in the coordinate plane  
Perpendicular lines in the coordinate plane  
Triangles and angles  
Congruence and triangles  
Proving triangles are congruent  
Using congruent triangles  
Isosceles, equilateral, and right triangles  
Perpendiculars and bisectors  
Bisectors of a triangle  
Medians and altitudes of a triangle  
Midsegment Theorem  
Inequalities in One Triangle  
Polygons  
Properties of parallelograms  
Proving quadrilaterals are parallelogram  
Rhombuses, rectangles, and squares  
Trapezoids and kites  
Special quadrilaterals  
Areas of triangles and quadrilaterals  
Rigid motion in a plane

Reflections  
Rotations  
Translations and vectors  
Glide reflections and compositions  
Frieze patterns  
Ratio and proportion

## PRE-CALCULUS

### Course Description

Functions will be studied in the first semester as well as exponents, logarithms, analytic geometry, sequences, series, and matrices. The second semester will focus on the study of trigonometry. Other topics studied include probability theory, statistics and introductory calculus. Graphing calculators will be used. The course is designed for students who are college or university bound. Recommended for/prerequisite: passed Algebra I, Geometry, and Algebra II.

### Sequence / organization of standards

	<b>State Mathematics Standards</b>		
1. Functions, graphs, and applications			
A. Length of a segment, midpoint of a segment, and coordinates of intersecting lines.	a1 a4 m1 n2.	a2  m3 n3	a3
B. Parallel, perpendicular, and intersecting lines	a1 a3 m2 n2 s1	a2 a4 m3 n3 s2	n1   s3
C. Equations of lines	a1 a4 m3 n3	a2 g1 n1	a3 g2 n2
D. Linear Functions	a1 a4 m1 n1 s1	a2  m2 n2 s2	a3   n3
E. Add, subtract, multiply and divide complex numbers	a1 n1	a2 n2	a4 n3
F. Solve quadratic equations	a1 g1 n2	a2 g2 n3	a4
G. Quadratic functions	a1 a4 n2	a2 g1 n3	a3 g2
H. Modeling using quadratics	a1 a4 m3	a2 m2 m1 n3	a3  n2 s1

## 2. Polynomial functions

A. Identifying polynomials, synthetic division, and zeroes	a1 a5 a10 n7	a2 a6 s1 s4	a3 a9 n6 s3
B. Synthetic division and zeroes of a polynomial	a2 n2	a4 s1	
C. Graphing polynomials	a1 n2	a2 n3	a4 g1
D. Maximums and minimums in story problems	a1 a4 n1	a2 g2 n2	a3 g3 n3
E. Using calculators to solve polynomial equations	a1 a4 g1 n1	a2 g2 n2	a3 n3
F. Solving polynomials equations by factoring, quadratic forms, and rational root theorem	a1 a4 g1 n1	a2 g2 n2	a3 n3

## 3. Inequalities

A. Inequalities in one variable	a1 g1 n3	a3 n1	a4 n2
B. Polynomial inequalities in one variable	a1 n2	a2 n3	a4
C. Graphing polynomials in two variables and solution sets of systems of inequalities	a1 g1	a2 n2	a4
D. Linear programs and applied problems	a1 a4 n2	a2 g1 n3	a3 m3 s1

## 4. Functions

A. Identifying functions, domain, range, and zeroes	a3 n3	a4 n2	a1
B. Operations with functions	a1 n2	a2 n3	a3

C. Symmetry in sketching graphs	a1	a4	
D. Period, amplitude, and reshaping graphs	a3 n2	a4 n3	
E. Inverse functions	a3 n2	a4 n3	a1
F. Functions of two variables	a1 n3	n4	n2
G. Minimums or maximums of functions of one variable	a1 m1 n2	a3 m2 n3	a4 m3
4. Exponents and logarithms			
A. Growth and decay with integer exponents and rational exponents	a3 n1	a4 n2	m3 n3
B. Exponential functions	a1 a9 n1 s1	a2 m3 n2 s2	a3 n3
C. Definition and laws of logarithms	a3 n1	a4 n2	g15 n3
D. Solving exponential equations and change of base for logarithms	a2 n1	a4 n2	a3 n3
5. Analytic Geometry			
A. Coordinate geometry, circles, and lines	a1 g1 n2	a3 g2 n3	a4
B. Ellipse, hyperbola, parabola	a1 n2	a3 n3	a4
C. Systems of second degree equations	a1 g1 n2	a2 g2 n3	a3 m3
D. Eccentricity	a3	n2	n3
6. Circular Trigonometric Functions			
A. Degrees, radians, arc length, area sector, apparent size	g8 n1 a1	m3 n2 a3	m1 n3 a4



B. Values of the Sine and Cosine, reference angles and special angles	a1 g1 m3 n1.1	a3 g2 m1 n3.2	a4  m2 n3.1
C. Tangent, Cotangent, Secant, and Cosecant	a3 g1	a4 m3	a1
7. Trigonometric Equations and Applications			
A. Solving "simple" trigonometric equations	a1 a4 m3 n2	a2 g1 m1 n1	a3 g2  n3
B. Finding equations for sine and cosine curves	a1 a4  n1	a2 g1 m1 n2	a3 g2 m3 n3
C. Trigonometric Equations in modeling periodic behavior	a1 a4 m3 n1	a2 g1 m1 n2	a3 g2 m2 n3
D. Proving trigonometric identities and solving trigonometric equations	a1 a4 m3 n1	a2 g1 m1 n2	a3 g2 m2 n3
8. Triangle Trigonometry			
A. Finding the unknown parts of a right triangle	a1 g1 m1	a3 g2 n1 n3	a4 m3 n2
B. Area of a triangle when given two sides and the included angle	a3  n1	a4 g1 n2	g1 g2 n3
C. Laws of Sines and Law of Cosines	g1 m3 n2	g2 m2 n3	m1
D. Navigation and Surveying	g1 m1 n2	g2 m3 n3	n1

9. Trigonometric addition formulas

A. Sine, Cosine, and Tangent of a sum or difference

a1 a3 a4  
g1 g2  
m1 m2 m3  
n2 n3

B. Half-angle and double-angle formulas

a1 a3 a4  
g1 g2  
m1 m2 m3  
n2 n3

C. Identities and solving trigonometric identities

a1 a3 a4  
g1 g2  
m1 m2 m3  
n2 n3

10. Polar Coordinates and Complex Numbers

A. Graphing polar equations

a1 a4 m3  
n2 n3

B. Complex numbers in polar form and products of complex numbers in polar form

a1 a3 a4  
m3 n2 n3

C. DeMoivre's Theorem

a1 a3 a4  
m3 n2 n3

D. Roots of complex numbers

a1 a3 a4  
m3 n2 n3

11. Vectors and Determinants

A. Geometric and Algebraic representations of vectors

a1 a4  
a3 g2 m3  
n2 n3

B. Vectors and parametric equations

a3 a4 g2  
m3 n2 n3

C. Parallel and perpendicular vectors

a3 a4 g2  
n2 n3

D. Vectors in three dimensions

a3 a4 g2.2  
n2.1 n3.2 n3.1

E. Vectors and planes

a3 a4 g2  
n3

F. Determinants

a3 a4 g2  
n2 n3

## 12. Sequences and Series

A. Arithmetic and Geometric	a3 n2	a4 n3	m3
B. Recursive sequences	a4 g1	a3 n2	g3 n3
C. Arithmetic and Geometric series	a4 n2 p3	a3 n3	m3
D. Infinite sequences and series	a4 a2 n1	a3 m3 n3	ns3 n2
E. Sigma notation	a4 n3	a3	n2
F. Math Induction	a4 m3	ns3 n2	a3 n3

## 13. Matrices

A. Sum, difference, product, and scalar product of matrices	a4 n3	a3 a1	m3
B. Matrix inverse	a2 m3	a3 n2.1	a4 n3
C. Communication, Transition, and Transformation matrices	a4 g2 s1	a3 n3	g1

## 15. Combinatorics and probability

A. Venn Diagrams, multiplication, addition and complement principles	ns3 m3	a3 n3	g1. s1
B. Permutations and combinations	m3 a4	n3	a3
C. Binomial Theorem	g1	a3	

## 16. Statistics

A. Tables, Graphs, and Averages	a3 s1	a1 s2	a4
B. Box Whisker Plots	n2 a4 s1	n3 a3 s2	

C. Variability and the Normal Distribution	$\sigma^2$	$\sigma$	S1
D. Sampling, Confidence Intervals and Polls	$\mu$	$\sigma$	$\sigma^2$

**Assessments**

- Daily participation
- Daily work; homework
- Projects
- Tests
- Rubrics
- Ongoing informal teacher assessment

**Instructional Delivery**

- Cooperative groups
- Research
- Technology integration
- Critical thinking processes
- Authentic tasks
- Student presentations
- Large and small group discussion
- Process writing

**Materials**

- Textbooks
- Technology [calculators]
- Lab equipment

# Pre-Calculus

This outline of topics is intended to indicate the scope of the course, but it is not necessarily the order in which the topics are to be taught.

## **I. Functions and their Graphs**

Lines in plane  
Functions  
Graphs of functions  
Shifting, reflecting and stretching graphs  
Combining functions  
Inverse functions  
Linear Modeling and Scatter Plots

## **II. Polynomial and Rational Functions**

Quadratic functions  
Polynomial functions  
Zeroes of polynomials  
Complex numbers  
Fundamental Theorem of Algebra  
Rational functions and asymptotes  
Graphs of rational functions  
Quadratic modeling

## **III. Exponential and Logarithmic Functions**

Exponential functions  
Logarithmic functions  
Algebraic properties of logarithms  
Solving exponential and logarithmic equations  
Exponential and logarithmic modeling

## **IV. Linear Systems**

Solving systems of equations  
Systems of linear equations in two variables  
Multivariable linear systems

## **V. Trigonometric Functions**

Radian and degree measure  
Trigonometric functions using the Unit Circle  
Right triangle trigonometry  
Trigonometric functions of any angle  
Graphs of sine and cosine function  
Graphs of the other trigonometric functions

Inverse trigonometric functions  
Trigonometric applications and modeling

## **VI. Analytic Trigonometry**

Using fundamental identities  
Verify trigonometric identities  
Solving trigonometric equations  
Sum and difference formulas  
Multiple angle formulas

## **VII. Applications of Trigonometry**

Law of sines  
Law of cosines  
Vectors in the plane  
Vectors and dot products  
Trigonometric form of complex number

## **VIII. Sequences and Series**

Sequences and series  
Arithmetic sequences and partial sums  
Geometric sequences and series  
The Binomial Theorem

## **IX. Other Coordinate Systems**

Parametric equations  
Polar coordinates  
Graphs of polar equations  
The three-dimensional coordinate system  
Vectors in space

## **X. Limit Theory**

Introduction to limits  
Techniques to evaluate limits  
The tangent line problem  
Limits of infinity and limits of sequences

