**Curriculum**

**Algebra II**

**Course Overview**

This course is an in-depth study of algebra, including solutions of quadratic equations, inequalities and word problems, exponential and logarithmic functions, graphing of quadratic relations, fundamentals of trigonometry, study of sequences, binomial expansions, and permutations and combinations.

**Department Standards**

Students will be able to comprehend mathematical concepts.

Students will be able to apply mathematical procedures accurately, efficiently, and appropriately.

Students will be able to formulate, represent, and solve mathematical problems.

Students will develop logical mathematical thought and precise mathematical communication.

**Benchmarks**:

Students will be able to:

demonstrate a basic understanding of algebra;

demonstrate an understanding of functions and relations and their differences

write linear equations and functions;

find the products and factors of polynomials;

define the domain and range of rational expressions;

demonstrate a knowledge of different numbering systems;

use mathematical modeling to solve problems;

demonstrate an understanding of conics and recognize their equations;

solve exponential and logarithmic equations;

recognize patterns and use this recognition to solve problems; and

demonstrate a good understanding of triangle trigonometry.

**Performance Indicators**

First Quarter

Students will be able to:

recognize Real numbers and graph real numbers on a number line;

add, subtract, multiply, and divide real numbers;

solve equations in one variable, translate sentences into algebraic equations, and solving word problems using algebraic equations;

solve inequalities in one variable;

solve conjunctions and disjunctions;

solve word problems by using inequalities in one variable;

solve sentences involving absolute values;

use number lines to obtain equations and inequalities involving absolute value;

use axioms, definitions, and theorems to prove properties of real numbers and theorems about equalities and absolute value;

find and solve problems involving open sentences in two variables;

graph a linear equation in two variables;

find the slope of a line and to graph a line using its slope and a point on the line;

find an equation of a line using various information;

solve systems of linear equations in two variables;

solve problems using systems of equations;

graph linear inequalities in two variables, and systems of such inequalities;

find values of functions and to graph functions;

find equations of linear functions and to apply properties of linear functions

graph relations and to determine when relations are functions;

simplify, add, subtract and multiply polynomials using the laws of exponents;

find the Greatest Common Factor(GCF) and Least Common Multiple(LCM) of integers and monomials;

factor quadratic polynomials by using the GCF, by recognizing special products, and by grouping terms;

use factorizations to solve polynomial equations;

solve problems using polynomial equations;

solve polynomial inequalities;

simplify quotients using laws of exponents;

use scientific notation and significant digits;

simplify rational algebraic expressions;

add, subtract, multiply and divide rational expressions;

simplify complex fractions;

solve equations and inequalities having fractional coefficients; and

solve and use fractional equations.

Second Quarter

Students will be able to:

find roots of real numbers;

simplify expressions involving radicals;

simplify products and quotients of binomials that contain radicals;

solve equations containing radicals;

find and use decimal representations of real numbers;

use the imaginary number, i, to simplify square roots of negative numbers;

add, subtract and multiply complex numbers;

solve quadratic equations by completing the square and the quadratic formula;

determine the nature of the roots of a quadratic equation by using its discriminant;

recognize and solve equations in quadratic form;

graph parabolas and find the vertices and axis of symmetry;

analyze a quadratic function, draw its graph, and find its minimum or maximum value; and

learn the relationship between the roots and coefficients of a quadratic equation and write a quadratic equation or function using information about the roots of the graph.

Third Quarter

Students will be able to:

use mathematical modelling to solve problems involving direct, inverse and joint variation;

divide one polynomial by another;

use synthetic division to divide a polynomial by a first degree binomial;

use the remainder and factor theorems to find factors of polynomials and to solve polynomial equations;

use the Fundamental Theorem of Algebra, conjugate root theorem and Descartes' Rule of Signs to solve higher degree polynomials;

find rational roots of polynomial equations with integral coefficients;

approximate the real roots of a polynomial equation by using its graph;

use linear interpolation to find values not listed in a given table of data;

use the Distance and Midpoint Formulas between two points;

learn the relationship between the centre and radius of a circle and equation of a circle;

learn the relationship between the focus, directrix, vertex and axis of a parabola and the equation of a parabola;

learn the relationship between the centre, foci and intercepts of an elipse and the equation of an ellipse;

learn the relationship between the foci, intercepts and asymptotes of a hyperbola and the equation of a hyperbola;

find an equation of a conic section with centre not at the origin and to identify a conic as a circle, ellipse or hyperbola;

use graphs to determine the number of real solutions of a quadratic system and to estimate the solutions;

use algebraic methods to find exact solutions of quadratic systems.

solve systems of linear equations in three variables;

extend the meaning of exponents to include rational and irrational numbers and to define exponential functions;

find the composite of two given functions and find the inverse of a given function;

define logarithmic functions and learn how they are related to exponential functions;

learn and apply the basic properties of logarithms;

use common logarithms to solve equations involving powers and evaluate with any given base;

use exponential and logarithmic functions to solve growth and decay problems; and

define and use the natural logarithm function.

Fourth Quarter

Students will be able to:

determine whether a sequence is arithmetic, geometric or neither and to supply missing terms of a sequence;

find the formula for the nth term and use this to find specified terms of an arithmetic sequence;

find the formula for the nth term and use this to find specified terms of a geometric sequence;

identify series and use sigma notation;

find sums of finite arithmetic and geometric series;

find sums of infinite geometric series having ratios with absolute value less than 1;

use the binomial theorem to find a particular term of a binomial expansion;

use degrees to measure angles;

define trigonometric functions of acute angles;

define trigonometric functions of general angles;

use a calculator to find values of trigonometric functions;

find the sides and angles of a right triangle;

use the Law of Cosines to find sides and angles of triangles;

use the Law of Sines to find sides and angles of triangles;

solve any given triangle;

apply triangle area formulas;

use radians to measure angles;

define the circular functions;

use periodicity and symmetry in graphing functions;

graph the sine, cosine and related functions; and

evaluate expressions involving the inverse cosine and inverse sine.

**Assessments**

First Quarter

Daily assignments

Quizzes

Chapter Tests

Second Quarter

Daily assignments

Quizzes

Chapter Tests

Two hour Semester One Exam

Third Quarter

Daily assignments

Quizzes

Chapter Tests

Fourth Quarter

Daily assignments

Quizzes

Chapter Tests

Two hour Semester Two Exam

**Core Topics**

First Quarter

Basic concepts of Algebra I

Open sentences in one and two variables

Polynomials

Rational expressions

Second Quarter

Irrational and complex numbers

Quadratic functions

Variation and polynomial equations

Third Quarter

Conic sections

Exponential and logarithmic functions

Fourth Quarter

Sequences and series

Triangle trigonometry

Trigonometric graphs

**Specific Content**

First Quarter

The Language of Algebra

Operating with Real Numbers

Solving Equations and Solving Problems

Working with Inequalities

Working with Absolute Value

Proving Theorems

Linear Equations and their graphs

Linear Systems

Functions and relations

Working with Polynomials

Factors of Polynomials

Applications of factoring

Using the Laws of Exponents

Rational Expressions

Problem Solving using Fractional Equations

Second Quarter

Roots and Radicals

Real and Complex Numbers

Solving Quadratic Equations

Roots of Quadratic Equations

Quadratic Functions and their Graphs

Third Quarter

Variation and Proportion

Polynomial Equations

Solving Polynomial Equations

Circles and Parabolas

Ellipses and Hyperbolas

Systems of Equations

Exponential Functions

Logarithmic Functions

Applications of Exponential and Logarithmic Equations

Fourth Quarter

Sequences

Series

Binomial Expansion

Trigonometric Functions

Triangle Trigonometry

Circular Functions and their Graphs

Trigonometric Identities

Inverse Functions

**Resources**

Textbook: *Algebra and Trigonometry Structure and Method Book 2* by Brown, Dolciani, Sorgenfrey, and Kane published by McDougal Littell

TI-84(plus) Graphic Calculator

<http://www.glencoe.com/sec/math/algebra/algebra2/algebra2_05/>

SMART Board tools

Desmos Graphing Program

GeoGebra