Mathematics III, Semester A

Credits: 0.5

Course Overview and Goals

Mathematics III, Semester A, is a single-semester course in which you will pull together and apply skills and concepts from the previous Mathematics courses. You will begin by focusing on how expressions and functions can model relationships. The course has a concentrated focus on polynomial, radical, and rational functions, so you will expand your arithmetic skills to include polynomial, radical, and rational expressions and equations. You will analyze their key features with tables, graphs, and equations when they are in function form. You will also investigate and measure surface area and volume of geometric solids, applying what you discover to model and solve real-world problems.

By the end of this course, you will be able to do the following:

❖ Model and solve with expressions, equations, inequalities, and functions.
❖ Rewrite polynomial expressions to prove identities and theorems.
❖ Apply properties of complex numbers to quadratic solutions and polynomial identities.
❖ Analyze polynomial functions, apply the remainder theorem, and identify zeros and factorizations in real and complex forms.
❖ Apply geometric concepts to solve real-world and mathematical problems.
❖ Solve polynomial, radical, and rational equations by using graphs, tables, and algebraic techniques.
❖ Find and verify inverse functions.
❖ Model relationships and data with functions, and use the models to make predictions and interpret results.
❖ Interpret the key features of polynomial, radical, and rational functions using multiple representations.

Scope and Sequence

This document outlines the design of Mathematics III, Semester A, as well as the coverage of the Common Core State Standards: Mathematics within the course.

Common Core State Standards: Mathematics

UNIT 1: FOUNDATIONS OF ALGEBRA (DAYS 1 – 13)

In this unit, you will write expressions, equations, inequalities, and functions to model relationships and solve problems.

Lesson/*CCSS Standards*	Lesson Objective
Syllabus and Orientation	Review the Student Orientation and Course Syllabus at the beginning of this course.
Expressions *CCSS.Math.Content.HSA-APR.A.1,* *CCSS.Math.Content.HSA-SSE.A.1.a,* *CCSS.Math.Content.HSA-SSE.A.2*	Rewrite expressions in equivalent forms.
Equations and Inequalities *CCSS.Math.Practice.MP.4,* *CCSS.Math.Content.HSA-CED.A.1,* *CCSS.Math.Content.HSA-CED.A.3*	Write and solve equations and inequalities that model relationships.
Clarifying Big Ideas: Algebra and Reasoning	Consider ways to justify solutions. Explore the difference between showing a procedure and showing your thinking.
Functions *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.4,* *CCSS.Math.Content.HSF-IF.B.5,* *CCSS.Math.Content.HSF-IF.C.7.e*	Use a function to model and analyze a relationship between two quantities.
Unit Activity *CCSS.Math.Practice.MP.1,* *CCSS.Math.Content.HSA-SSE.A.1.a,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSA-CED.A.3,* *CCSS.Math.Content.HSF-IF.B.5*	Write expressions and equations to model situations and use them to solve problems.

UNIT 2: POLYNOMIAL RELATIONSHIPS (DAYS 14 – 34)

In this unit, you will perform arithmetic operations on polynomials, factor polynomials, and use polynomial expressions to prove theorems. You will also explore the properties of complex numbers and investigate graphs and key features of polynomial functions.

Lesson/*CCSS* Standards	Lesson Objective
Arithmetic with Polynomials *CCSS.Math.Practice.MP.1,* *CCSS.Math.Content.HSA-APR.A.1*	Add, subtract, and multiply polynomial expressions.
Clarifying Big Ideas: Variables	Investigate the power of variables.
Factoring Polynomials *CCSS.Math.Practice.MP.7,* *CCSS.Math.Content.HSA-SSE.A.2*	Factor polynomials using algebraic methods and identify special products.
Division with Polynomials *CCSS.Math.Content.HSA-APR.B.2,* *CCSS.Math.Content.HSA-APR.D.6*	Use division techniques to factor polynomials.
Polynomial Identities *CCSS.Math.Practice.MP.2,* *CCSS.Math.Practice.MP.7,* *CCSS.Math.Content.HSA-APR.C.4,* *CCSS.Math.Content.HSA-APR.C.5,* *CCSS.Math.Content.HSA-SSE.A.1.a*	Rewrite polynomial expressions to prove identities and theorems.
Factors, Zeros, and Solutions of Polynomial Equations *CCSS.Math.Practice.MP.7,* *CCSS.Math.Content.HSN-CN.C.8,* *CCSS.Math.Content.HSN-CN.C.9,* *CCSS.Math.Content.HSA-APR.B.3,* *CCSS.Math.Content.HSA-SSE.A.2,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.4,* *CCSS.Math.Content.HSF-IF.B.5*	Investigate how the solutions of a polynomial equation are related to the graph of the corresponding function.

Lesson/*CCSS Standards*	Lesson Objective
Graphing Polynomial Functions *CCSS.Math.Practice.MP.5,* *CCSS.Math.Content.HSA-APR.B.3,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.4,* *CCSS.Math.Content.HSF-IF.B.5,* *CCSS.Math.Content.HSF-IF.C.7.c,* *CCSS.Math.Content.HSF-IF.C.8*	Analyze key features of polynomial functions algebraically and graphically.
Unit Activity *CCSS.Math.Practice.MP.1,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSA-CED.A.3,* *CCSS.Math.Content.HSF-IF.B.4,* *CCSS.Math.Content.HSF-IF.C.7.c*	Analyze the graphs and equations of polynomial functions.

UNIT 3: GEOMETRIC MODELING (DAYS 35 – 47)

In this unit, you will relate plane and solid figures as you investigate cross sections of solids and rotations of plane figures. You will apply your understanding of plane figures to model prisms, pyramids, cylinders, cones, and spheres.

Lesson/*CCSS Standards*	Lesson Objective
Two- and Three-Dimensional Objects *CCSS.Math.Practice.MP.5,* *CCSS.Math.Practice.MP.7,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSG-MG.A.1*	Apply understanding of two-dimensional figures to create the net of a three-dimensional figure and find its surface area and volume.
Cross Sections of Three-Dimensional Objects *CCSS.Math.Practice.MP.7,* *CCSS.Math.Content.HSG-GMD.B.4*	Describe two-dimensional figures that result from slicing three-dimensional figures and identify three-dimensional objects generated by rotations of two-dimensional objects.
Clarifying Big Ideas: Relationships in Three-Dimensional Figures	Recognize and make use of relationships shown in three-dimensional figures.

Lesson/*CCSS* Standards	Lesson Objective
Modeling with Two- and Three-Dimensional Figures *CCSS.Math.Practice.MP.4,* *CCSS.Math.Content.HSA-CED.A.4,* *CCSS.Math.Content.HSG-MG.A.1,* *CCSS.Math.Content.HSG-MG.A.2,* *CCSS.Math.Content.HSG-MG.A.3*	Apply area and volume concepts to model real-world situations.
Conic Sections *CCSS.Math.Content.HSG-GMD.B.4,* *CCSS.Math.Content.HSG-MG.A.1*	Identify parabolas and circles as cross sections of cones and graph them using the equation.

UNIT 4: RADICAL RELATIONSHIPS (DAYS 48 – 59)

In this unit, you will explore radical functions, analyze key features of those functions, and use them to solve problems.

Lesson/*CCSS* Standards	Lesson Objective
Rational Exponents and Radicals *CCSS.Math.Practice.MP.7,* *CCSS.Math.Content.HSA-SSE.A.1.b,* *CCSS.Math.Content.HSF-IF.C.8*	Rewrite radical expressions and expressions with rational exponents.
Clarifying Big Ideas: Algebra Procedures	Create problems and find solutions, investigate a variety of solution methods, and re-evaluate misunderstandings about "the right way" to solve problems.
Writing and Solving Radical Equations *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSA-CED.A.3,* *CCSS.Math.Content.HSA-CED.A.4,* *CCSS.Math.Content.HSA-REI.A.2,* *CCSS.Math.Content.HSF-IF.B.5*	Write and solve radical equations in one variable and determine the validity of solutions algebraically and graphically.

Lesson/*CCSS* Standards	Lesson Objective
Graphs of Radical Functions *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.4,* *CCSS.Math.Content.HSF-IF.B.5,* *CCSS.Math.Content.HSF-IF.C.7.b,* *CCSS.Math.Content.HSF-BF.B.3*	Analyze key features of radical functions algebraically and graphically.
Unit Activity: Radical Functions *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSA-CED.A.4,* *CCSS.Math.Content.HSF-IF.C.7.b*	Use radical functions to solve problems algebraically and graphically.

UNIT 5: FUNCTION CONCEPTS (DAYS 60 – 72)

In this unit, you will examine transformations and inverses of functions. You will also model data sets and use the models to solve problems.

Lesson/*CCSS* Standards	Lesson Objective
Power Functions *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.5,* *CCSS.Math.Content.HSF-IF.C.7.b,* *CCSS.Math.Content.HSF-IF.C.7.c,* *CCSS.Math.Content.HSF-BF.B.3*	Identify and perform transformations on power functions.
Inverses of Functions *CCSS.Math.Practice.MP.2,* *CCSS.Math.Content.HSA-CED.A.4,* *CCSS.Math.Content.HSF-IF.B.5,* *CCSS.Math.Content.HSF-BF.B.4.a*	Find the inverse of a function algebraically and graphically.
Modeling Data with Functions *CCSS.Math.Practice.MP.4,* *CCSS.Math.Practice.MP.5,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.4*	Model data sets with linear, quadratic, and square root equations and use the models to solve problems.
Unit Activity: Function Concepts *CCSS.Math.Practice.MP.2,* *CCSS.Math.Content.HSF-IF.C.9*	Compare key features of functions using multiple representations.

UNIT 6: RATIONAL RELATIONSHIPS (DAYS 73 – 90)

In this unit, you will perform operations on rational expressions and use them to solve problems. You will also analyze key features of rational functions and use them to model real-world relationships.

Lesson/*CCSS* Standards	Lesson Objective
Multiplying and Dividing Rational Expressions *CCSS.Math.Content.HSA-APR.D.7,* *CCSS.Math.Content.HSA-SSE.A.1.a,* *CCSS.Math.Content.HSA-SSE.A.1.b*	Multiply and divide rational expressions.
Adding and Subtracting Rational Expressions *CCSS.Math.Content.HSA-APR.D.7,* *CCSS.Math.Content.HSA-SSE.A.1.a,* *CCSS.Math.Content.HSA-SSE.A.1.b,* *CCSS.Math.Content.HSA-CED.A.3*	Add and subtract rational expressions.
Writing and Solving Rational Equations *CCSS.Math.Practice.MP.1,* *CCSS.Math.Content.HSA-SSE.A.1.a,* *CCSS.Math.Content.HSA-CED.A.1,* *CCSS.Math.Content.HSA-CED.A.3,* *CCSS.Math.Content.HSA-REI.A.2*	Write and solve rational equations in one variable and determine the validity of solutions.
Variation Equations *CCSS.Math.Practice.MP.1,* *CCSS.Math.Practice.MP.3,* *CCSS.Math.Content.HSA-CED.A.1,* *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSA-CED.A.3,* *CCSS.Math.Content.HSA-CED.A.4*	Represent and solve problems involving direct and inverse variation.
Graphing Rational Functions *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSF-IF.B.4,* *CCSS.Math.Content.HSF-IF.B.5,* *CCSS.Math.Content.HSF-BF.B.3*	Analyze key features of rational functions algebraically and graphically.

Lesson/*CCSS* Standards	Lesson Objective
Unit Activity: Rational Relationships *CCSS.Math.Content.HSA-CED.A.2,* *CCSS.Math.Content.HSA-CED.A.4,* *CCSS.Math.Content.HSF-BF.B.4.a*	Rewrite and solve rational equations modeling real-world relationships.

Course Map

You will achieve course level objectives by completing each lesson's instruction, assignments, and assessments. For a detailed look at how the materials meet these objectives, review the course map for Semester B.