Common Core State Standards

Algebra II

Traditional Pathway

Program Overview

BW WALCH

This program was developed and reviewed by experienced math educators who have both academic and professional backgrounds in mathematics. This ensures: freedom from mathematical errors, grade level appropriateness, freedom from bias, and freedom from unnecessary language complexity.

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Contents of Program Overview

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Introduction

The *Common Core State Standards Traditional Pathway: Algebra II Program* is a complete set of materials developed around the Common Core State Standards, the CCSS curriculum map in Appendix A, and the Algebra II course descriptions. The components are designed to support students in meeting and exceeding the standards encompassed by the Algebra II course. The program realizes the benefits of exploratory and investigative learning, and employs a variety of instructional models to meet the needs of students across the range of learning styles.

This program realizes the benefits of exploratory and investigative learning and employs a variety of instructional models to meet the learning needs of students with a range of abilities.

The *Common Core State Standards Traditional Pathway: Algebra II Program* includes components that support problem-based learning, instruct and coach as needed, provide practice, and assess students' skills. Instructional tools and strategies are embedded throughout.

The set of unit materials or digital version of the program includes:

- More than 150 hours of lessons, addressing the six units of CCSS TP: Algebra II
- Essential Questions for each instructional topic
- Vocabulary
- Instruction and Guided Practice
- Problem-based Tasks and Coaching questions
- Step-by-step graphing calculator instructions for the TI-Nspire and the TI-83/84
- Station activities to promote collaborative learning and problem-solving skills

Purpose of Materials

The *Common Core State Standards Traditional Pathway: Algebra II Program* has been organized to coordinate with the CCSS Traditional Pathway: Algebra II content map and specifications from Appendix A of the Common Core State Standards.

Each lesson includes activities that offer opportunities for exploration and investigation. These activities incorporate concept and skill development and guided practice, then move on to the application of new skills and concepts in problem-solving situations. Throughout the lessons and activities, problems are contextualized to enhance rigor and relevance.

PROGRAM OVERVIEW
Introduction to the Program

This program includes all the topics addressed in the CCSS Traditional Pathway: Algebra II content map. These include:

- Polynomial Relationships
- Rational and Radical Relationships
- Trigonometric Functions
- Mathematical Modeling of Inverse, Logarithmic, and Trigonometric Functions
- Mathematical Modeling and Choosing a Model
- Inferences and Conclusions from Data

The eight Mathematical Practices described in the Common Core are infused throughout and are as follows:

- CCSS.MP.1: Make sense of problems and persevere in solving them.
- CCSS.MP.2: Reason abstractly and quantitatively.
- CCSS.MP.3: Construct viable arguments and critique the reasoning of others.
- CCSS.MP.4: Model with mathematics.
- CCSS.MP.5: Use appropriate tools strategically.
- CCSS.MP.6: Attend to precision.
- CCSS.MP.7: Look for and make use of structure.
- CCSS.MP.8: Look for and express regularity in repeated reasoning.

Structure of the Teacher Resource

The *CCSS Traditional Pathway: Algebra II Program* is provided as a collection of unit books and an overview book, or in binder format. The materials are completely reproducible. You may also have purchased the *CCSS Traditional Pathway: Algebra II Teacher Resource* in digital format. In this case, electronic "bookmarks" allow you to access the sections quickly and easily. The digital format also facilitates printing and copying student pages.

The Program Overview is the first section. Written for you, this section helps you to navigate the materials, offers several graphic organizers and suggested strategies for their use, and shows how the lessons correlate to the Common Core State Standards and the CCSS Traditional Pathway: Algebra II content map found in Appendix A of the Common Core State Standards.

The remaining materials focus on content, knowledge, and application of the units in the CCSS Traditional Pathway: Algebra II curriculum: Polynomial Relationships; Rational and Radical

Relationships; Trigonometric Functions; Mathematical Modeling of Inverse, Logarithmic, and Trigonometric Functions; Mathematical Modeling and Choosing a Model; and Inferences and Conclusions from Data. The units in the *CCSS Traditional Pathway: Algebra II Program* are designed to be flexible so that you can mix and match activities as the needs of your students and your instructional style dictate.

The Station Activities correspond to the content in the units and provide students with the opportunity to apply concepts and skills, while you have a chance to circulate, observe, speak to individuals and small groups, and informally assess and plan.

Each lesson begins with a pre-assessment and ends with a progress assessment. These allow you to assess students' progress as you move from lesson to lesson, enabling you to gauge how well students have understood the material and to differentiate as appropriate.

Glossary

The Glossary contains vocabulary terms and formulas from throughout the program, organized alphabetically. Each listing provides the term and the definition in both English and Spanish.

Standards Correlations

Each lesson in the *CCSS Algebra II* program was written specifically to address the Common Core State Standards. Each lesson lists the standards covered in all the sub-lessons, and each sub-lesson lists the standards addressed in that particular section. In this section, you'll find a comprehensive list mapping the sub-lessons to the CCSS.

Guide to Common Core State Standards Annotation

As you use this program, you will come across a symbol included with the Common Core standards for some of the lessons and activities. The description of the star symbol is found below, taken verbatim from the Common Core State Standards Initiative website, at www.corestandards.org.

Symbol: ⋆

Denotes: Modeling Standards

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. Specific modeling standards appear throughout the high school standards indicated by a star symbol (⋆).

From http://www.walch.com/CCSS/00006

Symbol: (+)

Denotes: College and Career Readiness Standards

Advanced mathematics standards that are required in higher-level courses such as advanced statistics may also be included in lower-level courses. These additional standards are denoted by (+). According to the Common Core State Standards Initiative, "the evidence concerning college and career readiness shows clearly that the knowledge, skills, and practices important for readiness include a great deal of mathematics prior to the boundary defined by (+) symbols in these standards. Indeed, some of the highest priority content for college and career readiness comes from Grades 6–8."

From http://www.walch.com/CCSS/00004

Connections to Future Courses

This section provides a map between topics introduced in each unit of this course and subsequent courses where each topic is revisited and built upon.

Topic	Lesson number	Title	Standard(s)
Unit 1A: Polynomial Relationships			
Topic A	**Polynomial Structures and Operating with Polynomials**		
	1A.1	Structures of Expressions	A.SSE.A.1a★
	1A.2	Adding and Subtracting Polynomials	A.APR.A.1
	1A.3	Multiplying Polynomials	A.APR.A.1
Topic B	**Operating with Complex Numbers**		
	1A.4	Defining Complex Numbers, i, and i^2	N.CN.A.1
	1A.5	Adding and Subtracting Complex Numbers	N.CN.A.2
	1A.6	Multiplying Complex Numbers	N.CN.A.2
Topic C	**Proving Identities**		
	1A.7	Polynomial Identities	A.SSE.A.1b★ A.SSE.A.2 A.APR.C.4
	1A.8	Complex Polynomial Identities	N.CN.C.8 (+) A.SSE.A.1b★ A.SSE.A.2 A.APR.C.4
	1A.9	The Binomial Theorem	A.SSE.A.1a★ A.SSE.A.1b★ A.SSE.A.2 A.APR.C.4 A.APR.C.5 (+)
Topic D	**Graphing Polynomial Functions**		
	1A.10	Describing End Behavior and Turns	F.IF.C.7c★
	1A.11	The Remainder Theorem	A.APR.B.2
	1A.12	Finding Zeros	A.APR.B.3 N.CN.C.9 (+) F.IF.C.7c★
	1A.13	Solving Quadratic Equations with Complex Solutions	N.CN.C.7 N.CN.C.9 (+)
	1A.14	The Rational Root Theorem	A.APR.B.3
Topic E	**Solving Systems of Equations with Polynomials**		
	1A.15	Solving Systems of Equations Graphically	A.REI.D.11★

Topic	Lesson number	Title	Standard(s)
Topic F	**Geometric Series**		
	1A.18	Geometric Sequences	A.SSE.B.4★
	1A.19	Sum of a Finite Geometric Series	A.SSE.B.4★
	1A.20	Sum of an Infinite Geometric Series	A.SSE.B.4★
Unit 1B: Rational and Radical Relationships			
Topic A	**Operating with Rational Expressions**		
	1B.1	Structures of Rational Expressions	A.SSE.A.1a★ A.SSE.A.1b★ A.SSE.A.2
	1B.2	Adding and Subtracting Rational Expressions	A.APR.D.7 (+) A.SSE.A.2
	1B.3	Multiplying Rational Expressions	A.APR.D.7 (+) A.SSE.A.2
	1B.4	Dividing Rational Expressions	A.APR.D.6 A.APR.D.7 (+) A.SSE.A.2
Topic B	**Solving Rational and Radical Equations**		
	1B.5	Solving Rational Equations	A.REI.A.2
	1B.6	Solving Radical Equations	A.REI.A.2
	1B.7	Solving Systems of Equations	A.REI.D.11★
Unit 2: Trigonometric Functions			
Topic A	**Radians and the Unit Circle**		
	2.1	Radians	F.TF.A.1 F.TF.A.2
	2.2	The Unit Circle	F.TF.A.2
	2.3	Special Angles in the Unit Circle	F.TF.A.2
	2.4	Evaluating Trigonometric Functions	F.TF.A.2
	2.5	Proving a Pythagorean Identity	F.TF.C.8
Topic B	**Graphs of Trigonometric Functions**		
	2.6	Periodic Phenomena and Amplitude, Frequency, and Midline	F.TF.B.5★
	2.7	Using Trigonometric Functions to Model Periodic Phenomena	F.TF.B.5★

Topic	Lesson number	Title	Standard(s)
Unit 3A: Mathematical Modeling of Inverse, Logarithmic, and Trigonometric Functions			
Topic A	**Inverses of Functions**		
	3A.1	Determining Inverses of Quadratic Functions	F.BF.B.4a
	3A.2	Determining Inverses of Other Functions	F.BF.B.4a
Topic B	**Modeling Logarithmic Functions**		
	3A.3	Logarithmic Functions as Inverses	F.BF.B.4a F.LE.A.4★
	3A.4	Common Logarithms	F.IF.C.8 F.LE.A.4★
	3A.5	Natural Logarithms	F.IF.C.8 F.LE.A.4★
	3A.6	Graphing Logarithmic Functions	F.IF.C.7e★
	3A.7	Interpreting Logarithmic Models	F.IF.B.4★ F.IF.B.5★ F.IF.B.6★
Topic C	**Modeling Trigonometric Functions**		
	3A.8	Graphing the Sine Function	F.IF.C.7e★
	3A.9	Graphing the Cosine Function	F.IF.C.7e★
Unit 3B: Mathematical Modeling and Choosing a Model			
Topic A	**Creating Equations**		
	3B.1	Creating Equations in One Variable	A.CED.A.1★
	3B.2	Representing and Interpreting Constraints	A.CED.A.3★
	3B.3	Rearranging Formulas	A.CED.A.4★
Topic B	**Transforming a Model and Combining Functions**		
	3B.4	Transformations of Parent Graphs	F.BF.B.3
	3B.5	Recognizing Odd and Even Functions	F.BF.B.3
	3B.6	Combining Functions	F.BF.A.1b★

Topic	Lesson number	Title	Standard(s)
Topic C	**Comparing Properties Within and Between Functions**		
	3B.7	Reading and Identifying Key Features of Real-World Situation Graphs	F.IF.B.4★ F.IF.B.5★ F.IF.B.6★
	3B.8	Calculating Average Rates of Change	F.IF.B.6★
	3B.9	Comparing Functions	F.IF.B.6★ F.IF.C.9
Topic D	**Choosing a Model**		
	3B.12	Linear, Exponential, and Quadratic Functions	A.CED.A.2★ F.IF.B.4★ F.IF.B.5★ F.BF.B.3
	3B.13	Piecewise, Step, and Absolute Value Functions	F.IF.B.4★ F.IF.B.5★ F.IF.C.7b★ F.BF.B.3
	3B.14	Square Root and Cube Root Functions	F.IF.B.4★ F.IF.B.5★ F.IF.C.7b★ F.BF.B.3
Unit 4: Inferences and Conclusions from Data			
Topic A	**Using the Normal Curve**		
	4.1	Normal Distributions and the 68–95–99.7 Rule	S.ID.A.4★
	4.2	Standard Normal Calculations	S.ID.A.4★
	4.3	Assessing Normality	S.ID.A.4★
Topic B	**Populations Versus Random Samples and Random Sampling**		
	4.4	Differences Between Populations and Samples	S.IC.A.1★
	4.5	Simple Random Sampling	S.IC.A.2★
	4.6	Other Methods of Random Sampling	S.IC.A.2★
Topic C	**Surveys, Experiments, and Observational Studies**		
	4.7	Identifying Surveys, Experiments, and Observational Studies	S.IC.B.3★
	4.8	Designing Surveys, Experiments, and Observational Studies	S.IC.B.3★

Topic	Lesson number	Title	Standard(s)
Topic D	**Estimating Sample Proportions and Sample Means**		
	4.9	Estimating Sample Proportions	S.IC.B.4★
	4.10	The Binomial Distribution	S.IC.B.4★
	4.11	Estimating Sample Means	S.IC.B.4★
	4.12	Estimating with Confidence	S.IC.B.4★
Topic E	**Comparing Treatments and Reading Reports**		
	4.13	Evaluating Treatments	S.IC.B.5★
	4.14	Designing and Simulating Treatments	S.IC.B.5★
	4.15	Reading Reports	S.IC.B.6★
Topic F	**Making and Analyzing Decisions**		
	4.16	Making Decisions	S.MD.B.6★ (+)
	4.17	Analyzing Decisions	S.MD.B.7★ (+)