

Algebra B Syllabus



Course Summary

This course is meant for students ages 12 to 15 who have completed, at a minimum, the Common Core (or equivalent) curriculum for Grade 8, Algebra 1 or an Introductory Algebra coursework. Students will be exposed to the Focus Areas section listed below, and we expect students to master the skills listed in the Expected Outcomes section listed below.

Focus Areas at this Level

Concepts, skills, and learning tools students see in this course include, but are not limited to:

- **Elementary functions:** polynomials, exponents & logarithms, quadratics and conics, trigonometric
- **Graphing and manipulations of functions:** polynomial division, polynomial roots, factoring multivariable polynomials, piecewise functions
- **Number theory:** complex numbers, sequences & series, binomial theorem

Expected Outcomes

Students will be **expected to adequately perform in or explain** the following areas after course completion:

- Write and manipulate expressions and equations in equivalent forms to solve problems
- Perform arithmetic operations on polynomials
- Understand the relationship between zeros and factors of polynomials
- Use polynomial identities to solve problems
- Understand and solve equations involving exponents and logarithms
- Solve systems of linear and nonlinear equations
- Represent and solve equations and inequalities graphically
- Define, evaluate, and compare functions
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres

Pre Requisites

Students registering for this course should be **comfortable with the following Math:**

- Algebra 1, Introductory Algebra or equivalent
- Arithmetic with positive and negative numbers, fractions, and decimals
- Arithmetic operations with variables
- Solving linear equations and systems of equations
- Factoring quadratic equations
- Manipulations of exponents and radicals
- Arithmetic by hand with at least 6-digit numbers
- Drawing and graphing points on a Cartesian plane

Students should also be **willing and able to:**

- Communicate in English
- Be respectful of other students in their classes
- Practice writing things down on paper
- Share their thoughts with the instructors to help them discover solutions to their problems

- Take constructive criticism when it comes to their learning habits

Course Materials (Required)

- All classes will be taught online, via [Zoom](#). Your student will need a device with a microphone and camera.
- Homework will be assigned via the textbook:
 - [The Art of Problem Solving: Intermediate Algebra](#) by Richard Rusczyk and Mathew Crawford
 - Purchasable here: <https://artofproblemsolving.com/store> ; **Mandatory purchase** required
 - Physical or eBook contain the same problems
- Parents are expected to have read and understood the online Parent Handbook
 - Parents should review the expectations in class with their student(s)
 - Parents of this age group will need to help their students learn the technology used on the student's end

Students should also have access to:

- Calculator with x^2 and x^y (at a minimum)
- Paper (graph paper preferred), Pencils and Erasers
- Colored pencils or markers
- Reliable internet connection and digital device

Homework Expectations

Homework at EMC is set up to be flexible for the needs of your student. Usually we feel students fall into three general categories:

- EMC is **replacing public school or** accelerating my student for **testing out of Math** in the future
 - All Homework is **mandatory**
- EMC is helping **improve my grades or skills**
 - Homework is **highly recommended**, we recommend concentrating on school homework first
- EMC is for **interest's sake** and/or for **exposure** to problem solving **before seeing it in school**
 - Homework is **recommended, yet optional**

Homework Delivery

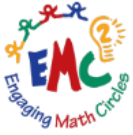
Homework is delivered in a two main ways:

- **Practice Homework**
 - Assigned through the Art of Problem Solving (AoPS) Textbook
 - PDFs of our lesson slides are posted weekly and include extra questions not assigned
 - AoPS has challenging questions and an alternate learning style compared to EMC, outlined below:
 - Problem Section
 - Questions designed to teach, read all these solutions if you're self-paced learning outside of the class times
 - Exercises
 - Questions to demonstrate understanding of the content ; we recommend not reading these solutions until after you have your first answer or get completely stuck
- **Assessment Homework** (aka Quizzes, Tests)
 - Canvas, set of questions to show instructors a student's understanding of the content
 - Auto-graded upon submission

- Instructors adjust grades after seeing results to give partial marks where appropriate, and plan to cover certain problem areas in the Homework Check portion of next class

Course Calendar

On yellow dates on the calendar below, no classes are held. Some days of the week (Sat, Sun, Mon) have less classes per year. These courses will have slightly condensed in-class schedules, and your instructor will let you know which homework assignments to do each week.



EMC SCHOOL

2026-2027 School Calendar

August 2026						
M	Tu	W	Th	F	Sa	Su
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

September 2026						
M	Tu	W	Th	F	Sa	Su
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

October 2026						
M	Tu	W	Th	F	Sa	Su
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

November 2026						
M	Tu	W	Th	F	Sa	Su
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

December 2026						
M	Tu	W	Th	F	Sa	Su
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

January 2027						
M	Tu	W	Th	F	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February 2027						
M	Tu	W	Th	F	Sa	Su
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March 2027						
M	Tu	W	Th	F	Sa	Su
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April 2027						
M	Tu	W	Th	F	Sa	Su
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May 2027						
M	Tu	W	Th	F	Sa	Su
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June 2027						
M	Tu	W	Th	F	Sa	Su
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

 First and Last Day of School
 School Holidays & Vacations

Aug 17 First Day of Classes
 Sep 5 - 7 Labor Day Weekend - No Classes
 Nov 23 - 29 Thanksgiving Week - No Classes
 Dec 21 - Jan 3 Winter Break - No Classes

Apr 12 - 18 Spring Break - No Classes
 May 29 - 31 Memorial Day - No Classes
 Jun 13 Last Day of School

Course Itinerary

EMC Chapter	Lesson	Class Dates	AoPS Homework Assigned
Chapter 1: Functions	1) Intro-function	Aug 17- Aug 23	Read and review all of Chapter 1: Basic Techniques for Solving Eqns 2.1 Functions Basics: 2.1.1 to 2.1.4 2.2 Graphing Functions: 2.2.1 to 2.2.3
	2) Inverse Functions	Aug 24 - Aug 30	2.3 Composition: 2.3.1 to 2.3.5 2.4 Inverse Functions: 2.4.1 to 2.4.4 Ch.2 Review & Challenge: 2.25, 2.26, 2.27, 2.45, 2.46
Chapter 2: Complex Numbers	3) What is Complex?	Aug 31 - Sept 6 OFF Sat Sept 5, Sun Sept 6 Labor Day	3.1 Arithmetic of Complex No.: 3.1.1 to 3.1.6 3.3 Real & Imaginary Parts: 3.3.3, 3.3.4, 3.3.6
	4) The Complex Plane	Sept 7 - Sept 13 OFF Mon Sept 7 Labor Day	3.2 Complex Plane: 3.2.1 to 3.2.6 3.4 Graphing in Complex Plane: 3.4.1 to 3.4.3
	5) Applying Conjugates	Sept 14 - Sept 20	Ch.3 Review & Challenge: 3.23, 3.27, 3.28, 3.33, 3.35
Chapter 3: Quadratics	6) What is a Quadratic again?	Sept 21 - Sept 27	4.1 Factoring Quadratics: 4.1.1 to 4.1.3 4.2 Relating Roots & Coeff.: 4.2.1 to 4.2.4
	7) The Quadratic Formula	Sept 28 - Oct 4	4.3 Completing the Square: 4.3.1 to 4.3.4 4.4 The Discriminant: 4.4.1 to 4.4.6
	8) Quadratic Inequalities	Oct 5 - Oct 11	4.5 Quadratic Inequalities: 4.5.1 to 4.5.4 Ch.4 Review & Challenge: 4.25 to 4.28
Chapter 4: Conics	9) What is a Parabola?	Oct 12 - Oct 18	5.1 Parabolas: 5.1.1 to 5.1.4 5.2 Problem Solving: 5.2.1 to 5.2.3
	10) Max/Min	Oct 19 - Oct 25	5.3 Maxima & Minima: 5.3.1 to 5.3.4
	11) Ellipses	Oct 26 - Nov 1	5.4 Circles: 5.4.1 to 5.4.2 5.5 Ellipses: 5.5.1 to 5.5.4
	12) Hyperbola	Nov 2 - Nov 8	5.6 Hyperbolas: 5.6.1 to 5.6.4 Ch.5 Review & Challenge: 5.35, 5.37, 5.40, 5.42, 5.45
Chapter 5: Polynomials	13) What is a Polynomial again?	Nov 9 - Nov 15	6.1 Polynomial Review: 6.1.1 to 6.1.4

	14) Synthetic Division	Nov 16 - Nov 22	6.2 Intro to Polynomial Division: 6.2.1 to 6.2.4 6.3 Synthetic Division: 6.3.1 to 6.3.5 6.4 Remainder Theorem: 6.4.1 to 6.4.3
Holiday	Thanksgiving	OFF Nov 23 - Nov 29	Have a great week!
Chapter 6: Polynomial Roots	15) The Factor Theorem	Nov 30 - Dec 6	7.1 The Factor Theorem: 7.1.1 to 7.1.5 7.2 Integer Roots: 7.2.1 & 7.2.2
	16) Roots Bounds and Graphs	Dec 7 - Dec 13	7.3 Rational Roots: 7.3.1 & 7.3.2 7.4 Bounds: 7.4.1 & 7.4.2
17) Midterm Review		Dec 14 - Dec 20	• Review of Chapters 1 through 5
Holiday	Winter Break	OFF 2 WEEKS Dec 21 - Jan 3	Have a great break!
Chapter 6: Polynomial Roots	18) The Fundamental Theorem of Algebra	Jan 4 - Jan 10	7.5 Graphing & The Fundamental Thm of Algebra: 7.5.1 to 7.5.4 Ch.7 Review & Challenge: 7.30, 7.32, 7.34, 7.47, 7.48
	19) Weird Roots	Jan 11 - Jan 17	8.1 Irrational Roots: 8.1.1 to 8.1.4 8.2 Nonreal Roots: 8.2.1 to 8.2.5 8.4 Using Roots to Make Eqs: 8.4.1 & 8.4.2
Chapter 7: Multivariable Polynomials	20) Grouping, Sums & Diff of Powers	Jan 18 - Jan 24	9.1 Grouping: 9.1.1 to 9.1.7 9.2 Sums & Diff. of Powers: 9.2.1 to 9.2.7
	21) Factor Theorem II	Jan 25 - Jan 31	9.3 The Factor Thm for Multivariable Polynomials Ch.9 Review & Challenge: 9.22, 9.24, 9.29, 9.30, 9.40, 9.43, 9.48 & 9.51
Chapter 8: $x =$ (Sums Sequences and Series)	22) Arithmetic x	Feb 1 - Feb 7	10.1 Arithmetic Sequences: 10.1.1 to 10.1.5 10.2 Arithmetic Series: 10.2.1 to 10.2.5
	23) Geometric x	Feb 8 - Feb 14	10.3 Geometric Sequences: 10.3.1 to 10.3.5 10.4 Geometric Series: 10.4.1 to 10.4.5
	24) Sigma Notation	Feb 15 - Feb 21	10.5 Sequences, Summation, Product Notation: 10.5.1 to 10.5.6 10.6 Nested Sums: 10.6.1 to 10.6.3 Ch.10 Review & Challenge: 10.41, 10.42, 10.45, 10.66, 10.69

	25) The Binomial Theorem	Feb 22 - Feb 28	11.1 Brute Force: 11.1.1 & 11.1.2 *Skip 11.2-11.3 (Ratios and Induction) 11.4 Binomial Theorem: 11.4.1, 11.4.2, & 11.4.4
Chapter 9: Exponentiation	26) Exponential vs Logarithmic	Mar 1 - Mar 7	13.1 Exponential Functions Basics: 13.1.1, 13.1.2, & 13.1.5 13.2 Intro to Logarithms: 13.2.1 to 13.2.4
27) Spring Review		Mar 8 - Mar 14	<ul style="list-style-type: none"> • Review of Chapters 6 through 8 • Math Map Where does this go?
Chapter 9: Exponentiation	28) Logarithm Identities	Mar 15 - Mar 21	13.3 Logarithm Identities: 13.3.1 to 13.3.5
	29) Manipulating Logarithms	Mar 22 - Mar 28	13.4 Using Log Identities: 13.4.1 to 13.4.3 13.5 Switching between Logs and Exponents: 13.5.1 to 13.5.4
	30) e and Natural Logarithms	Mar 29 - Apr 4	13.6 Natural Log & Exp .Decay: 13.6.1 to 13.6.6 Ch.13 Review & Challenge: 13.39, 13.43, 13.51, 13.57
Chapter 10: Special $y =$ (Functions)	31) Rational y	Apr 5 - Apr 11	<i>*NOTE: We skipped Ch.14, it will be covered in Pre-Calculus</i> 15.1 Rational Functions & Graphs: 15.1.1 to 15.1.3 15.2 Rational Functions & Inequalities: 15.2.1 to 15.2.4
Holiday	Spring Break	OFF Apr 12 - Apr 18	Have a great week!
Chapter 10: Special $y =$ (Functions)	32) Even/Odd, & Monotonic y	Apr 19 - Apr 25	15.3 Even & Odd Functions: 15.3.1 to 15.3.4 15.4 Monotonic Functions: 15.4.1 to 15.4.4
	33) Jagged y	Apr 26 - May 2	16.1 Intro to Piecewise Functions: 16.1.1 to 16.1.4 16.2 Absolute Value: 16.2.1 & 16.2.4
	34) Floor & Ceiling y	May 3 - May 9	16.3 Graphing Ab.Value: 16.3.1, 16.3.2, 16.3.3, & 16.3.5 16.4 Floor & Ceiling: 16.3.1, 16.4.2, 16.4.4, & 16.4.5
Chapter 11: Trigonometry	35) Right Angle Triangles	May 10 - May 16	EMC provided homework Introduction to Trigonometry Concepts like similarity, the Pythagorean theorem, and introducing foundations for trig ratios
	36) SOH CAH TOA	May 17 - May 23	EMC provided homework Solving for missing side lengths using trig functions

	37) Unit Circles and Radians	May 24 - May 30 OFF Sat Sun May 29 and 30 Memorial Day	EMC provided homework Using trig information to understand the definition of radians and equate values with degrees
	38) Graphing Trig Functions	May 31 - June 6 OFF Mon May 31 Memorial Day	EMC provided homework Introduce inverse trig functions and focus on graphing sin, cos, tan, arctan, arcsin, arccos
39) Final Review		June 7 - June 13	<ul style="list-style-type: none"> • Review of Chapters 6 through 9