Abington Heights School District
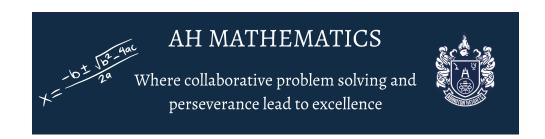# Algebra II Honors Curriculum

In Algebra II Honors, students develop their numeracy skills through the following areas of study:

1. Patterns, Relations, and Functions
2. Applications of Functions
3. Operations with Complex Numbers
4. Non-Linear Expressions
5. Non-Linear Equations
6. Data Analysis

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AH MATHEMATICS

Where collaborative problem solving and perseverance lead to excellence

Abington Heights Math Framework

Stakeholders	Actions
Students	★ Engage in mathematical discussions, share their ideas openly, be inquisitive, seek to understand and learn more about mathematical concepts, and try their best daily. ★ Exhibit creativity and curiosity in problem solving individually and collaboratively. ★ Persevere in engaging and challenging daily mathematical practice. ★ Come prepared to learn every day.
Teachers	★ Create a safe and collaborative classroom environment where students feel vested in a shared vision for mathematical excellence. ★ Develop high quality instruction that meets the needs of all learners through differentiation. ★ Use a variety of 21st century methodologies to advance learning. ★ Partner with parents and guardians to support student success. ★ Establish a collaborative community within the building and amongst grade levels to ensure a cohesive level of instruction.

Building Leaders	★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores
	  ○ Knowledgeable about program and grade level standards
	  ○ Ensure consistent and equal access to high-quality instructional materials and resources, building.
	★ Be partners with teachers, students and families:
	  ○ Provide guidance and support to the mathematical community.
	  ○ Understand needs of teachers, students and families.
	★ Trust the educators to make professional decisions based on program, student, and district needs.

Central Admin	★ Effectively communicate to the school board and community specific areas of need and how to support teachers and building leaders in a quest for mathematical excellence
	★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores
	  ○ Have a common metric for mathematical excellence.
	  ○ Ensure consistent and equal access to high-quality instructional materials and resources, district.
	  ○ Re-examine best practices/curriculum routinely (6 years).
	★ Support a culture of collaboration between the other stakeholder groups to maintain the standard of excellence of the Abington Heights
	★ Trust the educators to make professional decisions based on program, student, and district needs.

Parents/ Community	★ Be a strong support system and contribute by building a positive math community for students. ★ Encourage a positive math mindset. ★ Have conversations with their children about school and ask what they are learning about in school. ★ Be open, receptive to the district's ideas about student learning and reach out to teachers/school to learn more about how they can support. ★ Trust the educators to make professional decisions based on program, student, and district needs.

School Board	★ Provide the fiscal resources to support:
	  ○ Highly qualified professionals for mathematics
	  ○ High-quality instructional materials
	  ○ Effective and efficient math interventions for remediation
	  ○ Professional development for math content and instructional practices
	★ Trust the educators to make professional decisions based on program, student, and district needs.

Algebra II Honors Scope and Sequence

Month	Unit	Estimated Number of Weeks
September	Equations & Inequalities	2
	Linear Equations & Functions, Systems	2
October	Linear Equations & Functions, Systems	3
	Probability	2
November	Probability	1
	Quadratic Functions	2
December	Quadratic Functions	3
January	Quadratic Functions	2
February	Polynomial Functions	3
March	Powers, Roots & Radicals	3
	Exponential & Logarithmic Functions	1
April	Exponential & Logarithmic Functions	2
	Rational Equations & Functions	2
May	Rational Equations & Functions	1
	Conic Sections	3
June	Final Exam Review	1

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
Equations & Inequalities	What are real numbers? What are the order of operations? How do I use the inverse order of operations to solve equations?	Real numbers and number operations Algebraic expressions and models Solving linear equations Solving linear inequalities Solving absolute value equations and inequalities	Properties of real numbers PEMDAS Interval notation Solving linear equations/inequalities Assigning variables	CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10	Section Flipcharts WebWork Class Discussion	Homework Absolute Value Equations & Inequalities WebWork Solving Linear Equations and Inequalities WebWork Chapter 1 Test
Linear Equations & Functions, Systems	What is a function? How do I find the equation given basic information about a line? How do various functions' graphs behave, compare and contrast? How does domain dictate range of piecewise functions?	Functions and their graphs Slope and rate of change Writing equations of lines Correlation and best-fit lines Linear inequalities in two variables Piecewise functions	Graph linear functions Find slope Write linear equations when given various pieces of information (slope, point, two points, parallel/perpendicular relationship) Vertical Line Test	CC.2.1.HS.F.5 CC.2.2.HS.F.7 CC.2.2.HS.D.7 CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3	Sections Flipcharts (skip linear programming) WebWork Graphing Calculator Age Guessing Game Class Discussion "Around the Room" Review	Homework Slope and Linear Functions WebWork Piecewise Functions WebWork Lines and Equations Quiz Scatterplot and Inequalities Quiz Chapter 2 Test

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
Linear Equations & Functions, Systems (continued)		Absolute value functions Solving linear systems Graphing and solving systems of linear inequalities Graphing and solving linear equations in three variables	Understand domain and range Graph absolute value, piecewise and step functions Enter data into the graphing calculator and find regression lines Graph in 3-D Solve 3-variable systems	CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6		Functions Quiz Solving Systems Quiz Chapter 3 Test
Probability	How do you use the fundamental counting principle to count the number of ways an event can happen? What is the difference between permutations and combinations and under what circumstances are they used?	Basic Counting Combinations Permutations Theoretical vs Experimental Probability of an Event	Use formulas to calculate probability Interpret Differences in Scenarios Given Solve for likelihood of events to happen	CC.2.4.HS.B.4 CC.2.4.HS.B.5 CC.2.4.HS.B.6 CC.2.4.HS.B.7	Section Flipcharts WebWork Class Discussion Graphing Calculator Exercises "Around the Room" Review	Homework Combinations & Permutations Quiz Theoretical vs Experimental Quiz Chapter 4 Test

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
Probability (continued)	How do you find theoretical and experimental probabilities?					
Quadratic Functions	How do I solve quadratic equations? What are the elements of a parabola?	Factoring Solving using square roots Complex numbers Completing the square Quadratic Formula Discriminant Quadratic inequalities Modeling quadratic functions	Solve quadratic equations by factoring, taking square roots, completing the square and quadratic formula Utilize the discriminant to determine # of real zeros Use the graphing calculator to find points of interest (vertex, zeros, y-intercepts, values of intersection, etc.) State domain and range	CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.6 CC.2.1.HS.F.7 CC.2.2.HS.D.1 CC.2.2.HS.D.2 CC.2.2.HS.D.5 CC.2.2.HS.D.7 CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6	Section Flipcharts WebWork Completing the Square Real World Problems Packet Graphing Calculator Exercises	Homework Parabolas/Factoring Quiz Solving Quadratic Equations/Complex Numbers Quiz Discriminant/Quadratic Formula Quiz Real World Scenarios Packet Chapter 5 Test

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Polynomial Functions	How can I find the zeros of a polynomial function algebraically / graphically? What are the exponent properties? And how can I use them to simplify?	Properties of exponents Evaluating and graphing polynomial functions Adding, subtracting, multiplying and dividing polynomials Factoring and solving polynomial equations Remainder and factor theorem Finding rational zeros Analyze graphs of polynomial functions Modeling with polynomial functions	Simplify expressions using exponent rules Complete polynomial operations Graph polynomial functions Use the graphing calculator to find points of interest (local min / max, zeros, y-intercepts, values of intersection, etc.) Find zeros (algebraically and graphically) State domain and range	CC.2.1.HS.F.1 CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.7 CC.2.2.HS.D.1 CC.2.2.HS.D.2 CC.2.2.HS.D.3 CC.2.2.HS.D.4 CC.2.2.HS.D.5 CC.2.2.HS.D.7 CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6	Section Flipcharts WebWork Class Discussion Graphing Calculator Exercises "Around the Room" Review	Homework Polynomials WebWork Properties of Exponents Quiz Polynomial Operations Quiz Chapter 6 Test

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Powers, Roots & Radicals	What is an inverse? What is functionally different about the domain of even root vs odd root functions?	*n*th roots & rational exponents Properties of rational exponents Power functions Function operations Inverse functions Graphing square root & cube root functions Solving radical equations	Use properties of rational exponents to simplify expressions Find inverse functions algebraically Graph square root and cube root functions Use the graphing calculator to find points of interest (zeros, y-intercepts, values of intersection, etc.) State domain and range	CC.2.1.HS.F.1 CC.2.1.HS.F.6 CC.2.1.HS.F.7 CC.2.2.HS.D.2 CC.2.2.HS.D.5 CC.2.2.HS.D.7 CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6	Section Flipcharts WebWork Class Discussion Graphing Calculator Exercises	Homework Radicals WebWork Inverse Functions WebWork Radicals/Radical Equations Quiz Inverse Functions Quiz Chapter 7 Test
Exponential & Logarithmic Functions	What does it mean to be exponential?	Exponential Growth & Decay The number *e* Logarithmic functions	Identify growth vs decay functions Use logarithmic properties to simplify expressions	CC.2.1.HS.F.1 CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.7	Section Flipcharts WebWork Class Discussion Graphing Calculator	Homework Exponential Growth & Decay WebWork Properties of Logs WebWork

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Exponential & Logarithmic Functions (continued)	What differs in the equation of exponential growth vs decay functions? What are the properties of logarithms? What is the relationship between logs and exponentials? Can I solve log and exponential equations?	Properties of logarithms Solving exponential & logarithmic equations Modeling with exponential & logarithmic functions	Graph exponential and logarithmic equations Solve exponential and logarithmic equations Use the graphing calculator to find points of interest (zeros, y-intercepts, values of intersection, etc.) State domain and range	CC.2.2.HS.D.5 CC.2.2.HS.D.7 CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6	Exercises Exponential Growth/Decay Lab & Lab Packet "Around the Room" Review	Solving Logarithms WebWork Exponentials Quiz Logarithmic Properties Quiz Chapter 8 Test
Rational Equations & Functions	What is variation? How do I simplify complex fractions?	Inverse & joint variation Graphing rational functions Multiplying and dividing rational expressions Addition, subtraction and complex fractions	Identify direct, inverse and joint variation Graph rational functions Complete operations (add, subtract, multiply and divide) with complex fractions	CC.2.2.HS.D.1 CC.2.2.HS.D.2 CC.2.2.HS.D.3 CC.2.2.HS.D.4 CC.2.2.HS.D.5 CC.2.2.HS.D.6 CC.2.2.HS.D.7	Section Flipcharts WebWork Class Discussion Graphing Calculator Exercises	Homework Simplifying Rational Expressions WebWork Variation/Rational Functions Quiz Complex Fractions WebWork

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
Rational Equations & Functions (continued)		Solving rational equations	Solve rational equations	CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6		Complex Fractions / Solving Rational Expressions Quiz Chapter 9 Test
Conic Sections	What is a conic section? How do I recognize the difference in equations? How do I use the relationship of elements within each conic section to find missing information?	Midpoint and distance formulas Parabolas Circles Ellipses Hyperbolas Graphing and classifying conic sections Solving quadratic systems	Graph conic sections Identify points of interest (vertices, lengths major/minor axis, center, slopes asymptotes, etc) Solve equations of conic sections	CC.2.3.HS.A.10	Section Flipcharts WebWork Class Discussion	Homework Parabolas / Circles WebWork Ellipses / Hyperbolas WebWork Conic Sections Summative WebWork Chapter 10 Test (time depending)

Portrait of an Abington Heights Mathematician

By the end of Algebra II, students will:

Patterns, Relations, and Functions	Applications of Functions	Operations with Complex Numbers	Non-Linear Expressions	Non-Linear Equations	Data Analysis
☐ Analyze a set of data for the existence of a pattern, and represent the pattern with a rule algebraically and/or graphically ☐ Determine the domain, range, or inverse of a relation ☐ Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g. intercepts, zeros)	☐ Create, interpret, and/or use the equation, graph, or table of quadratic, absolute value, piecewise, and step functions ☐ Determine, use, and/or interpret minimum and maximum values over a specified interval of a graph of quadratic, absolute value, piecewise, or step functions ☐ Translate a quadratic, absolute value, piecewise, or step function from one representation of a function to another (graph, table, and equation)	☐ Simplify/write square roots in terms of i ☐ Simplify/evaluate expressions involving powers of i ☐ Add and subtract complex numbers ☐ Multiply and divide complex numbers	☐ Use exponential expressions to represent rational numbers ☐ Simplify/evaluate expressions involving positive and negative exponents and/or roots ☐ Simplify/evaluate expressions involving multiplying with exponents, powers of powers, and powers of products ☐ Simplify or evaluate expressions involving logarithms and exponents ☐ Factor algebraic expressions, including difference of squares and trinomials ☐ Simplify rational algebraic expressions	☐ Write and/or solve quadratic equations (including factoring and using Quadratic Formula) ☐ Solve equations involving rational and radical expressions ☐ Write and/or solve a simple exponential or logarithmic equation ☐ Use algebra processes to solve a formula for a given variable ☐ Identify or describe the effect of changing parameters within a family of functions	☐ Draw, identify, find, interpret, and/or write an equation and make predictions for a linear regression model for a scatter plot ☐ Use combinations, permutations, and the fundamental counting principle to solve problems involving probability ☐ Use odds to find probability and/or use probability to find odds ☐ Use probability for independent, dependent, or compound events to predict outcomes