

Abington Heights School District

Algebra II Curriculum



In Algebra II, 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

Board Approval Date: June 7, 2023

Adoption: 2023 - 2024 SY

Review Date:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

AH MATHEMATICS

Where collaborative problem solving and
perseverance lead to excellence



Abington Heights Math Framework

Stakeholders	Actions
Students	<ul style="list-style-type: none"> ★ 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	<ul style="list-style-type: none"> ★ 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	<ul style="list-style-type: none"> ★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores <ul style="list-style-type: none"> ○ 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: <ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> ★ 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 <ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> ★ 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	<ul style="list-style-type: none"> ★ Provide the fiscal resources to support: <ul style="list-style-type: none"> ○ 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 Scope and Sequence

Month	Unit	Estimated Number of Weeks
September	Tools of Algebra	3
October	Functions, Equations, and Graphs	4
November	Quadratic Equations and Functions	3
December	Quadratic Equations and Functions	3
January	Probability	3
February	Polynomials and Polynomial Functions	4
March	Polynomials and Polynomial Functions	1
	Radical Functions and Rational Exponents	3
April	Radical Functions and Rational Exponents	1
	Exponential and Logarithmic Functions	3
May	Rational Functions	2 1/2
	Conic Sections	1
June	Final Exam Review	1

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Tools of Algebra	<p>What are real numbers?</p> <p>What are the order of operations?</p> <p>How do I use the inverse order of operations to solve equations?</p> <p>How do I solve and graph inequalities?</p> <p>How do I solve absolute value equations/ inequalities?</p> <p>How do I graph absolute value inequalities?</p>	<p>Properties of real numbers</p> <p>Algebraic expressions</p> <p>Solving equations</p> <p>Solving inequalities</p> <p>Absolute value equations and inequalities</p>	<p>Properties of real numbers</p> <p>PEMDAS</p> <p>Interval notation</p> <p>Solving linear equations / inequalities</p> <p>Assigning Variables</p> <p>Solving absolute value equations / inequalities</p> <p>Graphing inequalities</p> <p>Extraneous solutions</p>	<p>CC.2.2.HS.D.8</p> <p>CC.2.2.HS.D.9</p> <p>CC.2.2.HS.D.10</p>	<p>Flip Charts</p> <p>Note Packets</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p> <p>Worksheets</p> <p>Review worksheet</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p> <p>Section Quizzes</p>
Functions, Equations, and Graphs	<p>What is a relation?</p> <p>What is a function?</p> <p>What is a linear Equation?</p>	<p>Relations and Functions</p> <p>Functions</p> <p>Linear equations</p> <p>Direct variation</p>	<p>f(x) notation and evaluating functions at a value</p> <p>Graph linear functions</p> <p>Find slope</p>	<p>CC.2.1.HS.F.3</p> <p>CC.2.1.HS.F.5</p> <p>CC.2.1.HS.F.7</p> <p>CC.2.2.HS.D.7</p> <p>CC.2.2.HS.D.8</p>	<p>Flip Charts</p> <p>Note Packets</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p>

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Functions, Equations, and Graphs (continued)	<p>How do I write linear equations given basic information on a line, point, etc.?</p> <p>What is direct variation?</p> <p>How do I graph absolute value functions?</p> <p>How do I graph linear inequalities and absolute value inequalities?</p>	<p>Absolute value functions and graphs</p> <p>Two-variable inequalities</p> <p>Families of functions</p>	<p>Write linear equations when given various pieces of information (slope, point, two points, parallel / perpendicular relationship)</p> <p>Make predictions using the graphs or equations of scatter plots (lines of best fit)</p> <p>Vertical Line Test</p> <p>Understand domain and range</p> <p>Graph absolute value equations</p> <p>Graph linear / absolute value inequalities</p> <p>Writing inequalities</p>	<p>CC.2.2.HS.D.9</p> <p>CC.2.2.HS.D.10</p> <p>CC.2.2.HS.C.1</p> <p>CC.2.2.HS.C.2</p> <p>CC.2.2.HS.C.3</p> <p>CC.2.2.HS.C.4</p> <p>CC.2.2.HS.C.5</p> <p>CC.2.2.HS.C.6</p>	<p>Worksheets</p> <p>Review worksheet</p> <p>Graphing Google Slides Activity</p>	Section Quizzes

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Quadratic Equations and Functions	What is a quadratic function?	Modeling data with quadratic functions	Identifying vertex and axis of symmetry	CC.2.1.HS.F.3	Note Packets	Homework
				CC.2.1.HS.F.4	Homework	Open Ended Questions / Discussions
	How do I identify a quadratic function?	Properties of parabolas	Graphing quadratic functions	CC.2.1.HS.F.6	Khan Academy	
		Transforming parabolas		CC.2.1.HS.F.7	WebWork	Exit Slips
	How do I graph quadratic functions?	Factoring quadratic expressions	Finding minimum and maximum value of quadratic functions	CC.2.2.HS.D.1	Class Discussions	Khan Academy
	How do I solve quadratic equations?	Quadratic equations	Solve quadratic equations by factoring, taking square roots, and quadratic formula	CC.2.2.HS.D.2	Worksheets	Section Quizzes
	What are the elements of a parabola?	Complex numbers		CC.2.2.HS.D.4	Review worksheet	
				CC.2.2.HS.D.5		
	What are complex numbers?	The Quadratic Formula	Identify imaginary and complex numbers	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		

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Probability	<p>How can you find the probability of events and combinations of events?</p> <p>How are conditional probability and independence related?</p> <p>How are combinations and permutations useful when finding probabilities?</p> <p>How are odds and probabilities related?</p>	<p>Probability</p> <p>Odds</p> <p>Combinations</p> <p>Permutations</p> <p>Fundamental Counting Principle</p> <p>Independent, Dependent, and Compound Events</p>	<p>Use combinations, permutations, and the fundamental counting principle to solve problems involving probability</p> <p>Use odds to find probability and / or use probability to find odds</p> <p>Use probability for independent, dependent, or compound events to predict outcomes</p>	<p>CC.2.4.HS.B.4</p> <p>CC.2.4.HS.B.5</p> <p>CC.2.4.HS.B.6</p> <p>CC.2.4.HS.B.7</p>	<p>Note Packets</p> <p>Homework</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p> <p>Worksheets</p> <p>Review worksheet</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p> <p>Section Quizzes</p>
Polynomials and Polynomial Functions	<p>What is a polynomial function?</p> <p>How can I find the zeros of a polynomial function algebraically / graphically?</p>	<p>Properties of exponents</p> <p>Polynomial functions</p> <p>Polynomials and linear factors</p> <p>Dividing polynomials using synthetic division</p>	<p>Identify standard form and degrees of polynomials</p> <p>Simplify expressions using exponent rules</p> <p>Write a polynomial in factored form</p>	<p>CC.2.1.HS.F.1</p> <p>CC.2.1.HS.F.4</p> <p>CC.2.1.HS.F.7</p> <p>CC.2.2.HS.D.1</p> <p>CC.2.2.HS.D.2</p> <p>CC.2.2.HS.D.3</p> <p>CC.2.2.HS.D.4</p>	<p>Flip Charts</p> <p>Note Packets</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p> <p>Worksheets</p> <p>Review worksheet</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p> <p>Section Quizzes</p>

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Polynomials and Polynomial Functions (continued)		<p>Solving polynomial equations</p> <p>Function operations</p>	<p>Complete polynomial operations</p> <p>Complete polynomial operations using function notation [ex. Find $(f + g)(x)$]</p> <p>Solve polynomial equations by factoring</p>	<p>CC.2.2.HS.D.5</p> <p>CC.2.2.HS.D.7</p> <p>CC.2.2.HS.D.8</p> <p>CC.2.2.HS.D.9</p> <p>CC.2.2.HS.D.10</p> <p>CC.2.2.HS.C.3</p> <p>CC.2.2.HS.C.4</p> <p>CC.2.2.HS.C.5</p> <p>CC.2.2.HS.C.6</p>		
Radical Functions and Rational Exponents	<p>What is nth root?</p> <p>How do I simplify radical expressions?</p> <p>How do I solve radical equations?</p>	<p>nth roots & rational exponents</p> <p>Simplify expressions with rational exponents</p> <p>Solve square roots and other radical equations</p>	<p>Find roots</p> <p>Multiply and divide radical expressions</p> <p>Simplify binomial radical expressions</p> <p>Use properties of rational exponents to simplify expressions</p>	<p>CC.2.1.HS.F.1</p> <p>CC.2.1.HS.F.3</p> <p>CC.2.1.HS.F.6</p> <p>CC.2.1.HS.F.7</p> <p>CC.2.2.HS.D.2</p> <p>CC.2.2.HS.D.7</p> <p>CC.2.2.HS.D.8</p> <p>CC.2.2.HS.D.9</p> <p>CC.2.2.HS.D.10</p>	<p>Flip Charts</p> <p>Note Packets</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p> <p>Worksheets</p> <p>Review worksheet</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p> <p>Section Quizzes</p>

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Radical Functions and Rational Exponents (continued)				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		
Exponential and Logarithmic Functions	<p>What does it mean to be exponential?</p> <p>What are the properties of logarithms?</p> <p>What is the relationship between logs and exponentials?</p> <p>Can I solve log and exponential equations?</p>	<p>Exponential functions</p> <p>Inverse functions</p> <p>Logarithmic functions</p> <p>Properties of logarithms</p> <p>Solving exponential & logarithmic equations</p>	<p>Interpret key features of exponential functions</p> <p>Find inverse functions</p> <p>Use logarithmic properties to simplify expressions</p> <p>Graph basic exponential and logarithmic equations</p> <p>Solve exponential and logarithmic equations</p>	<p>CC.2.1.HS.F.1</p> <p>CC.2.1.HS.F.3</p> <p>CC.2.1.HS.F.4</p> <p>CC.2.1.HS.F.7</p> <p>CC.2.2.HS.D.5</p> <p>CC.2.2.HS.D.7</p> <p>CC.2.2.HS.D.8</p> <p>CC.2.2.HS.D.9</p> <p>CC.2.2.HS.D.10</p> <p>CC.2.2.HS.C.2</p> <p>CC.2.2.HS.C.3</p> <p>CC.2.2.HS.C.4</p> <p>CC.2.2.HS.C.5</p>	<p>Flip Charts</p> <p>Note Packets</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p> <p>Worksheets</p> <p>Review worksheet</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p> <p>Section Quizzes</p>

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Exponential and Logarithmic Functions (continued)				CC.2.2.HS.C.6		
Rational Functions	How do I write rational expressions in the simplest form? How do I solve rational equations?	Multiplying and dividing rational expressions Addition, subtraction of complex fractions Solving rational equations	Simplify rational expressions Find LCM and LCD to simplify rational expressions Add, subtract, multiply, divide rational expressions Solve rational equations	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 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	Flip Charts Note Packets Khan Academy WebWork Class Discussions Worksheets Review worksheet	Homework Open Ended Questions / Discussions Exit Slips Khan Academy Section Quizzes

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
Conic Sections	<p>What are the conic sections?</p> <p>How can I determine the conics from equations and graphs?</p>	<p>Parabolas</p> <p>Circles</p> <p>Ellipses</p> <p>Hyperbolas</p> <p>Identifying conic sections</p>	<p>Write and graph equations of circles</p> <p>Using characteristics to identify conics</p>	CC.2.3.HS.A.10	<p>Flip Charts</p> <p>Note Packets</p> <p>Khan Academy</p> <p>WebWork</p> <p>Class Discussions</p> <p>Worksheets</p> <p>Review worksheet</p>	<p>Homework</p> <p>Open Ended Questions / Discussions</p> <p>Exit Slips</p> <p>Khan Academy</p> <p>Quiz</p>

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
<ul style="list-style-type: none"> <input type="checkbox"/> Analyze a set of data for the existence of a pattern, and represent the pattern with a rule algebraically and/or graphically <input type="checkbox"/> Determine the domain, range, or inverse of a relation <input type="checkbox"/> Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function (e.g. intercepts, zeros) 	<ul style="list-style-type: none"> <input type="checkbox"/> Create, interpret, and/or use the equation, graph, or table of quadratic, absolute value, piecewise, and step functions <input type="checkbox"/> Determine, use, and/or interpret minimum and maximum values over a specified interval of a graph of quadratic, absolute value, piecewise, or step functions <input type="checkbox"/> Translate a quadratic, absolute value, piecewise, or step function from one representation of a function to another (graph, table, and equation) 	<ul style="list-style-type: none"> <input type="checkbox"/> Simplify/write square roots in terms of i <input type="checkbox"/> Simplify/evaluate expressions involving powers of i <input type="checkbox"/> Add and subtract complex numbers <input type="checkbox"/> Multiply and divide complex numbers 	<ul style="list-style-type: none"> <input type="checkbox"/> Use exponential expressions to represent rational numbers <input type="checkbox"/> Simplify/evaluate expressions involving positive and negative exponents and/or roots <input type="checkbox"/> Simplify/evaluate expressions involving multiplying with exponents, powers of powers, and powers of products <input type="checkbox"/> Simplify or evaluate expressions involving logarithms and exponents <input type="checkbox"/> Factor algebraic expressions, including difference of squares and trinomials <input type="checkbox"/> Simplify rational algebraic expressions 	<ul style="list-style-type: none"> <input type="checkbox"/> Write and/or solve quadratic equations (including factoring and using Quadratic Formula) <input type="checkbox"/> Solve equations involving rational and radical expressions <input type="checkbox"/> Write and/or solve a simple exponential or logarithmic equation <input type="checkbox"/> Use algebra processes to solve a formula for a given variable <input type="checkbox"/> Identify or describe the effect of changing parameters within a family of functions 	<ul style="list-style-type: none"> <input type="checkbox"/> Draw, identify, find, interpret, and/or write an equation and make predictions for a linear regression model for a scatter plot <input type="checkbox"/> Use combinations, permutations, and the fundamental counting principle to solve problems involving probability <input type="checkbox"/> Use odds to find probability and/or use probability to find odds <input type="checkbox"/> Use probability for independent, dependent, or compound events to predict outcomes