

Chambersburg Area School District Mathematic Curriculum
9th grade Algebra 1

This course is designed to help students successfully transition from pre-algebraic to algebraic concepts. Topics include constructing, analyzing, and modeling functions, systems of equations and inequalities, operations with polynomials, basic probability, and an introduction to quadratic functions. Problem solving is emphasized throughout all concepts.

Standards for Mathematical Practice

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

Career Education and Work Standards

- (13.2.11 E) Career Acquisition (Getting a Job)
 - Demonstrate the application of essential workplace skills
 - The workplace skills include: attitude, punctuality/attendance, commitment, communication, dependability, initiative, time management, teamwork, technical literacy, and getting along with others.
- (13.3.11 B) Career Retention and Advancement
 - Evaluate team member roles to describe and illustrate active listening techniques
 - Active listening techniques include: clarifying, encouraging, restating, and summarizing when working as a part of the team

Unit of Study	Unit 1: Area and Perimeter Patterns
Time Frame/Pacing	12 days
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.
Unit Essential Questions	1. How do we use and manipulate hands-on tools to represent algebraic expressions? 2. How do students build workplace skills through cooperative learning?

PA Core Standards		PA Assessment Anchors	
CC.2.2.HS.C.3		A1.1.1.2 A1.2.1.1 A1.1.1.5	
PA Eligible Content		A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.1.1.5.1 Add, subtract, and/or multiply polynomial expressions (express answers in simplest form)-- with the use of manipulatives.	
Learning Objectives		• Understand and create polyominoes • Arrange polyominoes to maximize and minimize perimeter • Relate names of manipulatives (flat Lab Gear blocks) to their area and volume • Use manipulatives (Lab Gear blocks) to understand how to combine like terms • Find perimeter and surface areas of different manipulative (flat Lab Gear) arrangements • Recognize patterns when finding surface areas of rectangular prisms • Use different methods to find area of different geoboard shapes	
Lesson Essential Questions		• What are polyominoes and how do you create them? • How are the tetris and Blokus games related to mathematics? • How do we arrange a given polyomino in order to maximize and minimize its perimeter? • How are the names of the “flat” Lab Gear blocks related to their area? • How are the names of the 3-D Lab Gear blocks related to their volume? • How do you sketch all the Lab Gear blocks? • How do the Lab Gear blocks help when learning to combine like terms? • How do you find the perimeter of any “flat” Lab Gear arrangement? • How do you use subtraction for partial lengths? • How do you find the surface area of any Lab Gear arrangement? • Do you recognize any patterns when finding the surface area for each rectangular prism? • What different methods can you use to find the area of different geoboard shapes?	
Key Vocabulary:		• area • perimeter • polynomial • term • volume • surface area • constant • variable • like terms	
Assessments		Unit 1 Assessment: Area and Perimeter Patterns	

	Quick checks
Resources and Differentiation Tools	- Team building activities throughout the unit - Setting social norms of the classroom - Desmos activity expressions bundle https://teacher.desmos.com/activitybuilder/custom/57b4e4d1d10935cb09ad667b
Authentic Examples (real-world tasks)	https://teacher.desmos.com/activitybuilder/custom/58798fc7e338613f05a42feb
Visual Representations & Strategies	Interlocking blocks Lab Gear Geoboards
Writing in Math	Type 1 writings Reflection journal
Culturally Responsive Activities	- Growth mindset lessons, discussions, and activities https://www.youcubed.org https://www.mindsetworks.com/science Culturally-Responsive-Teaching-Strategies-and-Examples.pdf

Unit of Study	Unit 2: Relationships Between Quantities					
Time Frame/Pacing	13 days					
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.					
Unit Essential Questions	1. How can algebraic and numeric quantities be manipulated to represent real world situations? 2. How can expressions and equations be used to quantify, solve, model and/or analyze mathematical situations?					
<table><tr><th>PA Core Standards</th><th>PA Assessment Anchors</th></tr><tr><td></td><td> A1.1.1.2 A1.1.1.4 </td></tr></table>			PA Core Standards	PA Assessment Anchors		A1.1.1.2 A1.1.1.4
PA Core Standards	PA Assessment Anchors					
	A1.1.1.2 A1.1.1.4					
PA Eligible Content	A1.1.1.4.1 Use estimation to solve problems.					
Learning Objectives	● Identify parts of an expression ● Factor numbers and variables to identify all prime factors					

	- Describe algebraic expressions when speaking using accepted mathematical vocabulary - Use rates to determine solutions to real world problems - Determine what an expression represents in a given situation - Solve multistep problems involving unit conversions - Correctly choose and interpret units in formulas - Solve real world problems using numbers expressed in scientific notation
Lesson Essential Questions	- What are the parts of the expression and how do we identify them? - How are numbers and variables factored to identify all prime factors? - How can we describe algebraic expressions when speaking using accepted mathematical vocabulary? - How can rates be used to determine solutions to real-world problems? - How do we determine what an expression represents in a given situation? - How do we solve multistep problems involving unit conversions? - How do we correctly choose and interpret units in formulas? - How do we solve real world problems using numbers expressed in scientific notation?
Key Vocabulary:	- expression - equation - variable - constant - term - coefficient - base - factor - dimensional analysis** - conversion factors (constant of proportionality) - scientific notation - rate - unit rate
Assessments	Unit 2.1-2.4 Quiz Unit 2 Assessment Quick Checks
Resources and Differentiation Tools	- Unit 2 Shared Materials folder - Unit 2 labs - Scientific Notation Calculator Exploration
Authentic Examples (real-world tasks)	- Desmos activity for scientific notation https://teacher.desmos.com/activitybuilder/custom/5d7890929702fd128b4a95e1
Visual Representations & Strategies	Unit 2 Lab Packet: Operations and Functions
Writing in Math	2016 Algebra 1 Item Sampler page 12 #3 2019 Algebra 1 Item Sampler page 12 #3 Use as open responses without multiple choice items

Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf
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Unit of Study	Unit 3: Equations and Relationships					
Time Frame/Pacing	16 days					
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.					
Unit Essential Questions	1. How can algebraic equations and inequalities be used to model real world scenarios? 2. How does modeling and solving linear equations assist in answering real world problems?					
<table><tr><th>PA Core Standards</th><th>PA Assessment Anchors</th></tr><tr><td> CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.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 </td><td> A1.1.2.1 A1.1.3.1 </td></tr></table>			PA Core Standards	PA Assessment Anchors	CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.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	A1.1.2.1 A1.1.3.1
PA Core Standards	PA Assessment Anchors					
CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.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	A1.1.2.1 A1.1.3.1					
PA Eligible Content	A1.1.2.1.1 Write, solve, and/or apply a linear equation (including problem situations). A1.1.2.1.2 Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation. Note: Linear equations only. A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities). A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. A1.1.3.1.3 Interpret solutions to problems in the context of the problem situation. Note: Linear inequalities only					
Learning Objectives	● Construct linear equations given different information ● Use linear equations to solve real world scenarios ● Solve linear equations ● Justify the steps to solving linear equations using algebraic properties ● Define algebraic properties for solving linear equations					

	• Determine what the solution to an equation or inequality means in a real world problem • Construct and solve compound inequalities by solving for one variable • Determine constraints of a variable given a compound inequality • Display the solution set(s) to a inequality on a number line
Lesson Essential Questions	• How do we create single variable equations and inequalities to solve problems? • How do we create equations with two or more variables? • Can I graph and identify similarities/differences of graphs of equations in two variables? • How do we represent constraints for equations and inequalities? • Can I justify all of my steps in solving an equation with an algebraic property? • How do we solve for a particular variable in a formula? • How do we represent and interpret the solution set of an inequality? • How do we solve compound inequalities?
Key Vocabulary:	• equation • inequality • constraint • $<$, $>$, $\leq$, $\geq$ • compound inequality • justify • solution • solution set • inverse • equality • satisfy
Assessments	Quiz 3.1-3.4 Unit 3 Assessment Quick checks
Resources and Differentiation Tools	• Unit 3 Shared Materials folder • Unit 3 Labs • Cover Up • Algebra Magic
Authentic Examples (real-world tasks)	Unit 3 Lab Instant Riches
Visual Representations & Strategies	Desmos activity for inequalities & compound inequalities ○ https://teacher.desmos.com/activitybuilder/custom/57d9fdc6ebf48f73093807b2 ○ https://teacher.desmos.com/activitybuilder/custom/57b7f808ce9904f705558c4e
Writing in Math	• Think about a Plan problems
Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf

Unit of Study	Unit 4: Functions	
Time Frame/Pacing	13 days	
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.	
Unit Essential Questions	1. What are the characteristics of a given function displayed in various forms?	
PA Core Standards		PA Assessment Anchors
CC.2.1.HS.F.5 CC.2.2.HS.D.7 CC.2.2.HS.D.10 CC.2.2.8.B.2 CC.2.2.8.C.1 CC.2.2.8.C.2 CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.5		A1.1.1.1 A1.1.3.1 A1.2.1.1 A1.2.1.2 A1.2.2.1
PA Eligible Content	A1.1.1.1.1 Compare and/or order any real numbers. Note: Rational and irrational may be mixed. A1.2.1.1.2 Determine whether a relation is a function, given a set of points or a graph. A1.2.1.1.3 Identify the domain or range of a relation (maybe presented as ordered pairs, graph, or table). A1.2.2.1.1 Identify, describe, and/or use constant rates of change. A1.2.2.1.3 Write or identify a linear equation when given the graph of a line, two points on the line, or the slope and a point on the line (note: linear equation may be in point-slope, standard, and/or slope-intercept form). A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph. A1.2.1.2.1 Create, interpret, and/or use the equation, graph, or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (i.e., graph, table, and equation) A1.1.3.1.1 Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities) A1.1.3.1.2 Identify or graph the solution set to linear inequality on a number	
Learning Objectives	● Define, evaluate, and compare functions. ● Use the concept and notation of function to interpret and apply them in terms of their context.	

	- Construct and compare linear, quadratic, and exponential models and solve problems. - Create a function and/or sequence that model relationships between two quantities. - Create and/or analyze functions using multiple representations (graph, table, and equation). - Create new functions from existing functions (transformations of graphs).
Lesson Essential Questions	- How do we determine if a relation is a function? - How do we identify the domain and range of a relation? - How do we use function notation to evaluate functions? - How do we write an equation of a line in slope-intercept form? - How do we use $y = mx + b$ to find the slope and y-intercept of a graph? - How do we solve absolute value equations and inequalities?
Key Vocabulary:	- function - linear equations - nonlinear equation - rate of change/slope - domain/input - range/output - solution set - vertical line test - absolute value - function notation - slope-intercept form - standard form - point-slope form - independent variable - dependent variable - x-intercept - y-intercept
Assessments	4.1-4.3 Quiz Unit 4 Assessment (Defining Functions and Types of Functions) Quick Checks
Resources and Differentiation Tools	- Unit 4 Shared Materials folder - Unit 4 Labs: - Scaling on the Geoboard - Similar Rectangles - Discounts (Optional) - Nine Function Diagrams (Optional) - Staircase Sums - Gauss's Method (Optional) - Building Functions
Authentic Examples (real-world tasks)	- Desmos activity function notation: https://teacher.desmos.com/activitybuilder/custom/56d7528a9e6961430932681e
Visual Representations & Strategies	- Desmos activity Finding Domain & Range: https://teacher.desmos.com/activitybuilder/custom/56e8442cc2a23ba41da1c7d9 - Desmos activity writing equations & Linear and Functions bundle (focus y-intercept & slope): https://teacher.desmos.com/activitybuilder/custom/5bcd906c1d7660b58d8b866 - Desmos activity for absolute value inequalities on the number line https://teacher.desmos.com/activitybuilder/custom/57b8df55301844f605b76506

Writing in Math	2019 Algebra 1 Item Sampler page 19 #10, page 64 #4, page 68 #7 Use as open responses without multiple choice items
Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf

Unit of Study	Unit 5: Systems of Equations					
Time Frame/Pacing	17 days					
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.					
Unit Essential Questions	1. How can we determine and comprehend solutions with algebraic, graphic, and real world applications to both linear and nonlinear systems of equations or inequalities? 2. How can I solve a real world problem that has two unknowns?					
<table><tr><th>PA Core Standards</th><th>PA Assessment Anchors</th></tr><tr><td>CC2.1.HS.F.5 CC.2.2.8.B.3 CC.2.2.HS.D.7 CC.2.2.HS.D.9 CC..2.2.HS.D.10</td><td>A1.1.2.2 A1.1.3.2</td></tr></table>			PA Core Standards	PA Assessment Anchors	CC2.1.HS.F.5 CC.2.2.8.B.3 CC.2.2.HS.D.7 CC.2.2.HS.D.9 CC..2.2.HS.D.10	A1.1.2.2 A1.1.3.2
PA Core Standards	PA Assessment Anchors					
CC2.1.HS.F.5 CC.2.2.8.B.3 CC.2.2.HS.D.7 CC.2.2.HS.D.9 CC..2.2.HS.D.10	A1.1.2.2 A1.1.3.2					
PA Eligible Content	A1.1.2.2.1 Write and/or solve a system of linear equations (including problem solving situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations. A1.1.2.2.2 Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations. A1.1.3.2.1 Write and/or solve a system of linear inequalities using graphing. Note: Limit systems to two linear inequalities. A1.1.3.2.2 Interpret solutions to problems in the context of the problem situation. Note: limit systems to two linear inequalities.					
Learning Objectives	● Solve a system of two linear equations by graphing ● Solve a system of two linear equations by the substitution method ● Solve a system of two linear equations by the elimination method (linear combinations) ● Construct and solve a system of equations given a real world problem ● Determine what the solution to a system of linear equations means in a real world problem ● Solve a system of two linear inequalities by graphing					

	● Determine what the solution to a system of linear inequalities means in a real world problem ● Construct and solve a system of inequalities given a real world problem
Lesson Essential Questions	● How do we use graphs to identify solutions to linear equations in two variables? ● How do we use the graph of a system of two equations to identify the solution? ● How do we recognize and interpret the various types of solutions graphically? ● How do we find a solution to a system of equations by graphing? ● How do we solve a system of equations using algebra? ● How do we use a system of equations to solve real-world problems? ● How do we use vertical and horizontal lines to introduce graphing linear inequalities? ● How do we graph an inequality on a coordinate plane? ● How do we create and graph inequalities for real-world problems? ● How do we solve a system of inequalities by graphing?
Key Vocabulary:	● Systems of Linear Equations ● Systems of Linear Inequalities ● Substitution Method ● Linear Combinations (elimination) ● Equivalent Equations ● Point of Intersection ● Solution ● Solution Set ● Slope-Intercept Form ● Standard Form ● Point-Slope Form ● Infinitely Many Solutions ● Parallel Lines ● Horizontal Lines ● Vertical Lines ● Simultaneous Equations
Assessments	5.1 -5.3 Quiz 5.4-5.6 Quiz Unit 5 Assessment (Graphing Systems of Equations, Solving Systems of Equations, Graphing Systems of Inequalities) Quick Checks
Resources and Differentiation Tools	● Unit 5 Shared Materials folder ● Unit 5 Labs: ● Lab S.1 – At the Laundromat ● Lab S.2 – At the Laundromat (continued) ● Lab S.3 – Two Unknowns ● Lab S.4 – Mind Reading ● Lab S.5 – Line Intersections ● Lab S.6 – Combining Equations ● Lab S.7 – How Many Solutions? ● Lab S.8 – Postcards and Letters

	• Lab S.9- Postcards and Letters (continued) • Lab S.10 – Finding the Dimensions • Lab S.11 – Trinomial Patterns
Authentic Examples (real-world tasks)	Playing Catch Up (developing) & Racing Cars and Cookies and Creme (application) • https://teacher.desmos.com/activitybuilder/custom/56d139907e51c4ed1014b51f • https://teacher.desmos.com/activitybuilder/custom/56d74abe3df0d04006f0cb97
Visual Representations & Strategies	<u>Desmos Linear Systems Bundle (6 activities)</u> • Desmos activity <u>Solutions</u> to Systems of Equations (5.2): https://teacher.desmos.com/activitybuilder/custom/564a325345d9115d06270607 • Desmos activity Systems of Two Equations (5.3): https://teacher.desmos.com/activitybuilder/custom/5807d7306ef115e7053a142a • Desmos activity Card Sort: Linear Systems (after elimination and substitution): https://teacher.desmos.com/activitybuilder/custom/5798d64583de446662ea8ddd • Desmos activity practice graphing linear inequalities (point collector: lines 5.8): https://teacher.desmos.com/activitybuilder/custom/57e55435920c2cd506168126
Writing in Math	2018 Algebra 1 Item Sampler page 17 #8, page 20 #11, page 22 #12, page 24 #13 Use as open responses without multiple choice items 2019 Algebra 1 Item Sampler page 21 #12 Use as open responses without multiple choice items
Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf

Unit of Study	Unit 6: Analyzing Functions
Time Frame/Pacing	14 days
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.
Unit Essential Questions	1. How do we use functions to better understand real world scenarios? 2. How do you compare real world relationships that are represented in different forms?
PA Core Standards	PA Assessment Anchors
CC.2.2.8.C.1	A1.2.1.1
CC.2.2.8.C.2	A1.2.1.2
CC.2.1.HS.F.3	A1.2.2.1

CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.6	
PA Eligible Content	A1.2.1.1.1 Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. A1.2.1.1.3 Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). A1.2.1.2.1 Create, interpret, and/or use the equation, graph, or table of a linear function. A1.2.1.2.2 Translate from one representation of a linear function to another (i.e., graph, table, and equation). A1.2.2.1.1 Identify, describe, and/or use constant rates of change. A1.2.2.1.2 Apply the concept of linear rate of change (slope) to solve problems. A1.2.2.1.3 Write or identify a linear equation when given the graph of a line, two points on the line, or the slope and a point on the line (note: linear equation may be in point-slope, standard, and/or slope-intercept form).
Learning Objectives	● Define, evaluate, and compare functions. ● Use the concept and notation of function to interpret and apply them in terms of their context. ● Construct and compare linear, quadratic, and exponential models and solve problems. ● Create a function and/or sequence that model relationships between two quantities. ● Create and/or analyze functions using multiple representations (graph, table, and equation). ● Create new functions from existing functions (transformations of graphs).
Lesson Essential Questions	● How do we determine the average rate of change for a function represented as a graph or table? ● How do we interpret graphs for real-world situations? ● How do we determine the appropriate domains and ranges of a function? ● How do we represent sequences as functions? ● How do we write and use equations in slope-intercept form given real-world scenarios? ● How do we write the equation of a line given two points, a table, or a slope and a point? ● How do we use and interpret the parts of equations written in slope-intercept form to better understand real-world scenarios?
Key Vocabulary:	● function ● graph of a linear function ● linear equations ● nonlinear equation ● rate of change ● average rate of change ● domain ● range

	● interval ● arithmetic sequence
Assessments	6.1-6.4 Quiz Unit 6 Assessment Quick Checks
Resources and Differentiation Tools	● Unit 6 Shared Materials folder ● Unit 6 Labs: ● Graphing Stories with Dan Meyer ● The Bicycle Trip (Optional) ● 16 Function Diagrams (Optional) ● Stacking Cups ○ https://blog.mrmeyer.com/2008/linear-fun-2-stacking-cups/ ○ https://whenmathhappens.com/2016/02/16/5-practices-stacking-cups/ ○ https://www.101qs.com/1897-stacking-cups--act-1 ● Six Function Diagrams - Domain and Range (Optional) Writing Linear Equations Scavenger Hunt ● https://howweteach.com/wp-content/uploads/woocommerce_uploads/2020/01/Writing-Linear-Equations-Scavenger-Hunt-8.5I-8.F.B.4.pdf ● https://howweteach.com/wp-content/uploads/woocommerce_uploads/2019/12/Writing-Linear-Equations-Scavenger-Hunt-A.2B-A.2C-HSF.LE_A.2.pdf
Authentic Examples (real-world tasks)	Desmos activity Graphing stories: https://teacher.desmos.com/activitybuilder/custom/58797d35d81a612605304b1f Dan Meyers 3 Act Math Ditch Diggers Playing Catchup Coin Counting Estimation 180 3 Act Math Zipline Basketball Shots PSSA Item Sampler 2018, #7 and #10
Visual Representations & Strategies	Desmos activity Turtle crossing (graphing stories): https://teacher.desmos.com/activitybuilder/custom/5ddbf9ae009cd90bcdeaadd7 The Crow and the Pitcher - Rate of Change Activity https://mathequalslove.blogspot.com/2016/11/the-crow-and-pitcher-rate-of-change.html
Writing in Math	Start here: Module 2 Constructed Response #13, p. 72: Algebra 1 Item and Scoring Sampler 2019
Culturally Responsive Activities	Start here: Culturally Responsive Activities (see pp. 3-9): Culturally Responsive Teaching in Secondary Mathematics Graphing stories (created by students using personal experiences)

Unit of Study	Unit 7: Descriptive Statistics	
Time Frame/Pacing	13 days	
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.	
Unit Essential Questions	1. How do we gather, organize, display (dot plots, histograms, box plots, circle graphs, line graphs, scatter plots, stem and leaf plots) and analyze data?	
PA Core Standards		PA Assessment Anchors
CC.2.4.8.B.1 CC.2.4.HS.B.1 CC.2.4.HS.B.2 CC.2.4.HS.B.3 CC.2.4.HS.B.5		A1.2.2.2 A1.2.3.1 A1.2.3.2
PA Eligible Content	A1.2.2.2.1 Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot. A1.2.3.1.1 Calculate and/or interpret the range, quartiles, and interquartile range of data. A1.2.3.2.1 Estimate or calculate to make predictions based on a circle, line, bar graph, measure of central tendency, or other representation. A1.2.3.2.2 Analyze data, make predictions, and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency, or other representations). A1.2.3.2.3 Make predictions using the equations or graphs of best-fit lines of scatter plots.	
Learning Objectives	● Analyze a set of data for a pattern, and represent the pattern with an algebraic rule and/or a graph. ● Summarize, represent, and interpret single-variable data and two-variable data. ● Use measures of dispersion to describe a set of data (range, quartiles, interquartile range). ● Analyze and/or interpret data displays and/or use them to make predictions (circle graph, line graph, bar graph, box-and-whisker plot, stem-and-leaf plot, scatter plot). ● Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. ● Calculate and/or make predictions based upon measures of central tendency. ● Apply probability to practical situations, including compound events. ● Recognize and evaluate random processes underlying statistical experiments. ● Apply the rules of probability to compute probabilities of compound events in a uniform probability model.	
Lesson Essential Questions	● How do you compare the center and spread of various data? ● How do we use box plots and dot plots to display and interpret data?	

	• How do we construct and describe scatter plots? • How do we create a line of best fit for a scatter plot with linear associations? • How do we use the slope and intercept of linear functions in real-world situations? • How do we interpret/make predictions from data on graphs (dot plots, histograms, box plots, scatter plots, stem and leaf plots, circle graphs, line graphs)?
Key Vocabulary:	• measures of center (mean, median, and mode) • measures of variability • correlation (positive, negative, and no) • interquartile range • outlier • scatter plot • box plot • data distribution • quartiles, extremes (first, second, third, lower, and upper) • stem and leaf plot • range • dot plots • line of best fit • circle graph • line graph
Assessments	7.1-7.4 Quiz Unit 7 Assessment Quick Checks
Resources and Differentiation Tools	• Unit 7 Shared Materials folder • http://kiefermath406.pbworks.com/w/file/attach/108331384/426%20-%20Statistics%20-%20Intro%20to%20scatter%20plots%20and%20correlation%20-%20basic%20exercises%20with%20answers.pdf
Authentic Examples (real-world tasks)	https://whenmathhappens.com/2014/04/07/scatterplots-with-desmos
Visual Representations & Strategies	https://teacher.desmos.com/activitybuilder/custom/58cc26d4c722f106146a8310
Writing in Math	Algebra 1 Best Fit Line Project (Unit 7 Shared Materials folder) 2018 Algebra 1 Item Sampler page 67 #9, page 68 #10 Use as open responses without multiple choice items
Culturally Responsive Activities	Culturally Responsive Activities (see pp. 3-9): Culturally Responsive Teaching in Secondary Mathematics

Unit of Study	Unit 8: Properties of Exponents and Square Roots
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Time Frame/Pacing	13 days				
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.				
Unit Essential Questions	1. How can we use properties of exponents and radicals to represent numbers and expressions in equivalent forms?				
<table border="1"> <thead> <tr> <th>PA Core Standards</th><th>PA Assessment Anchors</th></tr> </thead> <tbody> <tr> <td> CC.2.1.8.E.1 CC.2.1.8.E.4 CC.2.2.8.B.1 CC.2.1.HS.F.1 CC.2.1.HS.F.2 CC.2.2.HS.D.2 CC.2.2.HS.D.3 CC.2.2.HS.D.5 CC.2.2.HS.D.6 </td><td> A1.1.1.1 A1.1.1.2 A1.1.1.3 A1.1.1.5 </td></tr> </tbody> </table>		PA Core Standards	PA Assessment Anchors	CC.2.1.8.E.1 CC.2.1.8.E.4 CC.2.2.8.B.1 CC.2.1.HS.F.1 CC.2.1.HS.F.2 CC.2.2.HS.D.2 CC.2.2.HS.D.3 CC.2.2.HS.D.5 CC.2.2.HS.D.6	A1.1.1.1 A1.1.1.2 A1.1.1.3 A1.1.1.5
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PA Eligible Content	A1.1.1.1.1 Compare and/or order any real numbers. Note: Rational and irrational may be mixed. A1.1.1.1.2 Simplify square roots (e.g., $\sqrt{24} = 2\sqrt{6}$). A1.1.1.3.1 Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from –10 to 10. A1.1.1.5.1 Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.				
Learning Objectives	• Represent and/or use numbers in equivalent forms (integers, fractions, decimals, percents, square roots, exponents). • Apply and extend properties of exponents to solve problems with rational exponents • Apply number theory concepts to show relationships between real numbers in problem-solving settings. • Use exponents, roots, and/or absolute values to solve problems. • Perform arithmetic operations on polynomials.				
Lesson Essential Questions	• What patterns do you see emerge when examining the values of a given population that doubles or triples every hour? • How do we rewrite polynomial expressions as products, quotients, and powers of monomials? • How do we rewrite polynomial expressions as equivalent expressions using what we know about the power of a product law? • How do we rewrite polynomial expressions as equivalent expressions using what we know about powers and ratios?				

	• How do we rewrite polynomial expressions with negative exponents as equivalent expressions with positive exponents? • How do we simplify polynomial expressions given as ratios? • How do we use the properties of exponents to rewrite expressions? • How do we rewrite expressions involving radicals and exponents? • How do we apply concepts of radicals and integer exponents to generate equivalent expressions?
Key Vocabulary:	• Base, Exponent, Power • Perfect Squares • Square Root • Radical • Polynomial (mono-, bi-, tri-) • Factor • Term
Assessments	8.1-8.6 Quiz Unit 8 Assessment Quick Checks
Resources and Differentiation Tools	Unit 8 Labs: • Geoboard Area • Squares and Square Roots • Geoboard Squares • Taxicab vs. Euclidean (Optional) • The Pythagorean Theorem (Optional) • Simplifying Radicals • Radical Operations Negative exponent rule explained: • https://mashupmath.com/blog/negative-exponent-rule?rq=negative%20exponent%20rule
Authentic Examples (real-world tasks)	• Teamwork 8.1: Bacteria and Exponential Growth #1-2 - exploration activity for exponents • Desmos: Circles ◦ https://teacher.desmos.com/activitybuilder/custom/5d56f89cd82b4905e2def1ac
Visual Representations & Strategies	• Simplifying radicals lab
Writing in Math	Think About a Plan (Unit 8 shared resources)
Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf

Unit of Study	Unit 9: Quadratic and Exponential Expressions
Time Frame/Pacing	14 days

Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.				
Unit Essential Questions	1. How do you rewrite polynomials by performing various arithmetic operations?				
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PA Core Standards	PA Assessment Anchors				
CC.2.1.6.E.3 CC.2.2.HS.D.1 CC.2.2.HS.D.3 CC.2.2.HS.D.5 CC.2.2.HS.D.6	A1.1.1.2 A1.1.1.5				
PA Eligible Content	A1.1.1.2.1 Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials. A1.1.1.5.1 Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial. A1.1.1.5.2 Factor algebraic expressions, including difference of squares and trinomials. Note: Trinomials are limited to the form $ax^2 + bx + c$ where a is equal to 1 after factoring out all monomial factors. A1.1.1.5.3 Simplify/reduce a rational algebraic expression.				
Learning Objectives	• Simplify/factor expressions involving polynomials. • Use polynomial identities. • Apply and extend previous understanding of arithmetic to algebraic expressions.				
Lesson Essential Questions	• How do we interpret quadratic expressions? • How do we compare, contrast, and apply sums and products of polynomials? • How do we factor quadratic expressions with special factoring patterns? • How do we add and subtract polynomials? • How do we solve real-world problems by adding, subtracting, and multiplying polynomials? • How do we add, subtract, multiply, and divide polynomials? How does that apply to area, perimeter, and volume? • How do we multiply polynomials? • How do we determine if two polynomials are equivalent? • How can we use polynomial operations to find area and perimeter in a real world context? • How do we simplify a rational expression?				
Key Vocabulary:	• factored form for a quadratic function • quadratic function • standard form for a quadratic function • binomial				

	• coefficient • factor (verb and noun) • linear term • quadratic term • trinomial • leading coefficient • degree of a term • degree of a polynomial • greatest common factor (GCF) • least common multiple (LCM)
Assessments	9.1-9.3 Quiz Unit 9 Assessment Quick Checks
Resources and Differentiation Tools	Unit 9 Labs: • Square Windows • Rectangular Pens • Zero Product Property
Authentic Examples (real-world tasks)	Unit 9 Shared Materials folder • Finding Area and Perimeter using Polynomials Unit 9 Labs: • Square Windows • Rectangular Pens
Visual Representations & Strategies	Unit 9 Lab Gear Tasks
Writing in Math	
Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf

Unit of Study	Mini Unit: Probability	
Time Frame/Pacing	4 days	
Big Ideas	1. Mathematical relationships among numbers can be represented, compared, and communicated. 2. Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. 3. Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. 4. Patterns exhibit relationships that can be extended, described, and generalized.	
Unit Essential Questions	1. How is probability used in the real world?	
PA Core Standards		PA Assessment Anchors

CC.2.4.7.B.3 CC.2.4.HS.B.4 CC.2.4.HS.B.7		A1.2.3.3
PA Eligible Content	A1.2.3.3.1 Find probabilities for compound events (e.g., find probability of red and blue, find probability of red or blue) and represent as a fraction, decimal, or percent.	
Learning Objectives	- Find simple probabilities of events occurring - Find probabilities for compound events	
Lesson Essential Questions	- How can we find the probability of simple events? - How is the probability of real life compound events found?	
Key Vocabulary:	- Probability - Events - Compound Probability - Percent - Decimal - Fraction - Independent Event - Dependent Event	
Assessments	Probability Quiz	
Resources and Differentiation Tools	- Mini Unit Labs: - Dice Games - What is Probability? - Random Walks (Optional) - Pascal Patterns (Optional) - Problems About Games and Probability (Optional) - Probability Review Stations	
Authentic Examples (real-world tasks)	Probability Task: Sitting Across From Each Other	
Visual Representations & Strategies	Dice Games Lab	
Writing in Math		
Culturally Responsive Activities	Culturally-Responsive-Teaching-Strategies-and-Examples.pdf	