| Overview | Standards for Mathematical Content | Unit Focus | Standards for Mathematical Practice |
|---|---|---|---|
| **Unit 1**: Positive and Negative Numbers | MA.7.NS.A.3<br>MA.7.NS.A.1<br>MA.7.NS.A.1c<br>MA.7.NS.A.2<br>MA.6.NS.C.5<br>MA.6.NS.C.6<br>MA.6.NS.C.6a<br>MA.6.NS.C.7<br>HSN.RN.B.3 | ● Extending the Number Line<br>● Putting Numbers in Order<br>● Adding with Negative Numbers<br>● Subtracting with Negative Numbers<br>● Adding & Subtracting<br>● Multiplying & Dividing<br>● Order of Operations<br>● Mixed Operations<br>● Number Properties<br>● Absolute Value<br>● Use properties of rational and irrational numbers.<br>● Word Problems | MP.1 Make sense of problems and persevere in solving them.<br><br>MP.2 Reason abstractly and quantitatively.<br><br>MP.3 Construct viable arguments & critique the reasoning of others.<br><br>MP.4 Model with mathematics. |
| *Unit 1:*<br><br>***Suggested Open Educational Resources*** | HSN/RN/B/tasks/608 | | MP.5 Use appropriate tools strategically. |
| **Unit 2**: Showing Relationships with Graphs | MA.8.F.B.4   MA.6.NS.C.6<br>MA.8.F.B.5   MA.6.NS.C.6b<br>MA.8.EE.B.6  MA.6.NS.C.6c<br>MA.8.EE.C.8  MA.7.RP.A.2<br>MA.6.EE.C.9  MA.7.RP.A.2a<br>MA.8.EE.C.8a MA.7.RP.A.2b<br>MA.6.RP.A.3  MA.8.F.A.3<br>MA.8.EE.C.8c MA.7.RP.A.2c<br>MA.6.RP.A.3b MA.7.RP.A.2d<br>MA.8.SP.A.1  MA.8.EE.B.5<br>HSA.CED.A.2 HSF.IF.B.5<br>HSA.REI.D.10 HSF.IF.B.6<br>HSA.REI.D.11 HSF.IF.C.7<br>HSF.IF.A.1  HSF.IF.C.7.A<br>HSF.IF.B.4  HSF.LE.A.1.B | ● Building the Coordinate Plane<br>● Constant Ratios & Graphing<br>● How Steep is the Line<br>● Introducing Slope<br>● Graphing Negative Values<br>● Relationships without a Constant Ratio<br>● Tables with proportional relationships/graphing<br>● Graphing Discrete & Continuous Data<br>● Linear Graphs<br>● Slope<br>● Parallel & Perpendicular Lines<br>● Interpreting Graphs | MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure.<br><br>MP.8 Look for and express regularity in repeated reasoning. |

Key:  ■ Major  |  □ Supporting  |  ○ Additional  |  * Benchmarked Standard

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| *Unit 2:*<br><br>*Suggested Open Educational Resources* | HSA/CED/A/2<br><br>HSA/REI/D/10<br><br>HSA/REI/D/11<br><br>HSF/IF/A/1<br><br>HSF/IF/B/4 | HSF/IF/B/5<br><br>HSF/IF/B/6<br><br>HSF/IF/C/7<br><br>HSF/LE/A/1 | |
| **Unit 3:**<br>**Expressions, Equations, and Exponents** | MA.6.EE.B.5   MA.6.EE.B.6<br>MA.6.EE.B.7   MA.8.EE.C.7<br>MA.8.EE.A.1   MA.6.EE.B.8<br>MA.8.EE.C.7b  MA.6.EE.A.1<br>MA.6.EE.A.2   MA.6.EE.A.2b<br>MA.6.EE.A.2c  MA.8.EE.A.2<br>MA.8.EE.A.3   MA.6.EE.A.3<br>MA.8.EE.A.4   MA.6.EE.A.4<br>MA.8.G.B.7    MA.7.EE.B.4<br>HSN.RN.A.1   HSA.SSE.B.3<br>HSN.RN.A.2   HSA.CED.A.1<br>HSA.SSE.A.1  HSA.CED.A.2<br>HSA.SSE.A.1.A HSA.REI.A.1<br>HSA.SSE.A.1.B HSA.REI.B.3 | • Representing Quantities with Expressions<br>• Evaluating Expressions<br>• Exponents<br>• Operations with Exponents<br>• Expressions & Area Models<br>• Combining Like Terms<br>• Adding & Subtracting Expressions<br>• Parentheses & Exponents<br>• Negative Exponents<br>• Scientific Notation<br>• square roots with estimating square root<br>• The Pythagorean Theorem<br>• Applying the Pythagorean Theorem<br>• Writing Equivalent Expressions<br>• Using Expressions in Geometry<br>• Writing Equations<br>• Addition Property of Equality<br>• Multiplication Property of Equality<br>• Combining the Properties of Equality | |
| *Unit 3:*<br><br>*Suggested Open Educational Resources* | HSN/RN/A/1/tasks/385<br><br>HSN/RN/A/1/tasks/1866<br><br>HSN/RN/A/2/tasks/608<br><br>HSA/CED/A/1<br><br>HSA/SSE/B/3 | HSA/CED/A/2<br><br>HSA/REI/A/1<br><br>HSA/REI/B/3<br><br>HSA/SSE/A/1 | |

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| **Unit 4:**<br>**Foundations of Algebra** | MA.6.EE.C.9  MA.6.EE.A.2a<br>MA.6.NS.B.4  MA.6.EE.A.2c<br>MA.6.EE.A.3  MA.6.EE.A.4<br>HSA.APR.A.1  HSA.REI.A.1<br>HSA.CED.A.1  HSA.REI.B.3<br>HSA.CED.A.3 | • Reasoning with Diagrams<br>• Reasoning with Numbers<br>• Reasoning with Variables<br>• Conventions for Using Numbers & Variables<br>• Conventions for Using Parentheses<br>• The Number Properties<br>• Conventions & Number Properties<br>• Using Variables & Formulas<br>• Distributive Property<br>• Applying the Distributive Property<br>• The Inverses of Addition & Multiplication<br>• Relationships Between Quantities<br>• Writing Formulas to Answer Questions |
| *Unit 4:*<br><br>*Suggested Open Educational Resources* | HSA/CED/A/1<br><br>HSA/CED/A/3<br><br>HSA/REI/A/1<br><br>HSA/REI/B/3 | HSA/APR/A/1 |
| **Unit 5**<br><br><br>**Modeling with Linear Equations, Inequalities, and Functions** | • N.Q.A.1  • S.ID.B.6<br>• N.Q.A.2  ■ S.ID.C.7<br>• N.Q.A.3  ■ S.ID.C.8<br>■ A.REI.B.3  ■ S.ID.C.9<br>■ A.REI.A.1  ■ A.REI.D.11<br>■ A.CED.A.4  ■ F.IF.A.1<br>■ A.SSE.A.1  ■ F.IF.A.2<br>■ A.CED.A.1  ■ F.IF.B.5<br>■ A.REI.A.1  ■ F.LE.A.2<br>■ A.CED.A.2<br>■ A.REI.D.10 | • Reason quantitatively and use units to solve problems<br><br>• Solve [linear] equations and inequalities in one variable<br><br>• Understand solving equations as a process of reasoning and explain the reasoning<br><br>• Create equations that describe numbers or relationships<br><br>• Interpret the structure of expressions<br><br>• Summarize, represent, and interpret data on quantitative variables.<br><br>• Interpret linear models<br><br>• Represent and solve equations and inequalities graphically |

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| | | • Interpret expressions for functions in terms of the situation<br><br>• Build a function that models a relationship between two quantities<br><br>• Understand the concept of a function and use function notation<br><br>• Interpret functions that arise in applications in terms of the context<br><br>• Analyze functions using different representations | |
| **Unit 5:**<br><br>**Suggested Open Educational Resources** | N.Q.A.1 Runners' World<br><br>N.Q.A.2 Giving Raises<br><br>N.Q.A.3 Calories in a Sports Drink<br><br>A.REI.B.3, A.REI.A.1 Reasoning with linear inequalities<br><br>A.CED.A.4 Equations and Formulas<br><br>A.SSE.A.1 Kitchen Floor Tiles<br><br>A.CED.A.1 Planes and wheat<br><br>A-CED.A.1 Paying the rent | A.REI.A.1 Zero Product Property 1<br><br>A.CED.A.2 Clea on an Escalator<br><br>S.ID.B.6,S.ID.C.7-9 Coffee and Crime<br><br>F.IF.A.1 The Parking Lot<br><br>F.IF.A.2 Yam in the Oven<br><br>F.LE.B.5 US Population 1982-1988<br><br>F.LE.A.2 Interesting Interest Rates | |

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| **Unit 1 Algebra 1** |

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| Content & Practice Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| MA.7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.<br>MA.7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.<br>MA.7.NS.A.1c Understand subtraction of rational numbers as adding the additive inverse, $- = + (-)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.<br>MA.7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.<br>MA.6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.<br>MA.6.NS.C.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.<br>MA.6.NS.C.6a Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; | MA.K-12.2 Reason abstractly and quantitatively.<br><br>MA.K-12.3 Construct viable arguments and critique the reasoning of others.<br><br>MA.K-12.4 Model with mathematics.<br><br>MA.K-12.5 Use appropriate tools strategically.<br><br>MA.K-12.6 Attend to precision.<br><br>MA.K-12.7 Look for and make use of structure.<br><br>MA.K-12.8 Look for and express ress regularity in repeated reasoning<br><br>MA.K-12.1 Make sense of problems and persevere in solving them. | Concept(s):<br><br>● The terms "positive" and "negative" are used to denote the sign of a number; the terms "plus" and "minus" are used only for operations on numbers.<br>● Addition is demonstrated by moving on the number line in the direction of the value of the number being added.<br>● Subtraction is the distance between two numbers on the number line.<br>● Multiplication of a negative number by a positive number can be interpreted on the number line as repeated additions of the negative number. The result is a negative number.<br>● The absolute value of a number is its distance from zero on a number line.<br><br>Students are able to:<br><br>● build understanding of the concepts of the extended number line with attention firmly focused on the correct use of language.<br>● Use the concepts of negative and positive directions in talking about the number line.<br>● Compare rational numbers using the relations $<, > \leq,$ and $\geq$.<br>● Use the distributive property in relation to negative and positive numbers.<br>● Use the number line to represent addition and subtraction of positive and negative numbers.<br>● Add, subtract, multiply and divide positive and negative numbers.<br>● Apply the definition of absolute value to solve simple equations and inequalities.<br>● Solve word problems involving positive and negative numbers.<br><br>Learning Goals:<br><br>● Build understanding of the concepts of the extended number line with attention firmly focused on the correct use of language.<br>● Positive and negative rational numbers correspond to points on the number line.<br>● '0' is neither negative nor positive, but it is a rational number.<br>● Concepts of negative and positive directions in talking about the number line.<br>● The commutative and associative properties hold for adding and multiplying negative and positive numbers. |

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| recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. MA.6.NS.C.7 Understand ordering and absolute value of rational numbers HSN.RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. | | |
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| Unit 1 Algebra 1 What This May Look Like | |
|---|---|
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| <ul><li>Week 1<ul><li>Lesson 1: Extending the Number Line</li><li>Lesson 2: Putting Numbers in Order</li><li>Lesson 3: Adding with Negative Numbers</li><li>Lesson 4: Subtracting with Negative Numbers</li><li>Lesson 5: Adding & Subtracting</li><li>Classwork and Homework IXL Level I, B2, B5, C2, C3</li></ul></li><li>Week 2<ul><li>Lesson 6: Putting Mathematics to Work - Balloon Model</li><li>Lesson 7: Putting It Together - Reviewing Addition & Subtraction</li><li>Quiz 1</li><li>Lesson 8: Multiplying & Dividing</li><li>Lesson 9: Order of Operations</li><li>Classwork and Homework IXL Level I C.7, E. M 11</li></ul></li><li>Week 3<ul><li>Lesson 10: Mixed Operations</li><li>Lesson 11: Number Properties</li><li>Lesson 12: Putting It Together - Progress Check and review</li><li>Quiz 2</li><li>Lesson 13: Absolute Value</li></ul></li></ul> | Unit 1 Assessment - On Linkit! |

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- ○ Week 4
  - ○ Lesson 14: Putting Mathematics to Work - It's Cold Up There
  - ○ Lesson 15: Word Problems
- ○ Week 5
  - ○ Lesson 16: Putting it Together - Unit Review
  - ○ Unit Review
  - ○ Unit Assessment

## Focus Mathematical Concepts

**Prerequisite skills:**
Fluently add, subtract, multiply and divide positive rational numbers. Operations with decimals and fractions. Order positive rational numbers on a number line. The relationship between addition/subtraction and multiplication/division. Simplify expressions without negative numbers or roots. Writing equations from tables or words. Ratios. The subsets of rational numbers.

**Common Misconceptions:**
Combining like terms. Using rules for integers incorrectly. Working with negative fractions and decimals. Scale of a graph. Interchanging x and y values.

| District/School Tasks | District/School Primary and Supplementary Resources |
|---|---|
| English Language Learners (N.J.A.C.6A:15)<br>❏ When discussing different ways of solving problems, focus on keywords and phrases. ELL Students might also benefit by using concrete objects to demonstrate different concepts.<br>❏ Create place cards or simple signs for students using the vocabulary words. They can use the signs as a reference throughout the lesson.<br>❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.<br>❏ Pair ELL students with a student who is fluent in English.<br><br>At-Risk Students (N.J.A.C.6A:8-4.3c)<br>❏ Encourage students to sketch and label diagrams to represent situations. Remind them to refer back to their sketches and labels as they work through problems.<br>❏ Have students create graphic organizers, modeling tables that focus on vocabulary words or break down information into smaller chunks.<br>❏ Students will use manipulatives to model abstract concepts.<br><br>Special Education Students (N.J.A.C.6A:8-3.1)<br>❏ All IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.) | Savvas enVision Algebra I<br>IXL<br>BrainPop<br>Illustrative Mathematics<br>Desmos<br>Khan Academy<br>NJCTL<br>Achieve the Core |

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## Instructional Best Practices and Exemplars

OnRamp to Algebra - Pearson Realize
Making Number Talks Matter by Cathy Humphreys & Ruth Parker
Routines for Reasoning: Fostering the Mathematical Practices in All Students by Grace Kelemanik
IXL

| Career and Technical Education | 21st Century Skills |
|---|---|
| 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs. | CRP1. Act as a responsible and contributing citizen and employee.<br>CRP2. Apply appropriate academic and technical skills.<br>CRP4. Communicate clearly and effectively and with reason.<br>CRP6. Demonstrate creativity and innovation.<br>CRP7. Employ valid and reliable research strategies.<br>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.<br>CRP9. Model integrity, ethical leadership and effective management.<br>CRP12. Work productively in teams while using cultural global competence. |

## Interdisciplinary Connections

**ELA - Students will apply reasoning skills to justify statements. Students will justify statements through oral
and written communication.
SCIENCE - Students will investigate the effects of hot air and weight on a Hot Air Balloon. Students will
solve problems relating air temperature to altitude.
GLOBAL AWARENESS - Students will solve problems regarding a flight from Beijing, China to San
Francisco.**

## Unit 2 Algebra 1

| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
|---|---|---|
| MA.8.F.B.4 Constructs a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (, ) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | MA.K-12.2 Reason abstractly and quantitatively.<br><br>MA.K-12.3 Construct viable arguments and critique the reasoning of others.<br><br>MA.K-12.4 Model with mathematics.<br><br>MA.K-12.6 Attend to precision. | Concept(s):<br><br>● Graphs that represent proportional relationships are always straight lines, and the constant of<br>● proportionality is the slope of the graph.<br>● A ratio can be used to define a relationship between two quantities that vary.<br>● Interpret the equation of a line in the form y=mx+b.<br><br>Students are able to: |

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| MA.8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.<br>MA.8.EE.B.6 Use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation = for a line through the origin and the equation = + for a line intercepting the vertical axis at .<br>MA.8.EE.C.8 Analyze and solve pairs of simultaneous linear equations.<br>MA.6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.<br>MA.8.EE.C.8a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.<br>MA.6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.<br>MA.8.EE.C.8c Solve real-world and mathematical problems leading to two linear equations in two variables. | MA.K-12.7 Look for and make use of structure.<br><br>MA.K-12.8 Look for and express regularity in repeated reasoning.<br><br>MA.K-12.1 Make sense of problems and persevere in solving them | • Plot points given in an (x, y) table where x and y are any rational number.<br>• Draw a line given two points.<br>• Learn how to find the slope of a line, and what the slope means in different relationships between<br>• quantities.<br>• Recognize the $y = mx$ or $y = kx$ form.<br>• Understand different representations of k, identifying types of proportional relationships and different<br>• types of constants of proportionality.<br>• Interpret and determine the sign of m or k by incline or decline of a line.<br>• Use graphs to estimate the output, given a specific input, and to estimate the possible inputs, given a<br>• specific output.<br>• Identify slope from an equation, table, line or two points.<br>• Understand linear rates of change and how they relate to slope.<br>• Model real-world phenomena using graphs and tables.<br>• Solve word problems that describe situations modeled by arithmetic operations and represent the<br>• relationship between the quantities using graphs, tables and formulas.<br>• Distinguish between linear and nonlinear equations (only graphically).<br>• Generalize to $y = mx +b$ form.<br>• Determine the y-intercept of a line from a graph and be able to explain the y-intercept.<br>• Identify and interpret parallel and perpendicular lines.<br>• Model real-world phenomena with general $y = mx + b$ form.<br>• Use linear models in problem solving.<br>• Solve systems of equations in two variables by graphing the equations.<br><br>Learning Goals:<br><br>• Recognize and represent proportional relationships between quantities using<br>• Slopes are constants of proportionality.<br>• k or m represents the slope of the graph and a constant increase or constant decrease.<br>• Different representations of k, identifying types of proportional relationships and different types of constants of proportionality<br>• Relationships between quantities can be represented using tables, graphs, and formulas. |

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| MA.6.RP.A.3b Solve unit rate problems including those involving unit pricing and constant speed.<br>MA.8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.<br>MA.6.NS.C.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.<br>MA.6.NS.C.6b Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.<br>MA.6.NS.C.6c Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.<br>MA.7.RP.A.2 Recognize and represent proportional relationships between quantities.<br>MA.7.RP.A.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.<br>MA.7.RP.A.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. | | ● Linear rates of changes and how they relate to slope. |

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MA.8.F.A.3 Interpret the equation $= +$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

MA.7.RP.A.2c Represent proportional relationships by equations.

MA.7.RP.A.2d Explain what a point (, ) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, ) where the unit rate.

MA.8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways

HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

HSA.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

HSA.REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

HSF.IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to

Key: ■ Major | □ Supporting | ○ Additional | * Benchmarked Standard

the input x. The graph of f is the graph of the equation y = f(x).

HSF.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*

HSF.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*

HSF.IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

HSF.IF.C.7.A Graph linear and quadratic functions and show intercepts, maxima, and minima.

HSF.LE.A.1.B Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

| Unit 2 Algebra 1 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| <ul><li>Week 1<ul><li>Lesson 1: Building the Coordinate Plane</li></ul></li></ul> | Unit 2 Assessment - on Linkit! |

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| ○ Lesson 2: Constant Ratios & Graphing<br>○ Lesson 3: How Steep is the Line<br>○ Lesson 4: Introducing Slope<br>● Week 2<br>  ○ Lesson 5: Graphing Negative Values<br>  ○ Lesson 6: Relationships without a Constant Ratio<br>  ○ Lesson 7: Putting Mathematics to Work - Graphs Showing Speed<br>  ○ Review<br>  ○ Quiz 1<br>  ○ Lesson 8: Graphing Geometric Geometric Relationships<br>● Week 3<br>  ○ Lesson 9: Graphing Discrete & Continuous Data<br>  ○ Lesson 10: Putting It Together - Progress Check<br>  ○ Lesson 11: Linear Graphs<br>  ○ Lesson 12: Focus on Slope<br>  ○ Lesson 13: Parallel & Perpendicular Lines<br>● Week 4<br>  ○ Review<br>  ○ Quiz 2<br>  ○ Lesson 14: Putting Mathematics to Work - Water Tank Problem<br>  ○ Lesson 15: Algebra of the Water Tank Problem<br>  ○ Lesson 16: Solving Systems by Graphing<br>● Week 5<br>  ○ Lesson 17: Putting Mathematics to Work - Interpreting Graphs<br>  ○ Lesson 18: Putting It Together - Unit Review<br>  ○ Unit Review<br>  ○ Unit Assessment<br>  ○ Comprehensive Review | Benchmark #1 - on Linkit! |

| **Focus Mathematical Concepts** |
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Prerequisite skills:

Graph ordered pairs in Quadrant I. Show proportional relationships among variables in a variety of ways. Identify the constant of proportionality. Identify variables to determine appropriate range.

Key: ■ Major | □ Supporting | ○ Additional | * Benchmarked Standard

Common Misconceptions:
- Students may misunderstand the context of a graph. They may believe that the coordinates moving up/down/left/right means that the context of the graph is also physically moving. Students may not understand the importance of consistent intervals on a graph or number line.
- Students may think that all linear relationships are proportional leading them to incorrectly find the slope or equation of the relationship. Students reverse the coordinates when representing slope as well as when plotting ordered pairs. Students forget to look at the scale of a graph before solving a problem assuming it is 1. Often graph labels are interchanged.
- Students may interchange x and y coordinates or the x and y axis. Students commonly think that vertical lines are linear functions.  Students have a difficult time getting past the idea that every equation has to end as x=a.  Students believe the variable is always on the left side of the equation. As students begin to build and work with expressions containing more than two operations, students tend to set aside the order of operations. Students commonly forget that the negative sign in front of a variable is really a coefficient of -1. Students confuse one-variable and two-variable equations. Students mistakenly believe that linear functions (with a constant rate of change) are the only type of functions. Students commonly do not recognize a constant rate of change when entries in a table are absent. Students frequently attempt to "solve" expressions.

| District/School Tasks | District/School Primary and Supplementary Resources |
|---|---|
| English Language Learners (N.J.A.C.6A:15)<br>❏ When discussing different ways of solving problems, focus on keywords and phrases. ELL Students might also benefit by using concrete objects to demonstrate different concepts.<br>❏ Create place cards or simple signs for students using the vocabulary words. They can use the signs as a reference throughout the lesson.<br>❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.<br>❏ Pair ELL students with a student who is fluent in English.<br><br>At-Risk Students (N.J.A.C.6A:8-4.3c)<br>❏ Encourage students to sketch and label diagrams to represent situations. Remind them to refer back to their sketches and labels as they work through problems.<br>❏ Have students create graphic organizers, modeling tables that focus on vocabulary words or break down information into smaller chunks.<br>❏ Students will use manipulatives to model abstract concepts.<br><br>Special Education Students (N.J.A.C.6A:8-3.1)<br>❏ All IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.) | Savvas enVision Algebra I<br>IXL<br>BrainPop<br>Illustrative Mathematics<br>Desmos<br>Khan Academy<br>NJCTL<br>Achieve the Core |

| Instructional Best Practices and Exemplars |
|---|
| OnRamp to Algebra - Pearson Realize<br>Making Number Talks Matter by Cathy Humphreys & Ruth Parker |

Key:  ■ Major |  ☐ Supporting |  ○ Additional  |  * Benchmarked Standard

Routines for Reasoning: Fostering the Mathematical Practices in All Students by Grace Kelemanik
IXL

| Career and Technical Education | 21st Century Skills |
| --- | --- |
| 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs. | CRP1. Act as a responsible and contributing citizen and employee.<br>CRP2. Apply appropriate academic and technical skills.<br>CRP4. Communicate clearly and effectively and with reason.<br>CRP6. Demonstrate creativity and inn<br>CRP7. Employ valid and reliable research strategies.<br>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.<br>CRP9. Model integrity, ethical leadership and effective management.<br>CRP12. Work productively in teams while using cultural global competence. |

| Interdisciplinary Connections |
| --- |
| **ELA - Students will apply reasoning skills to justify statements. Students will justify statements through oral and written communication.**<br>**SCIENCE - Students solve multi-step problems using rate, average speed, distance and time. Solve multistep problems involving volume, rate and time.** |

| Unit 3 Algebra 1 |
| --- |

| Content Standards | Suggested Standards for Mathematical Practice | Critical Knowledge & Skills |
| --- | --- | --- |
| MA.6.EE.B.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.<br>MA.6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.<br>MA.6.EE.B.7 Solve real-world and mathematical problems by writing and | MA.K-12.2 Reason abstractly and quantitatively.<br><br>MA.K-12.3 Construct viable arguments and critique the reasoning of others.<br><br>MA.K-12.4 Model with mathematics.<br><br>MA.K-12.5 Use appropriate tools strategically.<br><br>MA.K-12.6 Attend to precision.<br><br>MA.K-12.7 Look for and make use of structure. | Concept(s):<br><br>● Exponents represent the operations of multiplication and division.<br>● Equations are statements of equality between two expressions.<br>● Expressions (and equations) can be used to model (and solve) real-life problems.<br>● An inequality is a representation of two quantities which may not be equivalent.<br>● The solution to an inequality represents a range of possible solutions.<br>● Like terms are terms with identical variable parts.<br><br>Students are able to:<br><br>● Use the number properties to write equivalent expressions that represent the same quantity.<br>● Use algebraic terminology (e.g. variable, equation, term, coefficient, expression, constant) correctly.<br>● Evaluate expressions by substituting values into variables. |

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solving equations of the form + = and = for cases in which , and are all nonnegative rational numbers.

MA.8.EE.C.7 Solve linear equations in one variable.

MA.8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.

MA.6.EE.B.8 Write an inequality of the form $>$ or $<$ to represent a constraint or condition in a real- world or mathematical problem. Recognize that inequalities of the form $>$ or $<$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

MA.8.EE.C.7b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

MA.6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.

MA.6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.

MA.6.EE.A.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

MA.6.EE.A.2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

MA.K-12.8 Look for and express regularity in repeated reasoning.

MA.K-12.1 Make sense of problems and persevere in solving them.

- Represent quantities using corresponding area models and expressions.
- Use the number of properties to combine like terms.
- Use expressions to combine quantities that have different units.
- Add and subtract expressions.
- Write the expressions for the perimeters and areas of geometric figures.
- Express numbers and variables using exponential notation.
- Multiply and divide numbers into exponential form.
- Complete operations involving parentheses with numbers in exponential form.
- Evaluate expressions with negative exponents.
- Understand and apply the Pythagorean Theorem.
- Write and interpret numbers using scientific notation.
- Use the Addition and Multiplication Properties of Equality to solve equations.
- Solve equations by using more than one property of equality.
- Solve equations that require simplification by using number properties and the order of operations.
- Solve simple inequalities.

Learning Goals:

- The difference between solving an equation and evaluating an expression.

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MA.8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, which $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

MA.8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is better than the other.

MA.6.EE.A.3 Apply the properties of operations to generate equivalent expressions.

MA.8.EE.A.4 Perform operations with numbers expressed in scientific notation where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

MA.6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

MA.8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

MA.7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the

Key: ■ Major | ☐ Supporting | ● Additional | * Benchmarked Standard

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| quantities.<br>HSN.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.<br>HSN.RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.<br>HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.*<br>HSA.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients.<br>HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.<br>HSA.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*<br>HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.<br>HSA.CED.A.2 Create equations in two more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. | | |

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

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| HSA.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. HSA.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | | |

| Unit 3 Algebra 1 What This May Look Like | |
|---|---|
| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| <ul><li>Week 1<ul><li>Lesson 1: Representing Quantities with Expressions</li><li>Lesson 2: Evaluating Expressions</li><li>Lesson 3: Exponents</li><li>Lesson 4: Operations with Exponents</li><li>Lesson 5: Expressions & Area Models</li><li>Classwork and Homework practice IXL: Level F. F.9, G.1, G2 - Writing expressions</li><li>IXL: Level G. E1,E2, D.2- evaluating exponents</li></ul></li><li>Week 2:<ul><li>Review</li><li>Quiz 1</li></ul></li><li>Week 3:<ul><li>Lesson 6: Combining Like Terms</li><li>Lesson 7: Putting Mathematics to Work: Combining Quantities</li><li>Lesson 8: Adding & Subtracting Expressions</li><li>Classwork and homework practice IXL- Like Terms- Level H. Y14, Level I.R.13</li></ul></li><li>Week 4:<ul><li>Lesson 9: Parentheses & Exponents</li><li>Review</li><li>Quiz 2</li><li>Lesson 10: Negative Exponents</li><li>Lesson 11: Scientific Notation</li></ul></li></ul> | Mid-unit 3 Assessment - on Linkit!<br><br>Unit 3 Assessment - on Linkit! |

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

- - Lesson 12: Estimating Square Roots
    - Lesson 13: The Pythagorean Theorem
    - Lesson 14: Putting Mathematics to Work - Applying the Pythagorean Theorem
    - Classwork and Homework practice IXL- Negative exponents- Level K. V.3, H.D.6, H.D7
  - Week 5
    - Lesson 15: Putting It Together - Progress Check
    - Mid-Unit Review
    - Mid-Unit Assessment
    - Lesson 16: Writing Equivalent Expressions
    - Lesson 17: Using Expressions in Geometry
  - Week 6
    - Lesson 18: Writing Equations
    - Lesson 19: Addition Property of Equality
    - Lesson 20: Multiplication Property of Equality
    - Lesson 21: Combining the Properties of Equality
  - Week 7
    - Lesson 22: Solving Equations Requiring Simplification
    - Review
    - Quiz 3
    - Lesson 23: Inequalities
    - Lesson 24: Putting It Together - Unit Review
  - Week 8
    - Unit Review
    - Unit Review
    - Unit Assessment

## Focus Mathematical Concepts

Prerequisite skills:
- Understand the place value system. Simplify algebraic expressions. Parts of a power.

Common Misconceptions:
- Students commonly misinterpret exponents as multiplication instead of repeated multiplication. It may be difficult for students to remember how to apply properties of exponents and that the square root of a number has 2 possible solutions.  For Real Number Subgroups, students often think integers are irrational.  Also, that the most restrictive subgroup is the only classification of a number.

**District/School Tasks** | **District/School Primary and Supplementary Resources**

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

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|---|---|
| English Language Learners (N.J.A.C.6A:15)<br>❏ When discussing different ways of solving problems, focus on keywords and phrases. ELL Students might also benefit by using concrete objects to demonstrate different concepts.<br>❏ Create place cards or simple signs for students using the vocabulary words. They can use the signs as a reference throughout the lesson.<br>❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.<br>❏ Pair ELL students with a student who is fluent in English.<br><br>At-Risk Students (N.J.A.C.6A:8-4.3c)<br>❏ Encourage students to sketch and label diagrams to represent situations. Remind them to refer back to their sketches and labels as they work through problems.<br>❏ Have students create graphic organizers, modeling tables that focus on vocabulary words or break down information into smaller chunks.<br>❏ Students will use manipulatives to model abstract concepts.<br><br>Special Education Students (N.J.A.C.6A:8-3.1)<br>❏ All IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.) | Savvas enVision Algebra I<br>IXL<br>BrainPop<br>Illustrative Mathematics<br>Desmos<br>Khan Academy<br>NJCTL<br>Achieve the Core |

### Instructional Best Practices and Exemplars

**OnRamp to Algebra - Pearson Realize**
**Making Number Talks Matter by Cathy Humphreys & Ruth Parker**
**Routines for Reasoning: Fostering the Mathematical Practices in All Students by Grace Kelemanik et al**
**IXL**

| Career and Technical Education | 21st Century Skills |
|---|---|
| 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs. | CRP1. Act as a responsible and contributing citizen and employee.<br>CRP2. Apply appropriate academic and technical skills.<br>CRP4. Communicate clearly and effectively and with reason.<br>CRP6. Demonstrate creativity and innovation.<br>CRP7. Employ valid and reliable research strategies.<br>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.<br>CRP9. Model integrity, ethical leadership and effective management. |

### Interdisciplinary Connections

**ELA - Students will apply reasoning skills to justify statements. Students will justify statements through oral and written communication. Write a real-world equation that represents a given equation/inequality. Error analysis.**

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

| Unit 4 Algebra 1 | |
|---|---|
| **Content & Practice Standards** | **Critical Knowledge & Skills** |

| Content & Practice Standards | | Critical Knowledge & Skills |
|---|---|---|
| MA.6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. MA.6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers. MA.6.EE.A.2a Write expressions that record operations with numbers and with letters standing for numbers. MA.6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. MA.6.EE.A.2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). | MA.K-12.2 Reason abstractly and quantitatively. MA.K-12.3 Construct viable arguments and critique the reasoning of others. MA.K-12.4 Model with mathematics. MA.K-12.6 Attend to precision. MA.K-12.7 Look for and make use of structure. MA.K-12.8 Look for and express regularity in repeated reasoning. MA.K-12.1 Make sense of problems and persevere in solving them. | Concept(s): <br><br> ● How to use diagrams to show that two amounts are equal. <br> ● How to justify statements as always true, sometimes true, or never true. <br> ● That multiplication and addition are commutative and associative. <br> ● That 1 multiplicative identity. <br> ● That 0 is the additive identity. <br> ● The inverse properties of addition and multiplication. <br> ● That multiplication distributes over addition and understand the Distributive Property. <br><br> Students are able to: <br><br> ● Justify statements about mathematical expressions in which variables are used to stand for numbers. <br> ● Learn the conventions for using numbers and variables in mathematical expressions. <br> ● Use parentheses to clarify expressions. <br> ● Use variables in the formulas for the area and perimeter of a rectangle. <br> ● Use number properties of multiplication and addition through the commutative and associative properties. <br> ● Use variables, tables, and formulas to represent quantities that vary in relation to each other. <br> ● Use the distributive property. <br> ● Represent the relationship between two quantities as a graph. <br> ● Begin to learn the strategies for interpreting, representing, and solving word problems. <br> ● Practice understanding the situation described in a word problem, using a problem situation without questions. <br><br> Learning Goals: <br><br> ● The overall purpose of the unit is to introduce students to the foundations of reasoning - including justifying statements and answering "say why" questions - with mathematical expressions using variables and numbers. <br> ● Reasoning skills are essential for working with numbers, variables, diagrams and justifying statements. <br> ● Variables are used to express number properties. |

Key: ■ Major | ☐ Supporting | ◯ Additional | * Benchmarked Standard

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| MA.6.EE.A.3 Apply the properties of operations to generate equivalent expressions.<br>MA.6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).<br>HSA.APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.<br>HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.<br>HSA.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.<br>HSA.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.<br>HSA.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. | | ● The number properties (commutative property, associative property, identity properties of addition and multiplication, distributive property, and inverse properties) are used to justify statements of equivalence.<br>● Formulas, tables and graphs represent related quantities. |

| Unit 4 Algebra 1 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

- Week 1:
  - Lesson 1: Reasoning with Diagrams
  - Lesson 2: Reasoning with Numbers
  - Lesson 3: Reasoning with Variables
  - Lesson 4: Conventions for Using Numbers & Variables
  - Lesson 5: Conventions for Using Parentheses
  - Student classwork and homework practice: IXL level e.e2,.e5,e6,e7,
- Week 2:
  - Review Lessons 1-5
  - Quiz 1
  - Lesson 6: The Number Properties
  - Lesson 7: Putting It Together - Conventions & Number Properties
  - Lesson 8: Using Variables & Formulas
  - Classroom and homework practice IXL E.O.5 using variables to represent real world problems.
  - Number properties IXL - Level E. N9, N.10
- Week 3:
  - Lesson 9: Distributive Property
  - Lesson 10: Putting Mathematics to Work - Applying the Distributive Property
  - Lesson 11: The Inverses of Addition & Multiplication
  - Lesson 12: Putting It Together - Progress Check - to review definitions, conventions, and properties and how they can help with mathematical reasoning
  - Classwork and Homework IXL practice - Level E.N2, N.7
- Week 4:
  - Lesson 13: Relationships Between Quantities
  - Lesson 14: Using Graphs to Represent Relationships
- Week 5:
  - Lesson 15: Understanding the Problem Situations
  - Review
  - Quiz 2
  - Lesson 16: Representing Problem Situations

Benchmark #2- on Linkit!
Unit 4 Assessment - on Linkit!

Key: ■ Major | □ Supporting | ○ Additional | * Benchmarked Standard

- Week 6:
  - Lesson 17: Writing Formulas to Answer Questions
  - Lesson 18: Putting It Together - Unit Review
  - Unit Review
  - Unit Assessment
  - Comprehensive Assessment*

## Focus Mathematical Concepts

Prerequisite skills:
- Order of operations. Parts of a power. Variables. Solving one-step equations with positive rational numbers. Evaluating expressions.

Common Misconceptions:
- The idea of an inverse and "undoing" an operation to solve can be confusing without a model. Students fail to see juxtaposition (side by side) as indicating multiplication. For example, evaluating $3x$ as 35 when $x = 5$ instead of 3 times $5 = 15$. Students attempt to solve expressions instead of simplifying. Students may miss the understood "1" in front of a variable like a or x or p. Students may misinterpret exponents as multiplication instead of repeated multiplication. When using distributive property, students may not multiply all terms by the outside term.
- Inverse of a fraction. Combining like terms. Taking the sign in front of a term.
- Solving equations. Mixing up formulas. Substituting values into the wrong variables.

| District/School Tasks | District/School Primary and Supplementary Resources |
|---|---|
| English Language Learners (N.J.A.C.6A:15)<br>❏ When discussing different ways of solving problems, focus on keywords and phrases. ELL Students might also benefit by using concrete objects to demonstrate different concepts.<br>❏ Create place cards or simple signs for students using the vocabulary words. They can use the signs as a reference throughout the lesson.<br>❏ Work with ELL Teacher to allow for all assignments to be completed with extra time.<br>❏ Pair ELL students with a student who is fluent in English.<br><br>At-Risk Students (N.J.A.C.6A:8-4.3c)<br>❏ Encourage students to sketch and label diagrams to represent situations. Remind them to refer back to their sketches and labels as they work through problems.<br>❏ Have students create graphic organizers, modeling tables that focus on vocabulary words or break down information into smaller chunks.<br>❏ Students will use manipulatives to model abstract concepts.<br><br>Special Education Students (N.J.A.C.6A:8-3.1)<br>❏ All IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.) | Savvas enVision Algebra I<br>IXL<br>BrainPop<br>Illustrative Mathematics<br>Desmos<br>Khan Academy<br>NJCTL<br>Achieve the Core |

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

| Instructional Best Practices and Exemplars |
|---|
| OnRamp to Algebra - Pearson Realize<br>Making Number Talks Matter by Cathy Humphreys & Ruth Parker<br>Routines for Reasoning: Fostering the Mathematical Practices in All Students by Grace Kelemanik et al<br>IXL |

| Career and Technical Education | 21st Century Skills |
|---|---|
| **9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.** | **CRP1. Act as a responsible and contributing citizen and employee.**<br>**CRP2. Apply appropriate academic and technical skills.**<br>**CRP4. Communicate clearly and effectively and with reason.**<br>**CRP6. Demonstrate creativity and innovation.**<br>**CRP7. Employ valid and reliable research strategies.**<br>**CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**<br>**CRP9. Model integrity, ethical leadership and effective management.**<br>**CRP12. Work productively in teams while using cultural global competence.** |

| Interdisciplinary Connections |
|---|
| **ELA - Students will apply reasoning skills to justify statements. Students will justify statements through oral and written communication.** |

| Unit 5 Algebra 1 | | |
|---|---|---|
| **Content & Practice Standards** | **Suggested Standards for Mathematical Practice** | **Critical Knowledge & Skills** |
| N.Q.A.1. Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.<br><br>N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.<br><br>N.Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | MP.1 Make sense of problems and persevere in solving them.<br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.5 Use appropriate tools strategically. | Concept(s):<br>● Units are associated with variables in expressions and equations in context.<br>● Quantities may be used to model attributes of real world situations.<br>● Measurement tools have an inherent amount of uncertainty in measurement.<br>Students are able to:<br>● use units to understand real world problems.<br>● use units to guide the solution of multi-step real world problems (e.g. dimensional analysis).<br>● choose and interpret units while using formulas to solve problems.<br>● identify and define appropriate quantities for descriptive modeling.<br>● choose a level of accuracy when reporting measurement quantities.<br><br>Learning Goal 1: Solve multi-step problems, using units to guide the solution, interpreting units consistently in formulas and choosing an appropriate level of accuracy on measurement quantities. Develop descriptive models by defining appropriate quantities. |

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

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| ■ A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.<br>■ A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.<br>■ A.CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R. | MP 2 Reason abstractly and quantitatively.<br>MP.6 Attend to precision.<br>MP.7 Look for and make use of structure. | Concept(s).<br>● Literal equations can be rearranged using the properties of equality.<br>Students are able to.<br>● solve linear equations with coefficients represented by letters in one variable.<br>● use the properties of equality to justify steps in solving linear equations.<br>● solve linear inequalities in one variable.<br>● rearrange linear formulas and literal equations, isolating a specific variable.<br><br>Learning Goal 2. Solve linear equations and inequalities in one variable (including literal equations); justify each step in the process. |
| ■ A.SSE.A.1. Interpret expressions that represent a quantity in terms of its context.<br>  A.SSE.A.1a. Interpret parts of an expression, such as terms, factors, and coefficients. | MP.1 Make sense of problems and persevere in solving them.<br>MP 2 Reason abstractly and quantitatively. | Concept(s): No new concept(s) introduced<br>Students are able to:<br>● identify different parts of an expression, including terms, factors and constants.<br>● explain the meaning of parts of an expression in context.<br><br>Learning Goal 3: Interpret terms, factors, coefficients, and other parts of expressions in terms of a context . |
| ■ A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear functions and quadratic functions, and simple rational and exponential functions.<br>■ A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. | MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.7 Look for and make use of structure. | Concept(s):<br>● Equations and inequalities describe relationships.<br>● Equations can represent real-world and mathematical problems.<br>Students are able to:<br>● identify and describe relationships between quantities in word problems.<br>● create linear equations in one variable.<br>● create linear inequalities in one variable.<br>● use equations and inequalities to solve real world problems.<br>● explain each step in the solution process.<br><br>Learning Goal 4: Create linear equations and inequalities in one variable and use them in contextual situations to solve problems. Justify each step in the process and the solution. |

Key: ■ Major | ☐ Supporting | ○ Additional | * Benchmarked Standard

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| ■ A.CED.A.2. Create equations in two or more variables to represent relationships between quantities; Graph equations on coordinate axes with labels and scales.<br><br>N.Q.A.1. Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.<br>■ A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). [Focus on linear equations.] | MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.7 Look for and make use of structure. | Concept(s):<br>● Equations represent quantitative relationships.<br>Students are able to:<br>● create linear equations in two variables, including those from a context.<br>● select appropriate scales for constructing a graph.<br>● interpret the origin in graphs.<br>● graph equations on coordinate axes, including labels and scales.<br>● identify and describe the solutions in the graph of an equation.<br><br>Learning Goal 5: Create linear equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. |
| ■ S.ID.B.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.<br>S.ID.B.6a. Fit a function to the data (including the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.<br>S.ID.B.6c. Fit a linear function for a scatter plot that suggests a linear association.<br>■ S.ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.<br>■ S.ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.<br>■ S.ID.C.9. Distinguish between correlation and causation. | MP.1 Make sense of problems and persevere in solving them.<br>MP 2 Reason abstractly and quantitatively.<br>MP.4 Model with mathematics.<br>MP.5 Use appropriate tools strategically.<br>MP.6 Attend to precision. | Concept(s):<br>● Scatter plots represent the relationship between two variables.<br>● Scatter plots can be used to determine the nature of the association between the variables.<br>● Linear models may be developed by fitting a linear function to approximately linear data.<br>● The correlation coefficient represents the strength of a linear association.<br>Students are able to:<br>● distinguish linear models representing approximately linear data from linear equations representing "perfectly" linear relationships.<br>● create a scatter plot and sketch a line of best fit.<br>● fit a linear function to data using technology.<br>● solve problems using prediction equations.<br>● interpret the slope and the intercepts of the linear model in context.<br>● determine the correlation coefficient for the linear model using technology.<br>● determine the direction and strength of the linear association between two variables.<br><br>Learning Goal 6: Represent data on a scatter plot, describe how the variables are related and use technology to fit a function to data.<br>Learning Goal 7: Interpret the slope, intercept, and correlation coefficient of a data set of a linear model; distinguish between correlation and causation. |

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| ■ A.REI.D.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* [Focus on linear equations.] | MP.1 Make sense of problems and persevere in solving them.<br>MP.3 Construct viable arguments and critique the reasoning of others.<br>MP.5 Use appropriate tools strategically. | Concept(s):<br>● y = f(x), y=g(x) represent a system of equations.<br>● Systems of equations can be solved graphically (8.EE.C.8).<br>Students are able to:<br>● explain the relationship between the x-coordinate of a point of intersection and the solution to the equation f(x) = g(x) for linear equations y = f(x) and y = g(x).<br>● find approximate solutions to the system by making a table of values, graphing, and finding successive approximations.<br><br>Learning Goal 8: Explain why the solutions of the equation f(x) = g(x) are the x-coordinates of the points where the graphs of the linear equations y=f(x) and y=g(x) intersect. ** function notation is not introduced here<br>Learning Goal 9: Find approximate solutions of f(x) = g(x), where f(x) and g(x) are linear functions, by making a table of values, using technology to graph and finding successive approximations. |
| ■ F.IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).<br>■ F.IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. | MP 2 Reason abstractly and quantitatively.<br><br>MP.6 Attend to precision.<br><br>MP.7 Look for and make use of structure. | Concept(s):<br><br>● F(x) is an element in the range and x is an element in the domain.<br>Students are able to:<br><br>● use the definition of a function to determine whether a relationship is a function.<br>● use function notation once a relation is determined to be a function.<br>● evaluate functions for given inputs in the domain.<br>● explain statements involving function notation in the context of the problem.<br><br>Learning Goal 10: Explain the definition of a function, including the relationship between the domain and range. Use function notation, evaluate functions and interpret statements in context. |
| ● F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums;* | MP 2 Reason abstractly and quantitatively.<br><br>MP.4 Model with mathematics.<br><br>MP.6 Attend to precision. | Concept(s): No new concept(s) introduced<br><br>Students are able to:<br><br>● given a verbal description of a relationship, sketch linear and exponential functions.<br><br>● identify intercepts and intervals where the function is positive/negative.<br><br>● interpret parameters in context. |

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| | | ● determine the *practical* domain of a function. |
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| *symmetries; end behavior; and periodicity.* *[Focus on exponential functions] F.LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context. ■ F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function* | | Learning Goal 11: Sketch graphs of linear and exponential functions expressed symbolically or from a verbal description. Show key features and interpret parameters in context. |
| F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.     F.LE.A.1a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.     F.LE.A.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.     F.LE.A.1c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F.LE.A.2. Construct linear and exponential functions - including arithmetic and geometric sequences - given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). *[Algebra 1 limitation: exponential expressions with integer exponents] | MP.3 Construct viable arguments and critique the reasoning of others. MP.6 Attend to precision. | Concept(s): ● Linear functions grow by equal differences over equal intervals. ● Exponential functions grow by equal factors over equal intervals. Students are able to: ● identify and describe situations in which one quantity changes at a constant rate. ● identify and describe situations in which a quantity grows or decays by a constant percent. ● show that linear functions grow by equal differences over equal intervals. ● show that exponential functions grow by equal factors over equal intervals. Learning Goal 12: Distinguish between and explain situations modeled with linear functions and with exponential functions. Learning Goal 13: Write linear and exponential functions given a graph, table of values, or written description |

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| Unit 5 Algebra 1 What This May Look Like | |
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| **District/School Formative Assessment Plan** | **District/School Summative Assessment Plan** |
| Topic 1 - Solving Equations and Inequalities <br>     ●     Readiness Assessment <br>     ●     Assessment <br>          ○     Quiz 1 - 1.2, 1.3 <br>          ○     Quiz 2 - 1.5, 1.6 <br>          ○     Quiz 3 - 1.4, 1.7 <br>          ○     Test 1 - Topic 1 <br>     ●   Optional: Topic 1 Performance Task <br> Topic 2 - Linear Equations <br>     ●     Readiness Assessment <br>     ●     Assessment <br>          ○     Quiz 1 - 2.1, 2.2 <br>          ○     Quiz 2 - 2.3, 2.4 <br>          ○     Test 1 - 2.1-2.4 <br>     ●   Optional: Topic 2 Performance Task <br> Topic 3 - Linear Functions <br>     ●     Readiness Assessment <br>     ●     Assessment <br>          ○     Quiz 1 - 3.1, 3.2 <br>      Optional: Topic 3 Performance Task | Topic 1 Assessment - on Savvas, need to upload to Linkit! <br><br> Benchmark Assessment 3 <br><br> Topic 2 Assessment - on Savvas, need to upload to Linkit! <br><br> Topic 3 Assessment - on Savvas, need to upload to Linkit! <br><br><br> Benchmark Assessment 4 - Use Algebra 1 MP1 Benchmark and upload to Linkit! |
| **Focus Mathematical Concepts** | |

Prerequisite skills:
- Graphing on a coordinate plane, converting meters to kilometers, graphing, converting seconds to hours
- Volume
- converting
- absolute value, parts of an expression re: negative and positive signs
- percentage growth
- surface area (circle and cylinder)
- solving equations and justifying steps
- solving for another variable with no numbers or coefficients and justifying your answer
- solving equations and inequalities
- solving inequalities
- writing and solving an equation
- writing, solving, comparing through mathematical explanation
- equations – solving for another variable
- graphing equations
- graphing inequalities

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- writing inequalities
- use linear equations to represent linear relationships
- write and solve linear equations
- distinguish between relations and functions

Common Misconceptions:
- In solving systems graphically, students may mistake a system with infinite solutions for a system with no solutions.
- When solving by substitution, students may substitute into the same equation they used to isolate the variable.
- Students may attempt to solve a system of linear equations using a less efficient method.
- When students are graphing a system of inequalities, they might shade the wrong side of the line.
- When students are graphing a system of inequalities, they might confuse whether the boundary line should be solid or dashed.
- When students are graphing a system of inequalities, they might not know what to do if a point falls ON one of the lines in the system.
- When students are graphing a system of inequalities whose graph forms a set of parallel lines, they might assume that the system has no solutions.

| District/School Tasks | District/School Primary and Supplementary Resources |
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| Enrichment activities for each section from Savvas Realize.<br><br>Achieve the Core Coherence Map | Savvas enVision Algebra I<br>IXL<br>BrainPop<br>Illustrative Mathematics<br>Desmos<br>Khan Academy<br>NJCTL<br>Achieve the Core |

| Instructional Best Practices and Exemplars |
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| **Number/Pattern talks**<br>**Which One Doesn't Belong**<br>**Performance Tasks**<br>**3-ACT tasks**<br>**3-Reads** |

| Career and Technical Education | 21st Century Skills |
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| 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.<br><br>9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth. | CRP2. Apply appropriate academic and technical skills.<br><br>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.<br><br>CRP11. Use technology to enhance productivity. |

| Interdisciplinary Connections |
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| **NJSLS ELA**<br>NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words. |

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**NJSLS Science**
HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects

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