## HONORS ALGEBRA PACING GUIDE: 1st Nine Weeks
### UNIT ONE: Quantities and Modeling

<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson</th>
<th>Standards</th>
<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE</td>
<td>Goals</td>
<td>A-RELA.1</td>
<td>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.</td>
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<tr>
<td></td>
<td>Expectations</td>
<td>A-RELB.3</td>
<td>Solve linear equations in one variable.</td>
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<td>i-Ready testing</td>
<td>N-Q.A.1</td>
<td>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret the scale and origin in graphs and data displays.</td>
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<td>N-Q.A.2</td>
<td>Define appropriate units for the purpose of descriptive modeling.</td>
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<td>N-Q.A.3</td>
<td>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</td>
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<td>M1:Quantitative Reasoning</td>
<td>Also A-RELB.3</td>
<td>Solve linear equations in one variable.</td>
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<td>Al.WCE.1</td>
<td>Evaluate expressions and solve equation fluently using substitution to verify solutions; Al.WCE.3: Convert unit rates of measurements in multistep arithmetic problems.;</td>
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</tbody>
</table>

I CAN:
- justify steps in solving multi-step equations using the properties of equality.
- write multi-step equations from word problems.
- use dimensional analysis to compare units and rates. Ratio and proportion are also introduced in this lesson.
- use significant digits to calculate and report values to an appropriate level of precision.
- give the solution of an equation using the correct units.
- use the scale to read the data correctly.
- define appropriate quantities.
- determine the accuracy of values based on their limitations in the context of the situation.
**THREE**

### M2: Algebraic Models

**A-SSE.A.1a:** Interpret expressions that represent a quantity in terms of its context.
- a. Interpret parts of an expression, such as terms, factors, and coefficients.

**A-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.

Also **A-CED.A.3; A-REI.B.3; A-SSE.A.1b; N-Q.A.2**

**FOUR**

### M2: Algebraic Models

**A-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.

**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 $R$.

Also **A-REI.B.3; Al.WCE.8:** Translate a real world situation by writing constraints for equation and inequalities.

**I CAN:**
- identify coefficients, terms, variables, factors.
- solve multi-step equations including those with variables on both sides of the equal sign and those requiring the distributive property.
- recognize and explain when 1 solution, no solution, or infinite solutions are the result of solving an equation.
- create linear equations and inequalities in one variable and use them in a contextual situation to solve problems.

<table>
<thead>
<tr>
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<th>Lesson</th>
<th>Standards</th>
<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
</table>
|      |        | **A-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. | **I CAN:**
  - isolate a given variable in literal equations and formulas.
  - create and solve multi-step inequalities including when there are variables on both sides of the inequality symbol, and those requiring the distributive property.
  - interpret the solution in the context of the problem.
  - solve, graph, and interpret compound inequalities in one variable.
  - describe the calculations needed to model a function between two quantities.
  - write equations to solve contextual problems that involve distance/time/rate, mixture, consecutive integers, and cost.
  - solve multi-variable formulas or literal equations, for a specific variable.
  - write and use a system of equations and/or inequalities to solve a real world problem.
  - represent constraints by equations or inequalities and by systems of equations and/or inequalities.
  - interpret solutions as viable or nonviable options in a modeling context.
  - solve systems of equations and inequalities with and without technology. | |
|      |        | **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 $R$.

Also **A-REI.B.3; Al.WCE.8:** Translate a real world situation by writing constraints for equation and inequalities. | | |
## UNIT TWO: Understanding Functions

<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson</th>
<th>Standards</th>
<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
</table>
| **FIVE**  | M3: Functions and Models | 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; symmetries; end behavior; and periodicity. | I CAN:  
- interpret qualitative graphs and sketch qualitative graphs given a written description.  
- given a linear function, identify key features in graphs and tables including: intercepts, intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetries.  
- use the problem situation to explain the end behavior of the function.  
- write a function to express a contextual problem.  
- describe a situation that matches a graph based on its shape. | |
| **SIX** | M3: Functions and Models | 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).  
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.  
Also A-CED.A.2.  
F-IF.B.5: Relate the domain of a function to its graph, and to the context it describes.  
F-IF.C.7: Graph functions symbolically and show key features of the graph by hand, using technology for more complex cases. | I CAN:  
- use input-output tables to graph ordered pairs of a function. This includes linear and quadratic functions.  
- identify the domain and the range and will represent a function graphically, on a table, and using mapping.  
- identify if a relation is or is not a function and will use the vertical line test.  
- use and write equations using function notation.  
- identify reasonable limitations on the function's domain and range.  
- know that the graph of the function, f, is the graph of the equation \( y = f(x) \).  
- find function values for expressions written in function notation.  
- write an algebraic expression or equation to generalize the pattern in a table.  
- determine whether or not a relation is a function and use the \( f(x) \) notation.  
- evaluate functions for inputs in their domain.  
- interpret statements that use function notation in terms of the context in which they are used.  
- can (given the graph) choose the practical domain of the function as it relates to the numerical relationship it describes.  
- explain when a relation is determined to be a function, use \( f(x) \) notation.  
- state the appropriate domain of a function that represents a problem situation, defend my choice, and explain why other numbers might be excluded from the domain.  
- graph or write the equation of a function when given a table of values.  
- convert a list of numbers (a sequence) into a function by making the whole numbers (0, 1, 2, etc.) the inputs and the elements of the sequence the outputs. | |
<table>
<thead>
<tr>
<th>M4: Patterns and Sequences</th>
<th>I CAN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-IF.A.3: Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by ( f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) ) for ( n &gt; 1 ).</td>
<td>- generate sequences given an explicit rule, and a recursive rule.</td>
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<tr>
<td>F-LF.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).</td>
<td>- graph sequences on a coordinate plane.</td>
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<tr>
<td>F-BF.A.1a: Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. Also F-IF.A.3, F-BF.A.2(+)</td>
<td>- explain that a recursive formula tells me how a sequence starts and tells me how to use the previous value(s) to generate the next element of the sequence.</td>
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<td>- explain that an explicit formula allows me to find any element of a sequence without knowing the element before it (e.g., if I want to know the 11th number on the list, I plug the number 11 into the explicit formulas.)</td>
<td>- distinguish between explicit and recursive formulas for sequences and use that knowledge to write equations based on functions.</td>
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<td>- determine explicit and recursive rules for a given arithmetic sequence.</td>
<td>- use contextual examples to create functions with both explicit and recursive sequences.</td>
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<td>- create linear and exponential functions, from a simple context, given the following situations: arithmetic and geometric sequences, a graph, a description of a relationship, and two points which can be read from a table.</td>
<td>- (From context), identify patterns and write an explicit expression.</td>
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<tr>
<td>- determine an expression by inspecting and defining a pattern.</td>
<td>- use tables, graphs and expressions to model situations.</td>
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<tr>
<td>- define a recursive process.</td>
<td>- define a recursive process.</td>
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<tr>
<td>F-LF.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).</td>
<td>- create linear and exponential functions, from a simple context, given the following situations: arithmetic and geometric sequences, a graph, a description of a relationship, and two points which can be read from a table.</td>
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<td>F-BF.A.1a: Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. Also F-IF.A.3</td>
<td>- use tables, graphs and expressions to model situations.</td>
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<tr>
<td>- define a recursive process.</td>
<td>- define a recursive process.</td>
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<td>Week</td>
<td>Lesson</td>
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</tbody>
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| NI   | M5: Linear Functions | F-LE.A.1: Distinguish between situations that are linear / exponential.  
a. Prove that linear functions grow by equal distances over equal intervals.  
b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.  
F-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.  
F-IF.C.7a: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★  
a. Graph linear and quadratic functions and show intercepts, maxima, and minima. Also F-LE.A.2, A-REI.10, F-LE.B.5, F-IF.B.4: Interpret key features of graphs and tables in terms of the quantities, and sketch graphs. | I CAN:  
• determine if a table of values represents a constant rate of change.  
• graph linear functions in standard form using an input-output table.  
• appropriately connect or not connect points on a graph.  
• graph linear functions by identifying x and y intercepts.  
• find the slope of a line using the formula, a coordinate plane, and a table of values.  
• describe whether a given situation in question has a linear pattern of change or an exponential pattern of change.  
• show that linear functions change at the same rate over time and that exponential functions change by equal factors over time.  
• describe situations where one quantity changes at a constant rate per unit interval as compared to another.  
• determine the parent function for the line f(x) = x.  
• describe a line as a translation of the parent function y = x.  
• identify and compare the different forms of linear functions. (point-slope, standard, slope-intercept)  
• identify the intercepts of a function.  
• compare the key features of two linear functions represented in different ways.  
• explain the connection between average rate of change and the slope formula.  
• calculate the average rate of change over a specified interval of a function presented symbolically or in a table.  
• estimate the average rate of change over a specified interval of a function from the function's graph.  
• interpret the meaning of the average rate of change (using units) as it relates to a real-world problem.  
• compare the rates of change of two or more functions when represented with function notation, with a graph, or with a table. | |
<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson</th>
<th>Standards</th>
<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
</table>
| ONE  | M6:    | **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).  
**A-CED.A.2:** Create equations in two variables or more variables to represent relationships between quantities.  
**F-BF.B.3:** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, and $f(kx)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.  
**F-IF.C.7a:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★  
a. Graph linear and quadratic functions and show intercepts, maxima, and minima.  
**F-IF.C.9:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.  
Also **F-LE.B.5:** ALWCE.9: Determine the equation of a line and/or graph a linear function; ALWCE.10: Write the equation of a line in point-slope, slope-intercept, and standard form; ALWCE.11: Describe and solve problems using the relationship between parallel and perpendicular lines. | I CAN:  
- write linear equations in slope-intercept form given: a slope and a y-int, 2 points and a y-int, and 2 points on the line, or a graph.  
- write linear equations in point-slope form given: a slope and a y-int, 2 points and a y-int, and 2 points on the line, or a graph.  
- write linear equations in standard form given: a slope and a y-int, 2 points and a y-int, and 2 points on the line, or a graph. Students will also translate between forms.  
- explore and be able to recognize transformations performed on linear functions including: Translations, stretches, shrinks, and reflections.  
- compare functions domain, range, slope, and y-intercept given a graph and a table.  
- explain that all solutions to an equation in two variables are contained on the graph of that equation.  
- create equations in two or more variables to represent relationships between quantities.  
- graph equations in two variables on a coordinate plane and label the axes and scales.  
- decide which functions are relatively easy to sketch accurately by hand and which should be graphed using technology.  
- compare properties of two functions and show their relationship using graphs, tables and verbal descriptions. |
<table>
<thead>
<tr>
<th>TWO</th>
<th>M7: Linear Equations and Inequalities</th>
</tr>
</thead>
</table>
| | **A-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.  
**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.  
Also **S-ID.C.7; N-Q.A.1; N-Q.A.2** |
| I CAN: | • write and use a system of equations and/or inequalities to solve a real world problem.  
• represent constraints by equations or inequalities and by systems of equations and/or inequalities.  
• interpret solutions as viable or nonviable options in a modeling context.  
• solve systems of equations and inequalities with and without technology.  
• explain why the intersection of $y = f(x)$ and $y = g(x)$ for any linear function.  
• find the solutions by using technology to graph the equations and determine their point of intersection, using tables of values, or using successive approximations that become closer and closer to the actual value. |

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<thead>
<tr>
<th>THREE</th>
<th>M7: Linear Equations and Inequalities</th>
</tr>
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</table>
| | **A-REI.D.12**: Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.  
Also **A-CED.A.3** |
| I CAN: | • write linear inequalities in two-variables in slope-intercept form, and be able to graph the solution manually and with technology. |

**UNIT FOUR: Statistical Models**
<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson on</th>
<th>Standards</th>
<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOUR</td>
<td>M9: One-Variable Data Distributions</td>
<td>S-ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).&lt;br&gt;S-ID.A.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.&lt;br&gt;Also N-Q.A.1, S-ID.A.3</td>
<td>I CAN: • construct dot plots, histograms, and box plots for data on a real number line. • make predictions based on graphs and data sets. • construct and interpret various forms of data representations, (including line graphs, bar graphs, circle graphs, histograms, scatter-plots, box-and-whiskers, stem-and-leaf, and frequency tables).* • describe a situation using center and spread. • use the correct measure of center and spread to describe a distribution that is symmetric or skewed. • identify outliers (extreme data points) and their effects on data sets. • compare two or more different data sets using the center and spread of each.</td>
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<tr>
<td>FIVE</td>
<td>M10: Linear Modeling and Regression</td>
<td>S-ID.B.6b-c: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.&lt;br&gt;b. Informally assess the fit of a function by plotting and analyzing residuals.&lt;br&gt;c. Fit a linear function for a scatter plot that suggests a linear association.&lt;br&gt;Also S-ID.B.6a, S-ID.C.7, S-ID.C.8, S-ID.C.9, F-LE.B.5</td>
<td>I CAN: • determine when linear, quadratic, and exponential models should be used to represent a data set. • determine whether linear and exponential models are increasing or decreasing. • determine the relationship shown in a scatterplot. • sketch the function of best fit on the scatter plot. • use technology to find the function of best fit for a scatter plot. • find the equation for the line of best fit and use it to make predictions. • compute the residuals (observed value minus predicted value) for the set of data and the function of best fit. • construct a scatter plot of the residuals. • analyze the residual plot to determine whether the function is an appropriate fit. • sketch a line of best fit on a scatter plot that appears linear. • write the equation of the line of best fit ((y = mx + b)) using technology or by using two points on the best fit line.</td>
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</tbody>
</table>

**UNIT FIVE: LINEAR SYSTEMS AND PIECEWISE-DEFINED FUNCTIONS**
| SIX | M11: Solving Systems of Linear Functions | **A-REI.C.5:** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.  
**A-REI.C.6:** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.  
**I CAN:**  
- solve pairs of linear equations in two variables using substitution and elimination.  
- choose the best method for solving a linear system, and I can justify my method.  
- graph a system of equations and determine its solution.  
- use technology to solve a linear system graphically.  
- solve a system of linear equations in two variables graphically and symbolically.  
- determine the number of solutions to the system of equations. |
| SEVEN | M12: Modeling with Linear Systems | **A-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.*  
**A-REI.D.12:** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.  
Also **F-LE.B.5, F.IF.C.7d:** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  
**I CAN:**  
- graph square root, cube root, and piecewise functions including step and absolute value.  
- graph linear inequalities on the coordinate plane and describe the meaning of the solution set.  
- graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary for non-inclusive inequalities  
- graph the solution set to a system of linear inequalities in two variables as the intersection of their corresponding half-planes. |
| EIGHT | M13: Piecewise-Defined Functions | **F-IF.C.7b:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.  
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  
Also **F-BF.A.1b, F-BF.B.3**  
**I CAN:**  
- determine the parent function for the line $f(x) = x$.  
- identify and compare the different forms of linear functions. (point-slope, standard, slope-intercept)  
- identify the intercepts of a function.  
- compare the key features of two linear functions represented in different ways.  
- describe a line as a translation of the parent function $y = x$. |
| NINE | M13: Piecewise-Defined Functions | **A-REI.B.3:** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.  
**I CAN:**  
- solve linear equations in one variable, including those with coefficients represented by letters.  
- solve linear inequalities in one variable, including those with coefficients represented by letters. |
| ed Functions | • solve compound inequalities and graph the solutions on a number line. (ACT)  
• solve *inequalities* in one variable and use them in a contextual situation to solve problems  
• match inequalities with their graphs. (*ACT) |
### UNIT FIVE: Linear Systems and Piecewise Functions (cont.)

<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson</th>
<th>Standards</th>
<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
</table>
| ONE  | 8th Grade Standard: Properties of Integer Exponents | [8.EE.A.1](#) | I CAN:  
● Understand the properties of integer exponents.  
● Use the properties of integer exponents to evaluate expressions with exponents.  
● Generate equivalent expressions. | |
| TWO  | M14: Rational Exponents and Radicals | N-RN.A.1(+)  
N-RN.A.2(+)  
Also [N-RN.B.3](#), [A-SSE.A.1b](#), ALWCE.20: Operate (add, subtract, multiply, divide, simplify, powers) with radicals and radical expressions including radicands involving rational numbers and algebraic expressions. | I CAN  
● Operate with positive, negative and fractional exponents.  
Students will also translate between radical form and exponential form.  
● Identify which sums and products are rational or irrational. An understanding of the Real Number system is assumed. | |

### UNIT SIX: Exponential Relationships

<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson</th>
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<th>Other Materials/Projects</th>
</tr>
</thead>
</table>
| THREE | M15: Geometric Sequences and Exponential Functions | [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).  
[F-BF.A.1a](#): Write a function that describes a relationship between two quantities.  
a. Determine an explicit expression, a recursive process, or steps for calculation from a context.  
Also [F-LE.A.3](#), [F-BF.A.2(+), F-IF.A.2](#) | I CAN:  
● Create linear and exponential functions, from a simple context, given the following situations: arithmetic and geometric sequences, a graph, a description of a relationship, and two points which can be read from a table.  
● Write an explicit expression, define a recursive process, or describe the calculations needed to model a function between two quantities. | |
### M15: Geometric Sequences and Exponential Functions

**F-BF.B.3:** Identify the effect on the graph of replacing \( f(x) \) by \( f(x) + k \), \( k f(x) \), and \( f(kx) \) for specific values of \( k \) (both positive and negative); find the value of \( k \) given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* Also F-IF.C.7e(+), F-IF.C.8b, F-IF.C.9, F-BF.A.1b

**I CAN:**
- transform a variety of functions including linear, quadratic and logarithmic.
- use technology to experiment with the graphs of various functions when transforming the equations using different values of \( k \).
- form conjectures based on my experiments with substituting different values into the general (parent) functions.

### M16: Exponential Equations and Models

**A-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.*

**F-LE.A.1c**
Also A-SSE.B.3c, A-REI.D.11, F-BF.A.1a-c, F-LE.A.2, F-LE.A.3, F-IF.B.5, S-ID.B.6b, A-CED.A.2, F-IF.C.7e(+)

**S-ID.B.6a**
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

**c.** Fit a function to the data; 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.*

**I CAN:**
- describe whether a given situation in question has a linear pattern of change or an exponential pattern of change.
- show that linear functions change at the same rate over time and that exponential functions change by equal factors over time.
- describe situations where one quantity changes at a constant rate per unit interval as compared to another.
- describe situations where a quantity grows or decays at a constant percent rate per unit interval as compared to another.
**UNIT SEVEN: POLYNOMIAL OPERATIONS**

<table>
<thead>
<tr>
<th>Week</th>
<th>Lesson</th>
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<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
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</table>
| SEVEN | M17: Adding and Subtracting Polynomials | A-SSE.A.1a: Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. A-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. Also A-SSE.A.1b, A-SSE.A.2, A-CED.A.1 | I CAN:  
- decompose polynomial expressions and make sense of multiple factors and terms by explaining the meaning of the individual parts focusing on quadratic and exponential expressions.  
- apply the definition of an integer to explain why adding or subtracting two integers always produces an integer.  
- add and subtract polynomials.  
- understand how closure applies under addition and subtraction. (*ACT) |  |
| EIGHT | M18: Multiplying Polynomials | A-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. Also A-SSE.A.1, A-CED.A.1; A-APR.D.6(+): Rewrite simple rational expressions in different forms; write \( \frac{a(x)}{b(x)} \) in the form \( q(x) + r(x)/b(x) \), where \( a(x), b(x), q(x), \) and \( r(x) \) are polynomials with the degree of \( r(x) \) less than the degree of \( b(x) \), using inspection, long division, or, for the more complicated examples, a computer algebra system; A-APR.D.7(+): Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. | I CAN:  
- apply the definition of an integer to explain why multiplying two integers always produces an integer.  
- multiply polynomials.  
- understand how closure applies under multiplication. (*ACT) |  |
### HONORS ALGEBRA PACING GUIDE: 4th Nine Weeks

#### UNIT EIGHT: Quadratic Functions

<table>
<thead>
<tr>
<th>Week</th>
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<th>Learning Target</th>
<th>Other Materials/Projects</th>
</tr>
</thead>
</table>
| ONE  | M19: Graphing Quadratic Functions | **F-BF.B.3:** Identify the effect on the graph of replacing \(f(x)\) by \(f(x) + k\), \(k f(x)\), \(f(kx)\), and \(f(x + k)\) for specific values of \(k\) (both positive and negative); find the value of \(k\) given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*  
**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; symmetries; end behavior; and periodicity.*  
*Also, F-IF.A.2, F-IF.C.7a, F-IF.C.8, F-BF.A.1, F-BF.B.4(+) |
|      |        | I CAN:  
- transform a variety of functions including linear, quadratic and logarithmic.  
- use technology to experiment with the graphs of various functions when transforming the equations using different values of \(k\).  
- form conjectures based on my experiments with substituting different values into the general (parent) functions.  
- (given a linear function) identify key features in graphs and tables including: intercepts, intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums; symmetries.  
- interpret and explain features of the graph of the function in terms of the context of the problem.  
- sketch a graph if given the key features of a function. |
| TWO  | M20: Connecting Intercepts, Zeros, and Factors | **F-IF.C.7a:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.  
- Graph linear and quadratic functions and show intercepts, maxima, and minima.  
**A-APR.B.3:** Identify zeros of polynomials when suitable factorizations are available, |
|      |        | I CAN:  
- graph quadratic functions and show intercepts, maxima, and minima.  
- find the zeros of a polynomial when the polynomial is factored.  
- use the zeros of a function to sketch the graph of the function.  
- transform a quadratic equation written in standard form to an equation in vertex form \((x - p)^2 = q\) by completing |
and use the zeros to construct a rough graph of the function defined by the polynomial.  
A-REI.B.4: Solve quadratic equations in one variable.  
a. Use the method of completing the square to transform any quadratic equation in \( x \) into an equation of the form \((x - p)^2 = q\) that has the same solutions. Derive the quadratic formula from this form.  
b. Solve quadratic equations by inspection (e.g., for \( x^2 = 49 \)), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as \( a \pm bi \) for real numbers \( a \) and \( b \).  

Also A-REI.D.11, A-APR.A.1, A-SSE.A.2, A-SSE.B.3  

<table>
<thead>
<tr>
<th>UNIT NINE: Quadratic Equations and Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week</strong></td>
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</table>
### Using Factors to Solve Quadratic Equations

**A-SSE.B.3a**
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- **a.** Factor a quadratic expression to reveal the zeros of the function it defines.

**A-REI.B.4b**
Solve quadratic equations in one variable.
- **b.** Solve quadratic equations by inspection (e.g., for \(x^2 = 49\)), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as \(a \pm bi\) for real numbers \(a\) and \(b\).

Also **A-SSE.A.2, A-SSE.B.3a**

### Using Square Roots to Solve Quadratic Equations

**A-REI.B.4a-b**
Solve quadratic equations in one variable.
- **a.** Use the method of completing the square to transform any quadratic equation in \(x\) into an equation of the form \((x - p)^2 = q\) that has the same solutions. Derive the quadratic formula from this form.
- **b.** Solve quadratic equations by inspection (e.g., for \(x^2 = 49\)), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as \(a \pm bi\) for real numbers \(a\) and \(b\).

**A-SSE.B.3b**
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- **b.** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Also **A-SSE.A.2, A-SSE.B.3a, F-IF.C.8a**

### I CAN:
- define an exponential functions, \(\ell(x) = \ell^x\).
- rewrite exponential functions using the properties of exponents.
- use properties of exponents, including rational exponents (such as power of a power, product of powers, power of a product, and rational exponents, etc...) to write an equivalent form of an exponential function to reveal and explain specific information about its approximate rate of growth or decay. (including negative and zero exponents). (*ACT)
- write exponential functions to represent growth, decay and compound interest.
- recognize the connection among factors, solutions (roots), zeros of related functions, and \(x\)-intercepts in quadratic functions.
- identify and factor perfect-square trinomials.
- complete the square to rewrite a quadratic expression \((\ell^2 + \ell + a)\) with the form \((\ell-\ell)^2 + a\).
- predict whether a quadratic will have a minimum or a maximum based on the value of \(a\).
FIVE

### M22: Using Square Roots to Solve Quadratic Equations

**A-REI.B.4b:** Solve quadratic equations in one variable.
- Solve quadratic equations by inspection (e.g., for \( x^2 = 49 \)), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as \( a \pm bi \) for real numbers \( a \) and \( b \).

**I CAN:**
- solve quadratic equations using a variety of strategies (factoring, completing the square, graphing, taking the square root of both sides of an equation, using the quadratic formula).
- simplify a radical that represents an imaginary number.
- write a complex solution as \( a \pm bi \) for real numbers \( a \) and \( b \).

### SIX

#### M23: Linear, Exponential, and Quadratic Models

**A-REI.C.7(+):**
I CAN:
- create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- graph equations in two variables on a coordinate plane and label the axes and scales.
- decide which functions are relatively easy to sketch accurately by hand and which should be graphed using technology. describe whether a given situation in question has a linear pattern of change or an exponential pattern of change.
- show that linear functions change at the same rate over time and that exponential functions change by equal factors over time.
- describe situations where one quantity changes at a constant rate per unit interval as compared to another.

### UNIT TEN: Inverse Relationships

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| SEVEN | M24:   | **F-IF.C.7b:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.  
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  
F-IF.C.7c(+)
F-BF.B.4a(+)
Also F-BF.B.3, F-BF.B.4c-d(+), A-CED.A.4, F-BF.B.5 | I CAN:  
- determine the parent function for the line \( f(x) = x \).  
- identify and compare the different forms of linear functions. ( point-slope, standard, slope-intercept)  
- identify the intercepts of a function.  
- compare the key features of two linear functions represented in different ways.  
- describe a line as a translation of the parent function \( y = x \). |                        |
| EIGHT | M24:   | **F-IF.C.7b:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. | I CAN:  
- determine the parent function for the line \( f(x) = x \).  
- identify and compare the different forms of linear functions. ( point-slope, standard, slope-intercept) |                        |
| Inverses | c. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.  
F-IF.C.7c(+)  
F-BF.B.4a(+)  
Also F-BF.B.3, F-BF.B.4c-d(+), A-CED.A.4, F-IF.B.5. | - identify the intercepts of a function.  
- compare the key features of two linear functions represented in different ways.  
- describe a line as a translation of the parent function $y = x$. |

| NE | WCS: Matrix | ALWCE.15(+): Represent a system of linear equations as a single matrix equation in a vector variable  
ALWCE.16 (+): Find the inverse of a matrix and use it to solve systems of linear equations (use technology for 3x3 and greater) | I CAN:  
- perform matrix operations (add, subtract, scalar multiplication and matrix multiplication) with and without technology  
- find the inverse of a matrix with and without technology  
- solve systems of equations using matrices |