### Testing Information

<table>
<thead>
<tr>
<th>Conceptual Category</th>
<th>Weight Distributions for Math I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number and Quantity</td>
<td>5-10%</td>
</tr>
<tr>
<td>Algebra</td>
<td>22-27%</td>
</tr>
<tr>
<td>Functions</td>
<td>35-40%</td>
</tr>
<tr>
<td>Geometry</td>
<td>10-15%</td>
</tr>
<tr>
<td>Statistics and Probability</td>
<td>15-20%</td>
</tr>
</tbody>
</table>

### Achievement Levels

<table>
<thead>
<tr>
<th>Math I</th>
<th>I</th>
<th>≤ 32%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>II</td>
<td>33-42%</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>43-50%</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>51-77%</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>≥ 78%</td>
</tr>
</tbody>
</table>

In addition to the content standards, the CCSS includes eight Standards for Mathematical Practice that cross domains, grade levels, and high school courses. Assessment items written for specific content standards will, as much as possible, also link to one or more of the mathematical practices.
# Vance County Schools

## Math I – Pacing Guide 2015-2016

The pacing guide should be used along with the Common Core State Standards for Math and the Math I unpacking document.

### To Be Addressed Throughout the Course When Appropriate
- N-Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units
- N-Q.2 Define appropriate quantities for the purpose of descriptive modeling.
- N-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

### Unit 1: One Variable Statistics – 7 Days

**Standards:** N-Q.1, N-Q.2, S-ID.1, S-ID.2, S-ID.3, S-ID.5

#### 1st Six Weeks

<table>
<thead>
<tr>
<th>Learning Targets</th>
<th>Vocabulary</th>
<th>Sample Questions/Clarification</th>
</tr>
</thead>
</table>
| 1. Represent data with plots on the real number line (Frequency, Histograms, Dot Plots)  - Create a frequency table  - Make and Interpret a Histogram  - Compare Sets of Data (peek, spread, centers, shape, and outliers) | Mean  Median  Mode  Range  Standard Deviation  Quartile  Interquartile Range  Outlier  Frequency  Histogram  Box and Whiskers  Dot Plots  Univariate  Shape of Histogram  Skewed  Measure of Dispersion | * Why does the shape of the distribution of incomes for professional athletes tend to be skewed to the right?  
* Two outliers will be added to the set of data displayed in the box plot below. One outlier is 1.5, and the other is 456.5. How will the median be changed by these outliers?  
* Mrs. Jones surveyed the class for the number of letters in their given first name. The data is recorded below.  
{5, 8, 6, 5, 4, 9, 8, 7, 6, 3, 8, 7, 5, 6, 7, 8} What is the interquartile range of the data? |
| 2. Understand which measure of center and spread is most appropriate to describe a given data set  - Find Mean, Median, Mode and determine when to use each  - Find Range  - Find and interpret Standard Deviation in the context of a prob.  - Understand why a distribution has a particular shape | |
| 3. Box and Whiskers  - Summarize Data using Min, Q1, Median, Q3, Max  - Make and Interpret Box and Whisker Plots  - Find Interquartile Range  - Determine if there are outliers for a data set | |
Learning Targets
1. Circles
   - Understand and apply definition
   - Find Circumference and Area

2. Cylinders
   - Find Volume using Cavalieri’s Principle (volume of a cylinder is area of base times height)

3. Use Volume formulas for Cylinders, Pyramid, Cones and Spheres *Formulas for pyramids, cones, and spheres will be given.*

4. Review formulas of area and perimeter of a rectangle

Vocabulary
- Circle
- Circumference
- Area
- Cylinder
- Pyramid
- Cone
- Cavalieri’s Principle

Sample Questions/Clarification

Note: Formulas for pyramids, cones, and spheres will be given.*

- A man holds a rope that leads a horse. The horse walks in a circular path as shown by the dashed line, and the man stands in the center. The length of the rope from the man to the horse is \( \frac{9}{2} \) feet. How far does the horse walk in one trip around the path?

\[ V = \frac{1}{3} BH \]

where \( B \) is the area of the base and \( H \) is the height of the cone. If a cone is inside a cylinder with a diameter of 12 in. and a height of 16 in., find the volume of the cone.

* A cylinder has a radius of 6 cm and a height of 9 cm. **About** how tall must a cylinder with a radius of 5 cm be for the volumes of the two cylinders to be the same?

* A model of a mountain is cone-shaped and has a diameter of 18 in. The volume of the model is 1,866 in.\(^3\). What is the approximate height of the model? (\( V = \frac{1}{3} \pi r^2 h \), where \( V \) is volume, \( r \) is radius, and \( h \) is height.)
### Unit 3: Tools of Algebra – 5 days

**Standards:** A-APR.1 along with various CCSS Math Standards from lower grades

<table>
<thead>
<tr>
<th>Learning Targets</th>
<th>Vocabulary</th>
<th>Sample Questions/Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of Essential Pre-requisite Skills</td>
<td>Additive Inverse</td>
<td>* Fifteen more than the product of six and some number ( m ) is one hundred fifty-nine. Write an equation that represents the number.</td>
</tr>
<tr>
<td>1. Integers, Multiplication, Long Division, Operations with Decimals, Fractions, Mixed Numbers and Percents, ratios/proportions</td>
<td>Multiplicative Inverse</td>
<td>* Which is the solution to the following expression? ( 3x^2 - x + 3 + x^2 + 2x - 4 )</td>
</tr>
<tr>
<td>2. Translate algebraic expressions from written text</td>
<td>Reciprocal</td>
<td>* Simplify ( 5(d + 3m) - 2(9d + 4) )</td>
</tr>
<tr>
<td>3. Understand and apply the order of operations</td>
<td>Algebraic Expression</td>
<td>* The temperature in Lukeville is (-13^\circ C). The temperature in Metroburg is (12^\circ C). What is the difference between the temperatures in the two cities?</td>
</tr>
<tr>
<td>4. Evaluate Expression</td>
<td>Constant</td>
<td>* Simplify ([4 \cdot 3 - 8 ÷ 2]^2 - 32]\div16 - 2</td>
</tr>
<tr>
<td>5. Write Algebraic Expressions into equivalent expressions (simplify expressions)</td>
<td>Coefficient</td>
<td>* Evaluate the expression ( p^2 + m ) for ( m = 1 ) and ( p = 5 )</td>
</tr>
<tr>
<td>6. Understand and apply Distributive Property and Combining Like Terms</td>
<td>Exponent</td>
<td>* A triangle has sides that are ( 2\frac{3}{4} ) inches, ( 3\frac{1}{2} ) inches, and ( 4\frac{1}{4} ) inches. What is the perimeter of the triangle?</td>
</tr>
<tr>
<td>7. Introduction to simple Polynomials</td>
<td>Base</td>
<td>* What is the value of the expression ( \frac{-7}{2} - \left(\frac{5}{3} + \frac{1}{4}\right) )</td>
</tr>
<tr>
<td>8. Properties to include Commutative, Associative, and Closure</td>
<td>Equivalent Expressions</td>
<td>** Students must fluently know the operational differences between:</td>
</tr>
<tr>
<td></td>
<td>Integers</td>
<td>( \frac{2}{3} + \frac{4}{5} )  ( \frac{2}{3} \div \frac{4}{5} )  ( \frac{2}{3} \cdot \frac{4}{5} )  ( \frac{2}{3} - \frac{4}{5} )  ( \frac{2}{3} = \frac{4}{x} )</td>
</tr>
<tr>
<td></td>
<td>Like Terms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Order of Operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Absolute Value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Simplify</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Term</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Variable</td>
<td></td>
</tr>
</tbody>
</table>
# Learning Targets

1. Solve linear equations in one variable and construct viable argument to justify a solution method. Include the following:
   - Two-Step Equations
   - Multi-Step Equations

2. Use units as a way to understand problems and interpret units consistently. Include the following:
   - Compare ratios
   - Solve proportions (include multi-step)
   - Use proportions to model and solve problems
   - Convert units

3. Solve linear inequalities in one variable. Include one/two and multi-step inequalities

4. Write equations and inequalities in one variable to model and solve problems.

5. Rearrange formulas to highlight a quantity of interest, use reasoning for each step – Literal Equations
   - Use units assigned to quantities in a problem and identify which variable they correspond to in a formula

---

# Vocabulary

<table>
<thead>
<tr>
<th>Equations</th>
<th>Solution of an Equation</th>
<th>Formula</th>
<th>Inverse Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Literal Equations</th>
<th>Proportions</th>
<th>Unit Analysis</th>
<th>Properties of Equality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Constraint</th>
<th>Solution of Inequality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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# Sample Questions/Clarification

*Note: Students should understand solving equations and inequalities as a process of reasoning and explain the reasoning to justify a solution.*

- **Mike works as an electrician. He charges $50.00 for the first hour and $35 for each additional hour. Mike was paid $155 for his last job. Which equation could be used to determine the number of hours, \( h \), that Mike worked?**

- **If \( H = \frac{kA(T_1 - T_2)}{L} \). Solve for \( T_2 \)**

- **The length of a rectangle is 3 more than 3 times its width. The perimeter of the rectangle is 174 inches. What is the length of the rectangle?**

- **A business owner will give each of his employees a 5% raise this year. Which equation shows the new pay amount, \( p \), in terms of the previous year's pay, \( s \)?**

- **When finding the area of a circle using the formula \( A = \pi r^2 \), which unit of measure would be appropriate for the radius? Solve for \( r \)**

- **In order to make a profit, a local carpenter must make at least 10 more cabinets than kitchen tables. If \( c \) is the number of cabinets made and \( t \) is the number of tables made, which inequality would be representative of this constraint?**

- **A salesperson earns $700 per month plus 20% of sales. Write an equation to find the minimum amount of sales needed to receive a salary of at least $2500 per month.**
# Unit 5: Introduction to Functions – 7 days

## Standards:
- F.IF.1
- F.IF.2
- F.IF.3
- F.IF.5
- F.IF.6
- A.REI.10
- F.BF.1
- F.BF.2
- F.LE.2

## 2nd Six Weeks

### Learning Targets

1. **Review of Coordinate Plane**
   - Label parts i.e. origin, axes, quadrants
   - Plot ordered pairs

2. **Use Graphs to Relate Two Quantities**
   - Analyze and Interpret Graph
   - Match table to a graph (vice versa)
   - Graph and show key features by hand (for simple cases) and using technology (for complicated cases)

3. **Patterns and Linear Functions**
   - Develop the pattern for an arithmetic sequence and write it recursively (use NOW-NEXT notation) and with an explicit formula from verbal description, table, formula, graph
   - Emphasize additive relationship
   - Use the formula to model situations in context
   - Use the formula to make predictions or find indicated values
   - Make connections between the formula and a linear function
   - Represent a Linear Function and be able to translate between forms
     - Table
     - Words
     - Equations
     - Graph

4. **Patterns and Non-Linear Functions**
   - Classify Functions (Linear vs. Non-Linear)
     - Tables
     - Words
     - Equations
     - Graphs

### Vocabulary

- **Graph**
- **Dependant Variable**
- **Domain**
- **Function**
- **Function Notation**
- **Independent Variable**
- **Linear Function**
- **Non-Linear Function**
- **Relation**
- **Sequence**
- **Vertical Line Test**

### Sample Questions/Clarification

**In which set of points is \( y \) a function of \( x \)?**

- A. \{ (1, 1), (2, 7), (3, 2), (8, 3), (10, 1) \}
- B. \{ (8, 3), (7, 3), (3, 3), (12, 3), (10, 3) \}
- C. \{ (1, 4), (1, 6), (1, 8), (1, 10), (1, 12) \}
- D. \{ (0, 5), (8, 4), (6, 14), (6, 6), (8, 4) \}

* A function is shown below.

\[ g(x) = 5(x + 30) \]

What is the value of \( g(200) \)?

* For what domain is the function \( f(x) = 3x + 6 \) positive?
  - A. all positive integers
  - B. all positive integers \( \geq 8 \)
  - C. all positive integers \( \geq 9 \)
  - D. all positive integers \( \geq 10 \)

* The profit or loss a company experiences from selling \( x \) units of a product is modeled by the function \( P(x) = 21.7x - 200 \). For which domain is the company making a profit?

* What was the average rate of change between 30 minutes and 120 minutes?
Learning Targets cont. (UNIT 5: INTRO TO FUNCTIONS)

5. Graph a Function from a function rule, table, ordered pairs (input-output pairs), or a description of the relationship.
   - Linear and Non-Linear (calculator active and inactive)
   - Identify the effect on the graph of $f(x)$ if replaced by $f(x)+k$ where $k$ is positive or negative
   - Calculate and interpret the average rate of change
   - Estimate the rate of change from a graph

6. Formalizing Relations and Functions
   - Identify Domain and Range
   - Make a Mapping
   - Is it a Function?
   - Vertical Line Test
   - Evaluate a function {use function notation $f(x)$}
   - Calculate and interpret the average rate of change using function notation

7. Write a Function Rule
   - Write and Evaluate Linear and Non-Linear with and without function notation

Sample Questions/Clarification cont.

* Which point is a solution of $y = 2x + 6$?
  A. (-6, 18)   B. (-3, 0)   C. (-2, 10)   D. (-1, 8)

* What is the average rate of change for the function shown in the table below over the interval of $x = 1$ to $x = 3$?

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
</tr>
<tr>
<td>3</td>
<td>189</td>
</tr>
</tbody>
</table>

* The table below shows the amount of tips a waitress earned on four consecutive days. What was the average rate of change in the amount of tips earned from day 2 to day 4?

<table>
<thead>
<tr>
<th>Day</th>
<th>Amount of Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$101.33$</td>
</tr>
<tr>
<td>2</td>
<td>$98.66$</td>
</tr>
<tr>
<td>3</td>
<td>$104.00$</td>
</tr>
<tr>
<td>4</td>
<td>$107.33$</td>
</tr>
</tbody>
</table>

* A rental car company charges $95 for a 3-day rental and $175 for a 7-day rental. Which function models the cost to rent a car from the company for $x$ days?

* A sandwich shop charges a flat fee of $19.95 for a 3-foot-long sandwich and $0.75 per additional inch. A customer has a coupon that reduces the price per additional inch by $0.25. Which function, $t(n)$, represents the total amount a customer using a coupon would be charged for a sandwich that is 3 feet, $n$ inches long?
## Learning Targets

1. **Slope/Rate of Change**
   - Find and interpret rate of change from table
   - Find slope from graph and from two points
   - Find slope of horizontal and vertical lines
   - Find and interpret slope in context of real world problems

2. **Understand that graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane**

3. **Slope-Intercept Form**
   - Explore and describe effects of slope and y-intercept
   - Identify the slope and y-intercept on a graph
   - Write an equation given m and b, given two points and from a graph
   - Use slope-intercept form to model real world problems and solve for specific information

4. **Standard Form**
   - Find the x- and y-intercepts
   - Graph using intercepts
   - Use standard form to model real world problems

5. **Point-Slope Form**
   - Write an equation given a point and the slope
   - Transform between all three of the forms
     a. Standard to Slope-Intercept
     b. Slope-Intercept to Standard
     c. Point-Slope to Slope-Intercept
     d. Point-Slope to Standard

6. **Given a written description, sketch a graphing showing key features**

## Vocabulary

- **Rate of Change**
- **Slope**
- **Linear Equation**
- **Slope-Intercept Form**
- **Standard Form**
- **Point-Slope Form**
- **x-intercept**
- **y-intercept**
- **Horizontal Line**
- **Vertical Line**
- **Translation**

## Sample Questions/Clarification

* The graph shows the relationship between the pounds of peanuts purchased and the cost of the peanuts.

* Which equation represents this situation?

* What is the x-intercept of the linear function that passes through the points (14, 2) and (28, 6)?

* Which is the graph of \( y = 6x + 3 \)?

* Sketch the graph with \( m = 0 \) and \( b = -4 \)

* What is the x-intercept of the function that fits the values in the table below?

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>−2</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>−1</td>
</tr>
</tbody>
</table>
Learning Targets cont. (UNIT 6: LINEAR FUNCTIONS)

7. Parallel and Perpendicular Lines
   - Understand and be able to apply the algebraic and geometric definitions of parallel and perpendicular
   - Use the formula for the slope of a line to determine if two lines are parallel or perpendicular
   - Write an equation for parallel or perpendicular lines
   - Classify lines as perpendicular, parallel or neither
   - Solve real world problems

8. Scatter Plots and Trend Lines
   - Collect real data using different measuring tools (Choose a level of accuracy appropriate to limitations on measurement when reporting quantities)
   - Make a Scatter Plot, choose appropriate scale, describe Correlation
   - Fit a function to the data to solve problems in the context of the data
   - Write an Equation of a Trend Line and make predictions (calculator inactive)
   - Find Line of Best Fit and Linear Regression (calculator active)
   - Find and Interpret Correlation Coefficient
   - Find difference between observed and predicted (residuals) and graph
   - Informally assess the fit of a function by plotting and analyzing residuals
   - Interpret Slope and Y-Intercept in context of the problem
   - Identify if a relationship is causal

Vocabulary cont.

- Parallel Lines
- Perpendicular Lines
- Opposite Reciprocal
- Linear Regression
- Line of Best Fit
- Correlation Coefficient
- Residual
- Scatterplot
- Positive Correlation
- Negative Correlation
- No Correlation
- Causation

Sample Questions/Clarification cont.

Note: Students must understand and be able to explain the meaning of the x-intercept, the y-intercept, the slope/correlation coefficient of real world line of best fit equations.

* Which is an equation of a line that is perpendicular to the line that passes through the points (20, 4) and (-1, -2)?

* Which is an equation of a line that is parallel to line t on the graph below?

* The table below shows the number of calories and the amount of fat in 5 items on a menu at a restaurant.

<table>
<thead>
<tr>
<th>Calories</th>
<th>Grams of Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>370</td>
<td>18</td>
</tr>
<tr>
<td>800</td>
<td>38</td>
</tr>
<tr>
<td>635</td>
<td>33</td>
</tr>
<tr>
<td>350</td>
<td>17</td>
</tr>
<tr>
<td>310</td>
<td>12</td>
</tr>
</tbody>
</table>

Using the line of best fit for the data, **about** how many grams of fat would be predicted in a menu item that has 450 calories?
### Learning Targets

1. Solve systems of equations by GRAPHING, SUBSTITUTION and ELIMINATION
   - Write a system and solve
   - Choose the appropriate method
   - Must know how to solve by hand for calculator inactive
   - Real-world applications of systems

2. Create system of equations/inequalities from context; solve and interpret the result

3. Graph Linear Inequalities
   - Identify solutions
   - Write an inequality from a graph

4. Systems of Inequalities
   - Graph a system
   - Write a system from a graph
   - Use a system to model and solve
   - Find max values and interpret solution in context of problem

### Sample Systems of Inequalities

* A basketball camp must have a total of at least 50 girls and boys in attendance to make a profit.
  - The number of boys, x, cannot exceed the number of girls, y, by more than 12.
  - The number of girls cannot exceed the number of boys by more than 12.

Which system of inequalities would model the constraints described for the camp to make a profit?

### Vocabulary

<table>
<thead>
<tr>
<th>Solutions of a System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elimination Method</td>
</tr>
<tr>
<td>Substitution Method</td>
</tr>
</tbody>
</table>

### Sample Questions/Clarification

* Amanda’s mother paid $1.25 for 3 pencils and 2 erasers. Trent’s mother paid $1.50 for 2 pencils and 3 erasers. What was the cost of each eraser?

* A system of equations is shown below.

  \[ 4x + 3y = 5 \]
  \[ -2x + y = -5 \]

  What is the solution to the system of equations?

* A school sells two sizes of drinks at a football game.
  - A small drink costs $3.
  - A large drink costs $5.
  - The school sold 735 total drinks.
  - The school made a total of $3,125.

  How many small drinks were sold?

* In two years, Nikki's mother will be four times as old as Nikki was three years ago. Nikki’s mother’s age is one less than three times Nikki’s age now. How old is Nikki?

* A system of equations is shown below.

  \[ 2x - 3 = 3y \]
  \[ -4x + 3y = -9 \]

  What is \( x + y \)?

* The admission fee at a carnival is $2.50 for children and $7.00 for adults. One day, 1,800 people entered the carnival and $6,052.50 was collected. How many children attended the carnival that day?
**Unit 8: Coordinate Geometry – 5 days**

**Standards:** G.CO.1, G.PE.4, G.PE.6, G.PE.7

<table>
<thead>
<tr>
<th>Learning Targets</th>
<th>Vocabulary</th>
<th>Sample Questions/Clarification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Simplify and operate with radicals (add, subtract, multiply)</td>
<td>Line Segment</td>
<td>* Parallellogram PQRS has vertices P(-2, -3), Q(8, -1), and R(14, 3). What are the coordinates of vertex S?</td>
</tr>
<tr>
<td>2. Find Distance between two points (use Distance Formula, Pythagorean Theorem)</td>
<td>Distance</td>
<td>* A diameter of a circle has endpoints at (-3, 2) to (-3, -3). What are the coordinates of the center of the circle?</td>
</tr>
<tr>
<td>3. Find the Midpoint or Endpoint of a line segment (directed line)</td>
<td>Midpoint</td>
<td>* The midpoint of a line segment is (-3, 4). The endpoints of the line segment are (x, 9) and (-4, -1). What is the value of x?</td>
</tr>
<tr>
<td>- Use real world applications</td>
<td>Pythagorean Theorem</td>
<td>* What is the area of the figure below?</td>
</tr>
<tr>
<td>- Use coordinates to prove simple geometric theorems algebraically</td>
<td>Polygon</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td>4. Classify Quadrilaterals (Parallelogram, Rhombus, Square, and Rectangles)</td>
<td>Quadrilateral</td>
<td>*A parallelogram has vertices (5, 0), (3, -3), (-4, -3), and (-2, 0). What is the approximate perimeter of the parallelogram?</td>
</tr>
<tr>
<td>- Use Distance, Midpoint, Parallel and Perpendicularity (include geometric definitions) to prove classification</td>
<td>Parallelogram</td>
<td>* HIJK is a rectangle with vertices H(m, 3), I(m,7), J(7, 7), and K(7, 3). The area of HIJK is 36 square units. Which could be the value of m?</td>
</tr>
<tr>
<td>5. Use coordinates to determine perimeters of polygons and areas of triangles and rectangles</td>
<td>Diagonals</td>
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<tr>
<td></td>
<td>Radius</td>
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<td>Diameter</td>
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<td>Endpoint</td>
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<td></td>
<td>Circle</td>
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<tr>
<td></td>
<td>Center of a Circle</td>
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<tr>
<td></td>
<td>Altitude</td>
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</tr>
</tbody>
</table>
# Unit 9: Polynomials – 5 days
Standards: N.RN.1, N.RN.2, A.SSE.1, A.SSE.2, A.APR.1

## Learning Targets

1. **Add and subtract polynomials**
   - Find perimeter using algebraic expressions as sides
   - Find difference between perimeters and areas using algebraic expressions as sides

2. **Laws of Exponents**
   - Understand and apply laws of exponents for multiplying, dividing, zero, negative, power to a power and rational
   - Investigate rational exponents by examining their pattern
   - Rewrite expressions involving radical and rational exponents using the laws of exponents

3. **Multiply Polynomials**
   - Include area application problems using algebraic expressions

4. **Use the structure of an expression to rewrite it by factoring**
   - Emphasize equivalent expressions
   - Factor GCF (using reverse distributive property)
   - Factor trinomial (\(ax^2+bx+c\) with or without a leading coefficient of 1)
   - Factor difference of squares

## Vocabulary

<table>
<thead>
<tr>
<th>Binomial</th>
<th>Degree of a monomial</th>
<th>Difference of squares</th>
<th>Monomial</th>
<th>Polynomial</th>
<th>Trinomial</th>
<th>Factor</th>
<th>Greatest Common Factor</th>
</tr>
</thead>
</table>

## Sample Questions/Clarification

*Note: Students should...*

- **Understand that the denominator of the rational exponent is the root index and the numerator is the exponent of the radicand.** For examples, \(\frac{1}{9} = \sqrt[9]{\sqrt[9]{5}}\) or \(\frac{2}{3} = \sqrt[3]{2}\)

- **Investigate the meaning of rational exponents by examining the pattern**
  
  \[
  2^4 = 16 \quad 2^2 = 4 \quad 2^1 = 2 \quad 2^\frac{1}{2} = \ ?
  \]

  * Which expression is equivalent to \((32\times10\times5)\)\(^\frac{3}{4}\)?

  * Which expression is equivalent to \(\sqrt[4]{2\times2\times3}\)?

  * Which expression is equivalent to \(2\times\frac{5}{4} \times 3\times\frac{1}{4}\)?

  * Which expression is equivalent to \(x^4 - 64\)?

  * Which expression is equivalent to \(2(2x^2 - 16) + 7\)?

  * Which expression is equivalent to \(14b^2 + 4b - 1 - (9b^2 - 2b + 13)\)?

  * Which expression is equivalent to \((2x - 1)^2\)?

  * A rectangular flower garden has a length of \(2x + 3\) and a width of \(3x + 8\). What is the area of the garden?
# Unit 10: Quadratic Functions – 7 days

**Standards:** F.IF.4, F.IF.8a, F.IF.7a, A.SSE.1, A.SSE.3, F.IF.9

## Learning Targets

*Use function notation and equation notation throughout the unit.*

1. **Quadratic Graphs and Their Properties**
   - Identify vertex and axis of symmetry
   - Graph (how does a affect the graph)
   - Graph (how does c affect the graph)
   - Falling Object Model (no initial velocity)

2. **Quadratic Functions and their graphs**
   - Graph (by hand and in the calc.)
   - Identify and Interpret key features: Intercepts, Intervals of Increasing and Decreasing, where the Function is Positive and Negative, and Maximum and Minimum

3. **Understand and state domain and range from graph, equation and verbal description**

4. **Solve Quadratic Equations and recognize equivalent forms of the equation by:**
   - Graphing
   - Using Square Roots
   - Factoring

5. **Solve real world application problems using quadratic equations/functions and interpret a, b, c, vertex, y-intercept, and x-intercepts (zeros) in the context of the problem (i.e Projectile Motions Profit)**

## Sample Questions/Clarification

*Note: Students should be able to compare the graph of a quadratic function to the equation of another quadratic function and determine which has the lowest minimum.*

- A ball is thrown from the ground at a velocity of 64 feet per second. The formula $h = -16t^2 + 64t$ gives the ball's height, in feet, after $t$ seconds. How many seconds will it take the ball to reach its maximum height?

- What is the minimum value of the function $y = x^2 + 16x + 61$?

- James dropped a rock from a height of 1,296 feet. The function $f(x) = 1,296 - 16x^2$ models the height of the rock after $x$ seconds. How long will it take the rock to hit the ground?

- Which is an equation of the axis of symmetry for the function $f(x) = x^2 + 7x + 12$?

- What are the zeros of the function defined by $y = 3x^2 + 5x - 28$?

- Benjamin compared the maximum of $g(x) = -4x^2 - 2x + 6$ to the maximum value of the quadratic function that fits the values in the table below.

<table>
<thead>
<tr>
<th>$x$</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>-4</td>
<td>5</td>
<td>6</td>
<td>-1</td>
<td>-16</td>
</tr>
</tbody>
</table>

Which statement best describes the maximum value of the two functions?
Learning Targets

1. Develop the pattern for a geometric sequence and write it recursively (use NOW-NEXT notation) and with an explicit formula
   - Use the formula to model situations in context
   - Use the formula to make predictions or find indicated values

2. Write formula for geometric sequences from Graphs, Sequences, Verbal Descriptions, and Tables
   - Connect and emphasize that geometric sequences are examples of exponential functions (emphasize multiplicative relationship)

3. Identify an Exponential Function from Table, Graph, Function, and Verbal descriptions
   - Distinguish between situations that can be modeled with linear functions and exponential function
   - Compare properties of two given functions (linear, quadratic, or exponential). Could be given as verbal expressions, tables, graphs or equations.

4. Evaluate an Exponential Function

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Vocabulary

- Compound Interest
- Decay Factor
- Exponential Decay
- Exponential Function
- Exponential Growth
- Growth Factor
- Decay Factor
- End Behavior
- Geometric Sequence

Sample Questions/Clarification

* What is the explicit formula for the arithmetic sequence shown below?

\[ \text{NEXT} = \text{NOW} + 5, \text{starting at } -11 \]

* What is the next term in the geometric sequence \(2x, 6x^2, 18x^3, 54x^4\)?

* Suppose that a population of fish in a pond doubled every 6 months. There were originally 8 fish in the pond. How many fish were in the pond after 10 years?

* The function \(f(x) = \frac{1}{2}x + 3\) was replaced with \(f(x) + k\) resulting in the function graphed below.

[Graph of a line with equation \(y = \frac{1}{2}x + 3\)]

What is the value of \(k\)?

* What is the value of \(f(0.5)\) in the function \(f(x) = 16^x - 3\)?

* Daniel saved $500 and decided to put his money into an account that pays 5% interest each year. What type of function could Daniel use to model his total amount of money saved?

Continued on next page...
5. Graph an Exponential Function
   - Identify as increasing or decreasing, growth or decay
   - Determine growth or decay factor, intercepts, and end behavior

6. Identify the effect on the graph of $f(x)$ if replaced by $f(x)+k$ where $k$ is positive or negative

7. Use the properties of exponents to recognize equivalent expressions for exponential functions (i.e. $y = (1.2)^{10}$ is the same as $y = (1.2^{10})^t$ or $y = (1.018)^t$)

8. Use an Exponential Function to model, solve, and make predictions
   - Exponential growth, decay, and Compound Interest
   - Interpret the different parts of the function in context of the problem
   - Determine Domain and Range

Sample Questions/Clarification cont.

* What is the $y$-intercept of the function $f(x) = \left(\frac{3}{2}\right)^x - 7$?

* Which is an equation of the function graphed below?

* A car company uses the equation $V = 22,500(0.76)^t$ to predict the value of a car after $t$ years. What does 0.76 represent in the equation?

* The function $y = 25(2.0)^x$ models the population of bumblebees in a hive after $x$ years. What is the meaning of the 25 in the equation?

* Which function, $g(x)$, is the result of translating the function $f(x) = 2^x$ up 4 units and 3 units to the right?

* What is the approximate $x$-intercept of the function $f(x) = 2^x - 7$?
<table>
<thead>
<tr>
<th>Available Resources - MANDATORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCDPI Released Test – Math I (Mock EOC)</td>
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</tbody>
</table>

Coach Book: Mathematics I First Edition

VCS 6-9 Math Items – Dropbox

<table>
<thead>
<tr>
<th>Available Resources - OPTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various TEST Prep documents – VCS Math 6-9 Dropbox</td>
</tr>
</tbody>
</table>

Khan Academy
Videos and practice problems on several Math I topics
https://www.khanacademy.org/

Math I Test Prep
This site offers sample Algebra 1 review problems. It does not go as in depth as the NC Algebra 1 EOC, but it is a resource to use if you choose.
http://www.testprepreview.com/modules/algebra1.htm

Regents Prep Center: Math I
Sample questions on Algebra 1 topics, organized by topic
http://regentsprep.org/Regents/math/ALGEBRA/math-ALGEBRA.htm

Blendspace
This site offers video review of released items from the Math I EOC; other resources are also available
https://www.blendspace.com/lessons/iYDODzQJ5fxPqA/math-1-algebra-1-eoc-review