

Sterling Middle School Scope and Sequence

Math 8	Cycle 1	Cycle 2	Cycle 3
<b>Central Concepts(s)</b>	<b>One Variable Statistics</b> <b>Linear Equations and Systems</b> <b>Two Variable Statistics</b>	<b>Linear Inequalities and Systems</b> <b>Functions</b> <b>Introduction to Exponential Functions</b> <b>Pythagorean Theorem</b>	<b>Introduction to Quadratic Functions</b> <b>Quadratic Functions</b> <b>Problem Solving</b> <b>Geometry</b>
<b>Supporting Concepts</b>	<b>Linear Equations and Systems</b> Create and graph linear equations Solve for a variable as in a scientific formula Interpret functions Understand solving equations as a process of reasoning and explain the reasoning Solve equations and inequalities in one variable Use linear equations to compare to cost structures e.g. two cell data plans with a fixed charge and a per GB cost Compare slopes given two sets of points <b>One and Two Variable Statistics</b> Summarize, represent, and interpret data on a single count or measurement variable Measures of center (mean, median, mode, StdDev, IQR) Outliers, skew left, skew right Analyze two variable data Compute and analyze residuals Use graphing calculator on exponential function data Interpret rate of change and y-intercept of line of best fit Compute and explain correlation coefficient Correlation is not causation	<b>Systems of Equations</b> Create equations that describe numbers or relationships Solving Systems of Equations Using Substitution Solving Systems of Equations Using Elimination Solve Systems of Equations and Inequalities Graphically <b>Functions</b> Understand the concept of a function and use function notation. Evaluate functions - plug in a value Domain and range of a function Interpret function according to the context Find average rate of change of function Represent functions with visual patterns Write a function from a verbal description Build geometric and arithmetic sequences <b>Introduction to Exponential Functions</b> Exponential growth as in compound interest Exponential decay as in depreciation of a car Construct and compare linear and exponential models Exponential growth always eventually outpaces linear growth <b>Pythagorean Theorem</b> Distance Formula Irrational square roots Pythagorean Triples	<b>Introduction to Quadratic Functions</b> Factoring Quadratic Expressions such as $x^2+8x+15$ Factor Quadratic Expressions such as $x^2=49$ Understand the relationship between zeros and factors of polynomials Sketch X and Y intercepts, vertex and line of symmetry of a quadratic without using a calculator <b>Quadratic Function</b> Factor to find key features of the context such as how long after a ball is thrown into the air it hits the ground Analyze quadratics in different contexts and forms <b>Geometry</b> Use coordinate geometry for area and perimeter Mid-point formula
<b>Essential Questions</b>	<b>Linear Equations and Systems</b> What corresponds to your breakeven point when you model your business sales as a linear equation and have some initial start-up costs? What does your y-intercept represent when graphing, e.g. average altitude gained per mile hiked? cost of a plumber's visit if there is a fixed fee for showing up and an hourly charge? If you think of a linear equation as a function machine, what two operations generally occur within the machine? What does it mean to interpolate a value in a scatter plot? What does it mean to extrapolate a value in a scatter plot? In the context of a specific scenario, what does slope mean? For example, what does slope refer to if you are graphing the money you earn vs the hours you worked? <b>One and Two Variable Statistics</b> In what situation is median a better measure of center than mean? Why is interquartile range a better measure of center than median or mode? Measured intelligence increases with shoe size. Explain why this is correlation but not causation. What does the slope of the line of best fit of a scatterplot of hours studied vs test score show? the y-intercept?	<b>System of Equations</b> In general, what does the intersection of two linear equations represent? In general, how many solutions does a linear equation have? What are the possible results when you have a system of two linear equations? How can you check your solution to a system of linear equations? If your cell phone provider offers two plans, one with lower monthly rate but higher per GB charge and the second with higher monthly rate but lower per GB charge, what does the intersection of the linear equations corresponding to these two plans mean? What are some good scenarios for explaining a system of equations? <b>Functions</b> How can I use a graph to distinguish a function from a non-function? Which straight line can I draw that is not a function? Which variable is generally used as the input variable and which as the output variable of a function? What is the difference between writing $f(x) = 3x+2$ and $y=3x+2$ ? <b>Introduction to Exponential Functions</b> Would you rather have \$1000 per day every day for thirty days or 1 penny on day one, two pennies on day two, doubling every day through day 30? A pond plant doubles in surface area every day. If 30 days after the plant was introduced to the pond it entirely covers the pond, after how many days did it cover half of the pond? A car's value depreciates by 10% per year. Is the dollar amount of its decrease in value constant, increasing or decreasing? <b>Pythagorean Theorem</b> How do video games use the Pythagorean theorem? How can you use the progression from one square to the next to find a Pythagorean triple starting with any odd number? How can you use the progression from one square to the next to find a Pythagorean triple starting with any even number?	<b>Problem Solving</b> How would you use scientific notation to solve a big problem, such as the number of seconds since the Big Bang? How can you make an overwhelming problem, such as how many days would it take to stack all of the Starbucks cups used and make a tower to the moon? Why can you round to the nearest power of 10 when doing calculations in a Fermi problem and usually come close to the precise answer? <b>Expressions and Polynomials</b> What is the difference between an expression and an equation? What variables would I include in an expression that describes the profit on a single item sold by my imaginary business? What variables would I include in an expression that describes the profit by my imaginary business? <b>Inequalities</b> How do I represent the idea of "at least" in an inequality? How do I represent "no more than" with an inequality? How do I represent "up to but not including" with an inequality? Into what four sections do two inequalities divide the Cartesian plane? <b>Problem Solving</b> How long would it take one person to paint the Great Pyramid of Giza Carolina blue? How many silkworms would it take to produce in one year enough cloth for Christo to wrap the Tower of Pisa?
<b>NC State Standards Alignment</b>	<b>Linear Equations and Systems</b> NC.M1.A-CED.2 (Create and graph linear equations) NC.M1.A-CED.4 (Solve for a variable as in a scientific formula) NC.M1.F-IF.1 (Interpret functions) NC.M1.A-REI.1 NC.M1.A-REI.3 NC.M1.F-BF.1b (use linear equations to compare e.g. cell plans) NC.M1.G-GPE.5 (compare slopes from sets of points) <b>One and Two Variable Statistics</b> NC.M1.S-ID.1 Summarize, represent, and interpret data on a single count or measurement variable NC.M1.S-ID.2 Measures of center NC.M1.S-ID.3 Outliers, skew NC.M1.S-ID.6a Analyze two variable data NC.M1.S-ID.6b Compute and analyze residuals NC.M1.S-ID.6c Use graphing calculator on exponential function data NC.M1.S-ID.7 Interpret rate of change and y-intercept of line of best fit NC.M1.S-ID.8 Compute and explain correlation coefficient NC.M1.S-ID.9 Correlation is not causation	<b>Systems of Equations</b> NC.M1.A-REI.5 NC.M1.A-REI.10 (Solve Systems Graphically) NC.M1.A-REI.10 <b>Functions</b> NC.M1.F-IF.1 NC.M1.F-IF.2 NC.M1.F-IF.3 (domain and range of a function) NC.M1.F-IF.4 (interpret function in context) NC.M1.F-IF.6 (find average rate of change of function) NC.M1.F-BF.1a (Represent functions with visual patterns) NC.M1.F-BF.1a (Write a function from a verbal description) NC.M1.F-BF.2 (geometric and arithmetic sequences) <b>Introduction to Exponential Functions</b> NC.M1.F-IF.8b (exponential growth and decay) NC.M1.F-LE.1 (construct/compare linear/exponential) NC.M1.F-LE.3 (linear vs exponential growth) <b>Pythagorean Theorem</b> NC.8.G.6 (Pythagorean theorem and its converse) NC.8.G.7 (apply, e.g. diagonal of a rectangular prism) NC.8.G.8 (distance formula)	<b>Introduction to Quadratic Functions</b> M1.A-APR.3 NC.M1.A-REI.4 <b>Quadratic Functions</b> NC.M1.F-IF.7 (identify intercepts, vertex, line of symmetry) NC.M1.F-IF.8a (factor for key features) NC.M1.F-IF.9 (Analyze quadratics in different contexts and forms) <b>Geometry</b> NC.M1.G-GPE.4 (area, perimeter) NC.M1.G-GPE.6 (mid-point formula)