Sterling Middle School Scope and Sequence

Internal Document

MATH 8

Cycle 1: Power & Potential	
Central Concepts	**Supporting Concepts**
○ **Numbers and Operations** ○ **Slope and Line of Best Fit** ○ **Problem Solving**	**Numbers and Operations** ○ Repeating Decimals ○ Exponents ○ Negative Exponents ○ Scientific Notation ○ Dividing Integers **Slope and Line of Best Fit** ○ Break Even Point vs. Going Broke ○ Two Point Method for Line of Best Fit ○ Correlation vs. Causation ○ Slope from Sections of a Curve ○ Scatterplots ○ Extrapolation and Interpolation **Problem Solving** ○ Orders of Magnitude ○ Powers of Ten ○ Scientific Notation ○ Listing your Assumptions
Essential Questions	**NC State Standards Alignment**
Numbers and Operations Why is a repeating decimal not an irrational number? Why is it best to think of 2^3 as 2*2*2*1? What kind of symmetry exists between the positive and negative powers of 10? Why do scientists use scientific notation? How can I use scientific notation in converting 60 mph to feet per sec? How can I explain to someone what a negative exponent stands for? **Slope and Line of Best Fit** What corresponds to your breakeven point when you model your business sales as a linear equation? What does your y-intercept represent when graphing, e.g. income vs percent home ownership? What does it mean to interpolate a value in a scatterplot? What does it mean to extrapolate a value in scatterplot? In a linear equation of with input: # of pieces of pizza eaten; output: hunger level; what does the x-intercept represent? In the context of a specific scenario, what does slope mean? For example, with input: number of pieces of pizza eaten;	**Numbers and Operations** ○ 8.NS.1 ○ 8.NS.2 ○ 8.EE.1 ○ 8.EE.2 **Slope and Line of Best Fit** ○ 8.F.1 ○ 8.F.2 ○ 8.F.3 ○ M1.S-ID.7 ○ M1.S-ID.8 ○ M1.S-ID.9 **Problem Solving** ○ 8.SP.1 ○ 8.SP.2 ○ 8.SP.3 ○ 8.SP.4 ○ M1.N-RN.2

output: hunger level; what does the slope represent? In a scatterplot of hours of sleep before test vs score on test what does the y-intercept of the line of best fit represent? How can I calculate slope for a section of a curve? What do the different slopes of different sections of a curve represent? **Problem Solving** 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?	

Cycle 2: Forces & Validation

Central Concepts

- **Equations**
- **Systems of Equations**
- **Data Acquisition and Analysis**
- **Problem Solving**
- **Pythagorean Theorem**

Supporting Concepts

Equations
- Review of Equations with One Variable
- Inequalities with One Variable
- Inequalities with Two Variables
- Word Problems – One Variable

Systems of Equations
- Graphing Systems of Equations
- Solving Systems of Equations Using Substitution
- Solving Systems of Equations Using Elimination
- Word Problems – Systems of Equations

Data Acquisition and Analysis
- Importing data from a web site to a Google Sheet
- Importing a spreadsheet from a data repository
- Calculating percent change from two columns of data
- Recognizing accelerating rates of change
- Symmetrical vs. Skewed Data

Problem Solving
- Volume of 3-D figures

Pythagorean Theorem
- Distance Formula
- Proofs of the Pythagorean Theorem
- Pythagorean Triples

Essential Questions

Equations

What are some of the most common patterns in one variable word problems?

What simplification strategies for equations in one variable reduce the chance of errors?

How do you explain the situation when you have to swap the sign in solving an inequality?

How can you check your solution to a equation with one variable?

What strategy works best when you represent 3 quantities as all relative to a single variable.

System of Equations

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?

In your imaginary business, what does the intersection of your linear equations for sales of two different products (including startup costs) mean?

NC State Standards Alignment

Equations
- 8.EE.7
- M1.A-CED.1
- M1.A-CED.2
- M1.A-CED.3
- M1.A-CED.4
- M1.A-REI.3
- M1.A-REI.4

Systems of Equations
- 8.EE.8
- M1.A-REI.1
- M1.A-REI.5
- M1.A-REI.6

Data Acquisition and Analysis
- M1.S-ID.1
- M1.S-ID.2
- M1.S-ID.3

Problem Solving
- 8.G.9

Pythagorean Theorem
- 8.G.6

What are some good scenarios for explaining a system of equations? **Data Acquisition and Analysis** Why are most relationships only linear for a subset of their range? When is percent change more important than absolute change? When is absolute change more important than percent change? Why does income data tend to be skewed right? What types of data tend to be symmetrically distributed? What is meant by the term "Black Swan"? What lesson should you draw from the life of a turkey? **Problem Solving** How does the length of time to fill a sphere vary with the radius of that sphere? **Pythagorean Theorem** 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? How can you prove the Pythagorean theorem?	○ 8.G.7 ○ 8.G.8

Cycle 3: Changes and Revolution

Central Concepts	Supporting Concepts
○ **Expressions and Polynomials** ○ **Inequalities** ○ **Problem Solving**	**Expressions and Polynomials** ○ Factoring Expressions ○ Simplifying Expressions ○ Expressions That Are Complex Fractions **Inequalities** ○ Inequalities with One Variable ○ Inequalities with Two Variables ○ Systems of Inequalities **Problem Solving** ○ Surface Area of 3-D Figures
Essential Questions	**NC State Standards Alignment**
Expressions and Polynomials 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? **Inequalities** 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 plain? **Problem Solving** 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?	**Expressions and Polynomials** ○ M1.A-SSE.1a ○ M1.A-SSE.1b ○ M1.A-APR.1 **Inequalities** ○ M1.A-REI.10 ○ M1.A-REI.11 ○ M1.A-REI.12 **Problem Solving** ○ 8.G.9

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<tr><th colspan="2">Cycle 4: Balance and Equity</th></tr>
<tr><th>Central Concepts</th><th>Supporting Concepts</th></tr>
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- **Quadratics**
- **Exponential Functions Radical Operations**

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Quadratics

- Factoring Quadratics
- Graphing Quadratics
- Quadratics in Vertex Form

Exponential Functions Radical Operations

- Exponential Growth
- Exponential Decay
- Compound Interest

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<tr><th>Essential Questions</th><th>NC State Standards Alignment</th></tr>
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Quadratics

Which form of a quadratic best shows the value when the input is zero?

Which form of the quadratic best shows the highest height of the flight of a projectile?

How can I derive the quadratic formula from the standard form of a quadratic by completing the square?

How can I derive the quadratic formula from a geometric representation of the quadratic?

Exponential Functions Radical Operations

Why do human beings have trouble understanding exponential growth?

How has the accelerating rate of societal change affected human happiness?

What was the rate of change during the first million years of hominid existence?

Is it better to save money until you can buy a house outright or buy a house with a mortgage?

Why should you always pay off your credit card balance each month?

How much does a payday loan really cost with interest?

How long will it take before the nuclear waste stored in Yucca Mountain, Nevada be radioactive?

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Quadratics

- M1.A-SSE.1a
- M1.A-SSE.1b
- M1.A-APR.3

Exponential Functions Radical Operations

- 8.F.4
- 8.F.5
- M1.A-REI.1

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