Rogers Middle School

Department: Mathematics
Course: Grade 8 Algebra

**Term 1**

<table>
<thead>
<tr>
<th>Topic: Introduction to Algebra</th>
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<tr>
<td><strong>Essential Questions:</strong></td>
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<tr>
<td>• How are adding and subtracting integers related?</td>
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<td>• Is the product or quotient of two integers positive, negative or zero?</td>
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<td>• How can you use the rules for the operations of integers to rational numbers?</td>
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<td>• How can you simplify an algebraic expression?</td>
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<td>• How can you determine whether expressions that appear to be different are equivalent?</td>
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<tr>
<td>• How are properties related to algebra?</td>
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<td>• How can you represent quantities, patterns, and relationships?</td>
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<tr>
<th>Topic: Exponents and Scientific Notation</th>
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<tr>
<td><strong>Essential Questions:</strong></td>
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<tr>
<td>• How can you use exponents to write numbers?</td>
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<tr>
<td>• How can you use inductive reasoning to observe patterns and write general rules involving properties of exponents?</td>
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<tr>
<td>• How can you multiply two powers that have the same base?</td>
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<td>• How can you divide two powers that have the same base?</td>
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<td>• How can you evaluate a nonzero number with an exponent of zero or a negative integer exponents?</td>
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<td>• How can you read and write numbers that are written in scientific notation?</td>
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<td>• How can you perform operations with numbers written in scientific notation?</td>
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<th>Extension Topic: Angles and Triangles</th>
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<td><strong>Essential Questions:</strong></td>
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<tr>
<td>• How can you describe angles formed by parallel lines and transversals?</td>
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<tr>
<td>• How can you describe the relationships among the angles of a triangle?</td>
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<td>• How can you find the sum of the interior angle measures and the sum of the exterior angle measures of a polygon?</td>
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<td>• How can you use angles to tell whether triangles are similar?</td>
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### Term 2

#### Topic: Solving Equations

**Essential Questions:**
- How can you use inductive reasoning to discover rules in mathematics? How can you test a rule?
- How can you solve a multi-step equation? How can you check the reasonableness of your solution?
- How can you solve an equation that has variables on both sides?
- How can you use a formula for one measurement to write a formula for a different measurement?

#### Topic: Linear Functions

**Essential Questions:**
- How can you recognize a linear equation? How can you draw its graph?
- How can you use the slope of a line to describe the line?
- How can you describe the graph of the equation \( y = mx \)?
- How can you describe the graph of the equation \( y = mx + b \)?
- How can you describe the graph of the equation \( ax + by = c \)?
- How can you write an equation of a line when you are given the slope and the y-intercept of the line?
- How can you write an equation of a line when you are given the slope and a point on the line?

#### Extension Topic: Volume and Similar Solids

**Essential Questions:**
- How can you find the volume of a cylinder?
- How can you find the volume of a cone?
- How can you find the volume of a sphere?
- When the dimensions of a solid increase by a factor of \( k \), how does the surface area change? How does the volume change?

### Term 3

#### Topic: Transformations

**Essential Questions:**
- How can you identify congruent triangles?
- How can you arrange tiles to make a tessellation?
- How can you use reflections to classify a frieze pattern?
- What are the three basic ways to move an object in a plane?
- How can you use proportions to help make decisions in art, design, and magazine layouts?
- How do changes in dimensions of similar geometric figures affect the perimeters and areas of the figures?
- How can a figure be enlarged or reduced in the coordinate plane?

#### Topic: An Introduction to Functions

**Essential Questions:**
- How can you use a mapping diagram to show the relationship between two data sets?
- How can you represent a function in different ways?
• How can you use a function to describe a linear pattern?
• How can you recognize when a pattern in real life is linear or nonlinear?
• How can you use a graph to represent relationships between quantities without using numbers?

**Topic: Systems of Linear Equations**

**Essential Questions:**
• How can you solve a system of linear equations?
• How can you use substitution to solve a system of linear equations?
• How can you use elimination to solve a system of linear equations?
• Can a system of linear equations have no solution? Can a system of linear equations have many solutions?

**Extension Topic: Real Numbers and the Pythagorean Theorem**

**Essential Questions:**
• How can you find the dimensions of a square or a circle when you are given its area?
• How is the cube root of a number different from the square root of a number?
• How are the lengths of the sides of a right triangle related?
• How can you find decimal approximations of square roots that are not rational?
• In what other ways can you use the Pythagorean Theorem?

## Term 4

**Topic: Inequalities**

**Essential Questions:**
• How do you represent relationships between quantities that are not equal?
• Can inequalities that appear to be different be equivalent?
• How can you solve inequalities?

**Topic: Polynomials**

**Essential Questions:**
• How can you add and subtract polynomials?
• How can you multiply two polynomials?
• What are the patterns in the special products \((a + b)(a - b)\), \((a + b)^2\), and \((a - b)^2\)?

**Extension Topic: Data Analysis and Displays**

**Essential Questions:**
• How can you construct and interpret a scatter plot?
• How can you use data to predict an event?
• How can you read and make a two-way table?
• How can you display data in a way that helps you make decisions?