

# Expressions and Equations: Pre-Algebra

| Stage 1 Desired Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <p><b>ESTABLISHED GOALS:</b></p> <p><u>Competencies:</u></p> <ul style="list-style-type: none"> <li>Students will demonstrate the ability to simplify numeric and algebraic expressions by applying the properties of operations and of arithmetic of real numbers.</li> <li>Students will demonstrate the ability to solve equations, inequalities and systems by analyzing structure and applying the properties of equality, inequality and rational expressions.</li> <li>Students will demonstrate the ability to model real world problems by building and analyzing the appropriate expression, equation, or function.</li> <li>Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.</li> <li>Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.</li> <li>Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.</li> </ul> <p><u>Content Standards:</u></p> <ul style="list-style-type: none"> <li>7.EE.A.1 - Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</li> <li>7.EE.A.2 - Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5% is the same as multiply by 1.05."</li> <li>7.EE.B.3 - Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.</li> <li>7.EE.B.4 - Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.               <ul style="list-style-type: none"> <li>Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.</li> <li>Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational</li> </ul> </li> </ul> | <b>Transfer</b>                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <b>Acquisition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>that properties of operations can be used to manipulate expressions.</li> <li>that positive and negative rational numbers can be used in any form (decimal, fraction, percent) to solve a problem.</li> <li>the difference between simplifying and solving.</li> <li>when multiplying or dividing by a negative number, the inequality sign must be reversed.</li> <li>that bases must be the same in order to perform operations with exponents.</li> <li>that exponents are subtracted when like bases are being divided.</li> <li>that any number raised to the zero power is equal to one.</li> <li>that exponents are added when like bases are being multiplied.</li> <li>that exponents are multiplied when a power is raised to a power.</li> <li>the commonly used perfect squares and cubes.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                        | <p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> <li>using the Commutative, Associative, Distributive, Identity, and Additive Inverse Properties to add, subtract, factor, expand, and simplify linear expressions with rational coefficients.</li> <li>translating words or real-life situations into algebraic equations and inequalities with rational numbers.</li> <li>solving multi-step mathematical and real world problems with rational numbers using tools strategically.</li> <li>using mental computation/estimation strategies to assess the reasonableness of an answer.</li> <li>solving real world problems using linear equations in the forms <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational numbers and <math>x</math> is the variable.</li> <li>solving real world problems using both algebraic and arithmetic approaches and comparing the steps involved in the two methods.</li> <li>solving real world problems using linear inequalities in the forms <math>px + q &gt; r</math> and <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational numbers and <math>x</math> is the variable.</li> <li>graphing the solution set of inequalities and</li> </ul> |

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| <p>numbers. Graph the solution set of the inequality and interpret it in the context of the problem.</p> <ul style="list-style-type: none"> <li>8.EE.A.1- Know and apply the properties of integer exponents to generate equivalent numerical expressions.</li> <li>8.EE.A.2 - Use square root and cube root symbols to represent solutions to equations of the form <math>x^2 = p</math> and <math>x^3 = p</math>, where <math>p</math> is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that <math>\sqrt{2}</math> is irrational.</li> <li>8.EE.A.3 - Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.</li> <li>8.EE.A.4 - Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.</li> <li>8.EE.C.7 - Solve linear equations in one variable. <ul style="list-style-type: none"> <li>Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form <math>x = a</math>, <math>a = a</math>, or <math>a = b</math> results (where <math>a</math> and <math>b</math> are different numbers).</li> <li>Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.</li> </ul> </li> <li>MP1 Make sense of problems and persevere in solving them.</li> <li>MP2 Reason abstractly and quantitatively.</li> <li>MP4 Model with mathematics.</li> <li>MP6 Attend to precision.</li> <li>MP7 Look for and make use of structure.</li> <li>MP8 Look for and express regularity in repeated reasoning.</li> </ul> | <ul style="list-style-type: none"> <li><i>that non-perfect squares and non-perfect cubes are irrational.</i></li> <li><i>that cubing a number and taking the cube root of a number are inverse operations.</i></li> <li><i>that scientific notation is used to express very large or very small numbers.</i></li> <li><i>that some equations have no solutions and that some equations have an infinite number of solutions.</i></li> <li><i>that negative exponents occur when there are more factors in the denominator. These exponents can be expressed as a positive if left in the denominator.</i></li> </ul> <p><i>vocabulary: equivalent expressions, algebraic expression, term, like term, coefficient, constant, evaluate, Identity Properties, substitute, simplify, translate, linear, factor, consecutive, combining like terms, inverse operation, inequality, linear, monomial, perfect cube, perfect square, cube root, perfect cube, scientific notation</i></p> | <p><i>interpreting the solution in the context of the problem.</i></p> <ul style="list-style-type: none"> <li><i>evaluating exponents with rational bases and integer exponents.</i></li> <li><i>simplifying expressions involving exponents.</i></li> <li><i>identifying square roots and cube roots of perfect squares and perfect cubes.</i></li> <li><i>evaluating and simplifying variable expressions involving squares &amp; square roots, and cubes &amp; cube roots.</i></li> <li><i>using square roots and cube roots to solve algebraic equations.</i></li> <li><i>converting between standard and scientific notation.</i></li> <li><i>comparing numbers written in scientific notation.</i></li> <li><i>using a scientific calculator to express a number in scientific notation.</i></li> <li><i>using the four operations on numbers in scientific notation.</i></li> <li><i>solving multi-step linear equations with rational coefficients.</i></li> <li><i>solving linear equations with variables on both sides.</i></li> <li><i>simplifying variable expressions using properties.</i></li> <li><i>interpreting <math>x = a</math>, <math>a = a</math>, or <math>a = b</math> results (where <math>a</math> and <math>b</math> are different numbers) to determine the number of solutions</i></li> <li><i>making sense of solutions, especially in real-world scenarios.</i></li> </ul> |
| <b>Content Area Literacy Standards</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>21<sup>st</sup> Century Skills</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul style="list-style-type: none"> <li>RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> <li>RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 6-8 texts and topics</i>.</li> <li>RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li><i>reason effectively</i></li> <li><i>use systems thinking</i></li> <li><i>make judgments and decisions</i></li> <li><i>solve problems</i></li> <li><i>access and evaluate information</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Stage 2 - Evidence  |                      |
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| Evaluative Criteria | Assessment Evidence  |
|                     | PERFORMANCE TASK(S): |

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|--|-----------------|
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|  | OTHER EVIDENCE: |

| <b>Stage 3 – Learning Plan</b><br><i>Summary of Key Learning Events and Instruction</i> |                                                              |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <b><i>Language Arts Integration</i></b>                                                 | <b><i>Mathematics Integration</i></b>                        |
| <ul style="list-style-type: none"> <li>1.OA.1 Use</li> </ul>                            | <ul style="list-style-type: none"> <li>1.OA.1 Use</li> </ul> |
| <b><i>Technology Integration</i></b>                                                    | <b><i>District Materials</i></b>                             |
| <ul style="list-style-type: none"> <li>1.OA.1 Use</li> </ul>                            |                                                              |