

**Mathematics 4.1- Grade 7 (NUMBER AND NUMERICAL OPERATIONS)**

<b>ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.</b>		<b><u>Suggested Learning and Interdisciplinary Activities</u></b> <b><u>4.1</u></b>
<b>A. Number Sense</b>	<b>BIG IDEA: Numeric reasoning involves fluency and facility with numbers.</b> <ol style="list-style-type: none"><li>1. Extend understanding of the number system by constructing meanings for the following (<b>unless otherwise noted, all indicators for grade 7 pertain to these sets of numbers as well</b>):<ul style="list-style-type: none"><li>• Rational numbers</li><li>• Percents</li><li>• Whole numbers with exponents</li></ul></li><li>2. Demonstrate a sense of the relative magnitudes of numbers.</li><li>3. Understand and use ratios, proportions, and percents (including percents greater than 100 and less than 1) in a variety of situations.</li><li>4. Compare and order numbers of all named types.</li><li>5. Use whole numbers, fractions, decimals, and percents to represent equivalent forms of the same number.</li><li>6. Understand that all fractions can be represented as repeating or terminating decimals.</li></ol>	<ul style="list-style-type: none"><li>• “Using Context to Determine Reasonable Values” <i>NCTM Activity 2</i></li><li>• “Operations on Fractions” <i>NCTM Activity 24</i></li><li>• “Percent Benchmarks” <i>NCTM Activity 37</i></li><li>• M &amp; M Estimation Activity: NJ <i>Math Framework p. 201</i></li></ul>

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<b>A. Numerical Operations</b>	<ol style="list-style-type: none"><li>1. Use and explain procedures for performing calculations with integers and all number types named above with:<ul style="list-style-type: none"><li>• Pencil-and-paper</li><li>• Mental math</li><li>• Calculator</li></ul></li><li>2. Use exponentiation to find whole number powers of numbers.</li><li>3. Understand and apply the standard algebraic order of operations, including appropriate use of parentheses.</li></ol>	<ul style="list-style-type: none"><li>• Literature Link: <u>The Rajah's Rice</u> by David Barry</li><li>• "Collection Connection" <u>Carnegie Learning</u> Activity 1.2 &amp; "Dogs &amp; Buns"</li><li>• <u>Carnegie Learning</u> Activity 1.3</li><li>• \$100 Catalog Shopping Activity: NJ <u>Math Framework</u> p. 276</li></ul>

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<b>C. Estimation</b>	1. Use equivalent representations of numbers such as fractions, decimals, and percents to facilitate estimation.	<ul style="list-style-type: none"><li>• Trash Activity: <i>NJ Math Framework p. 328</i></li><li>• Problem Solving Skill: Lesson 4-9 <b>Estimate with Fractions</b> <i>Holt MS Math Course 2</i></li><li>• Problem Solving Skill: Lesson 6-2 <b>Estimate with Percents</b> <i>Holt MS Math Course 2</i></li></ul>

**Mathematics 4.2- Grade 7 (*GEOMETRY AND MEASUREMENT*)**

<p><b>ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.</b></p> <p><b>BIG IDEA <i>GEOMETRY</i>: Spatial sense and geometric relationships are a means to solve problems and make sense of a variety of phenomena.</b></p> <p><b>BIG IDEA <i>MEASUREMENT</i>: Measurement is a tool to quantify a variety of phenomena.</b></p>		<p><b><u>Suggested Learning and Interdisciplinary Activities</u></b> <b><u>4.2</u></b></p>
<p><b>A. Geometric Properties</b></p>	<ol style="list-style-type: none"> <li>1. Understand and apply properties of polygons. <ul style="list-style-type: none"> <li>▪ Quadrilaterals, including squares, rectangles, parallelograms, trapezoids, rhombi</li> <li>▪ Regular polygons</li> </ul> </li>   <li>2. Understand and apply the concept of similarity. <ul style="list-style-type: none"> <li>• Using proportions to find missing measures</li> <li>• Scale drawings</li> <li>• Models of 3D objects</li> </ul> </li>   <li>3. Use logic and reasoning to make and support conjectures about geometric objects.</li> </ol>	<ul style="list-style-type: none"> <li>• Toothpick &amp; Gumdrop Activity to build models</li> <li>• “Cylinders, Cones, Spheres &amp; Circles” Activity <i>NCTM Activity 2B-2C</i></li> <li>• “Constructing Angles” Activity <i>NCTM Activity 3A-3B</i></li> </ul>

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<p><b>B. Transforming Shapes</b></p>	<ol style="list-style-type: none"> <li>1. Understand and apply transformations. <ul style="list-style-type: none"> <li>• Finding the image, given the pre-image, and vice-versa</li> <li>• Sequence of transformations needed to map one figure onto another</li> <li>• Reflections, rotations, and translations result in images congruent to the pre-image</li> <li>• Dilations (stretching/shrinking) result in images similar to the pre-image</li> </ul> </li> </ol>	<ul style="list-style-type: none"> <li>• Build a Staircase Activity: <i>NJ Math Framework p. 304</i></li> <li>• Venn Diagram Activity: <i>NCTM Activity 15-19</i></li> <li>• <b>Target Strategies 7:</b> Transforming Shapes Unit pp. 2-17</li> </ul>
<p><b>C. Coordinate Geometry</b></p>	<ol style="list-style-type: none"> <li>1. Use coordinates in four quadrants to represent geometric concepts.</li> <li>2. Use a coordinate grid to model and quantify transformations (e.g., translate right 4 units).</li> </ol>	<ul style="list-style-type: none"> <li>• Coordinates &amp; Symmetry Activity: <i>NCTM p. 70</i></li> <li>• Graphing Activities: <i>MS Math with Pizzazz pp. E-67,68,69</i></li> <li>• Transformation Lesson 7-10: <i>Holt Math Course 2</i></li> </ul>
<p><b>D. Units of Measurement</b></p>	<ol style="list-style-type: none"> <li>1. Solve problems requiring calculations that involve different units of measurement within a measurement system (e.g., 4'3" plus 7'10" equals 12'1").</li> <li>2. Select and use appropriate units and tools to measure quantities to the degree of precision needed in a particular problem-solving situation.</li> <li>3. Recognize that all measurements of continuous quantities are approximations.</li> </ol>	<ul style="list-style-type: none"> <li>• Scale Drawing p. 107: <i>Punchline with Pizzazz</i></li> <li>• Dimensional Analysis Lesson 5-4: <i>Holt MS Math Course 2</i></li> <li>• Measurement Activities: <i>MS Math with Pizzazz pp. D-16,17,18</i></li> <li>• Cross Country Trip Activity: <i>NJ Framework p. 302</i></li> </ul>

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<p><b>E. Measuring Geometric Objects</b></p>	<ol style="list-style-type: none"> <li>1. Develop and apply strategies for finding perimeter and area. <ul style="list-style-type: none"> <li>• Geometric figures made by combining triangles, rectangles and circles or parts of circles</li> <li>• Estimation of area using grids of various sizes</li> </ul> </li>   <li>2. Recognize that the volume of a pyramid or cone is one-third of the volume of the prism or cylinder with the same base and height (e.g., use rice to compare volumes of figures with same base and height).</li> </ol>	<ul style="list-style-type: none"> <li>• Problem Solving p. 443: <i>Holt MS Math Course 2</i></li> <li>• <b>Target Strategies 7:</b> Geometry Unit pp. 2-22</li> <li>• Teacher-created Worksheets: See Binder</li> </ul>

**Mathematics 4.3 – Grade 7 (PATTERNS AND ALGEBRA)**

<p><b>ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.</b></p> <p><b>BIG IDEA: Algebra provides language through which we communicate the patterns in mathematics.</b></p>		<p><b><u>Suggested Learning and Interdisciplinary Activities</u></b> <b><u>4.3</u></b></p>
<p><b>A. Patterns</b></p>	<p>1. Recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers.</p> <ul style="list-style-type: none"> <li>• Descriptions using tables, verbal and symbolic rules, graphs, simple equations or expressions</li> <li>• Finite and infinite sequences</li> <li>• Generating sequences by using calculators to repeatedly apply a formula</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Target Strategies 7:</b> Patterns Unit pp. 2-21</li> <li>• Problem Solving p. 608-9: <i>Holt <u>MS Math Course 2</u></i></li> <li>• Allowance Problem: Teacher-created Worksheets</li> <li>• Cookie Monster Activity: <i>NCTM pp. 32-34</i></li> </ul>
<p><b>B. Functions &amp; Relationships</b></p>	<p>1. Graph functions, and understand and describe their general behavior.</p> <ul style="list-style-type: none"> <li>• Equations involving two variables</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to Functions Lesson 12-1: <i>Holt <u>MS Math Course 2</u></i></li> <li>• Puzzle Activities pp. 127-130: <i><u>Punchline with Pizzazz</u></i></li> </ul>

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<p><b>C. Modeling</b></p>	<ol style="list-style-type: none"><li>1. Analyze functional relationships to explain how a change in one quantity can result in a change in another, using pictures, graphs, charts, and equations.</li><li>2. Use patterns, relations, symbolic algebra, and linear functions to model situations.<ul style="list-style-type: none"><li>• Using manipulatives, tables, graphs, verbal rules, algebraic expressions/equations/inequalities</li><li>• Growth situations, such as population growth and compound interest, using recursive (e.g., NOW-NEXT) formulas (cf. science standard 5.5 and social studies standard 6.6)</li></ul></li></ol>	<ul style="list-style-type: none"><li>• Interpreting Graphs Lesson 12-3: <i>Holt MS Math Course 2</i></li><li>• Numberless Graph Activity: <i>NJ Framework p. 360</i></li></ul>

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<p><b>D. Procedures</b></p>	<ol style="list-style-type: none"><li>1. Use graphing techniques on a number line.<ul style="list-style-type: none"><li>• Absolute value</li><li>• Arithmetic operations represented by vectors (arrows) (e.g., “-3 + 6” is “left 3, right 6”)</li></ul></li><li>2. Solve simple linear equations informally and graphically.<ul style="list-style-type: none"><li>• Multi-step, integer coefficients only (although answers may not be integers)</li><li>• Using paper-and-pencil, calculators, graphing calculators, spreadsheets, and other technology</li></ul></li><li>3. Create, evaluate, and simplify algebraic expressions involving variables.<ul style="list-style-type: none"><li>• Order of operations, including appropriate use of parentheses</li><li>• Substitution of a number for a variable</li></ul></li><li>4. Understand and apply the properties of operations, numbers, equations, and inequalities.<ul style="list-style-type: none"><li>• Additive inverse</li><li>• Multiplicative inverse</li></ul></li></ol>	<ul style="list-style-type: none"><li>• Puzzle Activities: <i>Bridge to Algebra: pp. 47-48</i></li><li>• Beginning Algebra pp. 92-117: <i>Holt MS Math Course 2</i></li><li>• <b>Target Strategies 7:</b> Equation Unit pp. 2-21</li></ul>

**Mathematics 4.4 – Grade 7 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS)**

<p><b>ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INFERENCES FROM DATA.</b></p> <p><b>BIG IDEA DATA ANALYSIS: Reading, understanding, interpreting, and communicating data are critical in modeling a variety of real-world situations, drawing appropriate inferences, making informed decisions, and justifying those decisions.</b></p>		<p><b><u>Suggested Learning and Interdisciplinary Activities</u></b></p> <p><b><u>4.4</u></b></p>
<p><b>A. Data Analysis</b></p>	<ol style="list-style-type: none"> <li>1. Select and use appropriate representations for sets of data, and measures of central tendency (mean, median, and mode). <ul style="list-style-type: none"> <li>• Type of display most appropriate for given data</li> <li>• Box-and-whisker plot, upper quartile, lower quartile</li> <li>• Scatter plot</li> <li>• Calculators and computer used to record and process information</li> </ul> </li> <li>2. Make inferences and formulate and evaluate arguments based on displays and analysis of data.</li> </ol>	<ul style="list-style-type: none"> <li>• Data Toolbox Chapter 1 pp. 4-47: <i>Holt <u>MS Math Course 2</u></i></li> <li>• Representing Data Activity: <i>NCTM pp. 23-26</i></li> </ul>
<p><b>B. Probability</b></p>	<ol style="list-style-type: none"> <li>1. Interpret probabilities as ratios, percents, and decimals.</li> <li>2. Model situations involving probability with simulations (using spinners, dice, calculators and computers) and theoretical models. <ul style="list-style-type: none"> <li>• Frequency, relative frequency</li> </ul> </li> <li>3. Estimate probabilities and make predictions based on experimental and theoretical probabilities.</li> <li>4. Play and analyze probability-based games, and discuss the concepts of fairness and expected value.</li> </ol>	<ul style="list-style-type: none"> <li>• <b>Target Strategies 7:</b> Probability Unit pp. 2-18</li> <li>• Intro to Probability Chapter 10 pp. 512-527: <i>Holt <u>MS Math Course 2</u></i></li> </ul>

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<p><b>C. Discrete Mathematics Systematic Listing &amp; Counting</b></p>	<ol style="list-style-type: none"><li>1. Apply the multiplication principle of counting.<ul style="list-style-type: none"><li>• Permutations: ordered situations with replacement (e.g., number of possible license plates) vs. ordered situations without replacement (e.g., number of possible slates of 3 class officers from a 23 student class)</li></ul></li><li>2. Explore counting problems involving Venn diagrams with three attributes (e.g., there are 15, 20, and 25 students respectively in the chess club, the debating team, and the engineering society; how many different students belong to the three clubs if there are 6 students in chess and debating, 7 students in chess and engineering, 8 students in debating and engineering, and 2 students in all three?).</li><li>3. Apply techniques of systematic listing, counting, and reasoning in a variety of different contexts.</li></ol>	<ul style="list-style-type: none"><li>• Intro to Probability Chapter 10 pp. 530-545: <i>Holt MS Math Course 2</i></li><li>• <b>Target Strategies 7:</b> Discrete Math Unit pp. 2-21</li></ul>

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<p><b>D.. Discrete Mathematics Vertex Edge Graphs &amp; Algorithms</b></p>	<p>1. Use vertex-edge graphs to represent and find solutions to practical problems.</p> <ul style="list-style-type: none"><li>• Finding the shortest network connecting specified sites</li><li>• Finding the shortest route on a map from one site to another</li><li>• Finding the shortest circuit on a map that makes a tour of specified sites</li></ul>	<ul style="list-style-type: none"><li>• Game Resources p. 404: <i>Holt MS Math Course 2</i></li><li>• Resource Activity “The Case of the Stolen Diamonds”: <i>Rutgers Leadership Program in Discrete Mathematics</i></li></ul>

Process Standard 4.5 (Mathematical Processes) is imbedded in the content of the first four standards.

Scope and Sequence for the Standards can be found on

[http://education.state.nj.us/cccs/?\\_standard\\_matrix;c=4](http://education.state.nj.us/cccs/?_standard_matrix;c=4)

Assessment check points for each standard and grade level:

- Assess prior knowledge
- Class participation/recap time
- Cooperative learning groups
- Review/test
- Formal multiple-choice/free response format
- Formal open-ended assessment
- Assessment rubric

“Frameworks” is referred to in the activities listed on the following pages. If the New Jersey Mathematics Curriculum Frameworks book is not available to you, it can be found on-line at:

<http://www.nj.gov/education/frameworks/math/> . This is a great source for activities.

Other useful websites: [www.trenton.k12.nj.us/cia/math.htm](http://www.trenton.k12.nj.us/cia/math.htm)  
[www.mathsurf.com](http://www.mathsurf.com)

Our schools also have useful links to websites.