

# New Jersey Core Curriculum Content Standards for Mathematics, Grade 8, Correlated to *Glencoe Pre-Algebra*

Lessons in which the standards are a primary focus are indicated in **bold**.

| Strands and Cumulative Progress Indicators           |   | Student Edition Lesson(s)  |
|--|---|--|
| <b>STANDARD 4.1: NUMBER AND NUMERICAL OPERATIONS</b> |   |  |
| <b>A. Number Sense</b>                               |   |  |
| <b>4.1.8A1</b>                                       | Extend understanding of the number system by constructing meanings for the following (unless otherwise noted, all indicators for grade 8 pertain to these sets of numbers as well): <ul style="list-style-type: none"> <li>• Rational numbers</li> <li>• Percents</li> <li>• Exponents</li> <li>• Roots</li> <li>• Absolute values</li> <li>• Numbers represented in scientific notation</li> </ul> | <b>2-1, 4-2, 4-7, 4-8, 5-1, 5-2, 5-3, 5-4, 5-5, 5-7, 6-4, 6-5, 6-6, 6-7, 6-8, 9-1, PS5, PS6, PS7, PS8, PS9, PS10, PS11, PS12</b> |
| <b>4.1.8A2</b>                                       | Demonstrate a sense of the relative magnitudes of numbers.  | 2-1, 4-8, 5-6, 6-4, 9-2, <b>PS5</b>  |
| <b>4.1.8A3</b>                                       | Understand and use ratios, proportions, and percents (including percents greater than 100 and less than 1) in a variety of situations.  | <b>6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8</b>  |
| <b>4.1.8A4</b>                                       | Compare and order numbers of all named types.   | 2-1, 4-8, 5-6, 6-4, 9-2, <b>PS5</b>  |
| <b>4.1.8A5</b>                                       | Use whole numbers, fractions, decimals, and percents to represent equivalent forms of the same number.  | <b>5-1, 5-2, 6-4</b>   |
| <b>4.1.8A6</b>                                       | Recognize that repeating decimals correspond to fractions and determine their fractional equivalents. <ul style="list-style-type: none"> <li>• <math>\frac{5}{7} = 0.714285714285\dots = 0.714285\overline{\phantom{000000}}</math></li> </ul>  | 5-1, 5-2   |
| <b>4.1.8A7</b>                                       | Construct meanings for common irrational numbers, such as $\pi$ (pi) and the square root of 2.  | 5-2, 9-2   |
| <b>B. Numerical Operations</b>                       |   |  |
| <b>4.1.8B1</b>                                       | Use and explain procedures for performing calculations involving addition, subtraction, multiplication, division, and exponentiation 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>   | 1-4, 1-5, 2-2, 3-1, 3-5, 3-6, 4-1, 4-3, 5-1, 5-8F, 6-4, <b>6-6, 9-1, 9-8, 10-7, 11-1</b>   |
| <b>4.1.8B2</b>                                       | Use exponentiation to find whole number powers of numbers.  | <b>4-2, 4-3</b>  |
| <b>4.1.8B3</b>                                       | Find square and cube roots of numbers and understand the inverse nature of powers and roots.  | <b>9-1, 9-2</b>  |
| <b>4.1.8B4</b>                                       | Solve problems involving proportions and percents.  | <b>6-2, 6-3, 6-4, 6-5, 6-6, 6-7, 6-8, 9-7</b>  |
| <b>4.1.8B5</b>                                       | Understand and apply the standard algebraic order of operations, including appropriate use of parentheses.  | 1-2, 1-3, 1-4, 4-2   |
| <b>C. Estimation</b>                                 |   |  |
| <b>4.1.8C1</b>                                       | Estimate square and cube roots of numbers.  | <b>9-1</b>   |
| <b>4.1.8C2</b>                                       | Use equivalent representations of numbers such as fractions, decimals, and percents to facilitate estimation.   | 5-1, 5-2, 6-4, <b>6-6</b>  |
| <b>4.1.8C3</b>                                       | Recognize the limitations of estimation and assess the amount of error resulting from estimation.   | 1-1, 3-5, 6-6, 9-1, 11-6, PS7, PS9, PS11, PS12   |

P = Preview Lesson, F = Follow-up Lesson, PS = Prerequisite Skill Appendix (pp. 706–723), RM = Reading Mathematics

| Strands and Cumulative Progress Indicators    |   | Student Edition Lesson(s)  |
|---|---|--|
| <b>STANDARD 4.2: GEOMETRY AND MEASUREMENT</b> |   |  |
| <b>A. Geometric Properties</b>                |   |  |
| <b>4.2.8A1</b>                                | Understand and apply concepts involving lines, angles, and planes. <ul style="list-style-type: none"> <li>• Complementary and supplementary angles</li> <li>• Vertical angles</li> <li>• Bisectors and perpendicular bisectors</li> <li>• Parallel, perpendicular, and intersecting planes</li> <li>• Intersection of plane with cube, cylinder, cone, and sphere</li> </ul>  | <b>10-1, 11-1</b>  |
| <b>4.2.8A2</b>                                | Understand and apply the Pythagorean theorem.   | <b>9-5P, 9-5</b>   |
| <b>4.2.8A3</b>                                | 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> <li>• Sum of measures of interior angles of a polygon</li> <li>• Which polygons can be used alone to generate a tessellation and why</li> </ul>  | <b>10-4, 10-6, 10-6F</b>   |
| <b>4.2.8A4</b>                                | 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>  | <b>6-3, 9-7, 11-1P, 11-1</b>   |
| <b>4.2.8A5</b>                                | Use logic and reasoning to make and support conjectures about geometric objects.  | 3-7F, 9-4, 9-5P, 9-5, 9-7, 9-8P, 10-2, 10-3P, 10-3, 10-3F, 10-4, 10-6, 11-1, 11-2, 11-6P, 11-6 |
| <b>B. Transforming Shapes</b>                 |   |  |
| <b>4.2.8B1</b>                                | 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> | <b>10-3, 10-3F, 10-6F</b>  |
| <b>4.2.8B2</b>                                | Use iterative procedures to generate geometric patterns. <ul style="list-style-type: none"> <li>• Fractals (e.g., the Koch Snowflake)</li> <li>• Self-similarity</li> <li>• Construction of initial stages</li> <li>• Patterns in successive stages (e.g., number of triangles in each stage of Sierpinski's Triangle)</li> </ul>   | 9-7  |
| <b>C. Coordinate Geometry</b>                 |   |  |
| <b>4.2.8C1</b>                                | Use coordinates in four quadrants to represent geometric concepts.  | 9-6, 9-7, 10-3, 10-3F  |
| <b>4.2.8C2</b>                                | Use a coordinate grid to model and quantify transformations (e.g., translate right 4 units).  | <b>10-3</b>  |
| <b>D. Units of Measurement</b>                |   |  |
| <b>4.2.8D1</b>                                | Solve problems requiring calculations that involve different units of measurement within a measurement system (e.g., 4'3" plus 7'10" equals 12'1").   | 11-7, <b>PS13, PS14</b>  |
| <b>4.2.8D2</b>                                | Use approximate equivalents between standard and metric systems to estimate measurements (e.g., 5 kilometers is about 3 miles).   | 6-2, PS13  |

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|--|---|--|
| <b>4.2.8D3</b>                             | Recognize that the degree of precision needed in calculations depends on how the results will be used and the instruments used to generate the measurements.  | Ch. 11 RM, <b>11-7</b>   |
| <b>4.2.8D4</b>                             | Select and use appropriate units and tools to measure quantities to the degree of precision needed in a particular problem-solving situation.   | Ch. 11 RM, 11-7, PS13  |
| <b>4.2.8D5</b>                             | Recognize that all measurements of continuous quantities are approximations.  | 11-7   |
| <b>4.2.8D6</b>                             | Solve problems that involve compound measurement units, such as speed (miles per hour), air pressure (pounds per square inch), and population density (persons per square mile).  | 3-7, <b>6-1</b>  |
| <b>E. Measuring Geometric Objects</b>      |   |  |
| <b>4.2.8E1</b>                             | 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> <li>Impact of a dilation on the perimeter and area of a 2-dimensional figure</li> </ul>   | 3-7, 10-5P, 10-5, <b>10-8</b>  |
| <b>4.2.8E2</b>                             | 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).  | <b>11-3</b>  |
| <b>4.2.8E3</b>                             | Develop and apply strategies and formulas for finding the surface area and volume of a three-dimensional figure. <ul style="list-style-type: none"> <li>Volume - prism, cone, pyramid</li> <li>Surface area - prism (triangular or rectangular base), pyramid (triangular or rectangular base)</li> <li>Impact of a dilation on the surface area and volume of a three-dimensional figure</li> </ul>                    | <b>11-2P, 11-2, 11-3, 11-4, 11-5, 11-6P, 11-6</b>                          |
| <b>4.2.8E4</b>                             | Use formulas to find the volume and surface area of a sphere.   | 11-3, 11-5   |
| <b>STANDARD 4.3: PATTERNS AND ALGEBRA</b>  |   |  |
| <b>A. Patterns</b>                         |   |  |
| <b>4.3.8A1</b>                             | Recognize, describe, extend, and create patterns involving whole numbers, rational numbers, and integers. <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>Arithmetic sequences (i.e., sequences generated by repeated addition of a fixed number, positive or negative)</li> </ul> | 1-1, 1-6, 2-3, 4-4, <b>5-10, 5-10F</b> , 8-1, 8-2P                         |
|  | <ul style="list-style-type: none"> <li>Geometric sequences (i.e., sequences generated by repeated multiplication by a fixed positive ratio, greater than 1 or less than 1)</li> <li>Generating sequences by using calculators to repeatedly apply a formula</li> </ul>  |  |
| <b>B. Functions and Relationships</b>      |   |  |
| <b>4.3.8B1</b>                             | Graph functions, and understand and describe their general behavior. <ul style="list-style-type: none"> <li>Equations involving two variables</li> <li>Rates of change (informal notion of slope)</li> </ul>  | 8-1, <b>8-2, 8-3</b> , 8-4, 8-5P, 8-5, <b>8-6</b> , 8-9, 13-5, 13-6, 13-6F |
| <b>4.3.8B2</b>                             | Recognize and describe the difference between linear and exponential growth, using tables, graphs, and equations.   | 4-2, 13-5  |

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|---|---|--|
| <b>C. Modeling</b>  |   |  |
| <b>4.3.8C1</b>  | Analyze functional relationships to explain how a change in one quantity can result in a change in another, using pictures, graphs, charts, and equations.  | 8-1, 8-2P, 8-2, 13-5, 13-6   |
| <b>4.3.8C2</b>  | Use patterns, relations, symbolic algebra, and linear functions to model situations. <ul style="list-style-type: none"> <li>Using concrete materials (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>   | 1-1, 1-2, 1-3, 1-5, 1-6, 1-7P, 1-7, 1-7F, 3-2, 3-3P, 3-3, 3-4, 3-5, Ch. 3 RM, 3-6, 5-9, 5-10, 5-10F, <b>6-7F</b> , 7-1P, 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, <b>8-1P, 8-1, 8-1F, 8-2, 8-7, 8-9, 8-10, 8-10F</b> , 13-5 |
| <b>D. Procedures</b>  |   |  |
| <b>4.3.8D1</b>  | 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., “<math>-3 + 6</math>” is “left 3, right 6”)</li> </ul>  | 2-1, <b>2-2, 2-3</b> , 2-4   |
| <b>4.3.8D2</b>  | Solve simple linear equations informally, graphically, and using formal algebraic methods. <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>  | 1-3F, 1-5, 3-3P, 3-3, 3-4, <b>3-5</b> , 3-7F, 5-9, 6-7, 6-7F, 7-1P, 7-1, 7-2, 8-9  |
| <b>4.3.8D3</b>  | Solve simple linear inequalities.   | <b>7-4, 7-5, 7-6</b>   |
| <b>4.3.8D4</b>  | 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>Distributive property</li> <li>Substitution of a number for a variable</li> </ul>   | <b>Ch. 1 RM, 1-2, 1-3, 1-4, 1-5</b> , 2-1, 2-3, 2-4, 2-5, <b>Ch. 3 RM, 3-1, 3-2, 3-6</b> , 4-2, 4-7, 5-3, 5-4, 5-5, 5-7, 7-2, Ch. 7 RM, 7-3, <b>8-7</b> , 13-4   |
|   | <ul style="list-style-type: none"> <li>Translation of a verbal phrase or sentence into an algebraic expression, equation, or inequality, and vice versa</li> </ul>  |  |
| <b>4.3.8D5</b>  | 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> <li>Addition and multiplication properties of equality</li> <li>Addition and multiplication properties of inequalities</li> </ul>   | <b>1-4</b> , 1-5, <b>2-2</b> , 2-3, <b>3-3</b> , 3-5, <b>5-4, 7-4, 7-5</b> , 13-3  |
| <b>STANDARD 4.4: DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS</b> |   |  |
| <b>A. Data Analysis</b>   |   |  |
| <b>4.4.8A1</b>  | 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> <li>Finding the median and mean (weighted average) using frequency data.</li> <li>Effect of additional data on measures of central tendency</li> </ul> | <b>1-7P, 1-7, 1-7F, 5-8, 5-8F</b> , 8-8, 12-1, <b>12-2, 12-3, 12-3F</b> , 12-4, <b>12-4F, PS15</b>   |

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|--|--|--|
| 4.4.8A2  | Make inferences and formulate and evaluate arguments based on displays and analysis of data.   | 1-7P, 1-7, 5-8P, 5-8, 5-8F, 8-8, 12-5, Ch. 12 RM               |
| 4.4.8A3  | Estimate lines of best fit and use them to interpolate within the range of the data.   | 8-8  |
| 4.4.8A4  | Use surveys and sampling techniques to generate data and draw conclusions about large groups.  | 5-8P, 6-2F, 6-9P, 6-9, Ch. 12 RM                               |
| <b>B. Probability</b>  |  |  |
| 4.4.8B1  | Interpret probabilities as ratios, percents, and decimals.   | 6-9, 6-9F, 12-6, 12-6F, 12-9, 12-9F                            |
| 4.4.8B2  | Determine probabilities of compound events.  | 12-9   |
| 4.4.8B3  | Explore the probabilities of conditional events (e.g., if there are seven marbles in a bag, three red and four green, what is the probability that two marbles picked from the bag, without replacement, are both red).  | 12-9   |
| 4.4.8B4  | 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>  | 4-6F, 6-9F, 12-4, 12-9F  |
| 4.4.8B5  | Estimate probabilities and make predictions based on experimental and theoretical probabilities.   | 6-9, 12-9F   |
| 4.4.8B6  | Play and analyze probability-based games, and discuss the concepts of fairness and expected value.   | 6-9F, 12-6, 12-9   |
| <b>C. Discrete Mathematics-Systematic Listing and Counting</b>   |  |  |
| 4.4.8C1.   | 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> <li>• Factorial notation</li> <li>• Concept of combinations (e.g., number of possible delegations of 3 out of 23 students)</li> </ul>   | 12-7   |
| 4.4.8C2.   | 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?).  | 4-4, 9-2 (Venn diagrams used for classification, not counting) |
| 4.4.8C3.   | Apply techniques of systematic listing, counting, and reasoning in a variety of different contexts.  | 12-6, 12-7, PS3  |
| <b>D. Discrete Mathematics-Vertex-Edge Graphs and Algorithms</b> |  |  |
| 4.4.8D1.   | Use vertex-edge graphs and algorithmic thinking to represent and find solutions to practical problems. <ul style="list-style-type: none"> <li>• Finding the shortest network connecting specified sites</li> <li>• Finding a minimal route that includes every street (e.g., for trash pick-up)</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> <li>• Limitations of computers (e.g., the number of routes for a delivery truck visiting <math>n</math> sites is <math>n!</math>, so finding the shortest circuit by examining all circuits would overwhelm the capacity of any computer, now or in the future, even if <math>n</math> is less than 100)</li> </ul> | beyond the scope of this course                                |

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