

New England Common Assessment Program

Grade 8 Expectations to Pre-Algebra

NECAP Grade Level Expectation for Grade 8	Pre-Algebra
Number and Operation	
M(N&O)-8-1 Demonstrates conceptual understanding of rational numbers with respect to absolute values, perfect square and cube roots, and percents as a way of describing change (percent increase and decrease) using explanations, models, or other representations.	2-1, 6-8, 9-1
M(N&O)-8-2 Demonstrates understanding of the relative magnitude of numbers by ordering or comparing rational numbers, common irrational numbers (e.g., $\sqrt{2}$, π), numbers with whole number or fractional bases and whole number exponents, square roots, absolute values, integers, or numbers represented in scientific notation using number lines or equality and inequality symbols.	2-1, 2-2, 4-8, 5-1, 5-6, 6-4, 9-2, Prerequisite Skills
M(N&O)-8-4 Accurately solves problems involving proportional reasoning (percent increase or decrease, interest rates, markups, or rates); multiplication or division of integers; and squares, cubes, and taking square or cube roots. (IMPORTANT: <i>Applies the conventions of order of operations.</i>)	2-4, 2-5, 6-1, 6-2, 6-3, 6-5, 6-7, 6-8, 9-1, 9-2, 9-5, 9-6, 13-6
M(N&O)-8-6 Mentally calculates benchmark perfect squares and related square roots (e.g., $1^2, 2^2 \dots 12^2, 15^2, 20^2, 25^2, 100^2, 1000^2$); determines the part of a number using benchmark percents and related fractions (1%, 10%, 25%, $33\frac{1}{3}\%$, 50%, $66\frac{2}{3}\%$, 75%, and 100%) (e.g., 25% of 16; $33\frac{1}{3}\%$ of 330). (IMPORTANT: <i>Mental arithmetic should be imbedded instructionally throughout all strands.</i>)	6-6, 9-1
M(N&O)-8-7 Makes estimates in a given situation (including tips, discounts, tax, and the value of a non-perfect square root as between two whole numbers) by identifying when estimation is appropriate, selecting the appropriate method of estimation; determining the level of accuracy needed given the situation; analyzing the effect of the estimation method on the accuracy of results; and evaluating the reasonableness of solutions appropriate to grade level GLEs across content strands. (IMPORTANT: <i>The intent of this GLE is to embed estimation throughout the instructional program, not to teach it as a separate unit.</i>)	3-5, 5-3, 5-5, 5-7, 6-5, 6-6, 6-7, 9-1, 10-7, 11-2, 11-6, Prerequisite Skills
M(N&O)-8-8 Applies properties of numbers (odd, even, remainders, divisibility, and prime factorization) and field properties (commutative, associative, identity [including the multiplicative property of one, e.g. $2^0 \times 2^3 = 2^{0+3} = 2^3$, so $2^0 = 1$], distributive, inverses) to solve problems and to simplify computations, and demonstrates conceptual understanding of field properties as they apply to subsets of real numbers when addition and multiplication are not defined in the traditional ways (e.g., If $a \Delta b = a + b - 1$, is Δ a commutative	1-4, 2-2, 2-4, 3-1, 3-2, 4-1, 4-3, 4-4, 5-4, 7-2, 10-5, 13-4

operation?)	
Geometry and Measurement	
M(G&M)–8–2 Applies the Pythagorean Theorem to find a missing side of a right triangle, or in problem solving situations.	9-5, 9-6
M(G&M)–8–5 Applies concepts of similarity to determine the impact of scaling on the volume or surface area of three-dimensional figures when linear dimensions are multiplied by a constant factor; to determine the length of sides of similar triangles, or to solve problems involving growth and rate.	6-1, 9-7 , 11-2, 11-3, 11-4, 11-6
M(G&M)–8–6 Demonstrates conceptual understanding of surface area or volume by solving problems involving surface area and volume of rectangular prisms, triangular prisms, cylinders, pyramids, or cones. Expresses all measures using appropriate units.	11-2, 11-3, 11-4, 11-5 , 11-6
Functions and Algebra	
M(F&A)–8–1 Identifies and extends to specific cases a variety of patterns (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; and generalizes a linear relationship (non-recursive explicit equation); generalizes a linear relationship to find a specific case; generalizes a nonlinear relationship using words or symbols; or generalizes a common nonlinear relationship to find a specific case.	5-10, 8-1, 8-2, 8-3, 8-5, 8-6, 8-7, 13-5, 13-6
M(F&A)–8–2 Demonstrates conceptual understanding of linear relationships ($y = kx$; $y = mx + b$) as a constant rate of change by solving problems involving the relationship between slope and rate of change; <u>informally and formally determining slopes and intercepts represented in graphs, tables, or problem situations</u> ; or <u>describing the meaning of slope and intercept in context</u> ; and distinguishes between linear relationships (constant rates of change) and nonlinear relationships (varying rates of change) represented in tables, graphs, equations, or problem situations; or describes how change in the value of one variable relates to change in the value of a second variable in problem situations with constant and varying rates of change.	8-3, 8-4, 8-5, 8-6 , 8-7, 8-8, 13-5, 13-6
M(F&A)–8–3 Demonstrates conceptual understanding of algebraic expressions by evaluating and <u>simplifying algebraic expressions</u> (including those with square roots, whole number exponents, or rational numbers); or by evaluating an expression within an equation (e.g., determine the value of y when $x = 4$ given $y = 7\sqrt{x} + 2x$).	1-3, 1-4, 2-3, 2-4, 2-5, 3-1, 3-2, 4-2, 5-3, 5-4, 5-5, 5-7, 8-2, 8-9, 9-2, 9-6, 13-2, 13-3, 13-4
M(F&A)–8–4 Demonstrates conceptual understanding of equality by showing equivalence between two expressions (<u>expressions consistent with the parameters of the left- and right-hand sides of the equations being solved at this grade level</u>) using models or different representations of the expressions, <u>solving formulas for a variable requiring one transformation</u> (e.g., $d = rt$; $d/r = t$); by <u>solving multi-step linear equations with integer coefficients</u> ; by <u>showing that two expressions are or are not equivalent by applying commutative, associative, or distributive properties, order of operations, or substitution</u> ; and by <u>informally solving problems involving systems of linear equations in a context.</u>	1-2, 1-4, 2-2, 2-4, 3-1, 3-2, 3-3, 3-4, 3-5 , 3-6, 3-7, 7-1, 7-2, 8-9 , 10-7
Data, Statistics, and Probability	
M(DSP)–8–1 Interprets a given representation (line graphs, scatter	1-7, 8-8 , 12-1, 12-3,

<p>plots, histograms, or <u>box-and-whisker plots</u>) to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems.</p> <p>(IMPORTANT: Analyzes data consistent with concepts and skills in M(DSP)–8–2.)</p>	<p>12-4, 12-5, Prerequisite Skills</p>
<p>M(DSP)–8–2 Analyzes patterns, trends, or distributions in data in a variety of contexts by determining or using measures of central tendency (mean, median, or mode), dispersion (range or variation), outliers, <u>quartile values</u>, or <u>estimated line of best fit</u> to analyze situations, or to solve problems; and evaluates the sample from which the statistics were developed (bias, <u>random</u>, or <u>non-random</u>).</p>	<p>5-8, 6-9, 8-8, 12-2, 12-3, 12-5</p>
<p>M(DSP)–8–3 Organizes and displays data using scatter plots to answer questions related to the data, to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems; or identifies representations or elements of representations that best display a given set of data or situation, consistent with the representations required in M(DSP)–8–1.</p> <p>(IMPORTANT: Analyzes data consistent with concepts and skills in M(DSP)–8–2.)</p>	<p>1-7, 8-8, 12-4, 12-5, Prerequisite Skills</p>
<p>M(DSP)–8–4 Uses counting techniques to solve problems in context involving combinations or permutations using a variety of strategies (e.g., organized lists, tables, tree diagrams, models, Fundamental Counting Principle, or others).</p>	<p>12-6, 12-7</p>
<p>M(DSP)–8–5 For a probability event in which the sample space may or may not contain equally likely outcomes, determines the experimental or theoretical probability of an event in a problem-solving situation; and predicts the theoretical probability of an event and tests the prediction through experiments and simulations; and compares and contrasts theoretical and experimental probabilities.</p>	<p>6-9, 12-6, 12-8, 12-9</p>
<p>M(DSP)–8–6 In response to a teacher or student generated question or hypothesis decides the most effective method (e.g., survey, observation, experimentation) to collect the data (numerical or categorical) necessary to answer the question; collects, organizes, and appropriately displays the data; analyzes the data to draw conclusions about the question or hypothesis being tested while <u>considering the limitations that could affect interpretations</u>; and when appropriate makes predictions; and asks new questions and makes connections to real world situations.</p> <p>(IMPORTANT: Analyzes data consistent with concepts and skills in M(DSP)–8–2.)</p>	<p>1-7, 6-9, 12-1</p>