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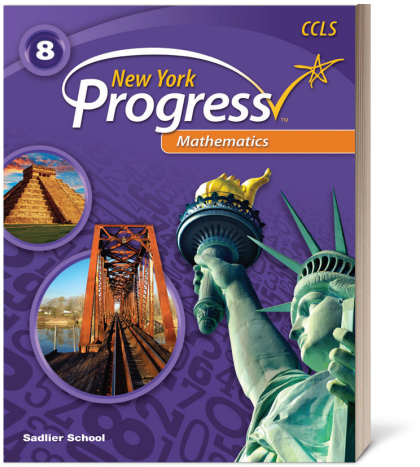
New York Progress Mathematics

Standards-Based Instruction & Practice



Aligned to the

New York State Learning Standards for Mathematics (Revised 2017)

Grade 8

Contents

Sadlier
William H. Sadlier, Inc.
www.sadlierschool.com
800-221-5175

The Number System

Grade 8 NYS Learning Standards for Mathematics	Sadlier New York Progress Mathematics, Grade 8
A. Know that there are numbers that are not rational, and approximate them by rational numbers.	
8.EE.A.1 1. Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers that are not rational are called irrational.	**Lesson 1** **Understand Rational and Irrational Numbers**—pp. 10–17
8.EE.A.2 2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions. ADDITIONAL CLARIFICATION/EXAMPLES e.g., by truncating the decimal expansion of $\sqrt{2}$ (square root of 2), show that $\sqrt{2}$ is between 1 and 2, closer to 1.	**Lesson 2** **Use Rational Approximations of Irrational Numbers**—pp. 18–25

Expressions, Equations and Inequalities

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A. Work with radicals and integer exponents.	
8.EE.A.1 1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{(-5)} = 3^{(-3)} = \frac{1}{(3^3)} = \frac{1}{27}$	**Lesson 3** **Understand Zero and Negative Exponent**—pp. 32–39 **Lesson 4** **Learn Properties of Exponents**—pp. 40–47 **Lesson 5** **Use Properties of Exponents Generate Equivalent Expressions**—pp. 48–55
8.EE.A.2 2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Know square roots of perfect squares up to 225 and cube roots of perfect cubes up to 125. Know that the square root of a non-perfect square is irrational. ADDITIONAL CLARIFICATION/EXAMPLES e.g., the $\sqrt{2}$ is irrational.	**Lesson 6** **Evaluate Square Roots and Cube Roots**—pp. 56–63 **Lesson 7** **Solve Simple Equations Involving Squares and Cubes**—pp. 64–71
8.EE.A.3 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. ADDITIONAL CLARIFICATION/EXAMPLES e.g., estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.	**Lesson 8** **Estimate and Compare Large or Small Quantities**—pp. 72–79

Expressions, Equations and Inequalities

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8.EE.A.4 4. Perform multiplication and division with numbers expressed in scientific notation, including problems where both standard decimal form and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.	**Lesson 9** **Calculate with Numbers in Scientific Notation**—pp. 80–87
B. Understand the connections between proportional relationships, lines, and linear equations.	
8.EE.B.5 5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. ADDITIONAL CLARIFICATION/EXAMPLES e.g., compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.	**Lesson 10** **Understand Proportional Relationships and Slope**—pp. 88–95
8.EE.B.6 6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.	**Lesson 11** **Understand Slope**—pp. 96–103 **Lesson 12** **Write Equations for Lines**—pp. 104–111
C. Analyze and solve linear equations and pairs of simultaneous linear equations.	
8.EE.C.7 7. Solve linear equations in one variable.	
8.EE.C.7a 7a. Recognize when linear equations in one variable have one solution, infinitely many solutions, or no solutions. Give examples and show which of these possibilities the case is by successively transforming the given equation into simpler forms.	**Lesson 13** **Solve Linear Equations**—pp. 112–119
8.EE.C.7b 7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms. ADDITIONAL CLARIFICATION/EXAMPLES Note: This includes equations that contain variables on both sides of the equation.	**Lesson 13** **Solve Linear Equations**—pp. 112–119

Expressions, Equations and Inequalities

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8.EE.C.8 8. Analyze and solve pairs of simultaneous linear equations.	
8.EE.C.8a 8a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. Recognize when the system has one solution, no solution, or infinitely many solutions.	**Lesson 14** **Solve Systems of Equations**—pp. 120–127
8.EE.C.8b 8b. Solve systems of two linear equations in two variables with integer coefficients: graphically, numerically using a table, and algebraically. Solve simple cases by inspection. ADDITIONAL CLARIFICATION/EXAMPLES Notes: Solving systems algebraically will be limited to at least one equation containing at least one variable whose coefficient is 1. Algebraic solution methods include elimination and substitution. This standard is a fluency expectation for grade 8. For more guidance, see Fluency in the Glossary of Verbs Associated with the New York State Math Standards. e.g., $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.	**Lesson 14** **Solve Systems of Equations**—pp. 120–127
8.EE.C.8c 2c. Solve real-world and mathematical problems leading to two linear equations in two variables. ADDITIONAL CLARIFICATION/EXAMPLES Note: Solving systems algebraically will be limited to at least one equation containing at least one variable whose coefficient is 1.	**Lesson 15** **Problem-Solving: Systems of Equations**—pp. 128–135

Functions

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A. Define, evaluate, and compare functions.	
8.F.A.1 1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. ADDITIONAL CLARIFICATION/EXAMPLES Notes: The use of function notation is not required at this level. The terms domain and range may be introduced at this level; however, these terms are formally introduced in Algebra I (F-IF.A.1).	**Lesson 16** **Understand Functions**—pp. 142–149 **Lesson 17** **Represent Functions**—pp. 150–157
8.F.A.2 2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**Lesson 17** **Represent Functions**—pp. 150–157 **Lesson 18** **Compare Functions**—pp. 158–165

Functions

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ADDITIONAL CLARIFICATION/EXAMPLES e.g., given a linear function represented by a table of values and a linear function represented by an algebraic equation, determine which function has the greater rate of change.	
8.F.A.3 3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line. Recognize examples of functions that are linear and non-linear. ADDITIONAL CLARIFICATION/EXAMPLES e.g., the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.	**Lesson 19** **Investigate Linear and Non-Linear Functions**—pp. 166–173
B. Use functions to model relationships between quantities.	
8.F.B.4 4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	**Lesson 20** **Use Functions to Model Relationships**—pp. 174–181 **Lesson 21** **Problem Solving: Use Linear Models**—pp. 182–189
8.F.B.5 5. Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described in a real-world context. ADDITIONAL CLARIFICATION/EXAMPLES e.g., where the function is increasing or decreasing or when the function is linear or non-linear.	**Lesson 22** **Analyze Graphs of Functions**—pp. 190–197

Geometry

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A. Understand congruence and similarity using physical models, transparencies, or geometry software.	
8.G.A.1 1. Verify experimentally the properties of rotations, reflections, and translations. ADDITIONAL CLARIFICATION/EXAMPLES Note: As an extension, the fourth type of rigid motion, a glide reflection, may be introduced as well. Glide reflections connect to 8.G.A.2 and students' work with compositions (describing a sequence) of transformations. That standard allows for students to investigate compositions of transformations and the single transformation that is equivalent.	

Geometry

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A translation displaces every point in the plane by the same distance (in the same direction) and can be described using a vector. The definition of a rotation requires knowing the center (point) and the measure/direction of the angle of rotation. The definition of a reflection requires a line and the knowledge of perpendicular bisectors.	
8.G.A.1a 1a. Verify experimentally lines are mapped to lines, and line segments to line segments of the same length.	**Lesson 23** **Verify Properties of Reflections and Translations**—pp. 204–211 **Lesson 24** **Verify Properties of Rotations**—pp. 212–219
8.G.A.1b 1b. Verify experimentally angles are mapped to angles of the same measure.	**Lesson 23** **Verify Properties of Reflections and Translations**—pp. 204–211 **Lesson 24** **Verify Properties of Rotations**—pp. 212–219
8.G.A.1c 1c. Verify experimentally parallel lines are mapped to parallel lines.	**Lesson 23** **Verify Properties of Reflections and Translations**—pp. 204–211 **Lesson 24** **Verify Properties of Rotations**—pp. 212–219
8.G.A.2 2. Know that a two-dimensional figure is congruent to another if the corresponding angles are congruent and the corresponding sides are congruent. Equivalently, two two-dimensional figures are congruent if one is the image of the other after a sequence of rotations, reflections, and translations. Given two congruent figures, describe a sequence that maps the congruence between them on the coordinate plane.	**Lesson 25** **Understand and Identify Congruent Figures**—pp. 220–227
8.G.A.3 3. Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. ADDITIONAL CLARIFICATION/EXAMPLES Note: Lines of reflection include both axes and lines of the form $y = k$, and $x = k$, where k is a constant. Rotations by 90 and 180 degrees.	**Lesson 26** **Reflect and Translate Figures on the Coordinate Plane**—pp. 228–235 **Lesson 27** **Rotate Figures on the Coordinate Plane**—pp. 236–243 **Lesson 28** **Dilate Figures on the Coordinate Plane**—pp. 244–251
8.G.A.4 4. Know that a two-dimensional figure is similar to another if the corresponding angles are congruent and the corresponding sides are in proportion. Equivalently, two two-dimensional figures are similar if one is the image of the other after a sequence of rotations, reflections, translations, and dilations. Given two similar two-dimensional figures, describe a sequence that maps the similarity between them on the coordinate plane. ADDITIONAL CLARIFICATION/EXAMPLES Note: The center and scale factor of the dilation must be specified with dilation.	**Lesson 29** **Identify Similar Figures**—pp. 252–259
8.G.A.5 5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	**Lesson 30** **Establish Facts about Parallel Lines and Angles**—pp. 260–265 **Lesson 31** **Establish Facts about Triangles and Angles**—pp. 266–275

Geometry

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ADDITIONAL CLARIFICATION/EXAMPLES e.g., arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so. Note: This standard does not include formal geometric proof. Multiple representations may be used to demonstrate understanding.	
B. Understand and apply the Pythagorean Theorem.	
8.G.B.6 6. Understand a proof of the Pythagorean Theorem and its converse.	**Lesson 32** **Understand the Pythagorean Theorem**—pp. 276–283
8.G.B.7 7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	**Lesson 33** **Understand the Converse of the Pythagorean Theorem**—pp. 284–291 **Lesson 34** **Problem Solving: The Pythagorean Theorem**—pp. 292–299
8.G.B.8 8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	**Lesson 35** **Calculate Distances in the Coordinate Plane**—pp. 300–307
C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.	
8.G.B.6 9. Solve problems, mathematical and real world, which use the formulas for the volume of cones, cylinders, and spheres.	**Lesson 36** **Learn and Apply Volume Formulas**—pp. 308–315

Statistics and Probability

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A. Investigate patterns of association in bivariate data.	
8.SP.A.1 1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	**Lesson 37** **Construct and Interpret Scatter Plots**—pp. 322–329
8.SP.A.2 2. Understand that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	**Lesson 38** **Fit Linear Models to Data**—pp. 330–337

Statistics and Probability

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8.SP.A.3 3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. ADDITIONAL CLARIFICATION/EXAMPLES e.g., in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	**Lesson 39** **Problem Solving: Use Linear Models**—pp. 338–345