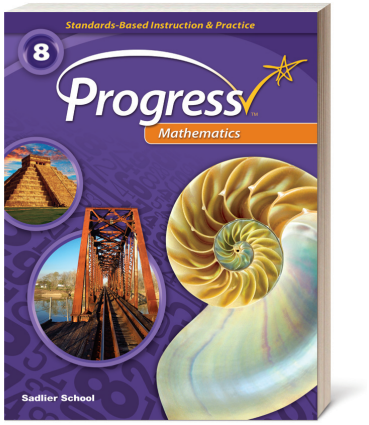
SADLIER

Progress Mathematics

Standards-Based Instruction & Practice



Aligned to the

Colorado Academic Standards for Mathematics

Eighth Grade

Contents

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Standard: 1. Number Sense, Properties, and Operations

Prepared Graduates:

- Understand the structure and properties of our number system. At their most basic level numbers are abstract symbols that represent real-world quantities

Concepts and skills students master:

1. In the real number system, rational and irrational numbers are in one to one correspondence to points on the number line

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Define irrational numbers.[1] [1]Know that numbers that are not rational are called irrational.	
b. Demonstrate informally that every number has a decimal expansion. (CCSS: 8.NS.1)	**Lesson 1** **Understand Rational and Irrational Numbers**—pp. 10–17
i. For rational numbers show that the decimal expansion repeats eventually. (CCSS: 8.NS.1)	**Lesson 1** **Understand Rational and Irrational Numbers**—pp. 10–17
ii. Convert a decimal expansion which repeats eventually into a rational number. (CCSS: 8.NS.1)	**Lesson 1** **Understand Rational and Irrational Numbers**—pp. 10–17
c. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.[2] (CCSS: 8.NS.2) [2]e.g., π^2. For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	**Lesson 2** **Use Rational Approximations of Irrational Numbers**—pp. 18–25
d. Apply the properties of integer exponents to generate equivalent numerical expressions.[3] (CCSS: 8.EE.1) [3]For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	**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
e. 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. (CCSS: 8.EE.2)	**Lesson 6** **Evaluate Square Roots and Cube Roots**—pp. 56–63 **Lesson 7** **Solve Simple Equations Involving Squares and Cubes**—pp. 64–71
f. Evaluate square roots of small perfect squares and cube roots of small perfect cubes.[4] (CCSS: 8.EE.2) [4]Know that $\sqrt{2}$ 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

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
g. Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.[5] (CCSS: 8.EE.3) [5]For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 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
h. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. (CCSS: 8.EE.4)	**Lesson 9** **Calculate with Numbers in Scientific Notation**—pp. 80–87
i. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.[6] (CCSS: 8.EE.4) [6]e.g., use millimeters per year for seafloor spreading.	**Lesson 9** **Calculate with Numbers in Scientific Notation**—pp. 80–87
ii. Interpret scientific notation that has been generated by technology. (CCSS: 8.EE.4)	**Lesson 9** **Calculate with Numbers in Scientific Notation**—pp. 80–87

Standard: 2. Patterns, Functions, and Algebraic Structures

Prepared Graduates:

- Understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations

Concepts and skills students master:

1. Linear functions model situations with a constant rate of change and can be represented numerically, algebraically, and graphically

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Describe the connections between proportional relationships, lines, and linear equations. (CCSS: 8.EE)	
b. Graph proportional relationships, interpreting the unit rate as the slope of the graph. (CCSS: 8.EE.5)	**Lesson 10** **Understand Proportional Relationships and Slope**—pp. 88–95
c. Compare two different proportional relationships represented in different ways.[1] (CCSS: 8.EE.5) [1]For example, 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
d. 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. (CCSS: 8.EE.6)	**Lesson 11** **Understand Slope**—pp. 96–103 **Lesson 12** **Write Equations for Lines**—pp. 104–111

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
e. 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. (CCSS: 8.EE.6)	**Lesson 11** **Understand Slope**—pp. 96–103
	Lesson 12 **Write Equations for Lines**—pp. 104–111

Standard: 2. Patterns, Functions, and Algebraic Structures

Prepared Graduates:

- Are fluent with basic numerical and symbolic facts and algorithms, and are able to select and use appropriate (mental math, paper and pencil, and technology) methods based on an understanding of their efficiency, precision, and transparency

Concepts and skills students master:

2. Properties of algebra and equality are used to solve linear equations and systems of equations

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Solve linear equations in one variable. (CCSS: 8.EE.7)	
i. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions.[2] (CCSS: 8.EE.7a) [2]Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).	**Lesson 13** **Solve Linear Equations**—pp. 112–119
ii. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (CCSS: 8.EE.7b)	**Lesson 13** **Solve Linear Equations**—pp. 112–119
b. Analyze and solve pairs of simultaneous linear equations. (CCSS: 8.EE.8)	
i. Explain 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. (CCSS: 8.EE.8a)	**Lesson 14** **Solve Systems of Equations**—pp. 120–127
ii. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.[3] (CCSS: 8.EE.8b) [3]For example, $3x + 2y = 5$ 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

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
iii. Solve real-world and mathematical problems leading to two linear equations in two variables.[4] (CCSS: 8.EE.8c) [4]For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	**Lesson 15** **Problem-Solving: Systems of Equations**—pp. 128–135

Standard: 2. Patterns, Functions, and Algebraic Structures

Prepared Graduates:

- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions

Concepts and skills students master:

3. Graphs, tables and equations can be used to distinguish between linear and nonlinear functions

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Define, evaluate, and compare functions. (CCSS: 8.F)	
i. Define a function as a rule that assigns to each input exactly one output.[5] (CCSS: 8.F.1) [5]Function notation is not required in 8th grade.	**Lesson 16** **Understand Functions**—pp. 142–149 **Lesson 17** **Represent Functions**—pp. 150–157
ii. Show that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (CCSS: 8.F.1)	**Lesson 16** **Understand Functions**—pp. 142–149 **Lesson 17** **Represent Functions**—pp. 150–157
iii. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).[6] (CCSS: 8.F.2) [6]For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.	**Lesson 17** **Represent Functions**—pp. 150–157 **Lesson 18** **Compare Functions**—pp. 158–165
iv. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line. (CCSS: 8.F.3)	**Lesson 19** **Investigate Linear and Non-Linear Functions**—pp. 166–173
v. Give examples of functions that are not linear.[7] [7]For example, 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

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
b. Use functions to model relationships between quantities. (CCSS: 8.F)	
i. Construct a function to model a linear relationship between two quantities. (CCSS: 8.F.4)	**Lesson 20** **Use Functions to Model Relationships**—pp. 174–181 **Lesson 21** **Problem Solving: Use Linear Models**—pp. 182–189
ii. 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. (CCSS: 8.F.4)	**Lesson 20** **Use Functions to Model Relationships**—pp. 174–181 **Lesson 21** **Problem Solving: Use Linear Models**—pp. 182–189
iii. 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. (CCSS: 8.F.4)	**Lesson 20** **Use Functions to Model Relationships**—pp. 174–181 **Lesson 21** **Problem Solving: Use Linear Models**—pp. 182–189
iv. Describe qualitatively the functional relationship between two quantities by analyzing a graph.[8] (CCSS: 8.F.5) [8]e.g., where the function is increasing or decreasing, linear or nonlinear.	**Lesson 22** **Analyze Graphs of Functions**—pp. 190–197
v. Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (CCSS: 8.F.5)	**Lesson 22** **Analyze Graphs of Functions**—pp. 190–197
vi. Analyze how credit and debt impact personal financial goals (PFL)	

Standard: 3. Data Analysis, Statistics, and Probability

Prepared Graduates:

- Solve problems and make decisions that depend on understanding, explaining, and quantifying the variability in data

Concepts and skills students master:

1. Visual displays and summary statistics of two-variable data condense the information in data sets into usable knowledge

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. (CCSS: 8.SP.1)	**Lesson 37** **Construct and Interpret Scatter Plots**—pp. 322–329

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
b. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. (CCSS: 8.SP.1)	**Lesson 37** **Construct and Interpret Scatter Plots**—pp. 322–329
c. 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.[1] (CCSS: 8.SP.2) [1]Know that straight lines are widely used to model relationships between two quantitative variables.	**Lesson 38** **Fit Linear Models to Data**—pp. 330–337
d. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.[2] (CCSS: 8.SP.3) [2]For example, 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
e. Explain patterns of association seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. (CCSS: 8.SP.4)	
i. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. (CCSS: 8.SP.4)	**Lesson 40** **Analyze Data in Two-Way Tables**—pp. 346–353
ii. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.[3] (CCSS: 8.SP.4) [3]For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	**Lesson 40** **Analyze Data in Two-Way Tables**—pp. 346–353

Standard: 4. Shape, Dimension, and Geometric Relationships

Prepared Graduates:

- Apply transformation to numbers, shapes, functional representations, and data

Concepts and skills students master:

1. Transformations of objects can be used to define the concepts of congruence and similarity

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Verify experimentally the properties of rotations, reflections, and translations.[1] (CCSS: 8.G.1) [1]Lines are taken to lines, and line segments to line segments of the same length. Angles are taken to angles of the same measure. Parallel lines are taken to parallel lines.	**Lesson 23** **Verify Properties of Reflections and Translations**—pp. 204–211 **Lesson 24** **Verify Properties of Rotations**—pp. 212–219

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
b. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (CCSS: 8.G.3)	**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
c. Demonstrate that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. (CCSS: 8.G.2)	**Lesson 25** **Understand and Identify Congruent Figures**—pp. 220–227
d. Given two congruent figures, describe a sequence of transformations that exhibits the congruence between them. (CCSS: 8.G.2)	**Lesson 25** **Understand and Identify Congruent Figures**—pp. 220–227
e. Demonstrate that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. (CCSS: 8.G.4)	**Lesson 29** **Identify Similar Figures**—pp. 252–259
f. Given two similar two-dimensional figures, describe a sequence of transformations that exhibits the similarity between them. (CCSS: 8.G.4)	**Lesson 29** **Identify Similar Figures**—pp. 252–259
g. 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.[2] (CCSS: 8.G.5) [2]For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	**Lesson 30** **Establish Facts about Parallel Lines and Angles**—pp. 260–265
	Lesson 31 **Establish Facts about Triangles and Angles**—pp. 266–275

Standard: 4. Shape, Dimension, and Geometric Relationships

Prepared Graduates:

- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions

Concepts and skills students master:

2. Direct and indirect measurement can be used to describe and make comparisons

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8
Students can:	
a. Explain a proof of the Pythagorean Theorem and its converse. (CCSS: 8.G.6)	**Lesson 32** **Understand the Pythagorean Theorem**—pp. 276–283
	Lesson 33 **Understand the Converse of the Pythagorean Theorem**—pp. 284–291

Eighth Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 8	
b. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. (CCSS: 8.G.7)	**Lesson 34**	**Problem Solving: The Pythagorean Theorem**—pp. 292–299
c. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (CCSS: 8.G.8)	**Lesson 35**	**Calculate Distances in the Coordinate Plane**—pp. 300–307
d. State the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. (CCSS: 8.G.9)	**Lesson 36**	**Learn and Apply Volume Formulas**—pp. 308–315