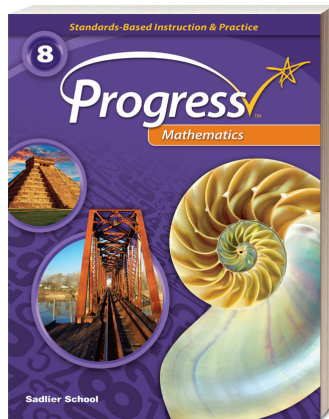


SADLIER

# Progress Mathematics



Aligned to the

## College and Career Ready Indiana Academic Standards Mathematics: Grade 8

### Contents

- 2 Number Sense
- 3 Computation
- 3 Algebra and Functions
- 5 Geometry and Measurement
- 7 Data Analysis, Statistics, and Probability



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William H. Sadlier, Inc.

[www.sadlierschool.com](http://www.sadlierschool.com)

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## Number Sense

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.NS.1:** Give examples of rational and irrational numbers and explain the difference between them. Understand that every number has a decimal expansion; for rational numbers, show that the decimal expansion repeats eventually, and convert a decimal expansion that repeats into a rational number.

**8.NS.2:** Use rational approximations of irrational numbers to compare the size of irrational numbers, plot them approximately on a number line, and estimate the value of expressions involving irrational numbers.

**8.NS.3:** Given a numeric expression with common rational number bases and integer exponents, apply the properties of exponents to generate equivalent expressions.

**8.NS.4:** Use square root symbols to represent solutions to equations of the form  $x^2 = p$ , where  $p$  is a positive rational number.

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 1 Understand Rational and Irrational Numbers**—pp. 10–17  
Understand: Decimal forms of rational numbers  
Understand: Decimal forms of irrational numbers  
Understand: How to write a terminating decimal in fraction form  
Understand: How to write a repeating decimal in fraction form

**Lesson 2 Use Rational Approximations of Irrational Numbers**—pp. 18–25  
Understand: How to approximate the side length of a square with an area of 2 ft<sup>2</sup>  
Understand: How to use rational approximations to compare irrational numbers  
Understand: How to use decimal approximations to locate irrational numbers on a number line

**Lesson 3 Understand Zero and Negative Exponent**—pp. 32–39  
Understand: Using patterns to find the value of 2<sup>0</sup>  
Understand: Using patterns to understand zero exponents  
Understand: Using patterns to understand negative exponents  
Understand: How to find the values of powers with negative exponents

**Lesson 4 Learn Properties of Exponents**—pp. 40–47  
Understand: The Product of Powers Property  
Understand: The Power of a Product Property  
Understand: The Power of a Power Property  
Understand: The Quotient of Powers Property  
Understand: The Power of a Quotient Property

**Lesson 5 Use Properties of Exponents Generate Equivalent Expressions**—pp. 48–55  
Understand: How to rewrite an expression so all the exponents are positive  
Understand: How to apply properties to compare expressions  
Understand: How to apply properties of exponents to show that expressions are equivalent  
Understand: How to use properties of exponents to write expressions that are equivalent to a given expression

**Lesson 6 Evaluate Square Roots and Cube Roots**—pp. 56–63  
Understand: How a square root is related to the side length of a square  
Understand: Square roots of a positive number  
Understand: Irrational square roots  
Understand: Square roots of decimals in simple cases  
Understand: Square roots of fractions in simple cases  
Understand: How a cube root is related to the edge length of a cube  
Understand: Cube roots of positive and negative numbers

## Number Sense

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 7** **Solve Simple Equations Involving Squares and Cubes**—pp. 64–71

Understand: Solving equations of the form  $x^2 = p$   
Understand: Solving equations of the form  $x^3 = p$   
Understand: Representing solutions of  $x^2 = p$ , when  $p$  is not a perfect square  
Understand: Real-world problems involving square roots  
Understand: The expression  $\sqrt{x^2}$

## Computation

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**8.C.1:** Solve real-world problems with rational numbers by using multiple operations.

**Lesson 14** **Solve Systems of Equations**—pp. 120–127  
Understand: The solution to a system of equations  
Understand: How to solve a system of equations algebraically  
Understand: Systems of equations with no solution

**Lesson 15** **Problem-Solving: Systems of Equations**—pp. 128–135  
Understand: Solving a real-world problem using a system of equations  
Understand: Finding a break-even point

**Lesson 34** **Problem Solving: The Pythagorean Theorem**—pp. 292–299  
Understand: Applying the Pythagorean Theorem  
Understand: Finding the length of a diagonal of a box

**Problem-Solving Model**—pp. 375–377

**8.C.2:** Solve real-world and other mathematical problems involving numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology, such as a scientific calculator, graphing calculator, or excel spreadsheet.

**Lesson 9** **Calculate with Numbers in Scientific Notation**—pp. 80–87  
Understand: Scientific notation  
Understand: A shortcut for writing numbers in scientific notation  
Understand: Multiplying numbers in scientific notation  
Understand: Dividing numbers in scientific notation  
Understand: Adding numbers in scientific notation

## Algebra and Functions

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**8.AF.1:** Solve linear equations with rational number coefficients fluently, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Represent real-world problems using linear equations and inequalities in one variable and solve such problems.

**Lesson 13** **Solve Linear Equations**—pp. 112–119  
Understand: Combining like terms before solving (using the Distributive Property)  
Understand: Solving equations with the variable on both sides

\*No inequalities at this level.

# Algebra and Functions

## MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.AF.2:** Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by transforming a 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).

**8.AF.3:** Understand that a function assigns to each  $x$ -value (independent variable) exactly one  $y$ -value (dependent variable), and that the graph of a function is the set of ordered pairs  $(x,y)$ .

**8.AF.4:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described.

**8.AF.5:** Interpret the equation  $y = mx + b$  as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. Describe similarities and differences between linear and nonlinear functions from tables, graphs, verbal descriptions, and equations.

**8.AF.6:** Construct a function to model a linear relationship between two quantities given a verbal description, table of values, or graph. Recognize in  $y = mx + b$  that  $m$  is the slope (rate of change) and  $b$  is the  $y$ -intercept of the graph, and describe the meaning of each in the context of a problem.

## SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 13 Solve Linear Equations**—pp. 112–119  
Understand: Solving equations with the variable on both sides  
Understand: Equations with no solution  
Understand: Equations with an infinite number of solutions

**Lesson 16 Understand Functions**—pp. 142–149  
Understand: The definition of function  
Understand: Identifying a function from ordered pairs  
Understand: Identifying a function from a table  
Understand: Identifying a function from a graph  
Understand: Identifying a function from an equation

**Lesson 17 Represent Functions**—pp. 150–157  
Understand: Representing the same function in different ways  
Understand: Real-world functions  
Understand: Equations that define functions

**Lesson 22 Analyze Graphs of Functions**—pp. 190–197  
Understand: Analyzing a graph  
Understand: Sketching a graph of a function based on a description  
Understand: Graphs that show change over time

**Lesson 19 Investigate Linear and Non-Linear Functions**—pp. 166–173  
Understand: The equation for a linear function  
Understand: Determining whether an equation represents a linear function

**Lesson 10 Understand Proportional Relationships and Slope**—pp. 88–95  
Understand: How the unit rate is represented in a graph  
Understand: The relationship between slope and steepness  
Understand: How to compare relationships given in different forms

**Lesson 11 Understand Slope**—pp. 96–103  
Understand: Calculating slope using different pairs of points  
Understand: Negative and zero slope  
Understand: Finding the slope of a line without counting units

**Lesson 12 Write Equations for Lines**—pp. 104–111  
Understand: The general equation for a line through the origin  
Understand: Writing an equation for a given line through the origin  
Understand: The general equation for a line through the point  $(0, b)$   
Understand: Writing an equation for a given line  
Understand: Graphing a line from its equation

## Algebra and Functions

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.AF.7:** Compare properties of two linear functions given in different forms, such as a table of values, equation, verbal description, and graph (e.g., compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed).

**8.AF.8:** Understand that solutions to a system of two linear equations correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously. Approximate the solution of a system of equations by graphing and interpreting the reasonableness of the approximation.

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 20 Use Functions to Model Relationships**—pp. 174–181  
Understand: Model a linear relationship given in a table  
Understand: Model a linear relationship given in a graph  
Understand: Model a linear relationship given two (x, y) pairs

**Lesson 21 Problem Solving: Use Linear Models**—pp. 182–189  
Understand: Using a linear function to model a real-world relationship given a table of values  
Understand: Using a linear function to model a real-world relationship given two pairs of values

**Lesson 17 Represent Functions**—pp. 150–157  
Understand: Representing the same function in different ways  
Understand: Real-world functions  
Understand: Equations that define functions

**Lesson 18 Compare Functions**—pp. 158–165  
Understand: Comparing rates of change  
Understand: Comparing a function represented by an equation to a function represented as a table

**Lesson 14 Solve Systems of Equations**—pp. 120–127  
Understand: The solution to a system of equations  
Understand: How to solve a system of equations algebraically  
Understand: Systems of equations with no solution

## Geometry and Measurement

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.GM.1:** Identify, define and describe attributes of three-dimensional geometric objects (right rectangular prisms, cylinders, cones, spheres, and pyramids). Explore the effects of slicing these objects using appropriate technology and describe the two-dimensional figure that results.

**8.GM.2:** Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres.

**8.GM.3:** Verify experimentally the properties of rotations, reflections, and translations, including: lines are mapped to lines, and line segments to line segments of the same length; angles are mapped to angles of the same measure; and parallel lines are mapped to parallel lines.

### SADLIER PROGRESS MATHEMATICS, GRADE 8

*\*Related content*  
**Lesson 36 Learn and Apply Volume Formulas** (cylinder, rectangular prism, cone, sphere)—pp. 308–315  
*\*No examination of the effects of slicing three-dimensional objects at this level.*

**Lesson 36 Learn and Apply Volume Formulas**—pp. 308–315  
Understand: How to calculate the volume of a cylinder  
Understand: How to calculate the volume of a cone  
Understand: How to calculate the volume of a sphere

**Lesson 26 Reflect and Translate Figures on the Coordinate Plane**—pp. 228–235  
Understand: How reflecting a figure across the y-axis affects the coordinates  
Understand: How reflecting a figure across the x-axis affects the coordinates  
Understand: Reflecting a figure across the line  $y = x$   
Understand: How translating a figure affects the coordinates

# Geometry and Measurement

## MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.GM.4:** Understand 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. Describe a sequence that exhibits the congruence between two given congruent figures.

**8.GM.5:** Understand 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. Describe a sequence that exhibits the similarity between two given similar figures.

**8.GM.6:** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

**8.GM.7:** Use inductive reasoning to explain the Pythagorean relationship.

## SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 27 Rotate Figures on the Coordinate Plane**—pp. 236–243  
Understand: How rotating a figure  $90^\circ$  around the origin affects the coordinates  
Understand: How rotating a figure  $180^\circ$  around the origin affects the coordinates  
Understand: How rotating a figure  $270^\circ$  around the origin affects the coordinates

**Lesson 28 Dilate Figures on the Coordinate Plane**—pp. 244–251  
Understand: Dilations centered at the origin  
Understand: Dilations with scale factors between 0 and 1

**Lesson 25 Understand and Identify Congruent Figures**—pp. 220–227  
Understand: Congruent figures  
Understand: Demonstrating that two figures are congruent

**Lesson 29 Identify Similar Figures**—pp. 252–259  
Understand: Similar figures  
Understand: Demonstrating that two figures are similar  
Understand: Relating corresponding side lengths and angle measures in similar figures

**Lesson 26 Reflect and Translate Figures on the Coordinate Plane**—pp. 228–235  
Understand: How reflecting a figure across the  $y$ -axis affects the coordinates  
Understand: How reflecting a figure across the  $x$ -axis affects the coordinates  
Understand: Reflecting a figure across the line  $y = x$   
Understand: How translating a figure affects the coordinates

**Lesson 27 Rotate Figures on the Coordinate Plane**—pp. 236–243  
Understand: How rotating a figure  $90^\circ$  around the origin affects the coordinates  
Understand: How rotating a figure  $180^\circ$  around the origin affects the coordinates  
Understand: How rotating a figure  $270^\circ$  around the origin affects the coordinates

**Lesson 28 Dilate Figures on the Coordinate Plane**—pp. 244–251  
Understand: Dilations centered at the origin  
Understand: Dilations with scale factors between 0 and 1

**Lesson 32 Understand the Pythagorean Theorem**—pp. 276–283  
Understand: What the Pythagorean Theorem says  
Understand: How to prove the Pythagorean Theorem  
Understand: How to find an unknown leg length

## Geometry and Measurement

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.GM.8:** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions.

**8.GM.9:** Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane.

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 33 Understand the Converse of the Pythagorean Theorem**—pp. 284–291  
Understand: The Converse of the Pythagorean Theorem  
Understand: How to prove the Converse of the Pythagorean Theorem  
Understand: Pythagorean triples

**Lesson 34 Problem Solving: The Pythagorean Theorem**—pp. 292–299  
Understand: Applying the Pythagorean Theorem  
Understand: Finding the length of a diagonal of a box

**Lesson 35 Calculate Distances in the Coordinate Plane**—pp. 300–307  
Understand: Calculating the distance between points  
Understand: Calculating distance without counting units  
Understand: Calculating distance without plotting

## Data Analysis, Statistics, and Probability

### MATHEMATICS STANDARDS & DESCRIPTION, GRADE 8

**8.DSP.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantitative variables. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

**8.DSP.2:** Know 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 describe the model fit by judging the closeness of the data points to the line.

**8.DSP.3:** Write and use equations that model linear relationships to make predictions, including interpolation and extrapolation, in real-world situations involving bivariate measurement data; interpret the slope and y-intercept.

**8.DSP.4:** Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. Understand and use appropriate terminology to describe independent, dependent, complementary, and mutually exclusive events.

**8.DSP.5:** Represent sample spaces and find probabilities of compound events (independent and dependent) using methods, such as organized lists, tables, and tree diagrams.

**8.DSP.6:** For events with a large number of outcomes, understand the use of the multiplication counting principle. Develop the multiplication counting principle and apply it to situations with a large number of outcomes.

### SADLIER PROGRESS MATHEMATICS, GRADE 8

**Lesson 37 Construct and Interpret Scatter Plots**—pp. 322–329  
Understand: Use a scatter plot for a two-variable data set  
Understand: Describe the relationship between variables using scatter plots

**Lesson 38 Fit Linear Models to Data**—pp. 330–337  
Understand: Fitting a trend line to data on a scatter plot  
Understand: Describing the association between variables on a scatter plot

**Lesson 39 Problem Solving: Use Linear Models**—pp. 338–345  
Understand: Using the trend line to answer questions about a situation  
Understand: Interpreting the slope and y-intercept of a trend line

**Lesson 40 Analyze Data in Two-Way Tables**—pp. 346–353  
Understand: Constructing a two-way table from a data set  
Understand: Using relative frequencies to analyze two-way tables

Not addressed at this level.

Not addressed at this level.