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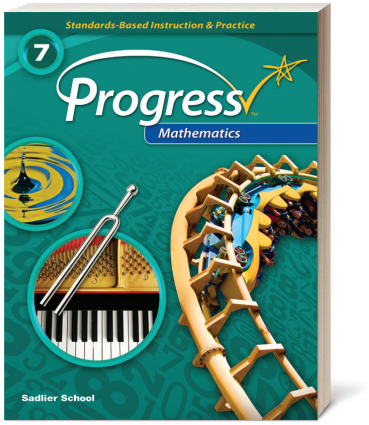
Progress Mathematics

Standards-Based Instruction & Practice



Aligned to the

Colorado Academic Standards for Mathematics

Seventh Grade

Contents

Sadlier
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Standard: 1. Number Sense, Properties, and Operations

Prepared Graduates:

- Make both relative (multiplicative) and absolute (arithmetic) comparisons between quantities. Multiplicative thinking underlies proportional reasoning

Concepts and skills students master:

1. Proportional reasoning involves comparisons and multiplicative relationships among ratios

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Analyze proportional relationships and use them to solve real-world and mathematical problems. (CCSS: 7.RP)	**Lesson 1** **Compute Unit Rates**—pp. 10–17
	Lesson 2 **Identify Proportional Relationships**—pp. 18–25
	Lesson 3 **Identify the Constant of Proportionality**—pp. 26–33
	Lesson 4 **Represent Proportional Relationships with Equations** —pp. 34–41
	Lesson 5 **Interpret Graphs of Proportional Relationships**—pp. 42–49
	Lesson 6 **Problem Solving: Multi-step Ratio Problems**—pp. 50–57
	Lesson 7 **Problem Solving: Multi-step Percent Problems**—pp. 58–65
b. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.[1] (CCSS: 7.RP.1) [1]For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour.	**Lesson 1** **Compute Unit Rates**—pp. 10–17
c. Identify and represent proportional relationships between quantities. (CCSS: 7.RP.2)	
i. Determine whether two quantities are in a proportional relationship.[2] (CCSS: 7.RP.2a) [2]e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.	**Lesson 2** **Identify Proportional Relationships**—pp. 18–25
ii. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. (CCSS: 7.RP.2b)	**Lesson 3** **Identify the Constant of Proportionality**—pp. 26–33

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
iii. Represent proportional relationships by equations.[3] (CCSS: 7.RP.2c) [3]For example, if total cost *t* is proportional to the number *n* of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.	**Lesson 4** **Represent Proportional Relationships with Equations** —pp. 34–41
iv. Explain what a point (*x, y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate. (CCSS: 7.RP.2d)	**Lesson 5** **Interpret Graphs of Proportional Relationships**—pp. 42–49
d. Use proportional relationships to solve multistep ratio and percent problems.[4] (CCSS: 7.RP.3) [4]Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.	**Lesson 6** **Problem Solving: Multi-step Ratio Problems**—pp. 50–57 **Lesson 7** **Problem Solving: Multi-step Percent Problems**—pp. 58–65
i. Estimate and compute unit cost of consumables (to include unit conversions if necessary) sold in quantity to make purchase decisions based on cost and practicality (PFL)	**Unit 1 Common Core Review** (compute unit cost)—p. 67
ii. Solve problems involving percent of a number, discounts, taxes, simple interest, percent increase, and percent decrease (PFL)	**Lesson 7** **Problem Solving: Multi-step Percent Problems**—pp. 58–65

Standard: 1. Number Sense, Properties, and Operations

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. Formulate, represent, and use algorithms with rational numbers flexibly, accurately, and efficiently

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Apply understandings of addition and subtraction to add and subtract rational numbers including integers. (CCSS: 7.NS.1)	
i. Represent addition and subtraction on a horizontal or vertical number line diagram. (CCSS: 7.NS.1)	**Lesson 8** **Understand Addition of Integers**—pp. 72–79 **Lesson 9** **Understand Subtraction of Integers**—pp. 80–87 **Lesson 10** **Add and Subtract Rational Numbers**—pp. 88–95

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
ii. Describe situations in which opposite quantities combine to make 0.[5] (CCSS: 7.NS.1a) [5]For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.	**Lesson 8** **Understand Addition of Integers**—pp. 72–79
iii. Demonstrate $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. (CCSS: 7.NS.1b)	**Lesson 8** **Understand Addition of Integers**—pp. 72–79
iv. Show that a number and its opposite have a sum of 0 (are additive inverses). (CCSS: 7.NS.1b)	**Lesson 8** **Understand Addition of Integers**—pp. 72–79
v. Interpret sums of rational numbers by describing real-world contexts. (CCSS: 7.NS.1c)	**Lesson 9** **Understand Subtraction of Integers**—pp. 80–87
vi. Demonstrate subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. (CCSS: 7.NS.1c)	**Lesson 9** **Understand Subtraction of Integers**—pp. 80–87
vii. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. (CCSS: 7.NS.1c)	**Lesson 9** **Understand Subtraction of Integers**—pp. 80–87
viii. Apply properties of operations as strategies to add and subtract rational numbers. (CCSS: 7.NS.1d)	**Lesson 10** **Add and Subtract Rational Numbers**—pp. 88–95
b. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers including integers. (CCSS: 7.NS.2)	
i. Apply properties of operations to multiplication of rational numbers.[6] (CCSS: 7.NS.2a) [6]Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers.	**Lesson 11** **Understand Multiplication of Integers**—pp. 96–103
ii. Interpret products of rational numbers by describing real-world contexts. (CCSS: 7.NS.2a)	**Lesson 11** **Understand Multiplication of Integers**—pp. 96–103
iii. Apply properties of operations to divide integers.[7] (CCSS: 7.NS.2b) [7]Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts	**Lesson 12** **Understand Division of Integers**—pp. 104–111
iv. Apply properties of operations as strategies to multiply and divide rational numbers. (CCSS: 7.NS.2c)	**Lesson 13** **Multiply and Divide Rational Numbers**—pp. 112–119

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
v. Convert a rational number to a decimal using long division. (CCSS: 7.NS.2d)	**Lesson 14** **Convert Rational Numbers to Decimal Form**—pp. 120–127
vi. Show that the decimal form of a rational number terminates in 0s or eventually repeats. (CCSS: 7.NS.2d)	**Lesson 14** **Convert Rational Numbers to Decimal Form**—pp. 120–127
c. Solve real-world and mathematical problems involving the four operations with rational numbers.[8] (CCSS: 7.NS.3) [8]Computations with rational numbers extend the rules for manipulating fractions to complex fractions.	**Lesson 15** **Apply Rational-Number Operations**—pp. 128–135

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. Properties of arithmetic can be used to generate equivalent expressions

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Use properties of operations to generate equivalent expressions. (CCSS: 7.EE)	
i. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. (CCSS: 7.EE.1)	**Lesson 16** **Combine Like Terms to Simplify Linear Expressions** —pp. 142–149 **Lesson 17** **Expand and Factor Linear Expressions**—pp. 150–157
ii. Demonstrate that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.[1] (CCSS: 7.EE.2) [1]For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."	**Lesson 16** **Combine Like Terms to Simplify Linear Expressions** —pp. 142–149 **Lesson 17** **Expand and Factor Linear Expressions**—pp. 150–157

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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:

2. Equations and expressions model quantitative relationships and phenomena

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form,[2] using tools strategically. (CCSS: 7.EE.3) [2]whole numbers, fractions, and decimals.	**Lesson 18** **Problem Solving: Multi-step Problems with Rational Numbers**—pp. 158–165
b. Apply properties of operations to calculate with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies.[3] (CCSS: 7.EE.3) [3]For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.	**Lesson 18** **Problem Solving: Multi-step Problems with Rational Numbers**—pp. 158–165
c. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (CCSS: 7.EE.4)	
i. Fluently solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. (CCSS: 7.EE.4a)	**Lesson 19** **Solve Linear Equations**—pp. 166–173 **Lesson 20** **Problem Solving: Linear Equations**—pp. 174–181
ii. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.[4] (CCSS: 7.EE.4a) [4]For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?	**Lesson 19** **Solve Linear Equations**—pp. 166–173 **Lesson 20** **Problem Solving: Linear Equations**—pp. 174–181
iii. Solve word problems[5] leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. (CCSS: 7.EE.4b) [5]For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.	**Lesson 21** **Solve Linear Inequalities**—pp. 182–189 **Lesson 22** **Problem Solving: Linear Inequalities**—pp. 190–197

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
iv. Graph the solution set of the inequality and interpret it in the context of the problem. (CCSS: 7.EE.4b)	**Lesson 21** **Solve Linear Inequalities**—pp. 182–189
	Lesson 22 **Problem Solving: Linear Inequalities**—pp. 190–197

Standard: 3. Data Analysis, Statistics, and Probability

Prepared Graduates:

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

Concepts and skills students master:

1. Statistics can be used to gain information about populations by examining samples

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Use random sampling to draw inferences about a population. (CCSS: 7.SP)	
i. Explain that generalizations about a population from a sample are valid only if the sample is representative of that population. (CCSS: 7.SP.1)	**Lesson 30** **Understand Sampling**—pp. 266–273
ii. Explain that random sampling tends to produce representative samples and support valid inferences. (CCSS: 7.SP.1)	**Lesson 30** **Understand Sampling**—pp. 266–273
iii. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. (CCSS: 7.SP.2)	**Lesson 31** **Use Sampling to Draw Inferences**—pp. 274–281
iv. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.[1] (CCSS: 7.SP.2) [1]For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.	**Lesson 31** **Use Sampling to Draw Inferences**—pp. 274–281
b. Draw informal comparative inferences about two populations. (CCSS: 7.SP)	
i. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.[2] (CCSS: 7.SP.3)	**Lesson 32** **Use Visual Overlap to Compare Distributions**—pp. 282–289

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
– continued from previous page – [2]For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.	
ii. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.[3] (CCSS: 7.SP.4) [3]For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.	**Lesson 33** **Use Sample Statistics to Compare Populations**—pp. 290–297

Standard: 3. Data Analysis, Statistics, and Probability

Prepared Graduates:

- Recognize and make sense of the many ways that variability, chance, and randomness appear in a variety of contexts

Concepts and skills students master:

2. Mathematical models are used to determine probability

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Explain that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.[4] (CCSS: 7.SP.5) [4]For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.	**Lesson 34** **Understand Probability of a Chance Event**—pp. 298–305
b. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.[5] (CCSS: 7.SP.6) [5]For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.	**Lesson 35** **Relate Relative Frequency and Probability**—pp. 306–313
c. Develop a probability model and use it to find probabilities of events. (CCSS: 7.SP.7)	
i. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (CCSS: 7.SP.7)	**Lesson 36** **Develop a Uniform Probability Model** (Think•Pair•Share)—p. 317 **Lesson 37** **Use a Chance Process to Develop a Probability Model** (Think•Pair•Share)—p. 325

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
ii. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.[6] (CCSS: 7.SP.7a) [6]For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.	**Lesson 36** **Develop a Uniform Probability Model**—pp. 314–321
iii. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.[7] (CCSS: 7.SP.7b) [7]For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?	**Lesson 37** **Use a Chance Process to Develop a Probability Model**—pp. 322–329
d. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. (CCSS: 7.SP.8)	
i. Explain that the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. (CCSS: 7.SP.8a)	**Lesson 38** **Find Probabilities of Compound Events**—pp. 330–337
ii. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. (CCSS: 7.SP.8b)	**Lesson 39** **Represent Sample Spaces for Compound Events**—pp. 338–345
iii. For an event[8] described in everyday language identify the outcomes in the sample space which compose the event. (CCSS: 7.SP.8b) [8]e.g., "rolling double sixes"	**Lesson 39** **Represent Sample Spaces for Compound Events**—pp. 338–345
iv. Design and use a simulation to generate frequencies for compound events.[9] (CCSS: 7.SP.8c) [9]For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?	**Lesson 40** **Simulate Compound Events**—pp. 346–353

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Standard: 4. Shape, Dimension, and Geometric Relationships

Prepared Graduates:

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

Concepts and skills students master:

1. Modeling geometric figures and relationships leads to informal spatial reasoning and proof

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. Draw construct, and describe geometrical figures and describe the relationships between them. (CCSS: 7.G)	
i. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. (CCSS: 7.G.1)	**Lesson 23** **Use Scale Drawings to Solve Problems**—pp. 204–211
ii. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. (CCSS: 7.G.2)	**Lesson 24** **Draw Shapes that Meet Given Conditions**—pp. 212–219 **Lesson 25** **Construct Triangles Using Both Side Lengths and Angle Measures**—pp. 220–227
iii. Construct triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. (CCSS: 7.G.2)	**Lesson 24** **Draw Shapes that Meet Given Conditions**—pp. 212–219 **Lesson 25** **Construct Triangles Using Both Side Lengths and Angle Measures**—pp. 220–227
iv. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. (CCSS: 7.G.3)	**Lesson 26** **Slice Three-Dimensional Figures**—pp. 228–235

Standard: 4. Shape, Dimension, and Geometric Relationships

Prepared Graduates:

- Understand quantity through estimation, precision, order of magnitude, and comparison. The reasonableness of answers relies on the ability to judge appropriateness, compare, estimate, and analyze error

Concepts and skills students master:

2. Linear measure, angle measure, area, and volume are fundamentally different and require different units of measure

Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
Students can:	
a. State the formulas for the area and circumference of a circle and use them to solve problems. (CCSS: 7.G.4)	**Lesson 27** **Use Formulas for Area and Circumference of Circles**—pp. 236–243

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Seventh Grade Evidence Outcomes	Sadlier *Progress Mathematics*, Grade 7
b. Give an informal derivation of the relationship between the circumference and area of a circle. (CCSS: 7.G.4)	**Lesson 27** **Use Formulas for Area and Circumference of Circles**—pp. 236–243
c. Use properties of supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. (CCSS: 7.G.5)	**Lesson 28** **Use Equations to Find Unknown Angle Measures**—pp. 244–251
d. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (CCSS: 7.G.6)	**Lesson 29** **Problem Solving: Area, Volume, and Surface Area**—pp. 252–259

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