

# Grade 6 Unit 1 at a Glance: Rational Numbers

## Overview and Pacing Guide

### Unit Overview

The first part of this unit builds on the prerequisite skills needed to develop the concept of negative numbers, the opposites of numbers, and absolute value. The unit starts with a real-world application that uses negative numbers so that students understand the need for them. The unit then introduces the idea of the *opposite of a number* and its absolute value and compares the difference in the definitions. The number line and positions of numbers on the number line are at the heart of the unit, including comparing positions with less than or greater than symbols.

The second part of the unit deals with the coordinate plane and extends student knowledge to all four quadrants. Students graph geometric figures on the coordinate plane and do initial calculations of distances that are a straight line. Students conclude the unit by investigating the reflections of figures across the  $x$ - and  $y$ -axes on the coordinate plane.



### Standards

#### The Number System

- ▶ 6.NS.C.5, 6.NS.C.6, 6.NS.C.6.a, 6.NS.C.6.b, 6.NS.C.6.c, 6.NS.C.7, 6.NS.C.7.a, 6.NS.C.7.b, 6.NS.C.7.c, 6.NS.C.7.d, 6.NS.C.8

#### Geometry

- ▶ 6.G.A.3

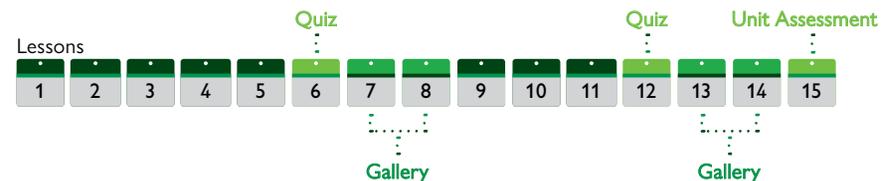
### Goals and Learning Objectives

- ▶ Identify and locate a number and its opposite on a number line.
- ▶ Define the opposite of a number, negative numbers, rational numbers, and integers.
- ▶ Understand when to talk about a number as negative and when to talk about the absolute value of a number.
- ▶ Find pairs of numbers that satisfy different statements about absolute values and/or the opposites of numbers.
- ▶ State whether an inequality is true or false and use a number line to prove it.
- ▶ Give coordinates of points on the coordinate plane.
- ▶ Reflect a figure across one of the axes on the coordinate plane and discern a pattern in the coordinates of the reflected figure.
- ▶ Track and review the choice of strategy when problem solving.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before each quiz (5, 11)
- ▶ Quiz (6, 12)
- ▶ Unit Assessment (15)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 2 at a Glance: Fractions and Decimals

## Overview and Pacing Guide

### Unit Overview

The beginning of this unit focuses on dividing with fractions. Students use a variety of methods, including repeated addition and drawing a model. Area models, bar models, and number lines are all introduced as tools for solving division problems. Students also work without a model by looking at the inverse relationship between division and multiplication. Students apply their learning to real-world contexts as they solve word problems that require dividing and multiplying mixed numbers.

Students also review the standard long-division algorithm for dividing whole numbers. They discuss the different ways that an answer to a whole-number division problem can be expressed (as a whole number plus a remainder, as a mixed number, or as a decimal). Students then solve a series of real-world problems that require the same whole-number division operation, but have different answers because of how the remainder is interpreted.

Students focus on decimal operations in the second part of the unit. They review addition, subtraction, multiplication, and division with decimals. Students review the algorithms for the four basic decimal operations, and use estimation or other methods to place the decimal points in products and quotients. They solve multistep word problems involving decimal operations.



### Standards

#### The Number System

- ▶ 6.NS.A.1, 6.NS.B.2, 6.NS.B.3

### Goals and Learning Objectives

- ▶ Learn how to divide by a fraction and divide a fraction by a whole number.
- ▶ Use models and other methods to divide a whole number by a fraction and to divide fractions by fractions.
- ▶ Apply knowledge of fraction multiplication and division to solve word problems.
- ▶ Answer a real-world word division problem in a way that makes sense in the context of the problem.
- ▶ Solve word problems involving simple addition, subtraction, multiplication, and division with decimals.
- ▶ Review and practice the algorithms for all four decimal operations.
- ▶ Determine when multiplying a number by a factor gives a result greater than the number and when it gives a result less than the number.
- ▶ Determine when dividing a number by a divisor gives a result greater than the number and when it gives a result less than the number.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before the quiz (11)
- ▶ Quiz (6, 12)
- ▶ Unit Assessment (15)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 3 at a Glance: Ratios

## Overview and Pacing Guide

### Unit Overview

The unit begins with an exploration activity that focuses on a ratio as a way to compare the amount of egg and the amount of flour in a mixture. The context motivates a specific understanding of the use of, and need for, ratios as a way of making comparisons between quantities. Following this lesson, the usefulness of ratios in comparing quantities is developed in more detail, including a contrast to using subtraction to find differences. Students learn to interpret and express ratios as fractions, as decimal numbers, in  $a:b$  form, in words, and as data; they also learn to identify equivalent ratios.

Then the unit looks at the tools used to represent ratio relationships and on simplifying and comparing ratios. Students learn to use tape diagrams, double number lines, ratio tables, and graphs. As these tools are introduced, students use them in problem-solving contexts to solve ratio problems, including an investigation of glide ratios. Students are asked to make connections and distinctions among these forms of representation throughout these lessons. Students also choose a ratio project in this part of the unit.

Finally, the unit covers understanding percents, including those greater than 100%.



### Standards

Ratios and Proportional Relationships

- ▶ 6.RP.A.1, 6.RP.A.3, 6.RP.A.3.a, 6.RP.A.3.c

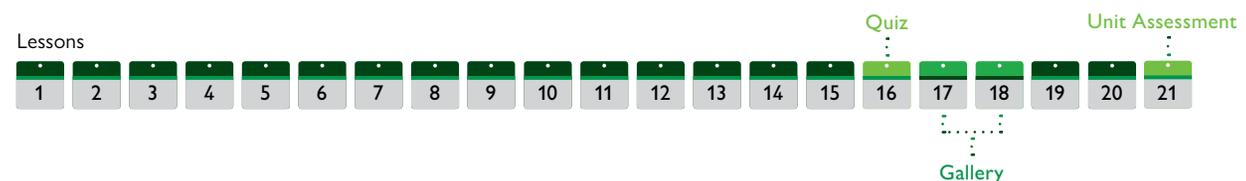
### Goals and Learning Objectives

- ▶ Use the definition of ratio to solve problems related to comparing quantities.
- ▶ Understand tape diagrams and double number line diagrams as ways to visually compare two or more quantities, and use them to solve ratio problems.
- ▶ Identify ratios that are equivalent but expressed differently, and make connections within and among different ways of representing ratios.
- ▶ Model ratios—including tables, tape diagrams, double number lines, and graphs—to represent a problem situation.
- ▶ Articulate strategies, thought processes, and approaches to solving a problem and defend why the solution is reasonable.
- ▶ Find a percent of a given quantity, and find a quantity given a part and the percent that part is of the whole.
- ▶ Understand the meaning of a percent greater than 100% in real-world situations.
- ▶ Synthesize and connect strategies for representing and investigating ratio relationships.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before the quiz (15)
- ▶ Quiz (16)
- ▶ Unit Assessment (21)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 4 at a Glance: Expressions

## Overview and Pacing Guide

### Unit Overview

Students learn to write and evaluate numerical expressions involving the four basic arithmetic operations and whole-number exponents. In specific contexts, they create and interpret numerical expressions and evaluate them. Then students move on to algebraic expressions, in which letters stand for numbers. Students simplify algebraic expressions and evaluate them for given values of the variables. Students learn about and use the vocabulary of algebraic expressions. Then they identify equivalent expressions and apply properties of operations, such as the distributive property, to generate equivalent expressions. Finally, students use geometric models to explore greatest common factors and least common multiples.



### Standards

#### The Number System

- ▶ 6.NS.B.4

#### Expressions and Equations

- ▶ 6.EE.A.1, 6.EE.A.2, 6.EE.A.2.a, 6.EE.A.2.b, 6.EE.A.2.c, 6.EE.A.3, 6.EE.A.4

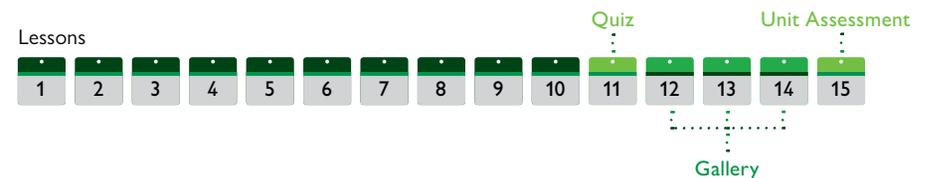
### Goals and Learning Objectives

- ▶ Evaluate numerical expressions and use the order of operations conventions.
- ▶ Translate between expressions in words and expressions in symbols.
- ▶ Evaluate expressions for the given values of the variables.
- ▶ Identify parts of an expression using appropriate mathematical vocabulary.
- ▶ Write expressions that fit specific descriptions (for example, the expression is the sum of two terms each with a different variable).
- ▶ Write equivalent expressions using the distributive property.
- ▶ Find the greatest common factor of two whole numbers equal to or less than 100, and find the least common multiple of two whole numbers equal to or less than 12.
- ▶ Develop fluency in writing expressions to represent situations and in evaluating the expressions for given values.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before the quiz (10)
- ▶ Quiz (11)
- ▶ Unit Assessment (15)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 5 at a Glance: Equations and Inequalities

## Overview and Pacing Guide

### Unit Overview

In the exploratory lesson, students use a balance scale to find a counterfeit coin that weighs less than the genuine coins. Then, continuing with a balance scale, students write mathematical equations and inequalities; identify numbers that are, or are not, solutions to an equation or an inequality; and learn how to use the addition and multiplication properties of equality to solve equations. Students then learn how to use equations to solve word problems, including word problems that can be solved by writing a proportion. Finally, students connect inequalities and their graphs to real-world situations.



### Standards

Ratios and Proportional Relationships

- ▶ 6.RP.A.3

Expressions and Equations

- ▶ 6.EE.B.5, 6.EE.B.6, 6.EE.B.7, 6.EE.B.8

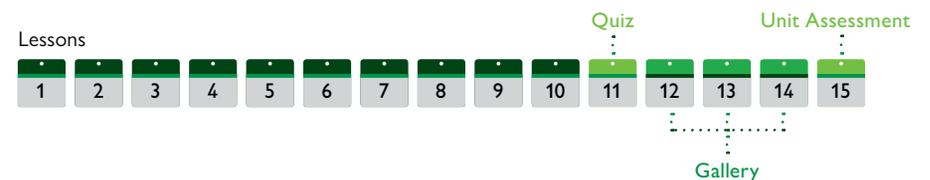
### Goals and Learning Objectives

- ▶ Use the equal sign ( $=$ ) and the greater than ( $>$ ) and less than ( $<$ ) symbols with rational numbers.
- ▶ Understand what solving an equation or inequality means.
- ▶ Use substitution to determine whether a given number makes an equation or inequality true.
- ▶ Recognize equations that have any number as a solution and equations that have no solutions.
- ▶ Practice solving equations using either the addition or the multiplication property of equality.
- ▶ Solve proportion problems using equations.
- ▶ Write inequality statements for real-world situations.
- ▶ Represent an inequality on a number line and using words.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before the quiz (10)
- ▶ Quiz (11)
- ▶ Unit Assessment (15)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 6 at a Glance: Rate

## Overview and Pacing Guide

### Unit Overview

In this unit, students explore the concept of rate in a variety of contexts: beats per minute, unit prices, fuel efficiency of a car, population density, speed, and conversion factors. Students write and refine their own definition for *rate* and then use it to recognize rates in different situations. Students learn that every rate is paired with an inverse rate that is a measure of the same relationship. Students figure out the logic of how units are used with rates. Then students represent quantitative relationships involving rates, using tables, graphs, double number lines, and formulas, and they see how to create one such representation when given another.



### Standards

#### Ratios and Proportional Relationships

- ▶ 6.RP.A.2, 6.RP.A.3, 6.RP.A.3.a, 6.RP.A.3.b, 6.RP.A.3.d

#### Expressions and Equations

- ▶ 6.EE.C.9

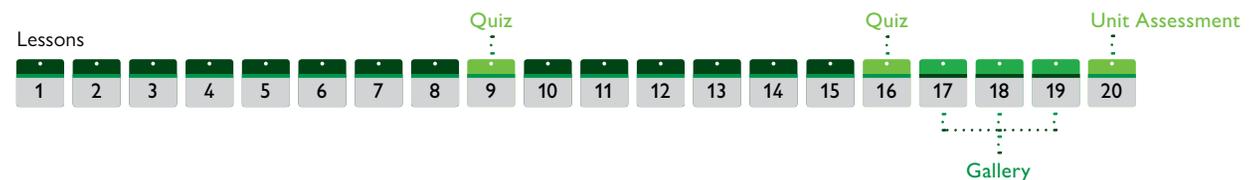
### Goals and Learning Objectives

- ▶ Investigate rate as a unit price.
- ▶ Explore rate in the context of fuel efficiency, population density, and finding and using conversion factors.
- ▶ Use a definition of *rate* to determine the kinds of situations that are rate situations and to recognize rates in new and different situations.
- ▶ Explore speed as a rate that measures the relationship between two aspects of a situation: distance and time.
- ▶ Understand the units that result from rate calculations.
- ▶ Use graphs to develop an understanding of rates.
- ▶ Use equations with two variables to express relationships between quantities that vary together.
- ▶ Understand that tables, graphs, double number lines, and formulas can be used to represent the same situation.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before each quiz (8, 15)
- ▶ Quiz (9, 16)
- ▶ Unit Assessment (20)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 7 at a Glance: Putting Math to Work

## Overview and Pacing Guide

### Unit Overview

As a class, students use problem-solving steps to work through a problem about lightning. Then they use the same problem-solving steps to solve a similar problem about lightning. The lightning problems use both rational numbers and rates. Students then choose a topic for a math project. Next, they solve two problems about gummy bears using the problem-solving steps. They then work on Gallery problems to test their problem-solving skills individually or with a partner. Students are encouraged to work on at least one problem individually so they can better prepare for a testing situation. The unit ends with project presentations and a short unit test.



### Standards

#### Ratios and Proportional Relationships

- ▶ 6.RP.A.3, 6.RP.A.3.a, 6.RP.A.3.b, 6.RP.A.3.d

#### The Number System

- ▶ 6.NS.B.3, 6.NS.C.8

#### Expressions and Equations

- ▶ 6.EE.B.6, 6.EE.B.7, 6.EE.C.9

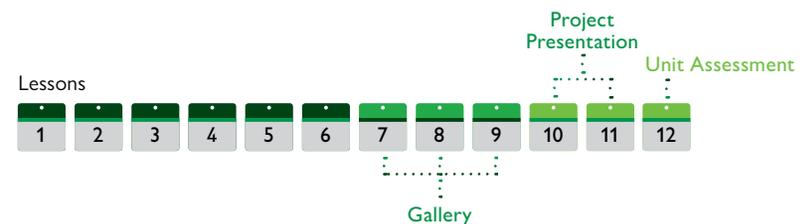
### Goals and Learning Objectives

- ▶ Create and implement a problem-solving plan.
- ▶ Create a rate table to organize data and make predictions.
- ▶ Create a graph to display proportional relationships, and use this graph to make predictions.
- ▶ Analyze the relationship between two variables.
- ▶ Apply the relationship between the variables to write a mathematical formula, and use the formula to solve problems.
- ▶ Articulate strategies, thought processes, and approaches to solving a problem, and defend the reasonability of the solution.
- ▶ Identify a partner or group to work collaboratively with on a math project.
- ▶ Use multiple representations—including tables, graphs, and equations—to organize and communicate data.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Unit Assessment (12)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 8 at a Glance: Distributions and Variability

## Overview and Pacing Guide

### Unit Overview

Students begin the unit by discussing what constitutes a statistical question. To answer a statistical question, data must be gathered in a consistent and accurate manner and then analyzed using appropriate tools.

Students learn different tools for analyzing data, including the following:

- Measures of center: mean (average), median, mode
- Measures of spread: mean absolute deviation (MAD), lower and upper extremes, lower and upper quartile, interquartile range
- Visual representations: line plot, box plot, histogram

These tools are compared and contrasted to help students better understand the benefits and limitations of each. Analysis of different data sets using these tools leads to an understanding of which ones are most appropriate to interpret the given data.

To demonstrate their understanding of the concepts, students work on a project for the duration of the unit. The project involves identifying an appropriate statistical question, collecting data, analyzing data, and presenting the results.



### Standards

#### Statistics and Probability

- ▶ 6.SP.A.1, 6.SP.A.2, 6.SP.A.3, 6.SP.B.4, 6.SP.B.5, 6.SP.B.5.a, 6.SP.B.5.b, 6.SP.B.5.c, 6.SP.B.5.d

### Goals and Learning Objectives

- ▶ Understand what a statistical question is, and realize there is variability in data.
- ▶ Compare data sets using measures of center (mode, median, mean) and spread (range and MAD).
- ▶ Explore how changing the data in a line plot affects the measures of center (mean, median).
- ▶ Describe an attribute of a typical sixth grade student using line plots and measures of center (mean and median) and spread (range and MAD).
- ▶ Apply knowledge of measures of center and range to solve problems.
- ▶ Learn about the five-number summary, the interquartile range, and how these are related to box plots.
- ▶ Compare a line plot and a box plot for the same set of data.
- ▶ Learn about histograms as another tool to describe data, and explore what the shape of the histogram tells about the data set.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before the quiz (13)
- ▶ Quiz (14)
- ▶ Unit Assessment (20)

### Instruction and Assessment Pacing Plan



# Grade 6 Unit 9 at a Glance: Surface Area and Volume

## Overview and Pacing Guide

### Unit Overview

This unit begins with an exploratory lesson about the volumes of containers. Then students investigate areas of 2-D figures. To find the area of a parallelogram, students consider how it can be rearranged to form a rectangle. To find the area of a trapezoid, students think about how two copies of the trapezoid can be put together to form a parallelogram. To find the area of a triangle, students consider how two copies of the triangle can be put together to form a parallelogram. By sketching and analyzing several parallelograms, trapezoids, and triangles, students develop area formulas for these figures. Students then find areas of composite figures by decomposing them into familiar figures. In the last lesson on area, students estimate the area of an irregular figure by overlaying it with a grid. Then the focus shifts to 3-D figures. Students build rectangular prisms from unit cubes and develop a formula for finding the volume of any rectangular prism. Students analyze and create nets for prisms. Then they compare a cube to a square pyramid with the same base and height as the cube. Finally, students use their knowledge of volume, area, and linear measurements to solve a packing problem.



### Standards

#### Geometry

- ▶ 6.G.A.1, 6.G.A.2, 6.G.A.3, 6.G.A.4

### Goals and Learning Objectives

- ▶ Explore how the surface areas and volumes of two different prisms made from the same-size sheet of paper compare.
- ▶ Develop and explore the formula for the area of a parallelogram and for the area of a trapezoid.
- ▶ Develop and explore the formula for the area of a triangle.
- ▶ Find the area of composite figures by decomposing and composing them into more basic figures.
- ▶ Use a grid to find the area of an irregular figure.
- ▶ Verify that the volume formula for rectangular prisms,  $V=lwh$  or  $V=Bh$ , applies to prisms with side lengths that are not whole numbers.
- ▶ Sketch the net of a rectangular prism and find the surface area of a rectangular prism.
- ▶ Change the net of a cube into the net of a pyramid and find the surface area of the pyramid.

### Assessments

- ▶ Exercises after each instructional lesson
- ▶ Self Check the day before the quiz (8)
- ▶ Quiz (9)
- ▶ Unit Assessment (13)

### Instruction and Assessment Pacing Plan

