Keeping the Big Ideas at the Center

Support your students in thinking about mathematics as an integrated and connected set of Big Ideas, rather than isolated topics.

To help you ensure deep, active learning for all of your students, the California Mathematics Framework centers instruction around the investigation of grade-level Big Ideas. These Big Ideas enfold clusters of standards together and are connected to each other and to authentic real-world and mathematical contexts. By designing instruction around student investigations that are focused on a set of interconnected Big Ideas, students are able to link many mathematical understandings into a coherent whole. (Chapter 1, pages 15–17)

Each Big Idea falls under one or more Content Connections (CC1, CC2, CC3, and CC4). These Content Connections help organize and connect each set of grade-level Big Ideas and provide mathematical coherence across the grades. (Chapter 1, page 24)

Content Connections

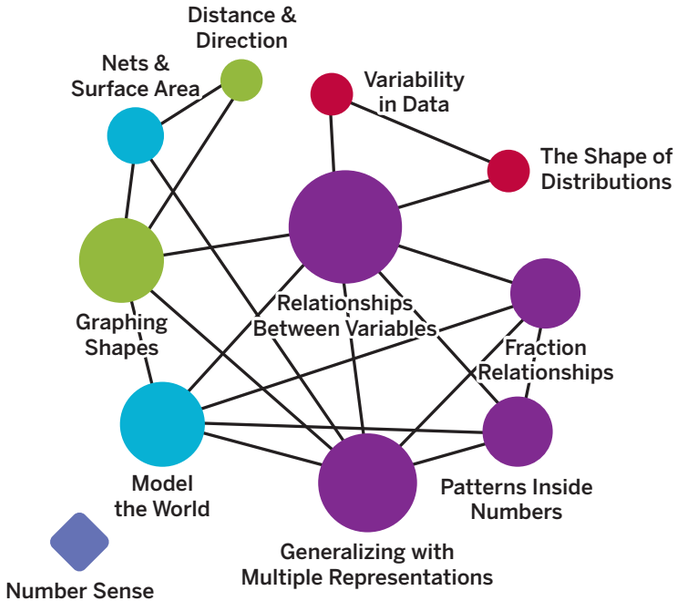
- CC1 Reasoning With Data
- CC2 Exploring Changing Quantities
- CC3 Taking Wholes Apart, Putting Parts Together
- CC4 Discovering Shape and Space

Meet the Big Ideas for Grade 6

Amplify Desmos Math California, Grade 6 is designed around the ten California Big Ideas for Grade 6 as described in the California Mathematics Framework (Chapter 7, page 41). The Big Ideas are represented by circles of varying sizes, with the size of each circle indicating the relative importance of the Big Idea it represents. This is determined by the number of connections, represented by line segments, the Big Idea has with other Big Ideas. Big Ideas are considered to be connected to one another when they enfold two or more of the same standards. The color of each Big Idea indicates its associated Content Connection. (Chapter 1, page 15)

In Grade 6, students spend the majority of their time investigating authentic problems that are structured to connect content standards, practice standards, and one or more Big Ideas. For more information about the development of the Big Ideas in Grade 6, refer to the Progression of Big Ideas that precedes each sub-unit.

On the following pages, you can read more about the Grade 6 Big Ideas as outlined by the California Mathematics Framework (Chapter 7, pages 41–43) as well as how Amplify Desmos Math California develops each Big Idea and connects it to other Big Ideas.



CC1 Variability in Data

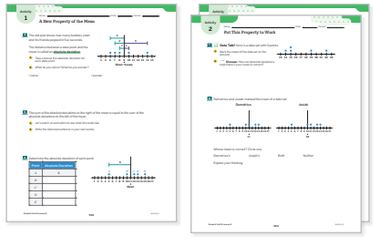
Investigate real world data sources, ask questions of data, start to understand variability within data sets and across different forms of data, consider different types of data, and represent data with different representations. **6.SP.1, 6.SP.5, 6.SP.4**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 8.** They begin to understand variability within data sets, describing how data can vary using a single measure (mean absolute deviation or interquartile range). Students calculate the mean absolute deviation and interquartile range to describe and compare real-world data sets.

Spotlight on . . .

In **Unit 8, Lesson 8, Activities 1 and 2,** students connect the Big Ideas *Variability in Data* and *The Shape of Distributions.* They explore a new property of the mean — that the sums of the absolute deviations on the left and right of the mean are equal — and use this property to check the value of the mean before exploring the mean absolute deviation in the next lesson.



Connecting to Other Big Ideas

CC1 The Shape of Distributions Unit 8 (Lessons 1, 4, 6–16)

CC2 Relationships Between Variables Unit 8 (Lesson 14)

CC1 The Shape of Distributions

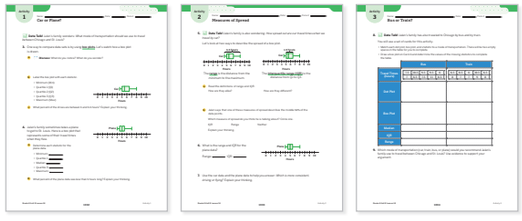
Consider the distribution of data sets — look at their shape and consider measures of center and variability to describe the data and the situation which is being investigated. **6.SP.2, 6.SP.3, 6.SP.5**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 8**. They explore the distributions of data sets that are displayed using dot plots, histograms, and box plots. They describe the overall shape of data distributions, overall patterns in the data, and measures of center and variability. Students describe the center of a data distribution using a single measure (mean or median) how data can vary using a single measure (mean absolute deviation or interquartile range).

Spotlight on . . .

In **Unit 8, Lesson 14, Activities 1–3,** students connect the Big Ideas *The Shape of Distributions, Variability in Data, and Relationships Between Variables.* They investigate a real-world situation involving different modes of transportation between Chicago and St. Louis and consider the overall shape of data distributions that represent travel times.



Connecting to Other Big Ideas

CC1 Variability in Data Unit 8 (Lessons 1, 4, 6–16)

CC2 Relationships Between Variables Unit 8 (Lesson 14)

CC2 Patterns Inside Numbers

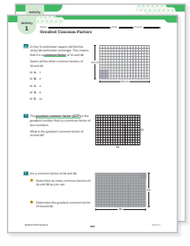
Consider how numbers are made up, exploring factors and multiples, visually and numerically. **6.NS.4, 6.RP.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2,** they investigate how numbers are made up by exploring factors and multiples and particularly, common factors and common multiples of two numbers. Students use visual models such as grids and patterns within hundreds charts to consider how numbers can be made up of factors and view patterns among the multiples of numbers. In **Unit 6**, they explore growing patterns using images, tables, and graphs.

Spotlight on . . .

In **Unit 2, Lesson 8, Activity 1,** students work toward the Big Idea *Patterns Inside Numbers* They visual models to illustrate factors and common factors, leading to the identification of the greatest common factor of two numbers.



Connecting to Other Big Ideas

CC2 Generalizing With Multiple Representations Unit 2 (Lesson 4)

CC2 Relationships Between Variables Unit 6 (Lesson 14)

CC3 Model the World Unit 2 (Lessons 4, 10–15)

Keeping the Big Ideas at the Center (continued)

CC2 Fraction Relationships

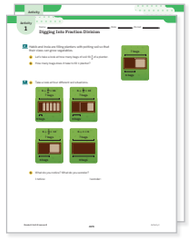
Understand fractions divided by fractions, thinking about them in different ways (e.g., how many $\frac{1}{3}$ are inside $\frac{2}{3}$?), considering the relationship between the numerator and denominator, using different strategies and visuals. Relate fractions to ratios and percentages. **6.NS.1, 6.RP.1, 6.RP.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2,** they begin their journey to understand ratio relationships, which will lead them to relate fractions to ratios and percentages in the next unit. They use double number lines to represent situations involving equivalent ratios, describe ratio relationships between two quantities using the term *per,* and begin to explore how ratios are related to fractions. Students build on this understanding in **Unit 3,** as they use visual models (tape diagrams, double number lines, and tables) and contextual problems to relate fractions, ratios, and percentages and calculate the percent of a number. In **Unit 4,** students reason about what it means to divide by a fraction and make connections between fraction division contexts, tape diagrams, and expressions. They develop strategies for calculating quotients of two fractions, including the use of common denominators, and use what they know about dividing fractions to solve problems. They move on to use fraction division to solve problems about comparing lengths and use division and multiplication to solve problems about areas and volumes with fractional dimensions. In **Unit 5,** students relate decimals to fractions and percentages. In Unit 6, they use multiple representations to solve equations of the form $x + p = q$ and $px = q$ in which the solution is a fraction.

Spotlight on . . .

In **Unit 4, Lesson 8, Activity 1,** students work toward the Big Idea *Fraction Relationships.* Through a real-world context involving potting soil, they use visuals and different strategies to understand the relationships between the dividend, divisor, and quotient when dividing with fractions.



Connecting to Other Big Ideas

CC2 Generalizing With Multiple Representations
Unit2 (Lesson 5), Unit 3 (Lesson 11), Unit 4 (Lessons 13, 14), Unit 6 (Lesson 4)

CC3 Model the World Unit 2 (Lessons 6, 9), Unit 3 (Lessons 9–13), Unit 5 (Lessons 14–16)

CC3 Nets and Surface Area Unit 4 (Lessons 13–15)

Connecting to Number Sense

NS Number Line Understanding
Unit 2 (Lessons 5, 6)

NS Ratios, Percents, and Proportional Relationships
Unit 2 (Lesson 9), Unit 3 (Lessons 9–13), Unit 5 (Lessons 14–16)

NS Generalized Numbers Leading to Algebra
Unit 6 (Lesson 4)

CC2 Generalizing With Multiple Representations

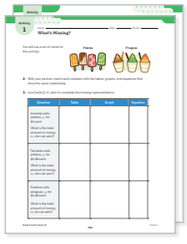
Generalize from growth or decay patterns, leading to an understanding of variables. Understand that a variable can represent a changing quantity or an unknown number. Analyze a mathematical situation that can be seen and solved in different ways and that leads to multiple representations and equivalent expressions. Where appropriate in solving problems, use unit rates.
6.EE.6, 6.EE.2, 6.EE.7, 6.EE.3, 6.EE.4, 6.RP.1, 6.RP.2, 6.RP.3

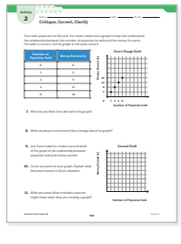
Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1,** they see letters representing changing quantities as they begin to use formulas to determine the areas of triangles, parallelograms, and trapezoids. In **Unit 2,** students understand ratio relationships using different representations, such as tape diagrams, double number lines, and tables. They use these representations to view changing quantities as they generate equivalent ratios. In **Unit 3,** students continue to use and connect multiple representations — tape diagrams, double number lines, and tables — as they multiply and divide to solve problems, now involving unit rates and percentages. In **Unit 6,** students recognize that a variable can represent a changing quantity or unknown number. They model and solve mathematical and real-world situations using equivalent expressions, equations, tape diagrams, and hangers. They define independent and dependent variables and use images, tables, and four quadrant graphs to model and solve real-world problems, including those involving rates and unit rates. In **Unit 7,** students use variables to write verbal and symbolic inequality statements, including boundary points. They identify and graph solutions to an inequality on a number line that can contain negative values. Students then use hanger diagrams to interpret and write inequalities that involve one variable and then more than one variable.

Spotlight on . . .

In **Unit 6, Lesson 15, Activities 1 and 2,** students connect the Big Ideas *Generalizing With Multiple Representations, Relationships Between Variables,* and *Model the World.* They model real-world situations using tables, graphs, and equations that show the same relationships and make connections between the representations.





Connecting to Other Big Ideas

CC2 Fraction Relationships Unit 2 (Lesson 5), Unit 3 (Lesson 11), Unit 4 (Lessons 13, 14), Unit 6 (Lesson 4)

CC2 Patterns Inside Numbers Unit 2 (Lesson 4)

CC2 Relationships Between Variables Unit 6 (Lessons 2, 3)

CC3 Model the World Unit 2 (Lessons 1–4, 6), Unit 3 (Lessons 4–8, 11), Unit 6 (Lesson 15)

CC3 Nets and Surface Area Unit 1 (Lessons 4, 5, 7, 8), Unit 4 (Lessons 13, 14), Unit 6 (Lessons 11, 12)

CC4 Graphing Shapes Unit 1 (Lessons 4, 5, 7, 8)

Connecting to Number Sense

NS Number Line Understanding
Unit 2 (Lesson 5), Unit 7 (Lessons 8, 9)

NS Ratios, Percents, and Proportional Relationships
Unit 3 (Lessons 4–8, 11), Unit 6 (Lessons 15, 16)

NS Generalized Numbers Leading to Algebra
Unit 6 (Lessons 1–9, 12)

CC2 Relationships Between Variables

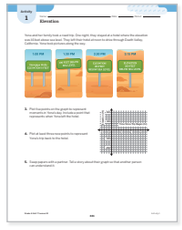
Use independent and dependent variables to represent how a situation changes over time, recognizing unit rates when it is a linear relationship. Illustrate the relationship using tables, 4-quadrant graphs and equations, and understand the relationships between the different representations and what each one communicates. **6.EE.9, 6.EE.5, 6.RP.1, 6.RP.2, 6.RP.3, 6.NS.8, 6.SP.1, 6.SP.2**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 6,** students represent real-world situations using equations, tape diagrams, and hangers, beginning to understand relationships between the two variables. They extend their understanding by defining the independent and dependent variable and use them to represent relationships in which one quantity is dependent upon (or changes based on) the second quantity. They illustrate these relationships using images, tables, and four quadrant graphs. They wrap up **Unit 6** by connecting different representations of the same relationship between the independent and dependent variables using real-world examples. In **Unit 7,** students use the four quadrants of the coordinate plane to demonstrate patterns among the variable quantities identified along each axis. They move on to model and solve real-world problems involving temperature and elevation and then participate in a *Graph Telephone* activity that connects the relationships between variables represented as graphs and stories. In **Unit 8,** they use box plots to visualize data sets that represent relationships involving distance, rate, and time.

Spotlight on . . .

In **Unit 7, Lesson 13, Activities 1 and 2**, students connect the Big Ideas *Relationships Between Variables, Model the World, and Distance and Direction.* They use graphs to represent how situations involving temperature and elevation change over time and then participate in a Graph Telephone activity that connects the relationships between variables represented as graphs and stories.



Connecting to Other Big Ideas

- CC1 **Variability in Data** Unit 8 (Lesson 14)
- CC2 **The Shape of Distributions** Unit 8 (Lesson 14)
- CC2 **Patterns Inside Numbers** Unit 6 (Lesson 14)
- CC2 **Generalizing With Multiple Representations** Unit 6 (Lessons 2, 3, 15, 16)
- CC3 **Model the World** Unit 6 (Lesson 15), Unit 7 (Lesson 13)
- CC4 **Distance and Direction** Unit 7 (Lesson 13)

Connecting to Number Sense

- NS **Number Line Understanding** Unit 7 (Lesson 11)
- NS **Generalized Numbers Leading to Algebra** Unit 6 (Lessons 2, 3, 15, 16)

CC3 Model the World

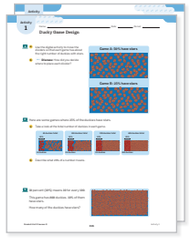
Solve and model real world problems. Add, subtract, multiply, and divide multi-digit numbers and decimals, in real-world and mathematical problems — with sense making and understanding, using visual models and algorithms. **6.NS.3, 6.NS.2, 6.NS.8, 6.RP.1, 6.RP.2, 6.RP.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2,** they model and solve real-world problems involving ratio relationships between two quantities, using sense making and visual models. They move on to model and solve real-world problems involving equivalent ratios using tools such as tables and double number lines. They wrap up **Unit 2** by modeling a real-world problem involving food waste. Then in **Unit 3,** students continue to use ratio reasoning to solve real-world problems, now involving unit rates and percentages. They use ratios to multiply and divide to convert measurements across systems of measurement. They connect two unit rates as unit price and amount per dollar using tables of equivalent ratios. Students move on to model and solve real-world real-world problems involving percentages using tape diagrams, double number lines, and tables. They wrap up **Unit 3** by using ratios, percentages, and visual models as they analyze the populations of various countries. In **Unit 5,** students solve real-world and mathematical problems by adding, subtracting, multiplying, and dividing decimals, use sense making, visual models, and algorithms. In **Unit 6,** they model real-world situations by making connections between different representations of the same relationship. In **Unit 7,** students use the coordinate plane to model and solve real-world problems involving temperature and elevation and then participate in a Graph Telephone activity that connects graphs and stories.

Spotlight on . . .

In **Unit 3, Lesson 9, Activity 1**, students connect the Big Ideas *Fraction Relationships* and *Model the World.* Through a real-world context involving a carnival game, they relate fractions to "friendly percentages," such as 10%, 25%, 50%, 75%, and 100%.



Connecting to Other Big Ideas

- CC2 **Fraction Relationships** Unit 2 (Lessons 6, 9), Unit 3 (Lessons 9–13), Unit 5 (Lessons 14–16)
- CC2 **Patterns Inside Numbers** Unit 2 (Lessons 4, 10–15)
- CC2 **Generalizing With Multiple Representations** Unit 2 (Lessons 1–5), Unit 3 (Lessons 4–8, 11, 14), Unit 6 (Lesson 15)
- CC2 **Patterns Inside Numbers** Unit 6 (Lesson 15), Unit 7 (Lesson 13)
- CC3 **Model the World** Unit 2 (Lesson 9)
- CC4 **Distance and Direction** Unit 7 (Lesson 13)
- CC4 **Graphing Shapes** Unit 7 (Lesson 12)

Connecting to Number Sense

- NS **Ratios, Percents, and Proportional Relationships** Unit 2 (Lessons 6, 9, 15), Unit 3 (Lessons 1–14), Unit 6 (Lesson 15), Unit 5 (Lessons 14–16)

Keeping the Big Ideas at the Center (continued)

CC3 Nets and Surface Area

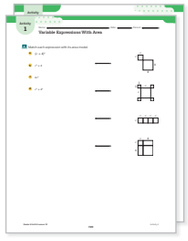
Build and decompose 3-D figures using nets to find surface area. Represent volume and area as expressions involving whole number exponents. *This Big Idea is also categorized under CC4: Discovering Shape and Space.*
6.EE.1, 6.EE.2, 6.G.4, 6.G.1, 6.G.2, 6.G.3

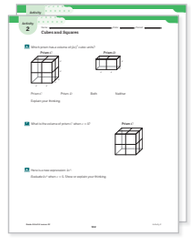
Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1,** they determine the areas of polygons using formulas and connect three-dimensional polyhedra and their nets, using those nets to determine surface areas. In **Unit 4,** they use expressions to express the area and volume of figures with fractional dimensions. In **Unit 6,** they use expressions involving whole-number exponents to represent the area of a square and the volume and surface area of a cube.

Spotlight on . . .

In **Unit 6, Lesson 12, Activities 1 and 2,** students connect the Big Ideas *Nets and Surface Area* and Generalizing With Multiple Representations. Students use multiple representations of diagrams and algebraic symbols to represent the volume of cubes and areas of different figures with expressions involving whole-number exponents.





Connecting to Other Big Ideas

CC2 **Fraction Relationships**
Unit 4 (Lessons 13–15)

CC2 **Generalizing With Multiple Representations**
Unit 1 (Lessons 4, 5, 7, 8), Unit 4 (Lessons 13, 14)
Unit 6 (Lesson 12)

CC4 **Graphing Shapes** Unit 1 (Lessons 1–9),
Unit 7 (Lesson 12)

Connecting to Number Sense

NS **Generalized Numbers Leading to Algebra**
Unit 6 (Lesson 12)

CC4 Distance and Direction

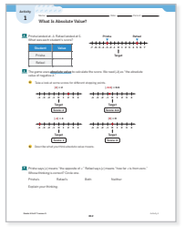
Students experience absolute value on numbers lines and relate it to distance, describing relationships, such as order between numbers using inequality statements. **6.NS.5, 6.NS.6, 6.NS.7, 6.G.1, 6.G.2, 6.G.3, 6.G.4**

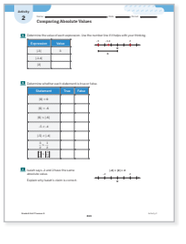
Developing the Big Idea

Students develop this Big Idea throughout **Unit 7.** They explore negative rational numbers, using the negative sign (-) to indicate direction. Students move on to understand the absolute value of a number as a way to describe its distance from zero on a number line. They compare and order values, making sense of both positive and negative numbers plotted on a number line.

Spotlight on . . .

In **Unit 7, Lesson 5, Activities 1 and 2,** students work toward the Big Idea *Distance and Direction.* They explore the absolute value of rational numbers, using number lines to relate absolute value to a number's distance from zero on the number line. They move on to use number lines to compare the absolute values of two numbers using inequality statements.





Connecting to Number Sense

NS **Number Line Understanding**
Unit 7 (Lessons 1–6, 10)

CC4 Graphing Shapes

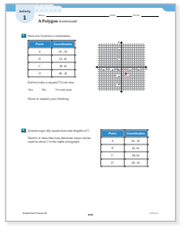
Use coordinates to represent the vertices of polygons, graph the shapes on the coordinate plane, and determine side lengths, perimeter, and area. **6.G.3, 6.G.1, 6.G.4, 6.NS.8, 6.EE.2**

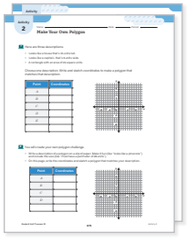
Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1,** they explore gridded polygons to understand how unit squares can be counted to determine area and then determine the areas of gridded polygons by decomposing and rearranging them. In **Unit 7**, they explore polygons graphed on the coordinate plane and use coordinates to determine side lengths, perimeter, and area.

Spotlight on . . .

In **Unit 7, Lesson 12, Activities 1 and 2**, students connect the Big Ideas *Graphing Shapes and Nets and Surface Area.* They use coordinates to represent the vertices of polygons and graph the shapes on a four-quadrant coordinate plane. They write expressions to help determine side lengths, perimeter, and area.





Connecting to Other Big Ideas

CC2 **Generalizing With Multiple Representations**
Unit 5 (Lessons 4, 5, 7, 8)

CC3 **Nets and Surface Area** Unit 1 (Lessons 1–9),
Unit 7 (Lesson 12)

CC3 **Model the World** Unit 7 (Lesson 12)