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

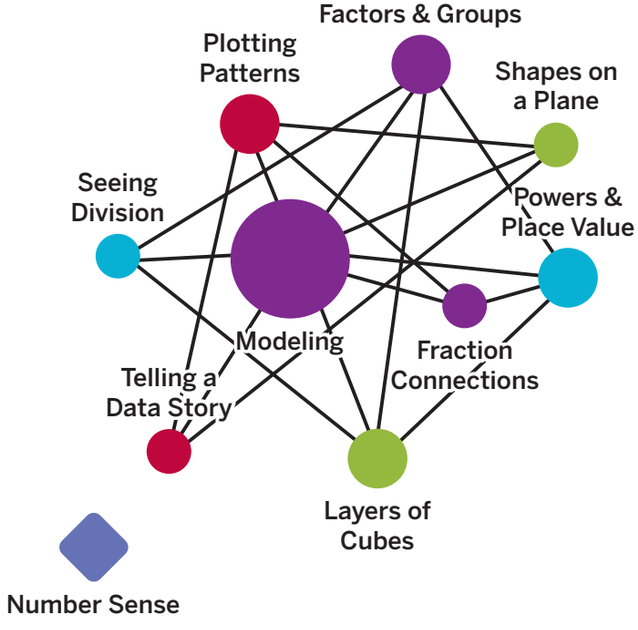
- CC1 Reasoning With Data
- CC2 Exploring Changing Quantities
- CC3 Taking Wholes Apart, Putting Parts Together
- CC4 Discovering Shape and Space

Meet the Big Ideas for Grade 5

Amplify Desmos Math California, Grade 5 is designed around the nine California Big Ideas for Grade 5 as described in the California Mathematics Framework (Chapter 6, page 45). 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 5, 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 5, refer to the Progression of Big Ideas that precedes each sub-unit.

On the following pages, you can read more about the Grade 5 Big Ideas as outlined by the California Mathematics Framework (Chapter 6, pages 122–123) as well as how Amplify Desmos Math California develops each Big Idea and connects it to other Big Ideas.



CC1 Plotting Patterns

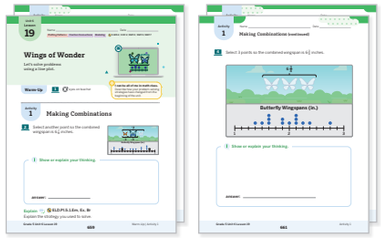
Students generate and analyze patterns, plotting them on a line plot or coordinate plane, and use their graph to tell a story about the data. Some situations should include fraction and decimal measurements, such as a plant growing.
5.G.1, 5.G.2, 5.MD.2, 5.NF.7, 5.OA.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 6**, they represent fractional measurement data on line plots, using the data to solve problems. In **Unit 7**, they study patterns among the ordered pairs of vertices of 2-D figures, generate and analyze patterns from 2 given rules, and graph the corresponding terms.

Spotlight on . . .

In **Unit 6, Lesson 19, Activities 1 and 2**, students connect the Big Ideas *Plotting Patterns*, *Fraction Connections*, and *Modeling*. Through the context of butterfly wingspans, they analyze patterns from fractional measurement data plotted on a line plot and plot additional points to tell a story about the data.



Connecting to Other Big Ideas

- CC1 Telling a Data Story Unit 7 (Lesson 8)
- CC2 Modeling Unit 6 (Lessons 18 and 19)
- CC2 Fraction Connections Unit 6 (Lessons 18 and 19)
- CC4 Shapes on a Plane Unit 7 (Lesson 8)

Connecting to Number Sense

- NS Fraction and Decimal Operations Unit 6 (Lessons 18 and 19)

CC1 Telling a Data Story

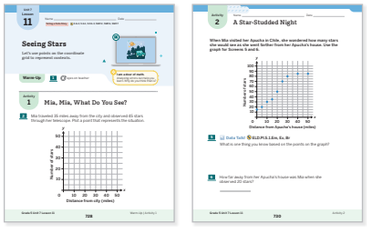
Understand a situation, graph the data to show patterns and relationships, and to help communicate the meaning of a real-world event. *This Big Idea is also categorized under CC2: Exploring Changing Quantities and CC4: Discovering Shape and Space.* **5.G.1, 5.G.2, 5.OA.3**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 7**. They locate and plot points on the coordinate plane, analyze patterns, and use the contextual data graphed as ordered pairs to answer questions.

Spotlight on . . .

In **Unit 7, Lesson 11, Activities 1 and 2**, students work toward the Big Idea *Telling a Data Story*. Through the context of star observation, students understand this real-world context by plotting points that represent the number of stars seen in the night sky based on the distance from a city. They communicate the meaning of ordered pairs and patterns within context.



Connecting to Other Big Ideas

- CC1 Plotting Patterns Unit 7 (Lesson 8)
- CC2 Modeling Unit 7 (Lesson 12)
- CC4 Shapes on a Plane Unit 7 (Lesson 8)

CC1 Factors and Groups

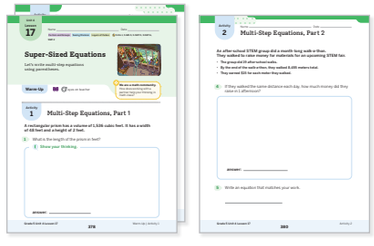
Students use grouping symbols to express changing quantities and understand that a factor can represent the number of groups of the quantity. **5.OA.1, 5.OA.2, 5.MD.4, 5.MD.5**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they apply their prior knowledge of factors from Grade 4 to write expressions that represent the volume of rectangular prisms, including expressions that use grouping symbols. In **Unit 4**, they use grouping symbols to write multi-step equations and interpret written and numerical expressions. In **Unit 5**, students write expressions that contain grouping symbols to solve multi-step, real-world problems.

Spotlight on . . .

In **Unit 4, Lesson 17, Activities 1 and 2,** students connect the Big Ideas *Factors and Groups*, *Seeing Division*, and *Layers of Cubes*. They solve real-world problems involving the volume of rectangular prisms and write expressions and equations involving grouping symbols to represent their solution strategies.



Connecting to Other Big Ideas

- CC2 Modeling Unit 1 (Lessons 5, 6, 8–14), Unit 5 (Lessons 15–19)
- CC3 Seeing Division Unit 4 (Lesson 17)
- CC3 Powers and Place Value Unit 5 (Lessons 15–18)
- CC4 Layers of Cubes Unit 1 (Lessons 5, 6, 8–14), Unit 4 (Lesson 17)

Connecting to Number Sense

- NS Multiplication and Division Unit 4 (Lesson 17)
- NS Fraction and Decimal Operations Unit 5 (Lessons 15–18)

Keeping the Big Ideas at the Center (continued)

CC2 Modeling

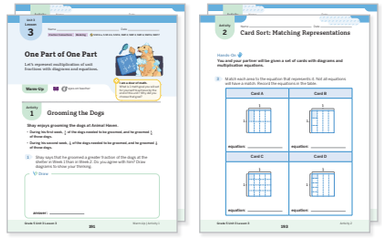
Set up a model and use whole, fraction, and decimal numbers and operations to solve a problem. Use concrete models and drawings and justify results. **5.NBT.3, 5.NBT.5, 5.NBT.7, 5.NF.1, 5.NF.2, 5.NF.3, 5.NF.4, 5.NF.5, 5.NF.6, 5.NF.7, 5.MD.4, 5.MD.5, 5.OA.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they use concrete models and drawings to solve problems involving the volume of rectangular prisms. In **Unit 2**, students model equal-sharing and part-of-a-whole story problems with diagrams and division expressions and equations. They connect visual models and tiled rectangles to expressions, while using the Distributive Property to multiply a whole number by a mixed number. They wrap up Unit 2 by reasoning about the products of whole numbers and fractions greater than 1 to solve problems and justify results. Then in **Unit 3**, students use visual models and equations to represent the product of a variety of fractions, including mixed numbers. They move on to use visual models to represent the division of a unit fraction by a whole number and a whole number by a unit fraction. In **Unit 4**, students model the multiplication of multi-digit numbers using area models and then move on to model division problems with mixed number remainders. In **Unit 5**, students multiply whole numbers and decimals using models and other representations. They use area models and other representations to model and solve multi-step, mathematical and real-world problems involving decimal multiplication and division. In **Unit 6**, students use operations to solve multi-step problems involving liquid volume and weight measurements. Students wrap up Unit 6 by representing fractional data on line plots and solving problems involving the data using all 4 operations. In **Unit 7**, students use operations to solve real-world problems by interpreting points on a graph in the coordinate plane.

Spotlight on . . .

In **Unit 3, Lesson 3, Activity 1**, students connect the Big Ideas *Modeling* and *Fraction Connections*. They create their own visual models to represent real-world problems involving the multiplication of unit fractions and justify their results.



Connecting to Other Big Ideas

- CC1 **Plotting Patterns** Unit 6 (Lessons 18 and 19)
- CC1 **Telling a Data Story** Unit 7 (Lesson 12)
- CC2 **Factors and Groups** Unit 1 (Lessons 5, 6, 8–14), Unit 5 (Lessons 15–19)
- CC2 **Fraction Connections** Unit 2 (Lessons 1, 2, 6–13), Unit 3 (Lessons 3–15), Unit 5 (Lesson 3), Unit 6 (Lessons 12, 18, 19)
- CC3 **Seeing Division** Unit 4 (Lesson 15), Unit 5 (Lessons 20–22, 24)
- CC3 **Powers and Place Value** Unit 5 (Lessons 1–4, 15–18)
- CC4 **Layers of Cubes** Unit 1 (Lessons 3–6, 8–14)

Connecting to Number Sense

- NS **Number Flexibility** Unit 5 (Lessons 1–4, 6)
- NS **Multiplication and Division** Unit 4 (Lesson 15)
- NS **Fraction and Decimal Operations** Unit 2 (Lessons 9–15), Unit 3 (Lessons 3–15), Unit 5 (Lessons 15–24), Unit 6 (Lessons 10–19)

CC2 Fraction Connections

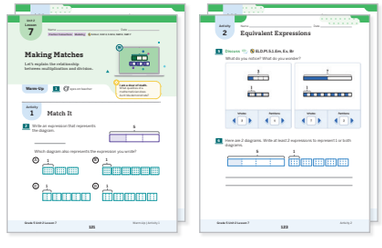
Make and understand visual models to show the effect of operations on fractions. Construct line plots from real data that include fractions of units. *This Big Idea is also categorized under CC3: Taking Wholes Apart, Putting Parts Together.*
5.NF.1, 5.NF.2, 5.NF.3, 5.NF.4, 5.NF.5, 5.NF.7, 5.MD.2, 5.NBT.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2**, they represent a fraction as a division expression and generalize the relationship between division and fractions. Students use models to apply their understanding of multiplying unit fractions by whole numbers to multiplying non-unit fractions by whole numbers. Then in **Unit 3**, students begin to explore fraction multiplication and use diagrams to represent a fraction of a fraction or a mixed number. They move on to use visual models and equations to represent the products of a variety of fractions, including mixed numbers. They visually represent the division of a unit fraction by a whole number and a whole number by a unit fraction using whole-number division concepts. In **Unit 5**, students use visual models to show the connection between fractional and decimal representations of numbers. In **Unit 6**, they use models to represent and solve real-world problems involving the addition and subtraction of fractions with unlike denominators. They move on to represent fractional data on line plots and solve problems involving the data using all 4 operations.

Spotlight on . . .

In **Unit 2, Lesson 7, Activities 1 and 2,** students connect the Big Ideas *Fraction Connections* and *Modeling*. They use visual models to understand the relationship between division and multiplication, showing that dividing 2 whole numbers is equivalent to multiplying the whole-number dividend by a unit fraction (the reciprocal of the divisor). *Students do not use the word reciprocal.*



Connecting to Other Big Ideas

- CC1 **Plotting Patterns** Unit 6 (Lessons 18 and 19)
- CC2 **Modeling** Unit 2 (Lessons 1, 2, 6–13), Unit 3 (Lessons 3–15), Unit 5 (Lesson 3), Unit 6 (Lessons 12, 18, 19)
- CC3 **Powers and Place Value** Unit 5 (Lesson 3)

Connecting to Number Sense

- NS **Number Flexibility** Unit 5 (Lesson 3)
- NS **Fraction and Decimal Operations** Unit 1 (Lessons 2–13), Unit 3 (Lessons 3–15), Unit 6 (Lessons 12, 18, 19)

CC3 Seeing Division

Solve real problems that involve volume, area, and division, setting up models, and creating visual representations. Some problems should include decimal numbers. Use rounding and estimation to check accuracy and justify results.

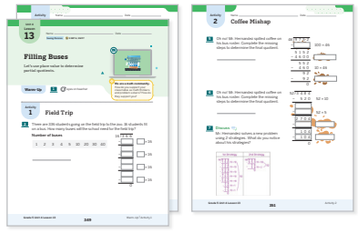
5.MD.3, 5.MD.4, 5.MD.5, 5.NBT.4, 5.NBT.6, 5.NBT.7

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 4**, they use place value strategies and partial quotients strategies to divide up to four-digit dividends and two-digit divisors. They move on to model division problems with mixed number remainders and estimate and justify quotients in division problems. They wrap up Unit 4 to represent and solve volume problems. In **Unit 5**, students solve mathematical and real-world problems by dividing whole numbers and decimals to the hundredths.

Spotlight on . . .

In **Unit 4, Lesson 13, Activity 1**, students work toward the Big Idea *Seeing Division*. They use partial quotient division strategies to solve real-world problems involving liquid volume and justify their results.



Connecting to Other Big Ideas

CC2 **Factors and Groups** Unit 4 (Lesson 17)

CC2 **Modeling** Unit 4 (Lesson 15), Unit 5 (Lessons 20–22, 24)

CC4 **Layers of Cubes** Unit 4 (Lesson 17)

Connecting to Number Sense

NS **Fraction and Decimal Operations** Unit 4 (Lessons 10–15, 17), Unit 5 (Lessons 20–24)

CC3 Powers and Place Value

Use whole-number exponents to represent powers of 10. Use expanded notation to write decimal numbers to the thousandths place and connect decimal notation to fractional representations, where the denominator can be expressed in powers of 10.

5.NBT.3, 5.NBT.2, 5.NBT.1, 5.OA.1, 5.OA.2

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 5**, they begin by extending their place value understanding to the thousandths place and recognizing aspects of the base-ten place-value system. They connect decimal notation to fractional representations with denominators of 10 or 100, which prepares them to reason about powers of 10 in the next unit. In **Unit 6**, students begin to use whole-number exponents to represent powers of 10, write decimals to the thousandths place using expanded notation, and determine patterns when multiplying and dividing powers of 10. They move on to use powers of 10 to convert between metric lengths and solve multi-step problems involving metric length and liquid volume measurement conversions.

Spotlight on . . .

In **Unit 6, Lesson 2, Activity 1,** students connect the Big Ideas *Powers and Place Value* and *Layers of Cubes*. They represent the volume of a cube using powers of 10 and expanded notation.

Connecting to Other Big Ideas

CC2 **Fraction Connections** Unit 5 (Lesson 3)

CC2 **Factors and Groups** Unit 5 (Lessons 15–18)

CC2 **Modeling** Unit 5 (Lessons 1–4, 15–18)

CC4 **Layers of Cubes** Unit 6 (Lesson 2)

Connecting to Number Sense

NS **Number Flexibility** Unit 5 (Lessons 1–4, 7), Unit 6 (Lessons 2, 6–8)

NS **Multiplication and Division** Unit 5 (Lessons 15–18)

Keeping the Big Ideas at the Center (continued)

CC4 Layers of Cubes

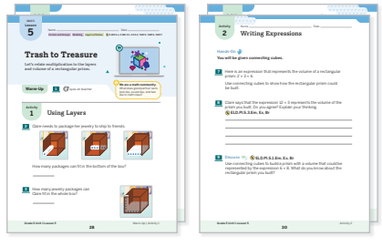
Students recognize volume as an attribute of three-dimensional space. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. **5.MD.5, 5.MD.4, 5.MD.3, 5.OA.1, 5.MD.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they explore concepts of volume and volume measurement, recognizing volume as an attribute of three-dimensional figures. Students come to understand that a unit cube can be used to measure volume and they build figures with unit cubes, connecting a greater volume to a figure that is composed of more unit cubes. They move on to use concrete models and drawings to determine the volume of rectangular prisms by using and describing the layered structure of prisms as arrays of cubes. Students use models and drawings of partially filled rectangular prisms to relate layers and volume to addition and multiplication, writing different multiplication expressions with grouping symbols. They generalize how to determine the volume of any rectangular prism using formulas. Students wrap up Unit 1 by determining the volumes of figures composed of rectangular prisms, while using models to determine unknown edge lengths. In **Unit 4**, they solve multi-step problems involving volume and use grouping symbols to write multi-step equations to represent those problems.

Spotlight on . . .

In **Unit 1, Lesson 5, Activities 1 and 2,** students connect the Big Ideas *Layers of Cubes, Factors and Groups*, and *Modeling*. Through the context of a real-world problem involving packaging, they relate the layers of a rectangular prism to volume and write multiplication expressions using grouping symbols to represent the volume.



Connecting to Other Big Ideas

CC2 **Factors and Groups** Unit 1 (Lessons 5, 6, 8–14), Unit 4 (Lesson 17)

CC2 **Modeling** Unit 1 (Lessons 3–6, 8–14)

CC3 **Seeing Division** Unit 4 (Lesson 17)

Connecting to Number Sense

NS **Fraction and Decimal Operations** Unit 4 (Lesson 17)

CC4 Shapes on a Plane

Graph 2-D shapes on a coordinate plane, notice and wonder about the properties of shapes, parallel and perpendicular lines, right angles, and equal length sides. Use tables to organize the coordinates of the vertices of the figures and study the changing quantities of the coordinates. *This Big Idea is also categorized under CC2: Exploring Changing Quantities.*

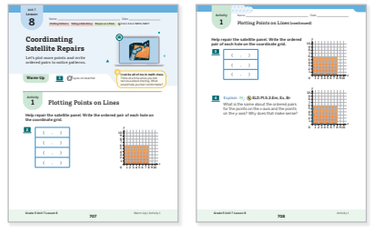
5.G.1, 5.G.2, 5.G.3, 5.G.4, 5.OA.3, 5.NF.4, 5.NF.5, 5.NF.6

Developing the Big Idea

Students develop this Big Idea throughout **Unit 7**. They classify quadrilaterals based on properties such as parallel and perpendicular lines, angle measurements, and side lengths. Students use their understanding of rectangles and the coordinate grid to graph two-dimensional shapes on the coordinate plane, using tables to organize the coordinates. They study patterns among the coordinates for ordered pairs that make the vertices of two-dimensional shapes.

Spotlight on . . .

In **Unit 7, Lesson 8, Activity 1**, students connect the Big Ideas *Shapes on a Plane, Plotting Patterns*, and *Telling a Data Story*. Through the context of a rectangular satellite panel whose vertices are plotted on a coordinate plane, students study the patterns among the ordered pairs that represent the vertices.



Connecting to Other Big Ideas

CC1 **Telling a Data Story** Unit 7 (Lesson 8)

CC1 **Plotting Patterns** Unit 7 (Lesson 8)