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)

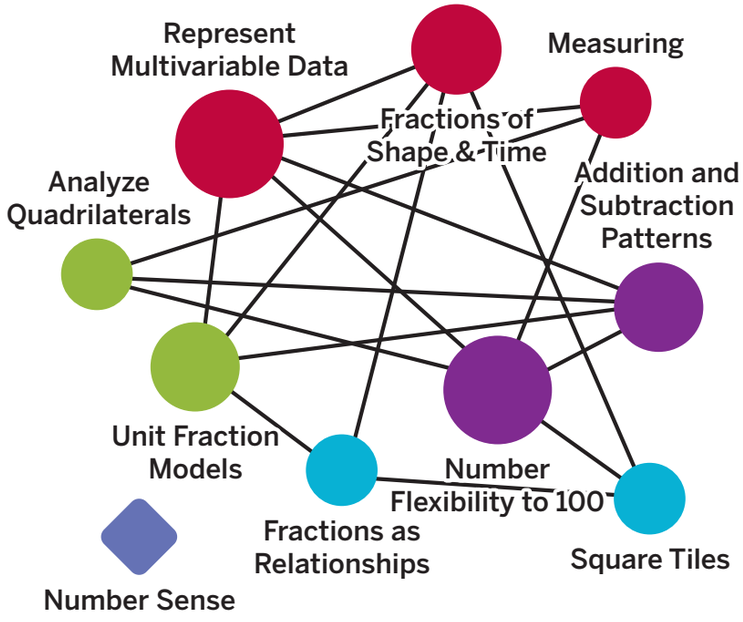
Each Big Idea falls under one or more Content Connections (CC1, CC2, CC3, and CC4). These Content Connections help organize and connect each set of grade-level Big Ideas and provide mathematical coherence across the grades. (Chapter 1, page 24)

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 3

Amplify Desmos Math California, Grade 3 is designed around the nine California Big Ideas for Grade 3 as described in the California Mathematics Framework (Chapter 6, page 117). 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 3, 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 3, refer to the Progression of Big Ideas that precedes each sub-unit.

On the following pages, you can read more about the Grade 3 Big Ideas as outlined by the California Mathematics Framework (Chapter 6, pages 117-119) as well as how Amplify Desmos Math California develops each Big Idea and connects it to other Big Ideas.

CC1 Represent Multivariable Data

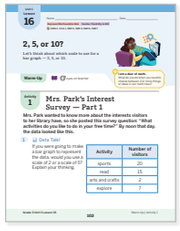
Collect data and organize data sets, including measurement data; read and create bar graphs and pictographs to scale. Consider data sets that include three or more categories (multivariable data). For example, when I interact with my puppy, I either call her name, pet her, or give her a treat. **3.MD.3, 3.MD.4, 3.MD.1, 3.MD.2, 3.NBT.1**

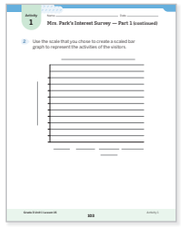
Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they interpret scaled bar graphs and scaled picture graphs. They move on to collect and organize data sets and determine the scale of a graph. In **Unit 3**, they analyze data by rounding to the nearest ten or hundred. In **Unit 6**, students collect, represent, and analyze fractional measurement data on a line plot. They estimate and measure the weights of objects in grams and kilograms, recording the measures as a set of data.

Spotlight on . . .

In **Unit 1, Lesson 16, Activity 1,** students connect the Big Ideas *Represent Multivariate Data* and *Number Flexibility to 100*. They use number sense to reason about the numbers in a data set and choose a scale for the bar graph they will create to represent the data set.





Connecting to Other Big Ideas

- CC1 **Fractions of Shape and Time** Unit 6 (Lessons 2 and 3)
- CC1 **Measuring** Unit 6 (Lessons 2, 3, 5–7)
- CC2 **Addition and Subtraction Patterns** Unit 3 (Lesson 17)
- CC2 **Number Flexibility to 100** Unit 1 (Lessons 15 and 16)
- CC4 **Unit Fraction Models** Unit 6 (Lesson 4)

Connecting to Number Sense

- NS **Fraction and Decimal Operations** Unit 6 (Lessons 2, 3, 5, 6)
- NS **Number Lines as Tools** Unit 6 (Lessons 2, 3, 5, 6)

CC1 Fractions of Shape and Time

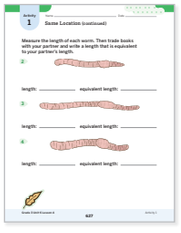
Collect data by time of day, show time using a data visualization. Think about fractions of time and of shape and space, expressing the base unit as a unit fraction of the whole. *This Big Idea is also categorized under CC3: Taking Wholes Apart, Putting Parts Together and CC4: Discovering Shape and Space.* **3.MD.1, 3.NF.1, 3.NF.2, 3.NF.3, 3.G.2**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 5**, they represent non-unit fractions with wholes greater than 1 using diagrams, explore number lines and partition them into equal parts to represent fractions, and locate whole numbers and other fractions on a number line. They move on to identify equivalent fractions using diagrams, including number lines. They compare fractions with the same numerators or denominators using diagrams, number lines, and square tiles. In **Unit 6,** they measure objects in halves and then fourths of inches, using equivalent fractions to describe length measurements. Later in Unit 6, they solve problems involving elapsed time using addition and subtraction, including times represented as fractional units.

Spotlight on . . .

In **Unit 6, Lesson 4, Activity 1,** students connect the Big Ideas *Fractions of Space and Time, Measuring,* and *Unit Fraction Models*. They measure fractional lengths using a standard ruler and use what they know about fractional equivalence to record the measurements in more than 1 way.



Connecting to Other Big Ideas

- CC1 **Represent Multivariable Data** Unit 6 (Lessons 2 and 3)
- CC2 **Measuring** Unit 6 (Lessons 2–4)
- CC2 **Addition and Subtraction Patterns** Unit 6 (Lesson 13)
- CC3 **Fractions as Relationships** Unit 5 (Lesson 5, 9, 11, 12, 15, 16)
- CC3 **Square Tiles** Unit 5 (Lessons 10, 11, 15)
- CC4 **Unit Fraction Models** Unit 5 (Lesson 5–7, 9, 12, 16, 17), Unit 6 (Lesson 4)

Connecting to Number Sense

- NS **Number Flexibility** Unit 6 (Lesson 13)
- NS **Fraction and Decimal Operations** Unit 5 (Lesson 5–7, 9, 11, 15, 16), Unit 6 (Lessons 2–4)
- NS **Number Lines as Tools** Unit 5 (Lesson 5–7, 9, 12), Unit 6 (Lessons 2–4)

Keeping the Big Ideas at the Center (continued)

CC1 Measuring

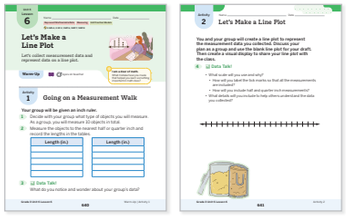
Measure volume and mass, incorporating linear measures to draw and represent objects in two-dimensional space. Compare the measured objects, using line plots to display measurement data. Use rounding where appropriate.
3.MD.2, 3.MD.4, 3.NBT.1

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 6,** they measure objects in halves and then fourths of inches. They move on to use equivalent fractions to describe length measurements and collect and represent measurement data on a line plot. They estimate and measure the weights of objects in grams and kilograms and are later introduced to liters as a unit of measure for liquid volume. They measure the volume of a large container using a 1-liter container. Later, they use number lines and fraction models to determine the volume of containers. Near the end of Unit 6**,** students craft questions about the weight and volume of objects and solve story problems related to volume using all 4 operations. In **Unit 7,** they determine the perimeter of polygons by adding the lengths of all of the sides. They wrap up Unit 7 by solving real-world problems involving the area and perimeter of quadrilaterals and explaining strategies for designing a space based on measurement requirements.

Spotlight on . . .

In **Unit 6, Lesson 6, Activities 1 and 2,** students connect the Big Ideas *Measuring, Represent Multivariate Data*, and *Unit Fraction Models*. They collect fractional measurement data by measuring objects to the nearest half or quarter inch. In Activity 2, they compare their measured objects by creating a line plot to represent the data.



Connecting to Other Big Ideas

- CC1 **Represent Multivariable Data** Unit 6 (Lessons 2, 3, 5, 6)
- CC1 **Fractions of Space and Time** Unit 6 (Lessons 2–4)
- CC2 **Addition and Subtraction Patterns** Unit 6 (Lesson 8), Unit 7 (Lesson 7)
- CC2 **Number Flexibility to 100** Unit 6 (Lessons 15 and 16), Unit 7 (Lesson 9)
- CC4 **Unit Fraction Models** Unit 6 (Lesson 8), Unit 7 (Lesson 7)
- CC4 **Analyze Quadrilaterals** Unit 7 (Lessons 7 and 13)

Connecting to Number Sense

- NS **Number Flexibility** Unit 6 (Lesson 8), Unit 7 (Lesson 7)
- NS **Fraction and Decimal Operations** Unit 6 (Lessons 2–6), Unit 7 (Lesson 13)
- NS **Number Lines as Tools** Unit 6 (Lessons 2–6, 10)

CC2 Addition and Subtraction Patterns

Add and subtract within 1,000 – Using student generated strategies and models, such as base 10 blocks (e.g., use expanded notation to illustrate place value and justify results). Investigate patterns in addition and multiplication tables, and use operations and color coding to generalize and justify findings. 3.NBT.2, 3.OA.8, 3.OA.9, 3.MD.1

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 3**, they add and subtract numbers within 1,000 using a variety of strategies and solve two-step story problems involving addition, subtraction, and multiplication. They extend this in **Unit 4** to solve two-step problems involving all 4 operations. Then in **Unit 6**, they use addition and subtraction to determine the weights of objects placed on balances by comparing with known weights. They add and subtract to solve elapsed time problems, including times represented as fractional units. Students solve volume word problems involving all 4 operations. In **Unit 7**, they determine the perimeter of polygons by adding the lengths of all of the sides.

Spotlight on . . .

In **Unit 3, Lesson 22, Activity 1**, students connect the Big Ideas *Addition and Subtraction Patterns* and *Number Flexibility to 100*. They solve two-step story problems involving all 4 operations, focusing on how representations can help them make sense of situations and choose which operations to use to solve them. They use rounding and estimation to check the reasonableness of their answers.

Connecting to Other Big Ideas

- CC1 **Represent Multivariable Data** Unit 3 (Lesson 17)
- CC1 **Fractions of Shape and Time** Unit 6 (Lesson 13)
- CC1 **Measuring** Unit 6 (Lesson 8), Unit 7 (Lesson 7)
- CC2 **Number Flexibility to 100** Unit 3 (Lessons 20–22), Unit 4 (Lesson 20), Unit 6 (Lesson 17)
- CC4 **Analyze Quadrilaterals** Unit 7 (Lesson 7)
- CC4 **Unit Fraction Models** Unit 6 (Lessons 10, 12, 14)

Connecting to Number Sense

- NS **Number Flexibility** Unit 3 (Lessons 1–14, 19–22), Unit 4 (Lesson 20), Unit 6 (Lessons 8, 13, 14), Unit 7 (Lesson 7)
- NS **Multiplication and Division** Unit 3 (Lessons 20 and 21), Unit 4 (Lesson 20)
- NS **Number Lines as Tools** Unit 6 (Lessons 10 and 12)

CC2 Number Flexibility to 100

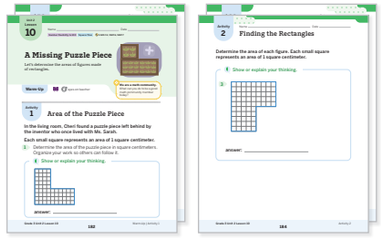
Multiply and divide within 100 and justify answers using arrays and student generated visual representations. Encourage number sense and number flexibility – not "blind" memorization of number facts. Use estimation and rounding in number problems. **3.OA.1, 3.OA.2, 3.OA.3, 3.OA.4, 3.OA.5, 3.OA.6, 3.OA.7, 3.OA.8, 3.NBT.3, 3.MD.7, 3.NBT.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they conceptualize multiplication and represent story problems by constructing arrays. They build on this in Unit 2 to relate the areas of rectangles to arrays, expressing the area of a rectangle as a product of 2 numbers. In **Unit 3**, they make reasonable estimates in two-step problems involving addition, subtraction, and multiplication. In **Unit 4**, they understand division as an unknown factor problem and use the relationship between multiplication and division to represent and solve problems involving all 4 operations. In **Unit 6**, they solve volume story problems involving all 4 operations. In **Unit 7**, they analyze polygons with missing side lengths and a given perimeter and use multiplication and division to reason about the length of the missing side(s). Students wrap up Unit 7 by using number flexibility to describe patterns in the perimeters of rectangles with the same perimeter and different areas, or different perimeters and same areas.

Spotlight on . . .

In **Unit 2, Lesson 10, Activities 1 and 2,** students connect the Big Ideas *Number Flexibility to 100* and *Square Tiles*. They decompose gridded rectangles made up of square tiles and multiply to determine the areas of individual rectangles, recognizing that area is additive.



Connecting to Other Big Ideas

- CC1 **Represent Multivariable Data** Unit 1 (Lessons 15 and 16)
- CC1 **Measuring** Unit 6 (Lessons 15 and 16)
- CC2 **Addition and Subtraction Patterns** Unit 3 (Lessons 20–22), Unit 4 (Lessons 15 and 20), Unit 6 (Lessons 15 and 17)
- CC3 **Square Tiles** Unit 2 (Lessons 5–13), Unit 4 (Lessons 9–11, 13), Unit 7 (Lessons 11 and 12)
- CC4 **Analyze Quadrilaterals** Unit 7 (Lessons 9, 11, 12)

Connecting to Number Sense

- NS **Number Flexibility** Unit 3 (Lessons 15–22), Unit 4 (Lessons 2–4, 15, 20), Unit 7 (Lesson 9)
- NS **Multiplication and Division** Unit 1 (Lessons 4–11), Unit 2 (Lessons 6–13), Unit 3 (Lessons 20 and 21), Unit 4 (Lessons 5–20),Unit 7 (Lessons 11 and 12)

CC3 Square Tiles

Use square tiles to measure the area of shapes, finding an area of *n* squared units, and learn that 1 square represents 1/*n*th of the total area. **3.MD.5, 3.MD.6, 3.MD.7, 3.OA.7, 3.NF.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2**, they compare areas of shapes using pattern blocks, square tiles, and unit measures. They compare the areas of different-sized rectangles by counting unit squares in a gridded rectangle. They build on this understanding to relate the areas of rectangles to arrays and multiplication. In **Unit 4**, students use gridded rectangles and square tiles to solve problems involving area. In **Unit 5**, they use diagrams involving square tiles to generate equivalent fractions and compare fractions using diagrams, number lines, and square tiles. In **Unit 7**, they solve real-world problems involving the area and perimeter of quadrilaterals and explain strategies for designing a space based on measurement requirements.

Spotlight on . . .

In **Unit 5, Lesson 11, Activity 2,** students connect the Big Ideas *Square Tiles* and *Fractions as Relationships*. They use diagrams partitioned into equal-size tiles to write 2 different fractions that represent the total shaded area of each diagram.

Connecting to Other Big Ideas

- CC1 **Fractions of Shape and Time** Unit 5 (Lessons 10, 11, 15)
- CC2 **Number Flexibility to 100** Unit 2 (Lessons 5–13), Unit 4 (Lessons 9–11, 13), Unit 7 (Lessons 11 and 12)
- CC3 **Fractions as Relationships** Unit 5 (Lessons 4, 11, 15)
- CC4 **Analyze Quadrilaterals** Unit 7 (Lessons 11 and 12)

Connecting to Number Sense

- NS **Multiplication and Division** Unit 2 (Lessons 6–13), Unit 4 (Lessons 9–11, 13), Unit 7 (Lessons 11–13)
- NS **Fraction and Decimal Operations** Unit 5 (Lessons 4, 11, 15)

Keeping the Big Ideas at the Center (continued)

CC3 Fractions as Relationships

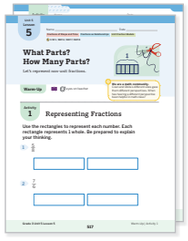
Know that a fraction is a relationship between numerators and denominators – and it is important to consider the relationship in context. Understand why $\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$. **3.NF.1, 3.NF.3**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 5**. They begin to understand fractions as numbers that represent a part of a whole. They move on to consider non-unit fractions and represent the relationship between their numerators and denominators with diagrams. Then they represent non-unit fractions with wholes greater than 1 using diagrams. They explore number lines and partition them into equal parts to represent the relationship between numerators and denominators and identify fractions that are equal to whole numbers by understanding the relationship between their numerators and denominators. They build on this understanding to generate equivalent fractions using diagrams and express whole numbers as fractions with a denominator of 1. They compare fractions with the same numerators or denominators using diagrams, number lines, and square tiles.

Spotlight on . . .

In **Unit 5, Lesson 5, Activity 1**, students connect the Big Ideas *Fractions as Relationships, Fractions of Shape and Time,* and *Unit Fraction Models*. They use the relationship between numerators and denominators to partition and shade fraction strips that represent non-unit fractions by first representing unit fractions.



Connecting to Other Big Ideas

- CC1 Fractions of Shape and Time Unit 5 (Lessons 5, 9, 11, 12, 15, 16)
- CC3 Square Tiles Unit 5 (Lessons 4, 11, 15)
- CC4 Unit Fraction Models Unit 5 (Lessons 5, 8, 9, 12, 13)

Connecting to Number Sense

- NS Fraction and Decimal Operations Unit 5 (Lessons 2–5, 8, 9, 11, 13, 15–17)
- NS Number Lines as Tools Unit 5 (Lessons 8, 9, 12, 13)

CC4 Unit Fraction Models

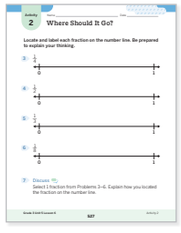
Compare unit fractions using different visual models including linear models (e.g., number lines, tape measures, time, and clocks) and area models (e.g., shape diagrams encourage student justification with visual models). *This Big Idea is also categorized under CC4: Discovering Shape and Space.* **3.NF.2, 3.NF.3, 3.MD.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 5,** they represent non-unit fractions with wholes greater than 1 using diagrams. They move on to identify and generate equivalent fractions using diagrams, including number lines. They compare fractions with the same numerators or denominators using diagrams, number lines, and square tiles. In **Unit 6**, they measure in whole, half, and quarter inches, using equivalent fractions to describe length measurements. Then they use number lines and fraction models to determine the volume of containers to the nearest fourth of a liter. Later in Unit 6, they solve problems involving elapsed time using addition and subtraction, including times represented as fractional units.

Spotlight on . . .

In **Unit 5, Lesson 6, Activity 2**, students connect the Big Ideas *Unit Fraction Models* and *Fractions of Shape and Time*. They use number lines to locate different sizes of unit fractions and defend their strategies.



Connecting to Other Big Ideas

- CC1 Represent Multivariable Data Unit 6 (Lessons 4–6)
- CC1 Measuring Unit 6 (Lessons 4 and 10)
- CC1 Fractions of Shape and Time Unit 5 (Lessons 5, 12, 16)
- CC2 Addition and Subtraction Patterns Unit 6 (Lesson 14)
- CC3 Fractions as Relationships Unit 5 (Lessons 5, 12, 16, 17)

Connecting to Number Sense

- NS Number Flexibility Unit 6 (Lesson 14)
- NS Fraction and Decimal Operations Unit 5 (Lessons 5, 13, 16, 17), Unit 6 (Lessons 4–6, 10)
- NS Number Lines as Tools Unit 5 (Lesson 12), Unit 6 (Lessons 4–6, 10)

Keeping the Big Ideas at the Center (continued)

CC4 Analyze Quadrilaterals

Describe, analyze, and compare quadrilaterals. Explore the ways that area and perimeter change as side lengths change, by modeling real world problems. Use rounding strategies to approximate lengths where appropriate.

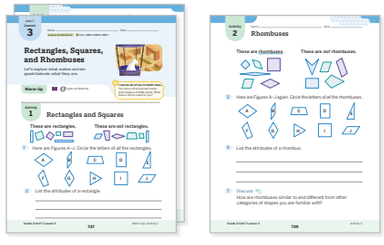
3.MD.8, 3.G.1, 3.G.2, 3.NBT.1, 3.OA.8

Developing the Big Idea

Students develop this Big Idea throughout **Unit 7**. They begin by describing, comparing, and sorting a variety of shapes to explore the attributes of different types of quadrilaterals. They are introduced to the idea of perimeter as they count the spaces between tick marks around a gridded shape and then move on to determine perimeter by adding the lengths of all of the sides. Students use their knowledge of quadrilaterals to determine the perimeter of rectangles with missing side lengths and analyze quadrilaterals with missing side lengths and a given perimeter to reason about the length of the missing side(s). They wrap up Unit 7 by solving real-world problems involving the area and perimeter of quadrilaterals and explaining strategies for designing a space based on measurement requirements.

Spotlight on . . .

In **Unit 7, Lesson 3, Activities 1 and 2**, students build toward the Big Idea *Analyze Quadrilaterals*. They explore the attributes of quadrilaterals by analyzing groups of rectangles, squares, and rhombuses to describe the attributes of each.



Connecting to Other Big Ideas

- CC1 Measuring Unit 7 (Lessons 7 and 13)
- CC2 Addition and Subtraction Patterns Unit 7 (Lesson 7)
- CC2 Number Flexibility to 100 Unit 6 (Lesson 14)
- CC3 Square Tiles Unit 5 (Lessons 5, 12, 16, 17)

Connecting to Number Sense

- NS Number Flexibility Unit 7 (Lessons 6, 7, 9, 10)
- NS Multiplication and Division Unit 7 (Lessons 11–13)