



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

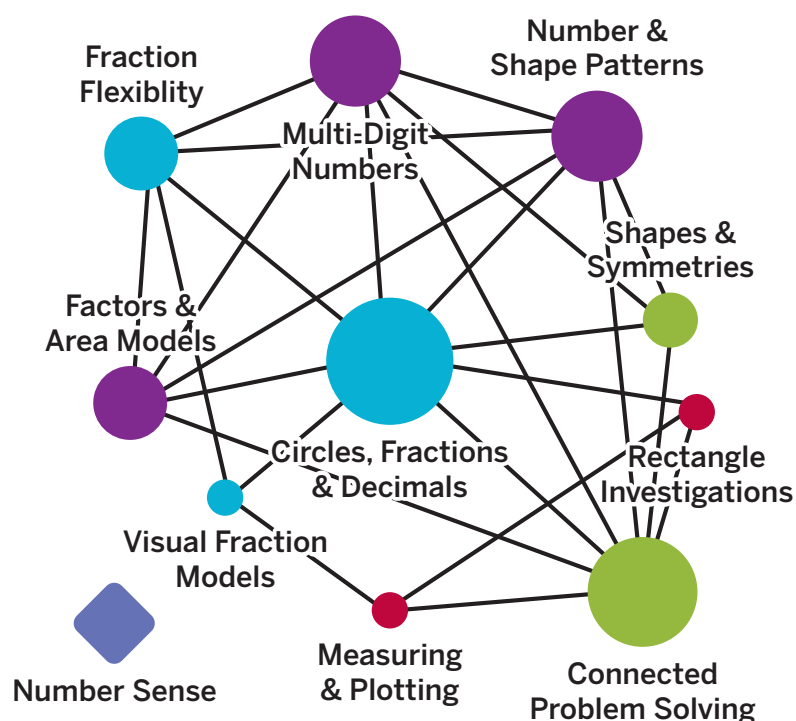
CC4 Discovering Shape and Space

Meet the Big Ideas for Grade 4

Amplify Desmos Math California, Grade 4 is designed around the ten California Big Ideas for Grade 4 as described in the California Mathematics Framework (Chapter 6, page 120). 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 4, 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 4, refer to the Progression of Big Ideas that precedes each sub-unit.

On the following pages, you can read more about the Grade 4 Big Ideas as outlined by the California Mathematics Framework (Chapter 6, pages 120–121) as well as how Amplify Desmos Math California develops each Big Idea and connects it to other Big Ideas.



CC1 Measuring and Plotting

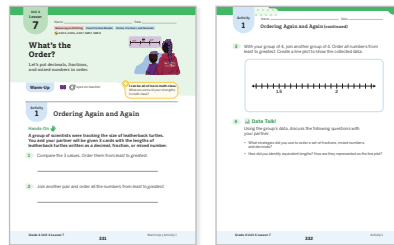
Collect data consisting of distance, intervals of time, volume, mass, or money. Read, interpret, and create line plots that communicate data stories where the line plot measurements consist of fractional units of measure. For example, create a line plot showing classroom or home objects measured to the nearest quarter inch.  **4.MD.1, 4.MD.4, 4.NF.1, 4.NF.2**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 3**, they create, interpret, and solve problems involving line plots to include data measured in eighths. In **Unit 4**, students plot measurement data involving fractions and decimals with denominators of 10 or 100 on a line plot. In **Unit 5**, they reason about the lengths of real-world objects to determine the relationship between meters and centimeters.

Spotlight on . . .

In **Unit 4, Lesson 7, Activity 1**, students connect the Big Ideas *Measuring and Plotting*, *Visual Fraction Models*, and *Circles, Fractions, and Decimals*. They analyze a set of length measurement data that includes decimals and fractions with denominators of 10 or 100. They create a line plot to represent the data, where the line plot shows fractional units of measure.



Connecting to Other Big Ideas

- CC1 Rectangle Investigations** Unit 5 (Lesson 8)
- CC3 Visual Fraction Models** Unit 4 (Lesson 7)
- CC3 Circles, Fractions, and Decimals** Unit 4 (Lesson 7)
- CC3 Fraction Flexibility** Unit 3 (Lessons 15 and 16)

CC1 Rectangle Investigations

Investigate rectangles in the world, measuring lengths and angles, collecting the data, and displaying it using data visualizations.

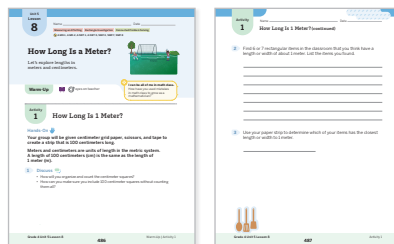
 **4.MD.1, 4.MD.2, 4.MD.3, 4.MD.5, 4.MD.6**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 5**, they investigate rectangular shapes in the real-world and reason about their lengths to determine the relationship between meters, centimeters, and kilometers. In **Unit 6**, they multiply multi-digit numbers using multiple strategies to compare the areas of rectangular gardens.

Spotlight on . . .

In **Unit 5, Lesson 8, Activity 1**, students connect the Big Ideas *Rectangle Investigations*, *Measuring and Plotting*, and *Connected Problem Solving*. To visualize the relationship between centimeters and meters, they use tools to create a strip that is 100 centimeters long (1 meter) and use that strip to measure the lengths of rectangular items they find in the classroom.



Connecting to Other Big Ideas

- CC1 Measuring and Plotting** Unit 5 (Lesson 8)
- CC2 Multi-Digit Numbers** Unit 6 (Lesson 6)
- CC2 Factors and Area Models** Unit 6 (Lesson 6)
- CC3 Circles, Fractions, and Decimals** Unit 5 (Lesson 9)
- CC4 Connected Problem Solving** Unit 5 (Lessons 8 and 9), Unit 6 (Lesson 6)

Connecting to Number Sense

- NS Multiplication and Division** Unit 6 (Lesson 6)
- NS Fraction and Decimal Operations** Unit 5 (Lessons 8 and 9)

CC2 Number and Shape Patterns

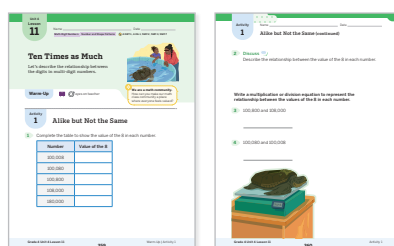
Generalize number and shape patterns that follow a given rule. Communicate understanding of how the pattern changes in words, symbols, and diagrams – working with multi-digit numbers.  **4.OA.5, 4.OA.1, 4.OA.2, 4.NBT.4**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they generalize patterns of numbers and shapes that follow given rules, and describe and extend patterns using a hundreds chart. In **Unit 4**, students use number patterns to identify and compare the values of digits in multi-digit numbers. They build on this understanding in **Unit 5** by using patterns and structure to design a measurement system, solve multiplicative comparison problems, and write and solve multiplication and division equations that represent problems involving distance. In **Unit 7**, students use patterns to relate the measure of an angle to its fractional equivalent on a clock face.

Spotlight on . . .

In **Unit 4, Lesson 11, Activity 1**, students connect the Big Ideas *Number and Shape Patterns* and *Multi-Digit Numbers*. They study a set of multi-digit numbers presented in a table and analyze the value of the digit 8 to generalize a number pattern – the value of the digit 8 in each number is 10 times the value of the digit 8 in the previous number.



Connecting to Other Big Ideas

- CC2 Multi-Digit Numbers** Unit 4 (Lesson 11)
- CC2 Factors and Area Models** Unit 1 (Lesson 4), Unit 5 (Lessons 2–5)
- CC4 Shapes and Symmetries** Unit 7 (Lesson 9)
- CC4 Connected Problem Solving** Unit 5 (Lesson 5)

Connecting to Number Sense

- NS Number Flexibility** Unit 1 (Lesson 4)
- NS Multiplication and Division** Unit 5 (Lessons 1–5)

Keeping the Big Ideas at the Center (continued)

CC2 Factors and Area Models

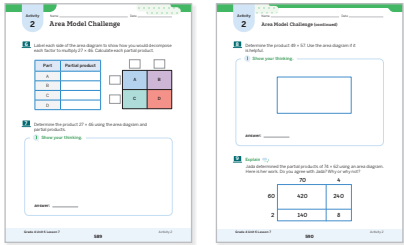
Break numbers inside of 100 into factors. Illustrate whole-number multiplication and division calculations as area models and rectangular arrays that illustrate factors.  **4.OA.1, 4.OA.2, 4.OA.4, 4.NBT.5, 4.NBT.6**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they use factors and area models to illustrate multiplication and solve real-world problems. In **Unit 5**, students represent and solve multiplication problems using objects, diagrams, and words. Then in **Unit 6**, they use factors and equal groups to multiply multi-digit numbers using partial product strategies. Students move on to use area models to divide multi-digit dividends, using partial quotients strategies to decompose dividends.

Spotlight on . . .

In **Unit 6, Lesson 7, Activity 2**, students connect the Big Ideas *Factors and Area Models* and *Multi-Digit Numbers*. They use area models that illustrate 2 factors of a product and use their understanding of place value and expanded form of multi-digit numbers to determine partial products and the total product.



Connecting to Other Big Ideas

- CC1 Rectangle Investigations** Unit 6 (Lesson 6)
- CC2 Number and Shape Patterns** Unit 1 (Lesson 4), Unit 5 (Lessons 2–5)
- CC2 Multi-Digit Numbers** Unit 6 (Lessons 2–9)
- CC4 Connected Problem Solving** Unit 1 (Lessons 5, 6, 9), Unit 5 (Lesson 5), Unit 6 (Lessons 6, 9–11, 21, 22)

Connecting to Number Sense

- NS Number Flexibility** Unit 1 (Lessons 4–7, 9–12), Unit 6 (Lessons 8 and 15)
- NS Multiplication and Division** Unit 5 (Lessons 2–5), Unit 6 (Lessons 1–9, 19–22)

CC2 Multi-Digit Numbers

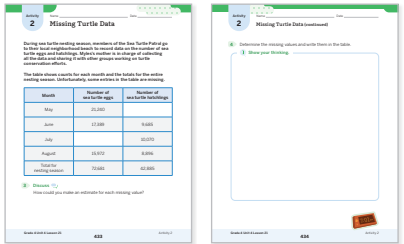
Read and write multi-digit whole numbers in expanded form and express each number component of the expanded form as a multiple of a power of ten.  **4.NBT.1, 4.NBT.2, 4.NBT.3, 4.NBT.4, 4.OA.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 4**, they explore place value relationships and represent multi-digit numbers in different ways. Students move on to compare multi-digit numbers by comparing the place value of the digits and round multi-digit numbers up to 1,000,000 to different place values. In **Unit 5**, they compare distances using their understanding of place value in multi-digit numbers. Then in **Unit 6**, students explore equal groups to determine possible factors and totals and multiply multi-digit numbers using partial product strategies.

Spotlight on . . .

In **Unit 4, Lesson 21, Activity 2**, students connect the Big Ideas *Multi-Digit Numbers* and *Connected Problem Solving*. They use their understanding of place value with multi-digit numbers to solve real-world problems involving sea turtle data.



Connecting to Other Big Ideas

- CC1 Rectangle Investigations** Unit 6 (Lesson 6)
- CC2 Number and Shape Patterns** Unit 4 (Lesson 11)
- CC2 Factors and Area Models** Unit 6 (Lessons 2–9)
- CC3 Fraction Flexibility** Unit 5 (Lesson 10)
- CC3 Circles, Fractions, and Decimals** Unit 5 (Lesson 10)
- CC4 Connected Problem Solving** Unit 4 (Lesson 21), Unit 5 (Lesson 10), Unit 6 (Lessons 6 and 9)
- CC4 Shapes and Symmetries Solving** Unit 4 (Lessons 19–21)

Connecting to Number Sense

- NS Number Flexibility** Unit 4 (Lessons 14 and 15), Unit 6 (Lesson 8)
- NS Multiplication and Division** Unit 5 (Lesson 10), Unit 6 (Lessons 2–9)

CC3 Fraction Flexibility

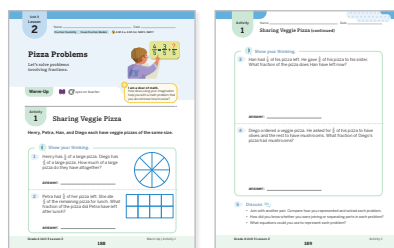
Understand that addition and subtraction of fractions as joining and separating parts that are referring to the same whole. Decompose fractions and mixed numbers into unit fractions and whole numbers, and express mixed numbers as a sum of unit fractions.  **4.NF.1, 4.NF.3, 4.NF.4, 4.NF.5, 4.OA.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2**, they determine whether fractions are equivalent by joining and separating parts of the same whole and write equations to show equivalence. In **Unit 3**, students connect addition and subtraction of fractions to visual models and solve story problems that involve adding and subtracting fractions, whole numbers, and mixed numbers. They apply fraction equivalence to add fractions with denominators of 10 and 100 and practice adding and subtracting fractions as they solve real-world problems.

Spotlight on . . .

In **Unit 3, Lesson 2, Activity 1**, students connect the Big Ideas *Fraction Flexibility* and *Visual Fraction Models*. They use fraction models to visualize the addition and subtraction of fractions as joining and separating parts that refer to the same whole.



Connecting to Other Big Ideas

- CC1 Measuring and Plotting** Unit 3 (Lessons 15 and 16)
- CC2 Multi-Digit Numbers** Unit 5 (Lesson 10)
- CC2 Factors and Area Models** Unit 3 (Lessons 11 and 13)
- CC3 Visual Fraction Models** Unit 2 (Lessons 6–8), Unit 3 (Lessons 1–5, 8)
- CC3 Circles, Fractions, and Decimals** Unit 3 (Lessons 13 and 14), Unit 5 (Lesson 10)
- CC4 Connected Problem Solving** Unit 5 (Lessons 10–12)

Connecting to Number Sense

- NS Multiplication and Division** Unit 5 (Lessons 10–12)
- NS Fraction and Decimal Operations** Unit 3 (Lessons 1–12)
- NS Number Lines as Tools** Unit 2 (Lessons 6–8)

CC3 Visual Fraction Models

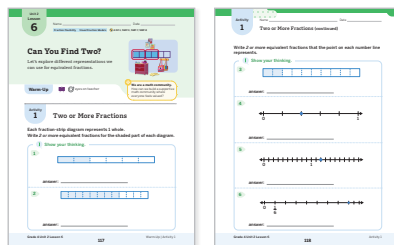
Use different ways of seeing and visualizing fractions to compare fractions using student generated visual fraction models. Use $>$, $<$, and $=$ to compare fraction size, through linear and area models, and determine whether fractions are greater or less than benchmark numbers, such as $\frac{1}{2}$ and 1.  **4.NF.1, 4.NF.2, 4.NF.3, 4.NF.5, 4.NF.6, 4.NF.7**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2**, they represent fractions less than 1 and greater than 1 as a sum of fractions and use visual fraction models, such as physical fraction strips, fraction strip diagrams, and number lines to make sense of the size of fractions and fractional relationships. Students build on this understanding to determine whether fractions are equivalent by joining and separating parts of the same whole and write equations to show equivalence, connecting the equations to visual models. Lastly, they compare and order fractions using multiple strategies, including visual fraction models, benchmark reasoning, and equivalent fractions. In **Unit 3**, students connect addition and subtraction of fractions with the same denominator to visual models. Then in **Unit 4**, they use visual fraction models to recognize fractions with denominators of 10 and 100 and express them as decimals.

Spotlight on . . .

In **Unit 2, Lesson 6, Activity 1**, students connect the Big Ideas *Visual Fraction Models* and *Fraction Flexibility*. They explore how representations of fractions illustrate fraction equivalence.



Connecting to Other Big Ideas

- CC1 Measuring and Plotting** Unit 4 (Lesson 7)
- CC3 Fraction Flexibility** Unit 2 (Lessons 6–8), Unit 3 (Lessons 1–5)
- CC3 Circles, Fractions, and Decimals** Unit 4 (Lessons 2–4, 7)

Connecting to Number Sense

- NS Fraction and Decimal Operations** Unit 3 (Lessons 1–5)
- NS Number Lines as Tools** Unit 2 (Lessons 1–4, 6–8, 14, 15)

Keeping the Big Ideas at the Center (continued)

CC3 Circles, Fractions, and Decimals

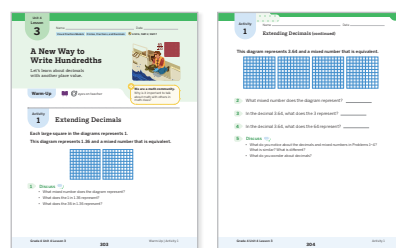
Understand, compare, and visualize fractions expressed as decimals. Recognize fractions with denominators of 10 and 100, e.g., 25 cents can be written as 0.25 or $\frac{25}{100}$. Connect a circle fraction model to the clock face. Example $\frac{3}{10} + \frac{4}{100} = \frac{30}{100} + \frac{4}{100} = \frac{34}{100}$. *This Big Idea is also categorized under CC4: Discovering Shape and Space.*  4.NF.5, 4.NF.6, 4.NF.7, 4.OA.1, 4.MD.2, 4.MD.5, 4.MD.7

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 3**, they apply their understanding of fraction equivalence to add fractions with different denominators, specifically tenths and hundredths. In **Unit 4**, students recognize fractions with denominators of 10 and 100 and express them as decimals. Then they compare and order decimals using multiple strategies, including number lines and representing decimals as equivalent fractions.

Spotlight on . . .

In **Unit 4, Lesson 3, Activity 1**, students connect the Big Ideas *Circles, Fractions, and Decimals* and *Fraction Flexibility*. They begin to develop the idea of fractions expressed as decimals by first recognizing that fractions with denominators of 100 can be expressed as equivalent fractions with denominators of 100, and vice versa.



Connecting to Other Big Ideas

- CC1 Measuring and Plotting** Unit 4 (Lesson 7)
- CC1 Rectangle Investigations** Unit 5 (Lesson 9)
- CC2 Factors and Area Models** Unit 3 (Lesson 13)
- CC3 Fraction Flexibility** Unit 3 (Lessons 13 and 14), Unit 5 (Lesson 10)
- CC3 Visual Fraction Models** Unit 4 (Lessons 2–4, 7)
- CC4 Shapes and Symmetries** Unit 7 (Lessons 6, 7, 9)
- CC4 Connected Problem Solving** Unit 5 (Lessons 9 and 10)

Connecting to Number Sense

- NS Multiplication and Division** Unit 5 (Lessons 9 and 10)

CC4 Shapes and Symmetries

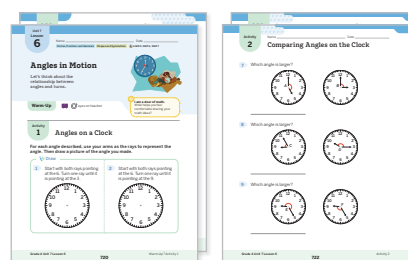
Draw and identify shapes, looking at the relationships between rays, lines, and angles. Explore symmetry through folding activities.  4.MD.5, 4.MD.6, 4.MD.7, 4.G.1, 4.G.2, 4.G.3, 4.NBT.3, 4.NBT.4

Developing the Big Idea

Students develop this Big Idea throughout **Unit 7**. They identify points, lines, line segments, and rays in geometric figures and drawings while using them to create their own drawings. Students move on to determine whether lines, line segments, and rays are parallel, perpendicular, or intersecting and explain how they know. They measure angles with and without a protractor and identify angles as acute, right, obtuse, or straight. They relate the measure of an angle to its fractional equivalent on a clock face. They identify triangles and quadrilaterals using what they know about segments, lines, and angles. They explore symmetry using folding, draw symmetric figures, and use symmetry to solve problems.

Spotlight on . . .

In **Unit 7, Lesson 6, Activities 1 and 2**, students connect the Big Ideas *Shapes and Symmetries* and *Circles, Fractions, and Decimals*. They relate the measure of an angle in degrees to its fractional equivalent of a circle on a clock face.



Connecting to Other Big Ideas

- CC2 Number and Shape Patterns** Unit 7 (Lesson 9)
- CC3 Circles, Fractions, and Decimals** Unit 7 (Lessons 6, 7, 9)
- CC4 Connected Problem Solving** Unit 7 (Lessons 17 and 18)

CC4 Connected Problem Solving

Solve problems with perimeter, area, volume, distance, and symmetry, using operations and measurement.

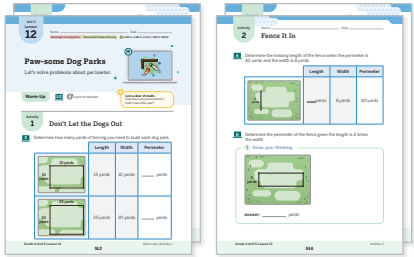
4.G.3, 4.MD.1, 4.MD.2, 4.MD.3, 4.NBT.3 (place value), 4.NBT.4, 4.NBT.5, 4.NBT.6, 4.OA.2, 4.OA.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they use the areas of rectangles to illustrate whole-number multiplication involving factors and solve problems using the measurement of connecting cubes to determine whether the tubes can be used to build up to a specific height, using what they have learned about factors and multiples. In **Unit 4**, they add and subtract multi-digit numbers to solve problems and use estimation to explain the reasonableness of the sums and differences. In **Unit 5**, they solve problems involving distance using multiplication and division operations, writing equations that represent unknown values. Students move on to use multiplicative comparison and measurement conversion strategies to solve multi-step problems involving units of length, liquid volume, weight, and time. Then in **Unit 6**, they explore equal groups to determine possible factors and totals and multiply multi-digit numbers using partial product strategies. They move on to use area models to divide three-digit dividends by one-digit divisors. Students wrap up Unit 6 by using the 4 operations to solve multi-step problems in a variety of contexts, including area, perimeter, and measurement. In **Unit 7**, they use symmetry to solve problems involving measurement.

Spotlight on . . .

In **Unit 5, Lesson 12, Activities 1 and 2**, students connect the Big Ideas *Rectangle Investigations* and *Connected Problem Solving*. Through the context of fencing a dog park, they solve real-world problems involving rectangles and perimeter.



Connecting to Other Big Ideas

- CC1 **Rectangle Investigations** Unit 5 (Lesson 9), Unit 6 (Lesson 6)
- CC2 **Number and Shape Patterns** Unit 5 (Lesson 5)
- CC2 **Multi-Digit Numbers** Unit 4 (Lesson 21), Unit 5 (Lesson 10), Unit 6 (Lessons 6 and 9)
- CC2 **Factors and Area Models** Unit 1 (Lessons 5, 6, 9), Unit 5 (Lesson 5), Unit 6 (Lessons 6, 9–11, 21, 22)
- CC3 **Fraction Flexibility** Unit 5 (Lesson 10)
- CC3 **Circles, Fractions, and Decimals** Unit 5 (Lessons 9 and 10)
- CC4 **Shapes and Symmetries** Unit 7 (Lessons 17 and 18)

Connecting to Number Sense

- NS **Number Flexibility** Unit 6 (Lesson 15)
- NS **Multiplication and Division** Unit 5 (Lessons 8–17), Unit 6 (Lessons 6, 9, 21, 22)