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)

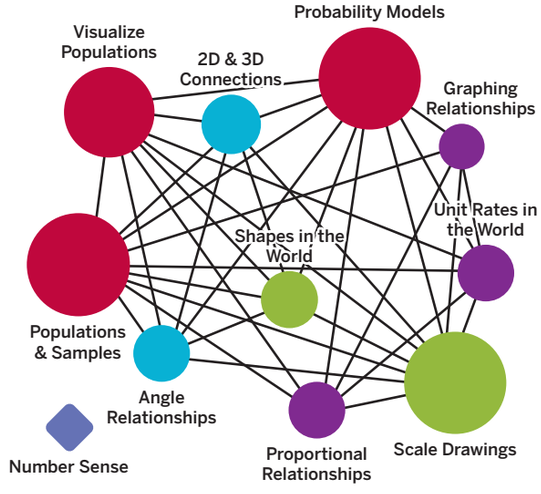
Each Big Idea falls under one or more Content Connections (CC1, CC2, CC3, and CC4). These Content Connections help organize and connect each set of grade-level Big Ideas and provide mathematical coherence across the grades. (Chapter 1, page 24)

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 7

Amplify Desmos Math California, Grade 7 is designed around the ten California Big Ideas for Grade 7 as described in the California Mathematics Framework (Chapter 7, page 44). 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 7, 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 7, refer to the Progression of Big Ideas that precedes each sub-unit.

On the following pages, you can read more about the Grade 7 Big Ideas as outlined by the California Mathematics Framework (Chapter 7, pages 44–46) as well as how Amplify Desmos Math California develops each Big Idea and connects it to other Big Ideas.

CC1 Populations and Samples

Study a population by taking random samples and determine if the samples accurately represent the population.

- Analyze and critique reports by examining the sample and the claims made to the general population
- Use classroom simulations and computer software to model repeated sampling, analyzing the variation in results.

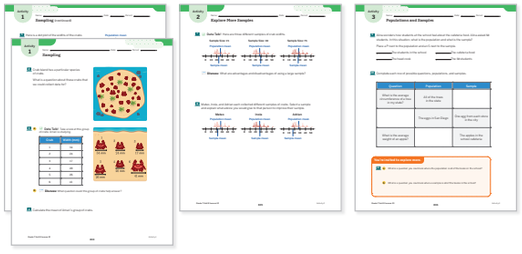
7.SP.1, 7.SP.2, 7.RP.1, 7.RP.2, 7.RP.3, 7.NS.1, 7.NS.2, 7.NS.3, 7.EE.3

Developing the Big Idea

Students develop this Big Idea throughout **Unit 8**. They study populations and samples and compare the sample means with the population mean to determine if the samples are representative. Students make inferences and critique claims made about the population by studying the sample. They use digital simulations to model repeated sampling, explaining how the sample selection process could be improved.

Spotlight on . . .

In **Unit 8, Lesson 10, Activities 1–3**, students connect the Big Ideas *Populations and Samples* and *Visualize Populations*. They analyze a large population of crabs by studying samples, comparing the sample means to the population mean to determine if the samples accurately represent the population.



Connecting to Other Big Ideas

- CC1 **Visualize Populations** Unit 8 (Lessons 10, 11, 13–15)
- CC1 **Probability Models** Unit 8 (Lessons 7, 12)
- CC2 **Proportional Relationships** Unit 8 (Lessons 2, 3, 5, 12)
- CC2 **Unit Rates in the World** Unit 8 (Lessons 7, 12)

CC1 Visualize Populations

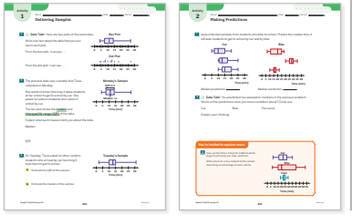
Draw comparative inferences about populations — consider what visual plots show, and use measures of center and variability. Students toggle between the mathematical results and their meaningful interpretation with their given context, considering audiences, implications, etc. **7.SP.3, 7.SP.4, 7.NS.1, 7.NS.2, 7.NS.3, 7.EE.3**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 8**. They study two or more populations of data by visually comparing their distributions. They calculate measures of center and variability of samples to make inferences and predictions about the populations within the context of the data.

Spotlight on . . .

In **Unit 8, Lesson 13, Activities 1 and 2**, students connect the Big Ideas *Visualize Populations* and *Populations and Samples*. They examine sets of two populations by visually comparing their distributions and by comparing their measures of center and variability to make meaningful inferences and predictions about the populations.



Connecting to Other Big Ideas

- CC1 **Populations and Samples** Unit 8 (Lesson 12)
- CC1 **Probability Models** Unit 8 (Lesson 12)
- CC2 **Proportional Relationships** Unit 8 (Lesson 12)
- CC2 **Unit Rates in the World** Unit 8 (Lesson 12)

Keeping the Big Ideas at the Center (continued)

CC1 Probability Models

Develop a probability model and use it to find probabilities of events and compound events, representing sample spaces and using lists, tables, and tree diagrams.

- Compare observed probability and expected probability.
- Explore potential bias and over-representation in real world data sets, and connect to dominating narratives and counter narratives used in public discourse.

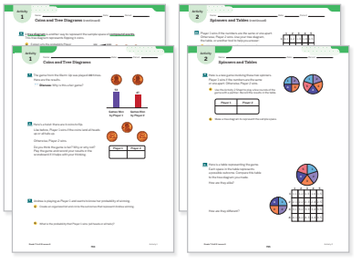
7.SP.5, 7.SP.6, 7.SP.7, 7.SP.8, 7.RP.1, 7.RP.2, 7.RP.3, 7.NS.1, 7.NS.2, 7.NS.3, 7.EE.3

Developing the Big Idea

Students develop this Big Idea throughout **Unit 8**. They connect likelihood and sample space to determine the probability of an event. They make predictions by designing simulations to estimate the probability of compound events. They move on to express probabilities as fractions, decimals, and percentages and use data from repeated experiments and proportional reasoning to make predictions. Students use simulations to estimate the probability of compound events.

Spotlight on . . .

In **Unit 8, Lesson 6, Activities 1 and 2**, students work toward the Big Idea *Probability Models*. They investigate games involving coin tosses to determine whether the games are fair, using probability models involving compound events and representing sample spacings using tree diagrams and tables.



Connecting to Other Big Ideas

CC1 Populations and Samples Unit 8 (Lessons 7, 12)

CC2 Proportional Relationships Unit 8 (Lessons 2, 3, 5, 12)

CC2 Unit Rates in the World Unit 8 (Lessons 3, 12)

CC2 Proportional Relationships

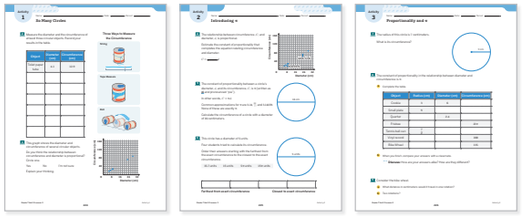
Explore, understand, and use proportional relationships using fractions, graphs, and tables. **7.EE.2, 7.EE.3, 7.RP.1, 7.RP.2, 7.RP.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they explore scale factors and scale within the context of proportional relationships, connecting the idea of scale to a unit rate. In **Unit 2**, students determine and interpret constants of proportionality to make sense of proportional relationships, and write equations of the form $y = kx$ that represent proportional relationships using two variables. Students use graphs that represent proportional relationships to predict and interpret other points on the graph, including the constant of proportionality. They move on to use graphs to model real-world situations involving proportional relationships. Then in **Unit 3**, students study the proportional relationship between the side length or diagonal of a square and its perimeter. They further recognize the circumference of a circle is proportional to its diameter. In **Unit 4**, students move on to use proportional relationships involving percentages to solve multistep percent problems involving sales tax and tip, discount and markup, percent error, and percent increase and decrease. They use tools, such as tables, constants of proportionality, and scale factors to determine unknown values in proportional relationships, solve problems involving proportional relationships with fractional quantities, and convert fractions to decimals using long division. In **Unit 5**, they solve real-world problems involving distance, rate, and time. In **Unit 8**, they use data from repeated experiments and proportional reasoning to make predictions and then estimate information about a population using proportional relationships and reasoning.

Spotlight on . . .

In **Unit 3, Lesson 3, Activities 1–3**, students connect the Big Ideas *Proportional Relationships, Unit Rates in the World*, and *Shapes in the World*. Within the context of real-world objects, they explore the proportional relationship between the circumference of a circle and its diameter. They come to recognize π as a constant of proportionality.



Connecting to Other Big Ideas

CC1 Populations and Samples Unit 8 (Lesson 7)

CC1 Probability Models Unit 8 (Lessons 2, 3, 5, 12)

CC2 Unit Rates in the World Unit 1 (Lessons 6, 7), Unit 2 (Lessons 1–13), Unit 3 (Lesson 3), Unit 4 (Lessons 2, 3, 5, 7, 9–12), Unit 5 (Lessons 7, 8), Unit 8 (Lessons 3, 12)

CC2 Graphing Relationships Unit 2 (Lessons 1–13), Unit 3 (Lesson 1)

CC3 2-D and 3-D Connections Unit 3 (Lesson 2)

CC4 Scale Drawings Unit 1 (Lessons 1–4, 6, 7), Unit 3 (Lesson 1), Unit 4 (Lesson 11)

CC4 Shapes in the World Unit 1 (Lesson 7), Unit 3 (Lessons 3, 4)

Connecting to Number Sense

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

NS Ratios, Percents, and Proportional Relationships Unit 1 (Lessons 1–4), Unit 2 (Lessons 4–7), Unit 4 (Lessons 1–12)

NS Generalized Numbers Leading to Algebra Unit 4 (Lesson 8), Unit 5 (Lesson 13)

CC2 Unit Rates in the World

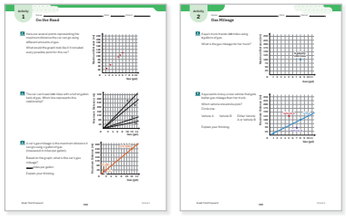
Solve real world problems using equations and inequalities, and recognize the unit rate within representations.
7.RP.1, 7.RP.2, 7.RP.3, 7.EE.1, 7.EE.2, 7.EE.3, 7.EE.4

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they explore scale factors and scale within the context of proportional relationships, connecting the idea of scale to a unit rate. In **Unit 2**, students analyze tables of equivalent ratios and use a variety of strategies, such as calculating unit rates, to determine whether ratios are equivalent. They recognize the constant of proportionality of a proportional relationship as a unit rate by understanding that when the value of one quantity in a proportional relationship is 1, the other quantity is the constant of proportionality (unit rate). They identify the unit rate in tables, graphs, and equations that represent proportional relationships. Then in **Unit 3**, students recognize the proportional relationship between the circumference of a circle and its diameter, noting that π is the unit rate. In **Unit 4**, they use percentages as unit rates to solve problems involving percent increase and decrease and recognize the unit rate in tape diagrams, double number line diagrams, equations, and tables. They move on to use proportional relationships involving percentages to solve multistep percent problems involving sales tax and tip, analyze wage systems, and percent error. In **Unit 5**, they solve real-world problems involving distance, rate, and time. In **Unit 6**, students connect moves on the hanger diagrams to solving equations to illustrate the idea of balance. They use equations and inequalities to solve a variety of real-world problems and make sense of their solutions within context. In **Unit 8**, they use data from repeated experiments and proportional reasoning to make predictions. They then estimate information about a population using proportional reasoning and unit rates.

Spotlight on . . .

In **Unit 2, Lesson 9, Activities 1 and 2**, students connect the Big Ideas *Unit Rates in the World, Proportional Relationships*, and *Graphing Relationships*. Through the real-world context of gas mileage, they represent proportional relationships using graphs and identify the unit rate as the constant of proportionality.



Connecting to Other Big Ideas

CC1 Populations and Samples Unit 8 (Lesson 12)

CC1 Probability Models Unit 8 (Lesson 3)

CC2 Proportional Relationships Unit 1 (Lessons 6, 7), Unit 2 (Lessons 1–13), Unit 3 (Lesson 3), Unit 4 (Lessons 2, 3, 5, 7, 9–12), Unit 5 (Lessons 7, 8), Unit 8 (Lessons 3, 12)

CC2 Graphing Relationships Unit 2 (Lessons 1–13)

CC4 Scale Drawings Unit 1 (Lessons 6–9, 11), Unit 4 (Lesson 11)

CC4 Shapes in the World Unit 1 (Lessons 7–9), Unit 3 (Lesson 3)

Connecting to Number Sense

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

NS Ratios, Percents, and Proportional Relationships Unit 2 (Lessons 4–7), Unit 4 (Lessons 2, 3, 5, 7, 9, 10, 12)

NS Generalized Numbers Leading to Algebra Unit 5 (Lesson 12), Unit 6 (Lessons 1, 2, 4, 12)

CC2 Graphing Relationships

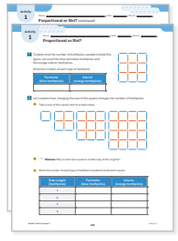
Solve problems involving proportional relationships that can lead to graphing using geometry software and making sense of solutions. **7.EE.4, 7.RP.1, 7.RP.2, 7.RP.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2**, they use graphs that represent proportional relationships to predict and interpret points on the graph, including the constant of proportionality. They move on to use graphs to model real-world situations involving proportional relationships. In **Unit 3**, students use graphs to study the proportional relationship between the side length or diagonal of a square and its perimeter.

Spotlight on . . .

In **Unit 3, Lesson 1, Activity 1**, students connect the Big Ideas *Graphing Relationships, Proportional Relationships* and *Scale Drawings*. They analyze squares made from toothpicks to explore how changing the size of the square changes the number of toothpicks used. The graph relationships of side length compared to either the number of perimeter toothpicks used or the number of interior toothpicks used, and determine which relationship is proportional.



Connecting to Other Big Ideas

CC2 Proportional Relationships Unit 2 (Lessons 1–13), Unit 3 (Lesson 1)

CC2 Unit Rates in the World Unit 2 (Lessons 8–13)

Keeping the Big Ideas at the Center (continued)

CC3 2-D and 3-D Connections

Draw and construct shapes, slice 3-D figures to see the 2-D shapes. Compare and classify the figures and shapes using area, surface area, volume, and geometric classifications for triangles, polygons, and angles. Make sure to measure with fractions and decimals, using technology for calculations. *This Big Idea is also categorized under CC4: Discovering Shape and Space.*

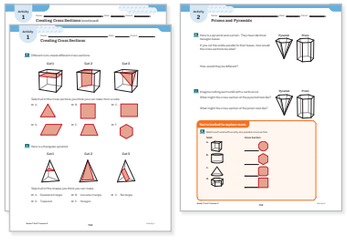
7.G.1, 7.G.2, 7.G.3, 7.NS.1, 7.NS.2, 7.NS.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 3**, they explore circles of various sizes, defining and connecting the measures (radius and diameter) that determine the size of a circle. In **Unit 7**, students study the impact of given angle measures and segment measures as they create triangles given three measures of side lengths of angles. They move on to make connections between 2-D cross sections that can be created from 3-D figures. They use the area of 2-D figures to calculate the surface area and volume of 3-D figures, calculate the surface area of 3-D models that represent actual structures, and calculate the surface area of the actual structures using a given scale.

Spotlight on . . .

In **Unit 7, Lesson 9, Activities 1 and 2**, students work toward the Big Idea *2-D and 3-D Connections*. They explore three-dimensional shapes, slicing them in various ways to view, compare, and classify their two-dimensional cross sections.



Connecting to Other Big Ideas

- CC2 **Proportional Relationships** Unit 3 (Lesson 2)
- CC3 **Angle Relationships** Unit 7 (Lessons 7, 8)
- CC4 **Scale Drawings** Unit 7 (Lesson 12)
- CC4 **Shapes in the World** Unit 3 (Lessons 6, 10), Unit 7 (Lessons 11–13)

CC3 Angle Relationships

Explore relationships between different angles, including complementary, supplementary, vertical, and adjacent, recognizing the relationships as the measures change. For example, angles A and B are complementary. As the measure of angle A increases, the measure of angle B decreases. *This Big Idea is also categorized under CC4: Discovering Shape and Space.*

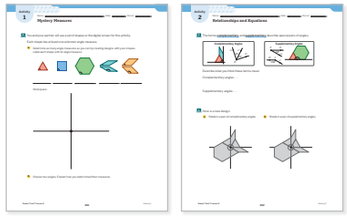
7.G.5, 7.G.6, 7.NS.1, 7.NS.2, 7.NS.3

Developing the Big Idea

Students develop this Big Idea throughout **Unit 7**. They analyze pinwheels created by copying one part over and over again around a vertex to explore angle relationships. They further explore angle relationships, including complementary, supplementary, vertical, and adjacent angles, and write and solve equations to determine missing angle measures. Students study the impact on angle measures as they create triangles given three measures of side lengths of angles.

Spotlight on . . .

In **Unit 7, Lesson 2, Activities 1 and 2**, students work toward the Big Idea *Angle Relationships*. Through creating designs made from two-dimensional shapes, they explore complementary and supplementary angle relationships and express those relationships using equations.



Connecting to Other Big Ideas

- CC3 **2-D and 3-D Connections** Unit 7 (Lessons 7, 8)
- CC4 **Shapes in the World** Unit 7 (Lesson 1)

Connecting to Number Sense

- NS **Generalized Numbers Leading to Algebra** Unit 7 (Lessons 2–4)

CC4 Scale Drawings

Solve problems involving scale drawings and construct geometric figures using unit rates to accurately represent real world figures. (Use technology for drawing). *This Big Idea is also categorized under CC2: Exploring Changing Quantities.*

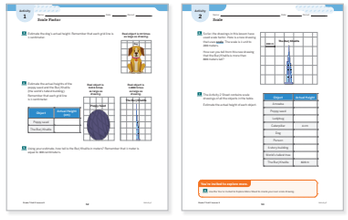
7.G.1, 7.EE.2, 7.EE.3, 7.EE.4, 7.NS.2, 7.NS.3, 7.RP.1, 7.RP.2, 7.RP.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they explore scaled copies and describe their characteristics, recognizing that a scale factor is used to create scaled copies. They move on to explore how different scale factors affect the area of scaled copies, noticing that the area is not scaled by the same scale factor as the side lengths. Students connect scale as a unit rate and determine actual and scaled distances from real-world scale drawings. They wrap up Unit 1 by choosing appropriate scales to create scale drawings of different sizes. Then in **Unit 3**, students study the proportional relationship between the side length or diagonal of a square and its perimeter, noticing the resized figures are scaled copies. In **Unit 4**, they use tools, such as tables, constants of proportionality, and scale factors to determine unknown values in proportional relationships. In **Unit 7**, students calculate the surface area of 3-D models that represent actual structures and calculate the surface area of the actual structures using a given scale.

Spotlight on . . .

In **Unit 1, Lesson 6, Activities 1 and 2**, students connect the Big Ideas *Scale Drawings, Proportional Relationships,* and *Unit Rates in the World*. They explore scale drawings and use scale to estimate actual lengths and heights of the objects they represent.



Connecting to Other Big Ideas

- CC2 **Proportional Relationships** Unit 1 (Lessons 1–4, 6, 7), Unit 3 (Lesson 1), Unit 4 (Lesson 7)
- CC2 **Unit Rates in the World** Unit 1 (Lessons 6–9, 11), Unit 4 (Lesson 7)
- CC2 **Graphing Relationship** Unit 3 (Lesson 1)
- CC3 **2-D and 3-D Connections** Unit 3 (Lessons 6, 10), Unit 7 (Lessons 11–13)
- CC4 **Shapes in the World** Unit 1 (Lessons 7–10), Unit 4 (Lesson 12)

CC4 Shapes in the World

Solve real life problems involving triangles, quadrilaterals, polygons, cubes, right prisms, and circles using angle measures, area, surface area, and volume. *This Big Idea is also categorized under CC2: Exploring Changing Quantities.*

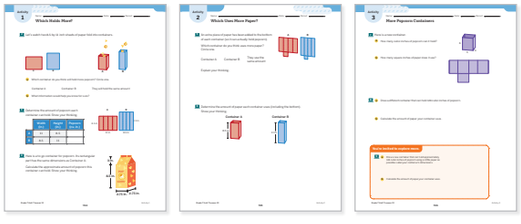
7.G.1, 7.G.2, 7.G.3, 7.G.4, 7.G.5, 7.G.6, 7.NS.1, 7.NS.2, 7.NS.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they apply their understanding of scale and scale factors to solve real-world problems involving shapes in the world using actual and scaled distances from scale drawings. Then in **Unit 3**, students use real-life circular objects to recognize the circumference of a circle is proportional to its diameter and solve real-world problems by calculating the perimeter of complex shapes made up of squares and fractions of circles. In **Unit 7**, students use the area of 2-D figures to calculate the surface area and volume of 3-D figures, calculate the surface area of 3-D models that represent actual structures, and calculate the surface area of the actual structures using a given scale.

Spotlight on . . .

In **Unit 7, Lesson 13, Activities 1–3**, students connect the Big Ideas *Shapes in the World* and *Popcorn Possibilities*. They apply their understanding of area, surface area, and volume to solve real-world problems involving the fabric used to create a tent and different shapes of popcorn containers - determining which shape holds more popcorn and which shape uses more material to construct.



Connecting to Other Big Ideas

- CC2 **Proportional Relationships** Unit 1 (Lesson 7), Unit 3 (Lessons 3, 4)
- CC2 **Unit Rates in the World** Unit 1 (Lessons 7–9), Unit 3 (Lesson 3)
- CC3 **2-D and 3-D Connections** Unit 7 (Lessons 11–13)
- CC4 **Scale Drawings** Unit 1 (Lessons 7–10), Unit 7 (Lesson 12)