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.

Content Connections

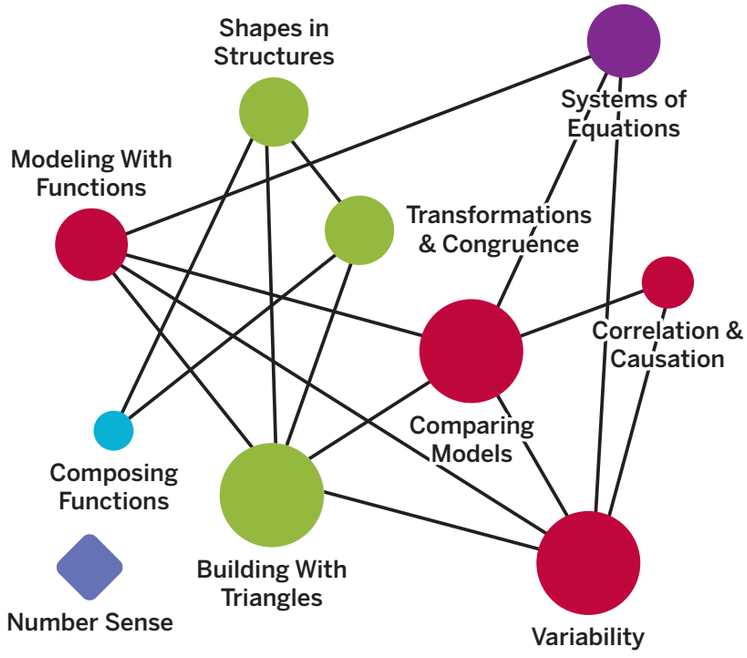
- CC1 Reasoning With Data
- CC2 Exploring Changing Quantities
- CC3 Taking Wholes Apart, Putting Parts Together
- CC4 Discovering Shape and Space

Meet the Big Ideas for Mathematics I

Amplify Desmos Math California, Mathematics I is designed around the nine California Big Ideas for Mathematics I described in the California Mathematics Framework (Chapter 8, page 56). 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 Mathematics I, 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 Mathematics I, refer to the Progression of Big Ideas that precedes each sub-unit.

On the following pages, you can read more about the Mathematics I Big Ideas as outlined by the California Mathematics Framework (Chapter 8, pages 56–58) as well as how Amplify Desmos Math California develops each Big Idea and connects it to other Big Ideas.



CC1 Modeling With Functions

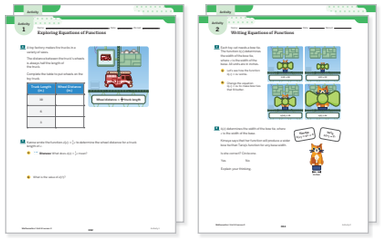
Build functions that model relationships between two quantities, including examples with inequalities; using units and different representations. Describe and interpret the relationships modeled using visuals, tables, and graphs. *This Big Idea is also categorized under CC2: Exploring Changing Quantities.* **N-Q.1, N-Q.2, N-Q.3, A-CED.2, F-BF.1, F-IF.1, F-IF.2, F-IF.4, F-LE.5, S-ID.7, A-CED.1, A-CED.2, A-CED.3, A-SSE.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they use explicit expressions and recursive definitions for sequences to model real-world situations, preparing them to understand sequences as functions in a later unit. In **Unit 2**, students build and construct linear equations and inequalities to model mathematical and real-world relationships between two variables. They analyze and compare multiple representations of these relationships using tables, graphs, and equations. In **Unit 3**, students build and construct systems of linear equations and inequalities to model mathematical and real-world relationships between two variables, using the solutions to make recommendations and decisions. In **Unit 4**, they determine whether a relationship is a function and use tables, graphs, and equations to describe and compare the key features of linear and absolute value. They interpret the domain and range of a function in context, expressing and restricting them using compound inequalities. In **Unit 5**, students distinguish between situations that can be modeled by linear functions or exponential functions. They compare and contrast key features, such as a growth factor, using different representations (equations, tables, and graphs). Students construct and interpret linear and exponential functions (growth and decay) that model real-world situations and data sets, assessing the fit of the function to the data. In **Unit 7**, students use correlation coefficients and lines of fit to model relationships in real-world bivariate data, assessing the fit of linear models using residual plots.

Spotlight on . . .

In **Unit 4, Lesson 3, Activities 1 and 2**, students work toward the Big Idea *Modeling With Functions*. They explore real-world relationships between two quantities using visuals, verbal descriptions, tables, and equations written in function notation. They construct functions to model these relationships and interpret the parameters of the functions they create within the context of the real-world situations.



Connecting to Other Big Ideas

- CC1 **Comparing Models** Unit 1 (Practice Day 1), Unit 2 (Lesson 8, Practice Day 1), Unit 3 (Lesson 7), Unit 5 (Lessons 1, 3, 4, 7–13, 15, Practice Days 1–2), Unit 7 (Lesson 17, Practice Day 2)
- CC1 **Variability** Unit 5 (Lessons 14, 15, Practice Day 2), Unit 7 (Explore, Lesson 17, Practice Day 2)
- CC1 **Correlation and Causation** Unit 7 (Practice Day 2)
- CC2 **Systems of Equations** Unit 2 (Lessons 6–9, 12–14, 16, 17, Practice Days 1–2), Unit 3 (Lessons 7, 12, Practice Days 1–3), Unit 4 (Lesson 7, Practice Day 1)
- CC3 **Composing Functions** Unit 4 (Lessons 12, 14, Practice Day 2), Unit 5 (Lessons 7, 10)
- CC4 **Building With Triangles** Unit 3 (Lessons 13, 14, Practice Day 3)
- CC4 **Transformations and Congruence** Unit 3 (Lessons 13–15, Practice Day 3)

Connecting to Number Sense

- NS **Parallels Between Numbers and Functions** Unit 1 (Practice Day 1)
- NS **Financial Literacy** Unit 2 (Lessons 9, 14, 16, Practice Day 2), Unit 3 (Lesson 9, Practice Day 3), Unit 5 (Lessons 11–13)

Keeping the Big Ideas at the Center (continued)

CC1 Comparing Models

Construct, interpret, and compare linear, quadratic, and exponential models of real data, and use them to describe and interpret the relationships between two variables, including inequalities. Interpret the slope and constant terms of linear models, and use technology to compute and interpret the correlation coefficient of a linear fit. *This Big Idea is also categorized under CC2: Exploring Changing Quantities.* **F-LE.1, F-LE.2, F-LE.3, F-IF.4, F-BF.1, F-LE.5, S-ID.7, S-ID.8, A-CED.1, A-CED.2, A-CED.3, A-SSE.1**

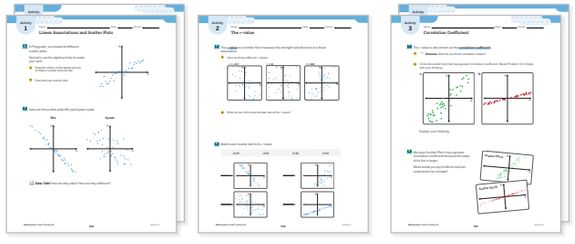
Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 1**, they construct explicit expressions and recursive definitions for sequences to model real-world situations, preparing them to understand sequences as functions in a later unit. In **Unit 4**, students explore linear functions using tables, graphs, and equations to describe and compare their key features. They construct and interpret functions to model real-world situations and interpret the slopes and constants within the context of the situations. In **Unit 5**, students distinguish between situations that can be modeled by linear functions or exponential functions. They compare and contrast key features, such as a growth factor, using different representations (equations, tables, and graphs). Students construct and interpret linear and exponential functions (growth and decay) that model real-world situations and data sets, assessing the fit of the function to the data. In **Unit 7**, students use correlation coefficients and lines of fit to model relationships in real-world bivariate data, assessing the fit of linear models using residual plots.

Note: Quadratic functions are not part of the California Common Core State Standards for Mathematics for the Mathematics I course.

Spotlight on . . .

In **Unit 7, Lesson 13, Activities 1–3**, students connect the Big Ideas *Comparing Models* and *Correlation and Causation*. They analyze different scatterplots, determine possible associations, and explore the r-value (correlation coefficient) of linear associations.



Connecting to Other Big Ideas

- **CC1 Modeling With Functions** Unit 1 (Practice Day 1), Unit 2 (Lesson 8, Practice Days 1–2), Unit 3 (Lesson 7), Unit 5 (Lessons 1, 3, 4, 7–13, 15, Practice Days 1–2), Unit 7 (Lesson 17, Practice Day 2)
- **CC1 Correlation and Causation** Unit 7 (Lessons 13, 14, 19, Practice Day 2)
- **CC1 Variability** Unit 5 (Lesson 15, Practice Day 2), Unit 7 (Lessons 14, 15, 17, 19, Practice Day 2)
- **CC2 Systems of Equations** Unit 2 (Lesson 8, Practice Days 1–2), Unit 3 (Lesson 7)
- **CC3 Composing Functions** Unit 5 (Lessons 7, 10)

Connecting to Number Sense

- **NS Parallels Between Numbers and Functions** Unit 1 (Practice Day 1)
- **NS Financial Literacy** Unit 2 (Practice Day 2), Unit 5 (Lessons 11–13, Practice Day 2)

CC1 Variability

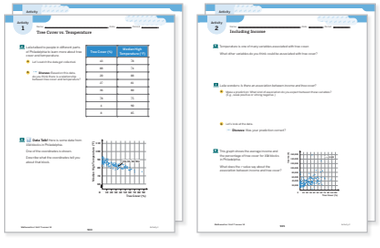
Summarize, represent, and interpret data. For quantitative data, use a scatter plot and describe how the variables are related. Summarize categorical data in two-way frequency tables and interpret the relative frequencies. *This Big Idea is also categorized under CC2: Exploring Changing Quantities.* **S-ID.5, S-ID.6, S-ID.7, S-ID.1, S-ID.2, S-ID.3, S-ID.4, A-SSE.1**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 5**, they model real-world population data using exponential growth functions and describe the fit of the model to the data. In **Unit 7**, students distinguish between categorical data and quantitative data. They explore how to organize categorical data in two-way frequency tables and conditional relative frequency tables, interpreting the values they calculate in context and using that information to analyze situations and make decisions. Students analyze one- and two-variable data sets and visualize data using dot plots, histograms, and box plots, considering the benefits of each representation. They use statistics appropriate to the shape of the data to compare one-variable data sets (mean and standard deviation or median and IQR). Students investigate scatter plots and use lines of best fit and the correlation coefficient to describe trends and make predictions, considering whether the relationship represents causation or correlation.

Spotlight on . . .

In **Unit 7, Lesson 14, Activities 1 and 2**, students connect the Big Ideas *Variability, Comparing Models*, and *Correlation and Causation*. They use correlation coefficients to analyze relationships between tree cover, average temperature, and income by describing trends and making predictions.



Connecting to Other Big Ideas

- **CC1 Modeling With Functions** Unit 5 (Lessons 14, 15, Practice Day 2), Unit 7 (Explore, Lessons 17, 19, Practice Day 2)
- **CC1 Comparing Models** Unit 5 (Lesson 15, Practice Day 2), Unit 7 (Lessons 14, 15, 17, 19, Practice Day 2)
- **CC1 Correlation and Causation** Unit 7 (Lessons 14, 19, Practice Day 2)

CC1 Correlation and Causation

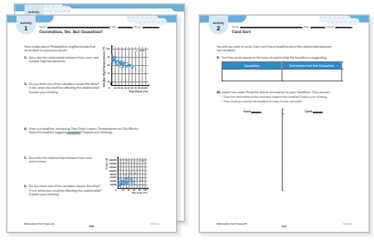
Explore data that highlights the difference between correlation and causation. Understand and use correlation coefficients, where appropriate. **S-ID.9, S-ID.8, S-ID.7**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 7**. They investigate scatter plots that show relationships between two variables and reason about possible associations between the variables. They use lines of best fit to model linear associations, using the correlation coefficient to describe trends and make predictions. Students explore data sets that show relationships between two variables and consider whether the relationship might represent causation or correlation, distinguishing between the two.

Spotlight on . . .

In **Unit 7, Lesson 18, Activities 1 and 2**, students connect the Big Ideas *Correlation and Causation*, *Comparing Models*, and *Variability*. They explore data that illustrates the differences between correlation and causation.



Connecting to Other Big Ideas

- CC1 **Modeling With Functions** Unit 7 (Practice Day 2)
- CC1 **Comparing Models** Unit 7 (Lessons 13, 14, 19, Practice Day 2)
- CC1 **Variability** Unit 7 (Lessons 14, 19, Practice Day 2)

CC2 Systems of Equations

Students investigate real situations that include data for which systems of 1 or 2 equations or inequalities are helpful, paying attention to units. Investigations include linear, quadratic, and absolute value. Students use technology tools strategically to find their solutions and approximate solutions, constructing viable arguments, interpreting the meaning of the results, and communicating them in multidimensional ways. *This Big Idea is also categorized under CC3: Taking Wholes Apart, Putting Parts Together.* **A-REI.1, A-REI.3, A-REI.4, A-REI.5, A-REI.6, A-REI.7, A-REI.10, A-REI.11, A-REI.12, NQ.1, A-SSE.1**

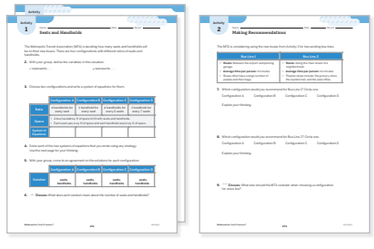
Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 2**, they model real-world situations with one- and two-variable linear equations and inequalities, interpreting the meaning of the solution or solution region in context. In **Unit 3**, they write, graph, and solve systems of linear equations and systems of linear inequalities to represent constraints and model real-world problems, interpreting solutions in context. In **Unit 4**, students determine possible solutions for inputs and outputs of functions by solving equations and interpreting the results within the context of real-world situations.

Note: Quadratic functions are not part of the California Common Core State Standards for Mathematics for the Mathematics I course.

Spotlight on . . .

In **Unit 3, Lesson 7, Activities 1 and 2**, students connect the Big Ideas *Systems of Equations* and *Modeling With Functions*. They model and solve real-world situations and constraints involving city bus transportation configurations with systems of linear equations, using their solutions to make recommendations.



Connecting to Other Big Ideas

- CC1 **Modeling With Functions** Unit 2 (Lessons 6–9, 12–14, 16, 17, Practice Days 1–2), Unit 3 (Lessons 7, 12, Practice Days 1–3), Unit 4 (Lesson 7, Practice Day 1)
- CC1 **Comparing Models** Unit 2 (Lesson 8, Practice Days 1–2), Unit 3 (Lesson 7)
- CC4 **Building With Triangles** Unit 3 (Practice Day 3)
- CC4 **Transformations and Congruence** Unit 3 (Practice Day 3)

Connecting to Number Sense

- NS **Financial Literacy** Unit 2 (Lessons 9, 14, 16, Practice Day 2), Unit 3 (Explore, Practice Days 2–3)

Keeping the Big Ideas at the Center (continued)

CC3 Composing Functions

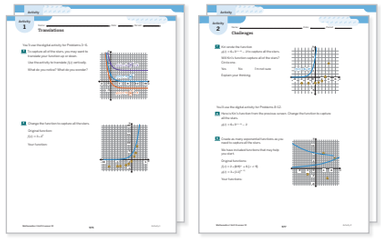
Build and explore new functions that are made from existing functions, and explore graphs of the related functions using technology. Recognize sequences are functions and are sometimes defined recursively. **F-BF.3, F-BF.2, F-IF.3**

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 4**, they recognize that sequences (which they initially explored in Unit 1) represent functions and that these relationships can be defined recursively. Students write recursive definitions of sequences using function notation, including the Fibonacci sequence. In **Unit 5**, they investigate exponential functions, connecting the parameters of exponential equations to the situations they represent. They build and interpret exponential growth and decay functions to model real-world situations involving percent increase or decrease. Students connect the parameters of exponential functions to the situations they represent, including translated exponential functions.

Spotlight on . . .

In **Unit 5, Lesson 10, Activities 1 and 2**, students connect the Big Ideas *Composing Functions, Modeling With Functions*, and *Comparing Models*. They build new exponential functions from existing exponential functions to explore the effect on their graphs using technology.



Connecting to Other Big Ideas

CC1 **Modeling With Functions** Unit 4 (Lessons 12, 14, Practice Day 2), Unit 5 (Lessons 7, 10)

CC1 **Comparing Models** Unit 5 (Lessons 7, 10)

CC4 Shapes in Structures

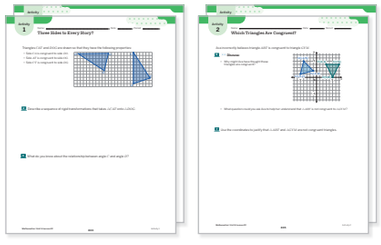
Perform investigations that involve building triangles and quadrilaterals, considering how the rigidity of triangles and non-rigidity of quadrilaterals influences the design of structures and devices. Study the changes in coordinates and express the changes algebraically. *This Big Idea is also categorized under CC3: Taking Wholes Apart, Putting Parts Together.*
G-CO.6, C-CO.7, C-CO.8, G-GPE.4, G-GPE.5, G.GPE.7, F.BF.3

Developing the Big Idea

Students develop this Big Idea throughout **Unit 6**. They discover the rigidity of triangles through investigations, noting that when two triangles have the same side lengths, they are congruent – revealing that a triangle's shape cannot be altered without altering the lengths of its sides. They explain the non-rigidity of quadrilaterals. Students use triangle rigidity to justify congruence between two triangles, using side-angle-side, angle-side-angle, and side-side-side triangle congruent theorems.

Spotlight on . . .

In **Unit 6, Lesson 22, Activities 1 and 2**, students connect the Big Ideas *Shapes in Structures* and *Transformations and Congruence*. They explore the side-side-side triangle congruence theorem which demonstrates triangle rigidity.



Connecting to Other Big Ideas

CC4 **Transformations and Congruence** Unit 6 (Lessons 8–14, 17, 22, Practice Days 2–3)

CC4 Building With Triangles

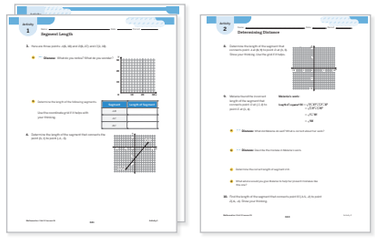
Investigate with geometric figures, constructing figures in the plane, relating the distance formula to the Pythagorean Theorem, noticing how areas and perimeters of polygons change as the coordinates change. Build with triangles and quadrilaterals, noticing positions and movement, and creating equations that model the changing edges using technology. *This Big Idea is also categorized under CC3: Taking Wholes Apart, Putting Parts Together.* **G-GPE.4, G-GPE.5, G-GPE.6, GPE.7, F-LE.1, F-LE.2, A-CED.2**

Developing the Big Idea

Students develop this Big Idea throughout **Unit 3**. They investigate geometric figures in the coordinate plane and use the Pythagorean theorem to derive the distance formula between two points on the coordinate plane. They attend to precision when using the distance formula to determine the length of segments. Students move on to explore and determine the area and perimeter of polygons whose vertices are plotted on the coordinate plane and notice how these measures change as the coordinates change. They build using triangles and quadrilaterals and write equations of parallel lines and reflect on how their equations guarantee quadrilateral shapes. Students apply their understanding to use a floor plan, coordinate grid, and the distance formula to determine the dimensions of a restaurant. They decompose the floor plan into a triangle and rectangle to find the area of both the dining room and the waiting area to determine the capacity of the restaurant. They also determine the perimeter of the interior of both areas to determine the amount of lighting needed.

Spotlight on . . .

In **Unit 3, Lesson 16, Activities 1 and 2**, students work toward the Big Idea *Building With Triangles*. They use the Pythagorean theorem to determine the length of a line segment and use the repeated calculations to generalize the distance formula that can be used to determine the length of any line segment graphed in the coordinate plane.



Connecting to Other Big Ideas

CC1 Modeling With Functions Unit 3 (Lessons 13, 14, Practice Day 3)

CC2 Systems of Equations Unit 3 (Practice Day 3)

CC4 Transformations and Congruence Unit 3 (Lessons 13, 14, Practice Day 3)

Connecting to Number Sense

NS Financial Literacy Unit 3 (Practice Day 3)

CC4 Transformations and Congruence

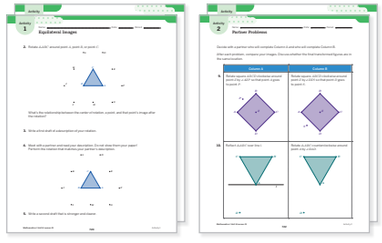
Explore congruence of triangles, including quadrilaterals built from triangles, through geometric constructions. Investigate transformations in the plane. Use geometry software to study transformations, developing definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, and parallel lines. Express translations algebraically.
G-CO.1, G-CO.2, G-CO.3, G-CO.4, G-CO.5, G-CO.12, G-CO.13, G-GPE.4, G-GPE.5, G.GPE.7, F-BF.3

Developing the Big Idea

Students develop this Big Idea across multiple units. In **Unit 3**, they use translations and rotations to explore, understand, and prove the slope criteria for parallel lines and perpendicular lines. Students make sense of how translations create parallel lines and algebraically show that parallel lines have the same slope. They investigate the effects of a $90°$ rotation on corresponding segments in a pre-image and image to discover that perpendicular lines have opposite reciprocal slopes. In **Unit 6**, they precisely define and construct rigid transformations using digital and physical construction tools, beginning by considering strategic uses of circles to measure equal distances. They apply their construction knowledge and skills to construct more complex figures. Students perform transformations off of a grid and precisely construct them using a variety of construction tools, such as tracing paper, compass and straightedge, and dynamic geometry software. They specify and perform sequences of transformations to move one figure onto another, making connections between sequences of rigid transformations between two figures and their corresponding parts. Students construct arguments for why certain segments or angles are congruent and attend to precision when determining if two triangles are congruent. They then use rigid transformations to understand that the side-side-side triangle congruence theorem is true. They apply SAS, ASA, and SSS triangle congruence theorems to prove two triangles are congruent.

Spotlight on . . .

In **Unit 6, Lesson 11, Activities 1 and 2**, students work toward the Big Idea *Transformations and Congruence*. They use circles to visualize the path of a point during a rotation and develop a precise definition for rotations in terms of angle measures and lengths of line segments.



Connecting to Other Big Ideas

CC1 Modeling With Functions Unit 3 (Lessons 13–15, Practice Day 3)

CC2 Systems of Equations Unit 3 (Practice Day 3)

CC4 Building With Triangles Unit 3 (Lessons 13, 14, Practice Day 3)

CC4 Shapes in Structures Unit 6 (Lessons 8–14, 17, 22, Practice Days 2–3)

Connecting to Number Sense

NS Financial Literacy Unit 3 (Practice Day 3)