Tools and Topics

Inspiring Connections Course 3, Prelude

Spotlight On: Venues for Learning

Throughout the school year, students will work in teams in various settings: at tables, at vertical non-permanent surfaces (VNPSs), and with electronic devices. Each day, they will use their Mathematician's Notebook and an electronic device to access the curriculum. The Mathematician's Notebook is where they can write down ideas, draw pictures, make graphs, work through problems, write solutions, and take notes to remember later. Students will use their electronic devices to access problems, look at images, access links, and more.

The Big Picture

CPM's methodology is based on the following principles.

- All students are capable of understanding mathematics deeply.
- Learning mathematics takes time, effort, and support.
- Students learn mathematics more deeply when they discuss the material with classmates and work in teams.
- Students make greater meaning and see more connections when they experience mathematics in different contexts and with a variety of problems.
- Students need to engage and re-engage with topics over time.

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

0.1.2: Operations with Rational Numbers
0.1.5: Solving Proportions

Welcome to *Inspiring Connections Course 3*!

Inspiring Connections Course 3 is a research-based course for mathematics with a student-centered, problem-based approach.

Current Topics

In the Prelude, students will learn the skills necessary for success in this course. These skills include working collaboratively, communicating mathematical ideas, giving and receiving productive feedback, practicing an academic mindset, and thinking like a mathematician.

Collaboration

An important function of the Prelude is to build a foundation for collaborative, working relationships. Students will work together to learn how their classmates show respect, communicate and participate in discussions, and view classroom working agreements.

Standards for Mathematical Practice

Students will be encouraged to use their full linguistic repertoire as they build their mathematical identities and work on the Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Positive Academic Mindsets

Supports in the Prelude include reflection questions, opportunities to promote various perspectives, and reminders to focus on the iterative learning process. In addition to building a classroom environment where students will thrive, these practices help students develop positive academic mindsets.

Try This at Home!

Throughout this course, students will write both learning reflections and goal reflections in their journals. Ask your student to show you these journals and talk about the benefits of writing down one's thoughts.

Tools and Topics

Inspiring Connections Course 3, Chapter 1

Spotlight On: Talking About Mathematics

Students who talk to others about mathematics learn more, retain more of what they learn, and take more responsibility for their learning. To facilitate mathematical talk, lessons include strategies such as Reciprocal Teaching, Go Chat, and Think-Ink-Pair-Share. For example, during a Go Chat, when teams are working on a problem, students form pairs and move to a different location to discuss their current ideas, then go back to their teams to share what they learned.

The Big Picture

Growing From

Comparing data sets;
Proportionality;
Unit rate

Working On

Create and interpret scatter plots;
Rigid transformations;
Interpret unit rate on a graph;
Graph linear relationships

Growing To

Identify features of a scatter plot;
Dilations and similar figures;
Identify slope and *y*-intercept in multiple representations

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

1.1.1: Axes, Quadrants, and Graphing on the Coordinate Plane
1.1.2: Converting Proportions
1.1.3: Solving Equations
1.1.4: Scatter Plots
1.2.1: Measures of Center and Spread
1.2.2: Diamond Problems
1.2.3: Dakabibi
1.3.1: Proportional Relationships
1.3.2: Patterns in Nature

Current Topics

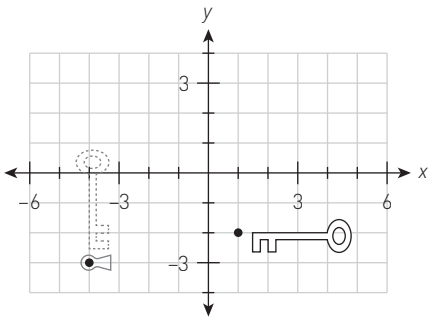
Much of the mathematics students will learn this year requires them to model linear relationships. In this chapter, students will represent bivariate data using scatter plots and explore the idea of trend lines. They will also translate figures in the coordinate plane and graph proportional and non-proportional linear relationships.

Data and Graphs (Section 1.1)

Section 1.1 begins with students moving from representing univariate data on histograms and dot plots to representing bivariate data on scatter plots. Students will also identify linear trends and graph trend lines to make predictions.

Introduction to Transformations (Section 1.2)

In Section 1.2, students will apply their knowledge of scale figures to describe rigid transformations in the plane. Students will initially describe these transformations informally as "flip," "slide," and "turn." In Lesson 1.2.2, they will formally name them "reflection," "translation," and "rotation." Students will also write the coordinates of the vertices of the preimage and image of a transformation.



Linear Relationships (Section 1.3)

In this section, students will graph proportional and non-proportional linear relationships from written descriptions, tile patterns, tables, or equations. Throughout the course, students will continue to work with multiple representations of linear relationships. Many real-world contexts can be represented with linear relations, and it is useful to use different representations to make sense of a context.

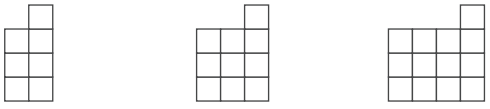
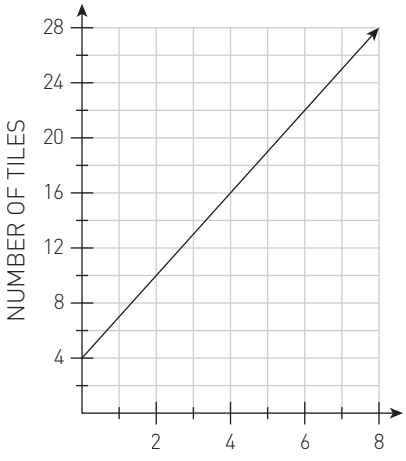
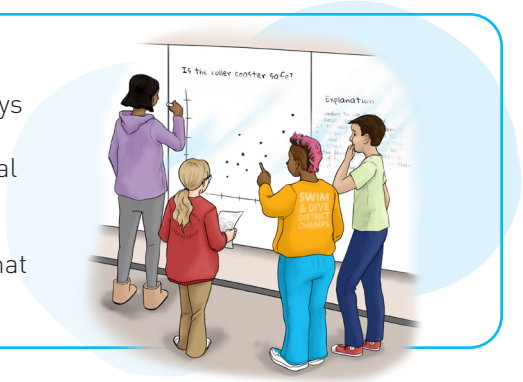


FIGURE 1 FIGURE 2 FIGURE 3



Try This at Home!

Students will see many data displays this year, discussing what they do and do not reveal. Share a statistical graph (such as a scatter plot) in a news article or other source, and talk with your student about how that picture tells a story.



Tools and Topics

Inspiring Connections Course 3, Chapter 2

Spotlight On: Collaborative Learning

Collaborative learning is one of the pillars of *Inspiring Connections*. The Prelude and Chapter 1 introduced several teamwork strategies and routines that students will continue to use throughout the course. These strategies and routines help students learn mathematics and communicate effectively with their teammates.

The Big Picture

Growing From

Rigid transformations;
Graphing linear relationships

Working On

Rigid transformations with coordinates;
Dilations and similar figures;
Interpreting a point of intersection on a graph

Growing To

Congruence of polygons on a coordinate plane;
Systems of equations

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

2.1.2: Rigid Transformations
2.2.5: Corresponding Parts of Similar Shapes
2.3.1: Dilations

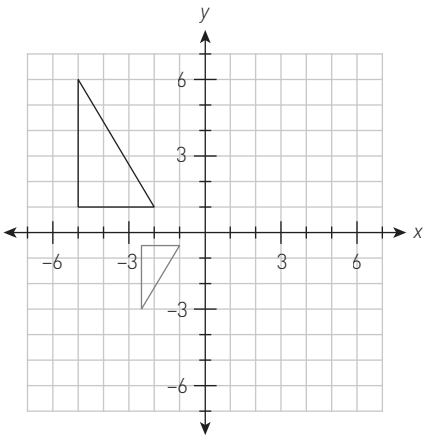
Current Topics

This chapter starts with a deeper look at the transformations that students investigated in Section 1.2 and adds a transformation called "dilation," which is related to scaled figures from a prior course. Later in the chapter, students practice plotting and interpreting points and connecting visual and other representations.

Rigid Transformations (Section 2.1) and Similarity (Section 2.2)

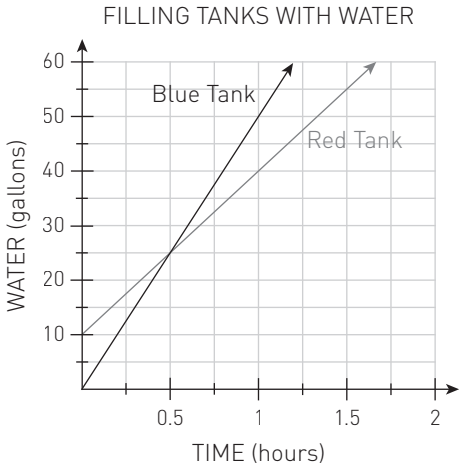
In Section 2.1, students work with rigid transformations: translation (slide), reflection (flip), and rotation (turn). Students describe the effect each of these transformations has on the coordinates of a shape.

In Section 2.2, students continue to work with transformations, focusing on dilations. In a previous course, students worked with similar figures using scale factors. In this course, students work with similarity in the coordinate plane by connecting the concept of similarity to dilations.



Graphing Systems of Equations (Section 2.3)

In this section, students revisit graphing linear equations, this time by graphing two lines on the same set of axes. They make sense of the point of intersection of the two lines. In Chapters 5 and 6, they will connect the point of intersection to the solution of a system of equations.



Try This at Home!

Look for patterns with repeating shapes, such as stones on a walking path or tiles on a bathroom floor. Talk with your student about how each shape in the pattern is placed. Maybe one shape is a rotation of another, or a shape could fit onto another if you slid it into position (a movement called a translation).

Tools and Topics

Inspiring Connections Course 3, Chapter 3

Spotlight On: Fostering Curiosity

This year, your student's teacher is working to foster curiosity by encouraging students to think about mathematics and the world in new ways. The explorations that result from students' questions promote higher-order thinking through analyzing, evaluating, and creating new ideas.

The Big Picture

Growing From

Linear relationships;
Interpreting graphs

Working On

Graphing linear relationships;
Solving equations with algebra tiles;
Association in a scatter plot

Growing To

Multiple representations;
Solving equations algebraically;
Trend lines on a scatter plot

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

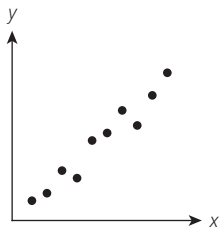
- 3.1.3: Describing Trends in Scatter Plots
- 3.2.1: Describing Patterns in Scatter Plots
- 3.2.3: Tile Moves
- 3.2.4: Using an Equation Mat
- 3.3.3: Discrete and Continuous Graphs
- 3.3.5: Independent and Dependent Variables

Current Topics

This chapter continues students' work with data and linear relationships. In addition, students begin working with algebra tiles to solve multi-step equations, before solving equations algebraically in Chapter 4. Students will continue to develop their skills in representing linear relationships as graphs, tables, equations, and written descriptions.

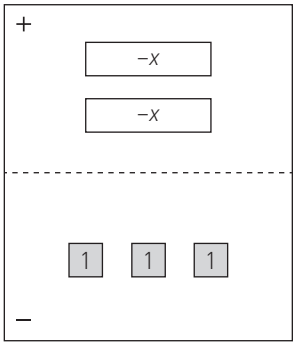
Trend Lines (Section 3.1)

In this section, students interpret scatter plots, like the one shown. In particular, they look for associations (linear and nonlinear, positive and negative), identify outliers, identify clusters, and determine the strength of associations. Students use trend lines on linear associations to make predictions about real-world contexts.



Solving Equations with Algebra Tiles (Section 3.2)

In this section, students revisit algebra tiles, which they worked with in *Inspiring Connections Course 1* and *Course 2*. Students use algebra tiles on an Expression Mat to rewrite expressions and on an Equation Mat to solve multi-step equations. As the course progresses, students use their understanding of algebra tiles to solve multi-step equations without visual aids.



$-2x - 3$

Graphing Linear Equations (Section 3.3)

Students will investigate visual representations of linear patterns and write descriptive and algebraic rules. They also graph linear relationships from tables and practice graphing coordinates with negative values and decimals.

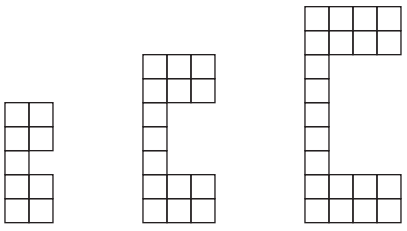
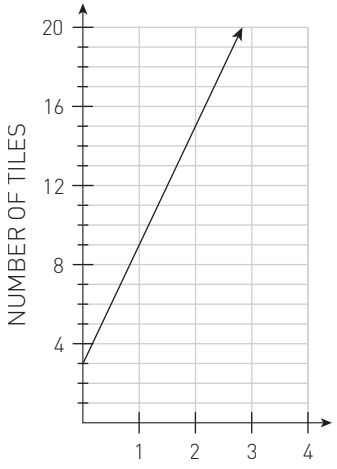
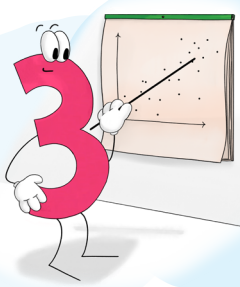


FIGURE 1 FIGURE 2 FIGURE 3



Try This at Home!

With your student, look through news articles to locate a scatter plot. Work together to interpret the graph by asking your student to describe the association and what it means in the context of the graph.



Tools and Topics

Inspiring Connections Course 3, Chapter 4

Spotlight On: Productive Struggle

Can you imagine if people only pursued fields of study where they got things right on the first try? What if athletes decided to quit after their first tough training session? Society sometimes sends the message that struggling to learn something is bad. Parents and teachers often rescue students when there is any struggle happening. The lessons in this course are designed to promote productive struggle. It is not bad to struggle—it is part of the learning process. Making sure the struggle is productive is the key!

The Big Picture

Growing From

Solving equations with algebra tiles;
Operations with exponents

Working On

Solving equations;
Exponent properties

Growing To

Solving systems of equations algebraically;
Scientific notation

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

4.1.1: Complete Graphs
4.1.2: Exponents
4.2.5: Solutions to an Equation with One Variable
4.3.2: Properties of Exponents

Current Topics

In this chapter, students will explore patterns in exponential notation to generalize properties of exponents and investigate solutions to complex equations. This chapter provides opportunities for students to build on their previous work with Equation Mats.

Exponents, Part 1 (Section 4.1)

In this section, students recognize the need for exponential notation and work to generalize properties of exponents. Along the way, they develop strategies to write equivalent exponential expressions.

$$(5^2)^3 = 5^2 \cdot 5^2 \cdot 5^2$$

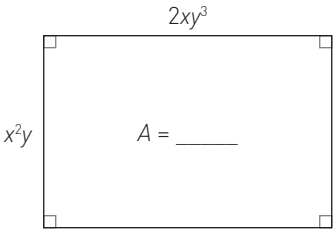
Solving Equations (Section 4.2)

In this section, students investigate solutions to complex equations that have one solution, no solutions, or infinitely many solutions. Throughout this section, students will transition from using Equation Mats to representing equations symbolically, without algebra tiles, as they test whether solutions to equations are valid.

Step 1: $2 - 3x - 8\left(\frac{1}{2}x - \frac{1}{2}\right) = 2 - 3 + (x - 1)$
Step 2: $2 - 3x - 4x + 4 = -1 + x - 1$
Step 3: $6 - 7x = -2 + x$
Step 4: $6 - 8x = -2$
Step 5: $-8x = -8$
Step 6: $x = 1$

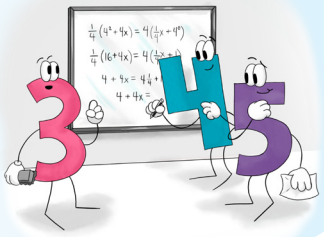
Exponents, Part 2 (Section 4.3)

In this section, students use patterns to continue their exploration of properties of exponents and the values of zero and negative exponents. Students will continue to expand their understanding of exponential notation and properties of exponents in Chapter 9, as they work with scientific notation.



Try This at Home!

Give your student two items, such as two coins or two pieces of candy, and ask them how many items they would have if they doubled or tripled the number of items each day for the next 5 days. This is an example of exponential growth, something students will work on this chapter.



Tools and Topics

Inspiring Connections Course 3, Chapter 5

Spotlight On: Communication

Mathematicians construct viable arguments and critique the reasoning of others. The ability to communicate mathematical ideas is vital for students to grow as mathematicians themselves. In addition, clear and open communication is necessary for success in a collaborative working environment. Your child's teacher will help students develop communication skills by using structures such as the Dyad, where each student has a set amount of time to explain their thinking and then answer clarifying questions. In this way, students learn to listen and to ask thoughtful questions in their team discussions.

The Big Picture

Growing From

Graphing linear equations;
Graphing systems of equations

Working On

Multiple representations;
Graphs and equations of systems

Growing To

Slope and rate of change;
Solving systems of equations algebraically

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

5.2.1: Patterns Web
5.2.2: Equivalent Equations
5.2.3: Solving Equations with Fractions

Try This at Home!

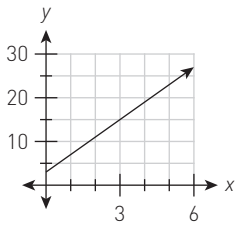
With your student, look for graphs or data on wealth in your area. This information could be found on the Bureau of Labor and Statistics or Census websites. Talk with your student about how the wealth is distributed and what else they notice about the data.

Current Topics

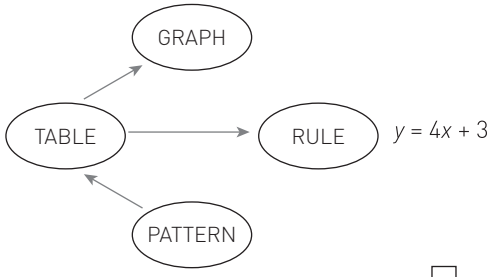
How can you represent growth mathematically? In this chapter, students will write and transform linear equations and represent the growth and starting values of linear and proportional relationships.

Representations of a Line (Section 5.1)

In this section, students will create and make connections across multiple representations of patterns (i.e., graphs, tables, drawings, rules). By the end of the section, students will formalize the rules of the linear patterns as $y = mx + b$ and complete a Patterns Web shown.



x	y
0	3
1	7
2	11
3	15
4	19



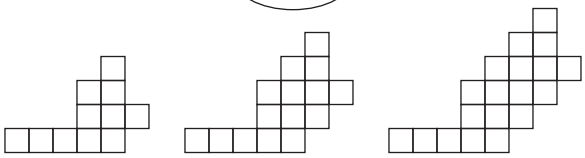
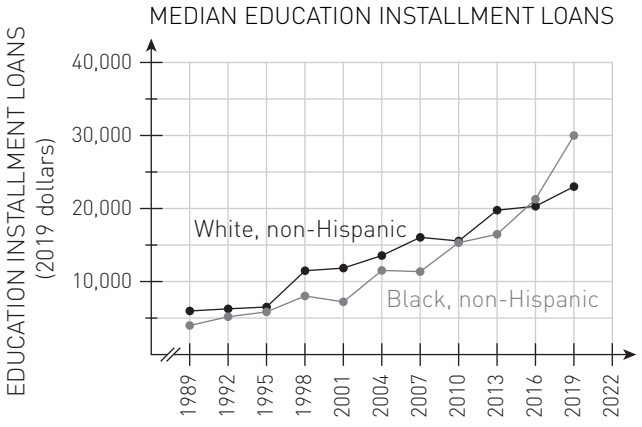


FIGURE 2 FIGURE 3 FIGURE 4

Graphs & Equations of Systems (Section 5.2)

Students begin this section by writing and solving equations that model real-world contexts. Then, students develop strategies to eliminate fractions and decimals from equations prior to solving. Students close Section 5.2 using technology to sketch and write equations for trend lines representing typical home values in the United States, organized by racial groups, and reflecting on the connections between generational wealth and housing prices within those groups.



source: federalreserve.gov

Tools and Topics

Inspiring Connections Course 3, Chapter 6

Spotlight On: Perseverance

People are rarely proficient when they first try something new, whether it is riding a bike, speaking a new language, or playing a new video game. Being unsure, identifying errors, and making mistakes are signs that someone is actively thinking about and making sense of new ideas and skills; they are signs that someone is learning and growing. In math class, your student is invited to engage with challenges productively. Students are encouraged to take risks, try new ideas, and learn from their mistakes.

The Big Picture

Growing From

Multiple representations;
Graphs of systems;
Trend lines on a scatter plot

Working On

Slope;
Solving systems of equations algebraically;
Equations of trend lines on a scatter plot

Growing To

Linear and nonlinear functions;
Linear regression

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

6.1.1: Systems of Equations Vocabulary
6.1.3: The Equal Values Method
6.1.4: Linear Equations
6.2.1: Solutions to a System of Equations
6.2.4: Proportional Equations
6.2.5: Slope of a Line

Current Topics

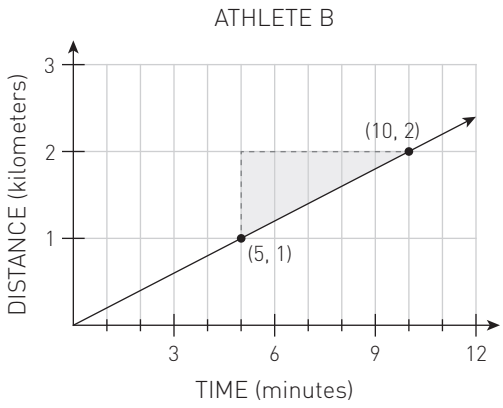
When will the United States meet its goals to reduce its carbon footprint? How many solutions do two linear equations have? Throughout this chapter, students will solve systems of equations using multiple representations, explore slope and growth triangles, and analyze relationships in scatter plots and two-way tables to address these questions.

Solving Systems Algebraically (Section 6.1)

In Section 6.1, students will continue their exploration of solutions to systems of linear equations from Chapter 2 and Chapter 5. They will write systems of linear equations and solve them algebraically in contexts related to climate change.

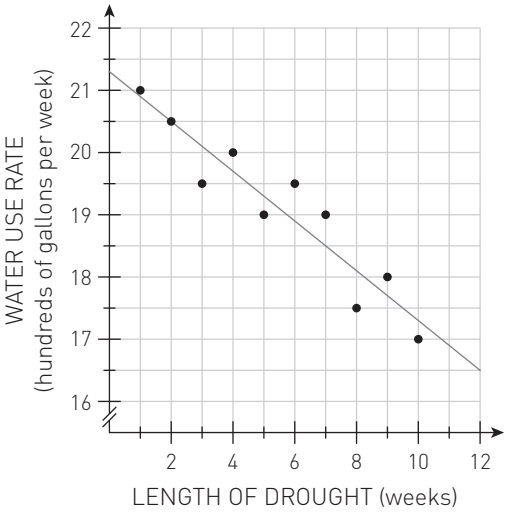
Slope and Rate of Change (Section 6.2)

In Section 6.2, students consolidate their understanding of unit rates, rates of change, and growth triangles to define slope as the ratio between the change in y-values and the change in x-values. Students will use this ratio while exploring race times from the 2016 Paralympics, efforts to reduce carbon emissions in buildings, and beliefs of sampled populations of varying sizes about efforts to mitigate climate change.



Associations (Section 6.3)

In Section 6.3, students continue their work with scatter plots from Chapter 1 and Chapter 3 by writing the equation for a trend line in $y = mx + b$ form and determining the slope of a trend line with slope triangles. Students explore association represented first by scatter plots, then in two-way tables in the last two lessons.



Try This at Home!

Work with your student to make sense of what a carbon footprint is and what it means to reduce the carbon footprint in your household.

Tools and Topics

Inspiring Connections Course 3, Chapter 7

Spotlight On: Goal Setting

It is really difficult to get somewhere if you do not know where you want to go. Throughout the year, students have been setting goals for their mathematical journey in their journals. They have probably reached or exceeded some goals and are still working on others. This is all part of the journey. Now might be a great time to check in and ask your student what their goals are for the rest of this school year!

The Big Picture

Growing From

Integers;
Properties of triangles;
Transformations

Working On

Irrational numbers;
Right Triangle Theorem;
Angle relationships

Growing To

Geometric proofs;
Complex numerical operations

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

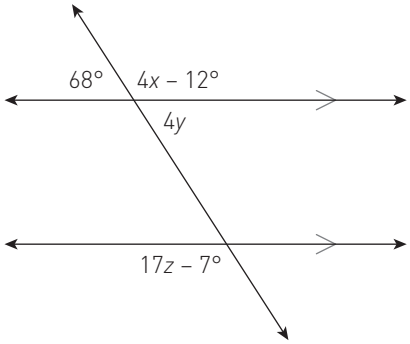
7.1.2: Angle Vocabulary
7.1.3: Parallel Lines and Angle Pairs
7.1.4: Triangle Sum Theorem
7.1.5: The Exterior Angle Theorem for Triangles
7.2.1: Angle–Angle Triangle Similarity Theorem
7.2.3: Right Triangle Theorem
7.2.4: Squaring and Square Roots
7.2.5: The Real Number System

Current Topics

In this chapter, your student will explore the relationships between the angles on the inside and outside of triangles and the angles formed when a third line crosses two parallel lines. Then, they will investigate relationships between the side lengths of right triangles and develop proofs of the Right Triangle Theorem.

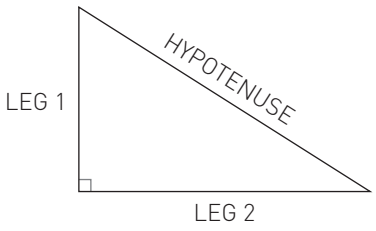
Angles (Section 7.1)

In Section 7.1, students will explore the angle relationships formed when a transversal (the diagonal line shown) cuts two parallel lines. Students continue to use these angle relationships to establish the Triangle Sum Theorem and the Exterior Angle Theorem.



Right Triangle Theorem (Section 7.2)

Section 7.2 focuses on the Right Triangle Theorem and irrational numbers. Students continue their explorations of triangles from Section 7.1 to investigate the relationships between the side lengths of right triangles and to formalize the Right Triangle Theorem. Then, students explore multiple proofs of the Right Triangle Theorem and apply it to three-dimensional real-world contexts.



Try This at Home!

Angles are everywhere. You can see angles in nature, in human designs, and in use at your local hardware store. Talk with your student about angles you see in the real world and ask what type of angles they see.

Tools and Topics

Inspiring Connections Course 3, Chapter 8

Spotlight On: Rough Draft Talk

Throughout *Inspiring Connections*, students will engage in rough draft talk, where they are encouraged to share ideas and brainstorms even if their initial methods are incorrect. It is common for students to feel that being wrong in mathematics is a bad thing when, in fact, it is an asset and is one way to build deeper conceptual understanding over time. Some of the ways rough draft talk is encouraged in the course are through Number Talks and Dot Talks, where students make observations about an open problem where there are multiple ways to arrive at the correct answer.

The Big Picture

Growing From
Multiple representations

Working On
Linear and nonlinear functions

Growing To
Functions

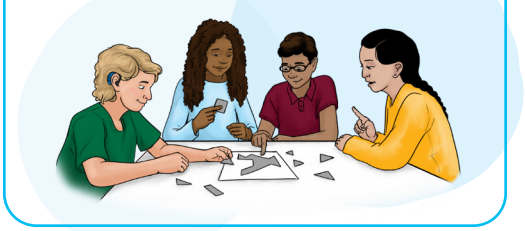
Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

8.1.1: The Converse of the Right Triangle Theorem
8.2.1: Functions

Try This at Home!

Much of the work with functions that students do in this chapter centers around problem solving. Strengthen their problem-solving skills (and your own) by playing games together that involve strategy, problem solving, and logic. Examples include Mastermind, Blokus, chess, and checkers.



Current Topics

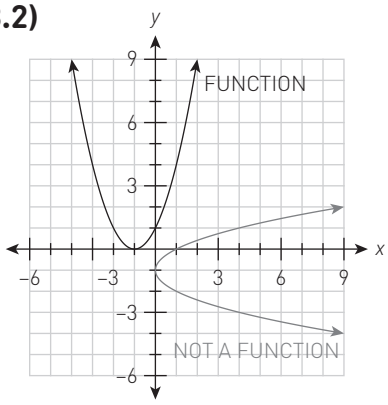
In previous courses, students explored situations, graphs, tables, and equations of proportional relationships. Earlier in this course, students extended their understanding of proportional relationships to linear relationships. This chapter brings together what students know about linear and nonlinear relationships to develop their understanding of a function as a rule that assigns exactly one output to each input. Students have been thinking about functions throughout this course, but the idea is refined and named for the first time in this chapter.

Introduction to Functions (Section 8.1)

In this section, students start learning about functions. They begin by using function tables to understand how inputs and outputs relate, with examples like code-breaking. Students also study graphs of linear and nonlinear functions by connecting them to everyday situations like eating habits and having food over time, as shown. They use both tables and graphs to solve real-world problems. Students play a game called "Guess My Rule," in which they figure out functions from given inputs and outputs. The section ends with an exploration of the different representations of relationships.

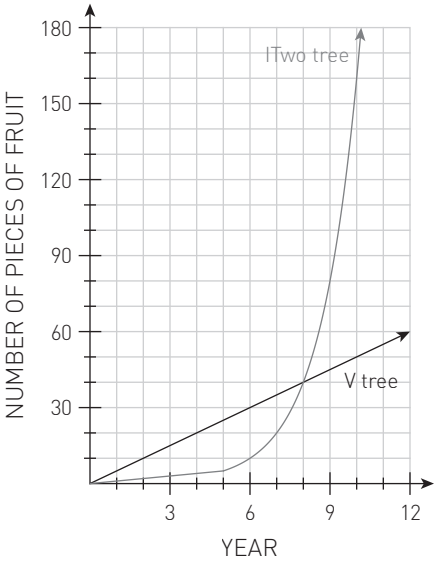
Characteristics of Functions (Section 8.2)

In this section, students continue building on their understanding of functions. They learn to recognize examples and non-examples of functions from tables and graphs. This helps them refine their idea of what functions are, considering factors like linearity, rates of change, smoothness, and continuity. Students practice graphing different functions in various scenarios, including a recurring context in this course: tile patterns.



Linear and Nonlinear Functions (Section 8.3)

The chapter wraps up by having students explore linear and nonlinear relationships in real-life situations. Students also explore functions that describe the area and perimeter of common shapes, as well as the surface area and volume of prisms and cylinders. These lessons set the stage for deeper explorations into volume in Chapter 9.



Tools and Topics

Inspiring Connections Course 3, Chapter 9

Spotlight On: Language

How many languages are spoken in your student's household? Do you ever discuss what your student is learning at school in multiple languages? There is research to show that activating a student's full linguistic repertoire, including nonverbal forms of communication, has benefits across school subjects, including math. For students who know multiple languages, it can be helpful to think about vocabulary words and their representations in other languages in addition to English.

The Big Picture

Growing From

Exponents;
Cross sections;
Volume;
Surface area

Working On

Scientific notation;
Volume

Growing To

Operations with exponents;
Volume formulas

Need Help?

Methods & Meanings boxes are included in the Mathematician's Notebook as reference.

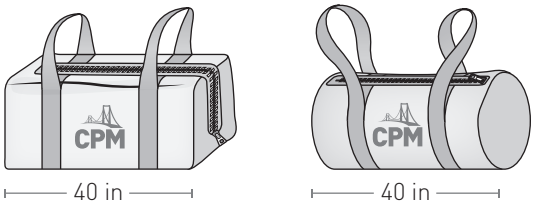
9.1.3: Volume of a Cylinder
9.1.5: Volume of a Pyramid and a Cone
9.2.1: Volume of a Sphere
9.2.3: Scientific Notation

Current Topics

In previous courses, students calculated the volumes and surface areas of prisms using the lengths of the sides. In this course, students use cube roots to reverse the process and determine the side lengths of cubes when they are given the volume, and they continue their investigations of the volume of solids from Chapter 8. Lastly, students work with scientific notation.

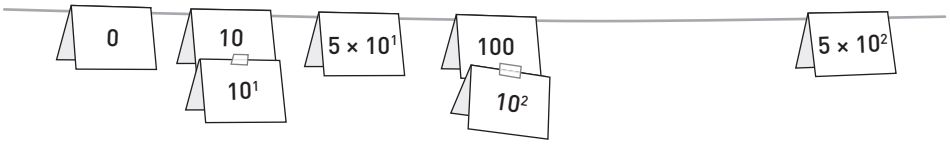
Volume (Section 9.1)

Throughout this section, students compare the volumes of everyday objects and generalize formulas for calculating the volume of cylinders, pyramids, cones, and spheres. This will prepare them for future work in high school when they will explain these volume formulas.



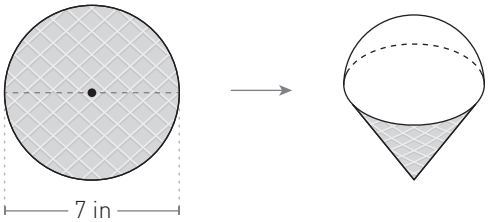
Scientific Notation (Section 9.2)

In this section, students explore scientific notation. Using number lines, students make sense of and compare very large and very small numbers written in both decimal and scientific notation. The last lesson of this section transitions from concrete, real-world scenarios that require operating with numbers written in scientific notation to abstract representations through Dakabibi puzzles.



Applications of Volume (Section 9.3)

The chapter concludes with students using multiple representations to explore whether various volume functions have linear or nonlinear relationships. Then, students work to maximize the volumes of cones, compare the sector angles and volumes using scatter plots, and estimate the dimensions of a closet provided with various irregularly shaped objects.



Try This at Home!

With your student, find containers around the house that look to be different sizes and compare their volumes. You could do this by filling each container with water or rice and comparing the amounts they hold. Then, discuss how the volume changes when different aspects, such as the height or width of an object, change.