Tools and Topics

Inspiring Connections Course 2, 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: Multiplying Fractions
0.1.3: Evaluating Algebraic Expressions
0.1.4: Area of Polygons
0.1.5: Unit Rate
0.1.6: Box Plots

Welcome to *Inspiring Connections Course 2*!

Inspiring Connections Course 2 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 2, Chapter 1

Spotlight On: Rough Draft Talk

Throughout *Inspiring Connections*, students will engage in rough draft talk, where they are encouraged to share ideas and brainstorming on problems, 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 one of the ways 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

Understanding unit rates;
Operations on decimals;
Reasoning about ratios

Working On

Proportional relationships;
Operations on integers;
Graphs of proportional relationships

Growing To

Graphing proportional relationships;
Operations on irrational numbers

Need Help?

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

1.1.2: Histograms
1.1.3: Measures of Central Tendency
1.1.4: Quartiles and Interquartile Range (IQR)
1.1.5: Equivalent Ratios
1.2.2: Integers
1.2.4: Integer Addition and Subtraction
1.2.5: Connecting Integer Addition and Subtraction

Current Topics

In this chapter, students will write equivalent ratios and practice addition and subtraction of integers. They will also answer questions based on graphs of real-world proportional relationships.

Proportions and Proportional Relationships (Section 1.1)

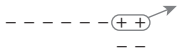
A ratio is a comparison of two quantities. If two ratios can be reduced to the same value, they are equivalent. For example, if a recipe calls for 2 cups of flour to 1 cup of water, an equivalent ratio would be 4 cups of flour to 2 cups of water, as well as 1 cup of flour to ½ cup of water. Ratios can be written as fractions, such as the equivalent ratios shown.

$$\frac{10}{28} = \frac{5}{14} = \frac{15}{42} = \frac{20}{56} = \frac{30}{84} = \frac{35}{98}$$

Integer Operations (Section 1.2)

Integer addition and subtraction are related operations. For example, adding a negative integer has the same result as subtracting a positive integer. This can be represented visually with integer tiles. Removing two positive tiles produces a difference of –8.

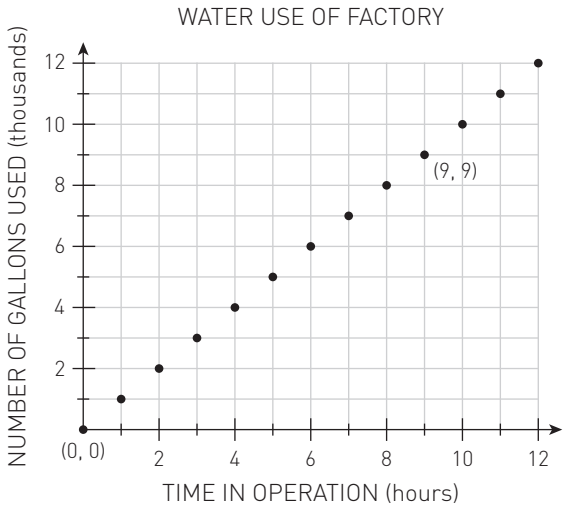
$$-6 - 2 = -6 + (-2) = -8$$



Proportions and Graphs (Section 1.3)

Graphs of proportional relationships can reveal information about a context and can be used to solve problems. For example, from the graph shown, it can be concluded that:

- The factory uses 9,000 gallons of water when it is in operation for 9 hours.
- The factory uses 0 gallons of water when it is not in operation.



Try This at Home!

Use household items such as two differently colored beans or game pieces to represent positive and negative integer tiles. Ask your student to show you how to solve some addition and subtraction problems using these items.

Tools and Topics

Inspiring Connections Course 2, Chapter 2

Spotlight On: Collaborative Learning

Throughout the course, your student will participate in collaborative learning activities. Learning experiences that are active, social, and student-owned lead to higher-level thinking and increased retention of information. When working together, students can have a boost in self-esteem and a sense of responsibility.

The Big Picture

Growing From

Interpreting fractions as division;
Interpreting ratios;
Representing 3D figures

Working On

Fractions and decimals;
Probability of events;
Proportionality of figures;
Cross sections and volume

Growing To

Identifying irrational numbers;
Compound probability;
Volume of prisms and pyramids

Need Help?

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

2.1.3: Fraction ⇔ Decimal ⇔ Percent
2.2.2: Probability Vocabulary and Definitions
2.2.4: Theoretical vs. Experimental Probability
2.3.5: Scale Factor
2.4.1: Solving Proportions
2.4.2: Polygons, Prisms, and Pyramids

Current Topics

In this chapter, students will convert fractions to decimals, determine the probability of single events, determine whether two geometric figures are proportional, recognize cross sections of solids, and calculate the volume of rectangular and triangular prisms.

Fraction and Decimal Conversions (Section 2.1)

In this section, students learn how to convert between fractions and decimals.

To convert from a fraction to a decimal, divide the numerator by the denominator.

$$\frac{3}{8} = 3 \div 8 = 0.375$$

To convert from a decimal to a fraction, use the digits as the numerator. Use the place value of the decimal as the denominator.

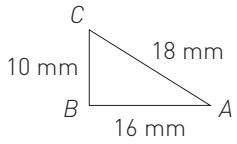
$$0.2 = \frac{2}{10} = \frac{1}{5}$$

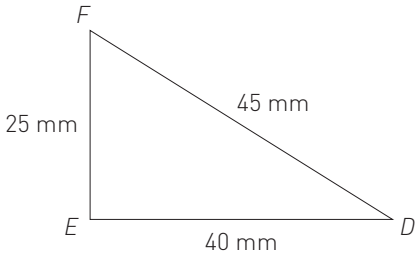
Probability (Section 2.2)

The probability of an event is the likelihood the event will occur. Probabilities can be represented as fractions, decimals, and percents. For example, if a bag contains 49 total marbles and 12 are red marbles, the probability of pulling a red marble out of the bag is $P(\text{red}) = \frac{12}{49} \approx 0.244 \approx 24.4\%$.

Scale Drawings (Section 2.3)

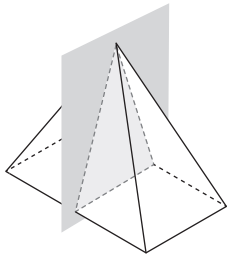
Two geometric figures are proportional if all corresponding angles are the same. Additionally, the ratio of each of the corresponding side lengths are equal. Since each pair of corresponding angles is the same and each pair of corresponding sides has a ratio of $\frac{5}{2}$, the triangles shown are proportional.

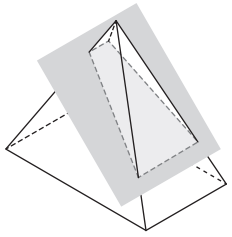




Cross Sections (Section 2.4)

Cross sections of three-dimensional figures can be taken by "slicing" through the figure. For example, when a pyramid is sliced horizontally, the shape of the cross section is the same as the pyramid's base. Slicing vertically or diagonally may produce differently shaped cross sections.





Try This at Home!

With your student, try to predict the shape of the cross section of different items sliced vertically, horizontally, or diagonally, then test your prediction. For example, an apple sliced vertically might have more of an oval shape, but sliced horizontally might be circular.

Tools and Topics

Inspiring Connections Course 2, Chapter 3

Spotlight On: Vertical, Non-Permanent Surfaces

In *Inspiring Connections*, students have opportunities to show their understanding of the mathematics in a variety of ways. Sometimes students work in teams to solve problems on vertical, non-permanent surfaces (VNPSs), which provide space to try different solving methods. When students know their work is not permanent, they are more likely to try out new ways of solving and to be willing to articulate incomplete ideas. Working at VNPSs also enables students to get out of their seats and move, which helps them stay engaged.

The Big Picture

Growing From
Using ratios to solve problems; Describing shape, center, and spread

Working On
Identifying proportional relationships; Sampling

Growing To
Graphing proportional relationships; Making inferences about populations

Need Help?

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

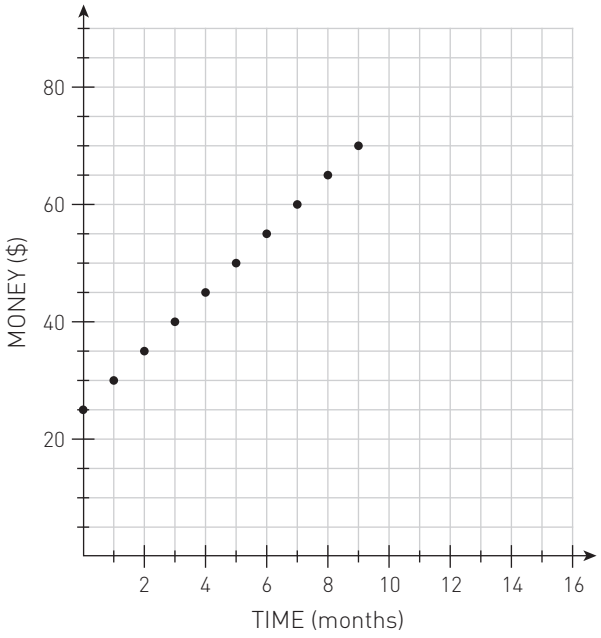
3.1.5: Scaling Axes
3.2.4: Random Samples and Representative Samples

Current Topics

In this chapter, students will identify proportional relationships represented in words, equations, tables, and graphs. They will also use probability simulations to make predictions about a population and identify when a sample does and does not represent a population.

Proportional Relationships (Section 3.1)

Proportional relationships contain the *xy*-pair (0, 0) and have a constant rate of change. The graph shown does not represent a proportional relationship because, although the values change at a constant rate, it does not pass through the point (0, 0). The table, however, does represent a proportional relationship since it contains (0, 0) and the values increase at a constant rate.



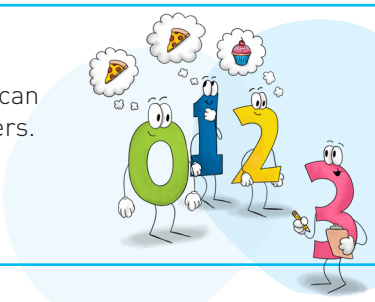
Time (months)	0	1	2	3	4
Money ($)	0	6.75	13.50	20.25	27

Data and Statistics: Using Samples to Make Predictions (Section 3.2)

If you were to poll your neighbors about whether they want a community garden paid for by the city, do you think their answers would be representative of the opinions of the entire town? Sometimes it is more feasible to ask a question to a small group of a population instead of asking every person in the population. Whether the results of a poll accurately represent the opinions of a population can depend on who was asked and the methods used to ask them.

Try This at Home!

Create a poll with your student that you can ask friends, neighbors, or family members. Work together to interpret the results.



Tools and Topics

Inspiring Connections Course 2, Chapter 4

Spotlight On: Windows and Mirrors

Learning mathematics in *Inspiring Connections* provides both a window and a mirror for students. It is a "mirror" because students can see elements of their own identities within lessons, including their personal interests, hobbies, cultures, and languages. It is a "window" because students learn about the identities and interests of others in their classes and communities. Throughout the course, these windows and mirrors are used to help students remain engaged in learning math and to see the relevance of mathematics in their own lives.

The Big Picture

Growing From

Equivalent ratios;
Area and perimeter of special polygons

Working On

Proportional relationships;
Area and circumference of circles

Growing To

Linear relationships;
Volume and surface area of prisms

Need Help?

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

4.1.7: Proportional Relationships
4.2.2: Circle Vocabulary
4.2.4: Circumference and Area of Circles

Current Topics

In this chapter, students will graph, write equations, and solve problems with proportional relationships. They will also apply the formulas for the area and circumference of circles to solve problems.

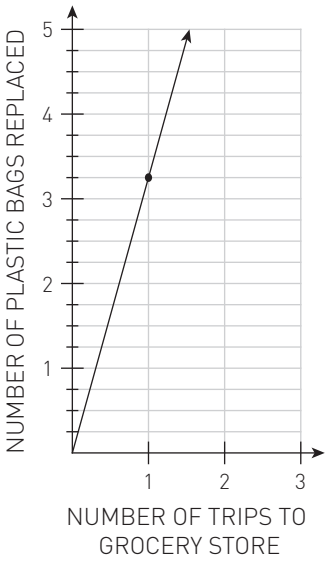
Multiple Representations of Proportional Relationships (Section 4.1)

Proportional relationships have a constant rate of change and include the point (0, 0). There are many representations of proportional relationships: graphs, tables, equations, and written descriptions.

Consider the example:

A reusable bag replaces 3.25 plastic bags for every 1 trip to the grocery store. The graph and table shown represent the same information, as does the equation $y = 3.25x$.

x	1	2	3	4	5
y	3.25	6.5	9.75	13	16.25

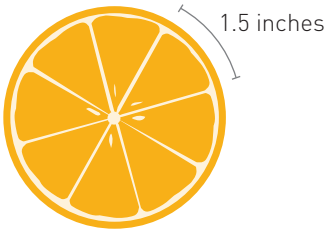


Circumference and Area of a Circle (Section 4.2)

Students learn the formulas for the area and circumference of a circle. If A is the area, C is the circumference, and r is the radius, then $A = \pi \cdot r^2$ and $C = \pi(2r)$.

Consider the example:

What is the area of the cross section of the orange shown?

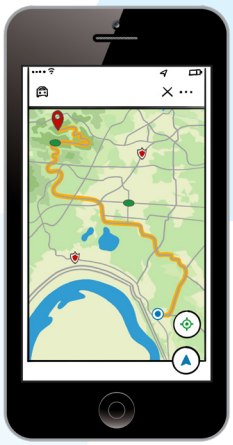


There are 8 equal segments of the orange, so the total circumference is $8 \cdot 1.5 = 12$ inches. The radius can be calculated by manipulating the circumference formula, resulting in $r = \frac{12}{2\pi} \approx 1.9$ inches.

Then, $A = \pi \cdot (1.9)^2 \approx 11.34$ square inches.

Try This at Home!

Ask your student to think of proportional relationships related to transportation, such as the speed of the bus, how many miles are driven per trip to the store, and more. Ask your student to explain how they know the relationship is or is not proportional.



Tools and Topics

Inspiring Connections Course 2, Chapter 5

Spotlight On: Co-Crafting Questions

Students are encouraged to be curious and inquire as to why mathematical concepts work the way they do. Throughout the course, students engage in lessons where they are asked to Co-Craft questions. Co-Crafting questions flips a math problem so that a set of information is provided, and students produce mathematical questions that could be asked about the information. This way of turning a problem on its head allows students to think deeply about new concepts and produce original ideas that add value to the class discussion. The next time you see an interesting infographic or set of numbers online, ask your student, "What mathematical questions could we ask about this?"

The Big Picture

Growing From
Probability of an event;
Adding and subtracting integers

Working On
Compound probability;
Multiplying and dividing integers

Growing To
Conditional probability;
Probability and independence;
Irrational numbers

Need Help?

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

5.1.5: Probability Models for Multiple Events
5.1.6: Probability of Compound Events
5.2.3: Multiplying Integers

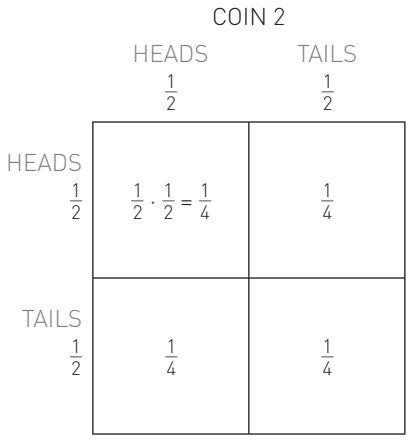
Current Topics

In this chapter, students will solve for the probability of compound events, where two or more events happen in a row. Students will represent compound events visually with lists, tables, area models, and tree diagrams. Students will also multiply and divide integers and represent the operations on a number line. Students will be able to determine whether multiplying or dividing two integers will produce a negative or positive solution.

Probability (Section 5.1)

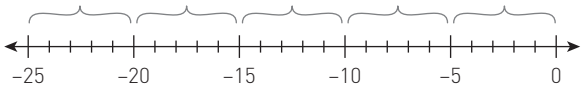
If you flip a coin two times, what is the probability of getting 1 heads and 1 tails? This can be represented with an area model, where each flip of the coin is a single event with two outcomes.

Notice that there are two ways to get 1 heads and 1 tails, so the probabilities of each of those events are added to get $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$.



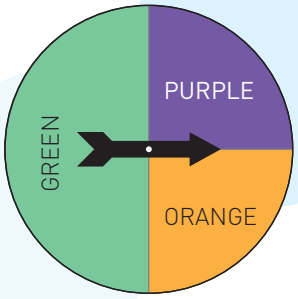
Integer Operations (Section 5.2)

Multiplying and dividing integers can result in the sign of the product or the quotient being positive or negative. There are visual ways to represent integer multiplication and division that help determine the sign of the result. For example, $-25 \div 5$ can be represented as combining 5 groups of -5 on a number line, so that $-25 \div 5 = -5$. The same visual model can also represent $(-5)(5) = -25$.



Try This at Home!

Students will explore probability in many contexts, like with a spinner as shown. With your student, look for examples of probability in your everyday life. For example, what are the chances it will rain tomorrow? Or, how likely is it to flip heads when tossing a coin?



Tools and Topics

Inspiring Connections Course 2, Chapter 6

Spotlight On: Data Chats

The ability to interpret data, make inferences, and draw conclusions is necessary for students to develop their critical thinking skills and determine whether claims are actually supported by the data used to make them. One way that students develop skills in analyzing and interpreting data is through Data Chats, where a relevant infographic is displayed and students are asked to make sense of trends or predictions.

The Big Picture

Growing From

Graphing data sets;
Building expressions

Working On

Collecting and graphing data sets;
Comparing data sets;
Equivalent expressions

Growing To

Standard deviation;
Solving equations;
Solving systems of equations

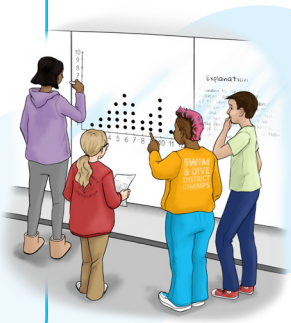
Need Help?

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

6.1.1: Describing Data Distributions
6.1.5: Comparing Distributions
6.2.1: Naming Algebra Tiles
6.2.2: Mathematical Properties
6.2.3: Combining Like Terms
6.2.4: Additive Inverse and Additive Identity
6.3.2: Distributive Property
6.3.3: Defining a Variable

Try This at Home!

Collect data with your student. For example, how long each sibling spends watching TV per week (in hours), or how late or early the bus arrives (in minutes). Then represent the data as a dot plot using stickers by creating a number line and placing a sticker above each number from the data you collected.

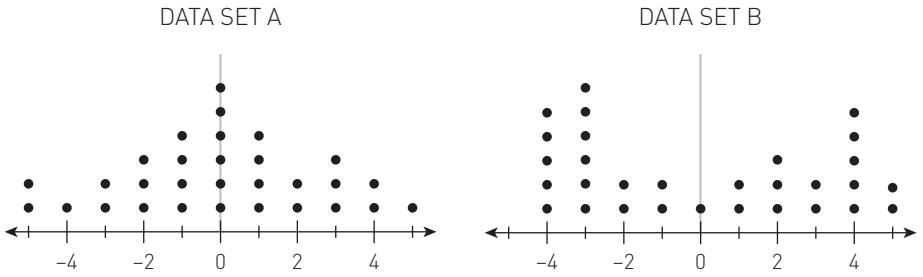


Current Topics

In this chapter, students will compare data sets that are represented visually. They will also continue building expressions and rewriting them in different forms. Below are a few examples.

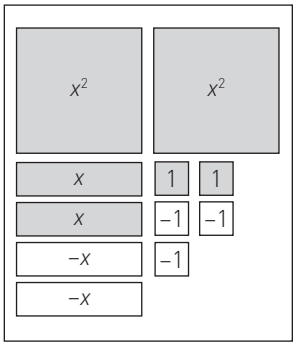
Data Distributions (Section 6.1)

In this section, students will practice interpreting data by comparing more than one data set. For example, both data sets shown have the same *mean*, 0. However, that value doesn't convey how spread out the points are in each data set. Looking at the two dot plots, the points in Data Set A appear to be clustered more closely around the mean than the points in Data Set B.



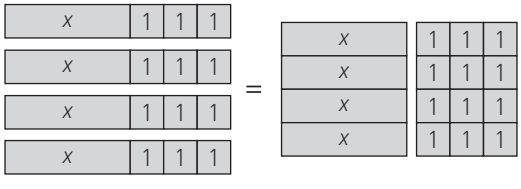
Numerical and Algebraic Expressions (Section 6.2)

Students will create equivalent expressions. Students will represent expressions using algebra tiles and show that two expressions are equivalent. For example, the algebra tiles shown can be represented as $2x + 4 - 2x - 3$. Expressions like $1 + (-1)$ and $(-x) + x$ create *zero pairs*. By removing *zero pairs* of algebra tiles, the original expression $(2x + 4 + (-2x) + (-3))$ can be rewritten as 1.



Equivalent Expressions (Section 6.3)

In this section, students will continue working with equivalent expressions by writing them in both expanded and factored form, using the *Distributive Property* to regroup terms in an expression. The Distributive Property can be verified with algebra tiles, as shown. The tiles can be grouped into 4 sets of $(x + 3)$, or $4(x + 3)$, or they can be grouped together as $4x + 12$.



Tools and Topics

Inspiring Connections Course 2, Chapter 7

Spotlight On: Language Repertoire

How many languages are spoken in your student's household(s)? Do you ever discuss what your student is learning at school in multiple languages? There is research to show that activating students' full language 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
Solving equations

Working On
Simple interest calculations; Calculating tax, gratuity, and commission

Growing To
Compound interest

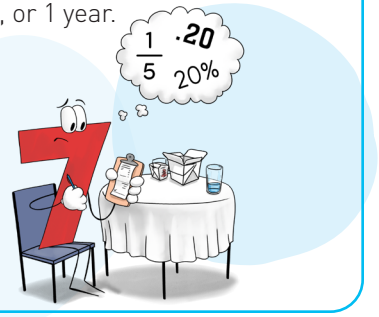
Need Help?

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

7.2.3: Part-to-Whole Relationship
7.3.3: Percent Increase or Decrease

Try This at Home!

With your student, research the annual percentage yield (APY) of various bank accounts and estimate how much money they would earn in interest by leaving an amount of money untouched for 3 months, 6 months, or 1 year.

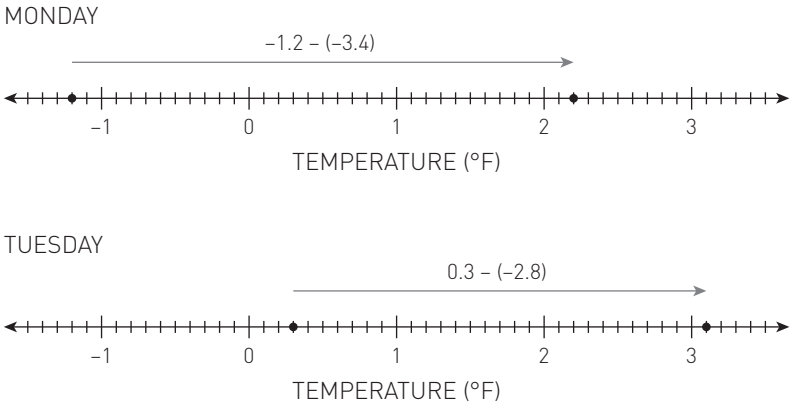


Current Topics

In this chapter, students will perform addition and subtraction of rational numbers. They will also solve percent problems involving simple interest, tax, gratuities, and commissions.

Operations With Rational Numbers (Section 7.1)

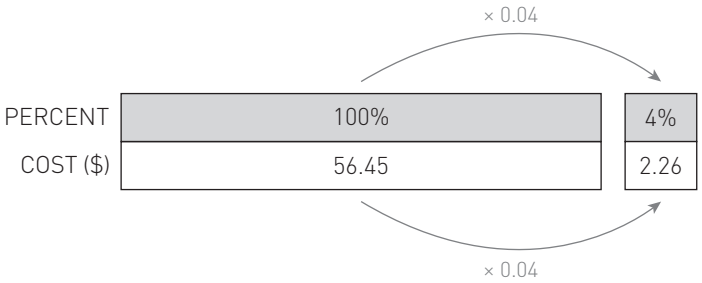
Students continue working with rational numbers by adding and subtracting using number lines. For example, the changes in temperature on two different days can be represented as subtraction on number lines, as shown.



Percent Change (Section 7.2)

Students solve multistep ratio and percent problems, such as calculating sales tax, tip, commission, and interest rates on purchases. Students create percentages of values using visual models and learn to solve percent problems arithmetically.

Consider shopping for groceries and having a total that amounts to $56.45. How much will the final cost be if the sales tax is 4%? The tape diagram shows how to represent this visually.



Percents in the Real World (Section 7.3)

This section builds upon the work in Section 7.2 as students use percents in real-world situations to determine markups and markdowns, percent change, and percent error.

Product	Wholesale Price ($)	Markup	Initial Price ($)	Days Since Last Sale	Current Price ($)
Sneakers	48	46%	70.08	70	70.08
Jewelry	25.75	123%	57.42	107	51.68
Hat	26	34%	34.84	2	34.84

Tools and Topics

Inspiring Connections Course 2, Chapter 8

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? 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

Multiplying and dividing fractions;
Writing one-variable expressions

Working On

Multiplying and dividing rational numbers;
Solving equations and inequalities in one variable

Growing To

Rational expressions;
Solving systems of equations and inequalities

Need Help?

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

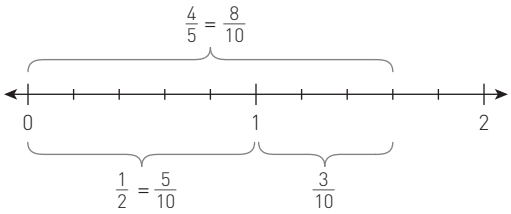
8.1.3: Mixed Numbers and Fractions Greater Than 1
8.1.5: Fraction Division
8.2.1: Inequality Symbols
8.3.2: Using an Equation Mat
8.3.3: Checking a Solution
8.3.4: Solving Problems with a Guess and Check Table
8.3.6: Solving Inequalities and Graphing Inequalities on a Number Line

Current Topics

In this chapter, students will perform multiplication and division of rational numbers. They will also solve equations and inequalities algebraically as well as by comparing expressions using a visual model.

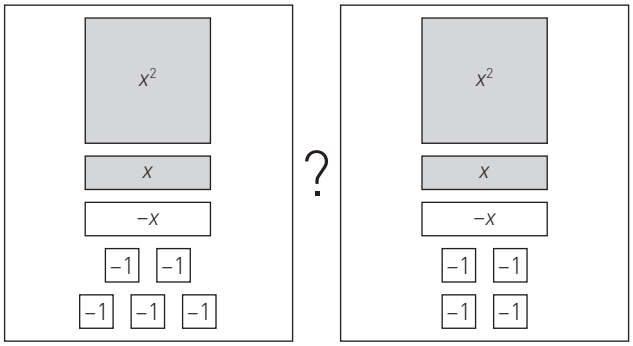
Multiplication and Division of Rational Numbers (Section 8.1)

Students will continue working with rational numbers by multiplying and dividing using number lines. The problem $\frac{4}{5} \div \frac{1}{2}$ can be represented on a number line, as shown.



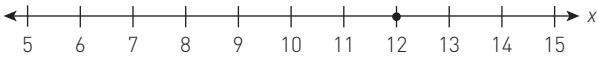
Working With Expressions (Section 8.2)

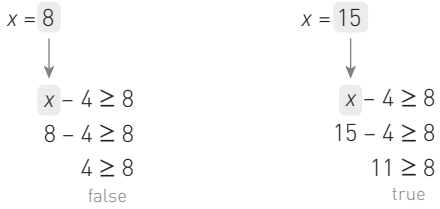
Students will compare expressions visually and determine whether one expression is less than, greater than, or equal to another given expression. In the example, the left side of the Expression Comparison Mat is represented by $x^2 + x + (-x) + (-5)$; and the right expression is $x^2 + x + (-x) + (-4)$. Which one is greater? The expressions on each mat can be reduced to -5 on the left and -4 on the right. Since $-5 < -4$, the relationship between the original expressions can be written as the inequality $x^2 + x + (-x) + (-5) < x^2 + x + (-x) + (-4)$.

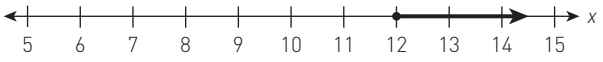


Writing and Solving Equations and Inequalities (Section 8.3)

To solve and graph an inequality with one variable, students treat the problem as if it were an equation and solve for the variable. This solution is called the boundary point. For example, to solve $x - 4 \geq 8$, first solve $x - 4 = 8$. The solution $x = 12$ is the boundary point for the inequality $x - 4 \geq 8$. To graph the inequality, students first test another point to see if the inequality holds true. If it does, then the arrow points towards the point. If it does not hold true, then the arrow points the opposite direction.

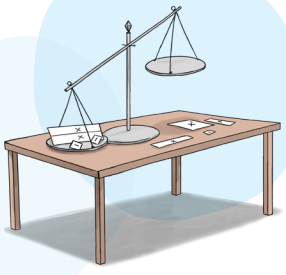






Try This at Home!

Working with inequalities is similar to using a balancing scale. To illustrate this, collect several light items and one heavy item and ask your student whether the combined weight of the light items is more or less than the weight of the heavy item.



Tools and Topics

Inspiring Connections Course 2, Chapter 9

Spotlight On: Spatial Reasoning

Have you ever tried to move a large piece of furniture through a narrow doorway? Have you ever looked at a room and estimated how much paint you need to cover all the walls? Most likely, your brain was engaging in spatial reasoning, which is an important skill in the development of geometric thinking. The ability to visualize something in your mind is useful for making many decisions in life and is connected to many areas of geometry.

The Big Picture

Growing From

Classifying angles;
Classifying triangles;
Area of polygons

Working On

Angle relationships;
Constructing triangles;
Volume and surface area of prisms

Growing To

Angle pair relationships;
Triangle congruence theorems;
Volume and surface area of cones and spheres

Need Help?

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

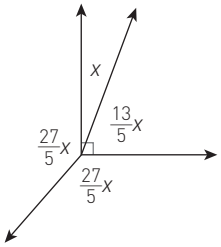
8.1.3: Mixed Numbers and Fractions Greater than 1
9.1.2: Angles
9.1.3: Angle Relationships
9.2.2: Triangle Inequality
9.3.3: Measurement in Different Dimensions
9.3.4: Volume of a Prism

Current Topics

In this chapter, students will solve for missing angle measures using information about the angle relationships in a given diagram. They will also construct triangles by hand and with technology, and solve real-world problems involving volume and surface area.

Angle Relationships (Section 9.1)

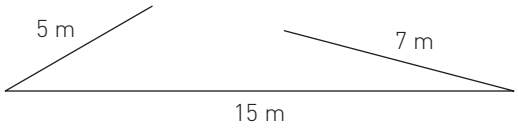
In this section, students will use what they know about angle relationships, expressions, and equations to solve problems like the one shown. In the visual, the angle labeled x and the angle labeled $\frac{13}{5}x$ are complementary angles, meaning they sum to 90°. Solving the equation shown, the measure of x is equal to 25°.



$\frac{13}{5}x + x = 90°$

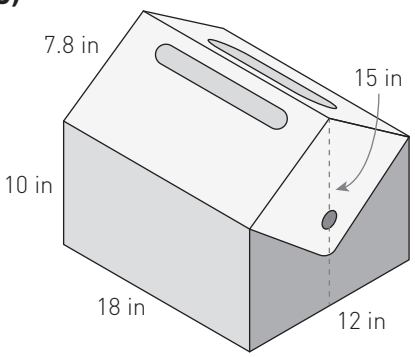
Triangle Creation (Section 9.2)

In this section, students develop some ideas about triangles. They explore the conditions where sets of angles or sides may form one, many, or no triangles. This lays the groundwork for triangle similarity and congruence, the Angle Sum Theorem, and the Right Triangle Theorem in the next course, and eventually geometric proofs.



Volume and Surface Area (Section 9.3)

This section combines the geometric concepts of area, surface area, and volume. Students build on their investigations of two-dimensional cross sections of prisms and pyramids from Chapter 2. They calculate the area of these cross sections and solve mathematical and real-world problems involving the surface area and volume of three-dimensional objects.



Try This at Home!

Find a packaged food item in your cupboard and ask your student how many of that item they would need to fill the whole cupboard.