Prelude

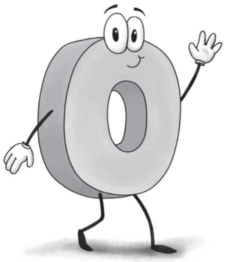
Welcome to *Inspiring Connections Course 2*!

The course Prelude will get you ready to learn mathematics this year. You will learn about team roles and about being a productive team member. You will work with your classmates to make sense of and solve challenging problems in various contexts. You will begin to build relationships with your teacher and classmates. And you will learn about developing an academic mindset, which involves reflective journaling and goal-setting.

You will also see the different venues in which you will be working: tables, vertical non-permanent surfaces (VNPSs), and devices. Each day, you will need your Mathematician's Notebook and your device. The Mathematician's Notebook is where you will jot down ideas, draw pictures, make graphs, work through problems, write solutions, and take notes to remember later. Depending on the lesson, you may be provided some images, tables, and texts to help you. To see entire lessons, refer to the text on your device. There, you will be able to access problems, look at images, access links, use eTools, and more!

Did you know that math is a social activity? Some people even call it a universal language. But how can you see what others are thinking and share your own thinking so others can understand? Get ready to explore these questions as you get to know your classmates and your teacher in this Prelude!

Prelude Table of Contents



Learning Targets

A learning target is a statement describing what you will learn in the lesson, and it is written in the form "I can…." You will see a list of learning targets at the beginning of each chapter. These learning targets also appear in the Reflection & Practice when they are introduced. The first time you see a new topic, you might reflect on your work and decide you have not reached that learning target yet. But after you have spent some time working with your teammates, asking questions, and practicing with the topic, you might realize that you can do it!

Revisit the list of learning targets throughout the chapter and year. Make notes to yourself when you notice improvement or when you struggle with a particular problem. Write down relevant problem numbers and what steps you might take to reach the learning target. An example is shown for the learning target in Lesson 0.1.6.

Lesson	Learning Target	N—Not yet, W—Working on it, Y—Yes, I can! Include comments or a plan for improvement.
0.1.6	I can use the Giant One to write equivalent ratios.	W: Problem 0-46: Ask my teacher about this one. Problem 0-49: I think I got it! Check with my teammate to see if they got the same solution.

Each chapter after the Prelude concludes with a section called Chapter Closure. Several of the learning targets appear again in a Chapter Closure section. You will see a learning target in a Chapter Closure after you have had a number of opportunities to engage with the topic. The learning targets may be in the chapter where you first see them or they may be from a previous chapter. At this point, reflect on your understanding again. You should feel more confident in this topic. If you need more support, a table in the Chapter Closure lists where to get the information and practice necessary to become confident with the topic.

Prelude Learning Targets

Lesson	Learning Target	N—Not yet, W—Working on it, Y—Yes, I can! Include comments or a plan for improvement.
0.1.1	I can identify the responsibilities of each team role. I can make generalizations about numbers and polygons.	
0.1.2	I can communicate effectively and provide appropriate feedback to my teammates. I can evaluate numerical expressions.	
0.1.3	I can value teamwork and different perspectives. I can extend patterns and describe what I see in numbers and words.	
0.1.4	I can persevere with my team. I can informally describe the center of a data set.	
0.1.5	I can value different perspectives. I can identify two-dimensional shapes from three-dimensional figures.	
0.1.6	I can identify a growth mindset. I can use the Giant One to write equivalent ratios.	
0.1.7	I can communicate effectively with my teammates. I can determine if a game is fair.	
0.1.8	I can understand how my actions contribute to a respectful learning environment.	

0.1.1 Shared and Unique Characteristics
What do they have in common?

Launch

Welcome to *Inspiring Connections Course 2*! Take a moment to share your name with your teammates, and then do the following.

a. Work together to arrange yourselves in order by first name.

b. Turn to another team and share your names in order.

c. Work to arrange both teams together in order by first name.

Explore

0-1.

Organizer: If your name comes first alphabetically.

- Make sure your team has a copy of the Lesson 0.1.1A Resource Page, glue, and a piece of colored construction paper.
- Make sure all team members record their work.
- Make sure your team cleans up by delegating tasks. You could say, *"I will put away the _____ while you _____."*

Coordinator: If your name comes second alphabetically.

- Start the team's discussion of similarities and differences by asking, *"What might we have in common?"*
- Keep everyone discussing each part together by asking questions such as, *"Does anyone have ideas for what makes us each unique or different?"* or *"What else might we have in common?"*

Representative: If your name comes third alphabetically.

- When your team is called, share your team's ideas and reasons with the class.
- Help the team agree on an idea. *"Do we agree that this would not be obvious to the rest of the class?"*

Investigator: If your name comes fourth alphabetically.

- Remind the team to stay on task. You can suggest, *"Let's move to the next part of the problem."*
- Listen for reasons and ask your teammates to justify their thinking. *"Why do you think that?"* or *"Would this be obvious to the rest of the class?"*
- Ask the teacher when the entire team has a question. *"No one has an idea? Should I ask the teacher?"*

Representative:
Investigator:
Coordinator:
Organizer:

Closure

Teams function well when everyone performs the duties of their team role. Each of you played an important role in today's lesson. What did you do that helped the team complete the lesson?

How did your team function well today, or what behaviors did you notice that contributed to successfully completing the activities? Think about these questions as a team and be prepared to discuss them with the class.

Reflection & Practice

At the end of each lesson, you will see a section labeled "Reflection & Practice." This section contains a variety of problems and questions for you to reflect on your learning and practice your skills.

There are four types of problems in the Reflection & Practice:

- brief problems that will help you think about how numbers work through visualization and problem-solving;
- problems related to what you learned in that day's lesson;
- problems reviewing content from previous lessons; and
- reflection questions to check in with yourself and your learning.

Each of these will support your mathematical learning. There will not be many problems, so attempt all of them and do your best.

0-3.

Mathematicians reason abstractly and quantitatively. Lacey has 36 more days before their birthday, while Joey has 4 weeks to wait for hers. Who has to wait longer? Why?

0-4.

I can identify the responsibilities of each team role.

Four students were working together as a team to solve a complex problem. Each student made a statement during class. Match each statement to a team role. Refer to the list of team roles in Lesson 0.1.1.

a. *"I will call the teacher over to ask our question."*

b. *"If we all agree on this method, we can begin to solve the problem."*

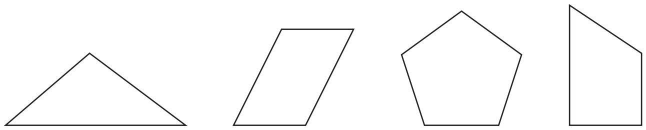
c. *"Since I will be reporting our solution to the rest of the class, let me make sure I completely understand what you are saying."*

d. *"We all need to write down our work for this problem."*

0-5.

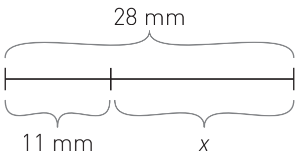
I can make generalizations about numbers and polygons.

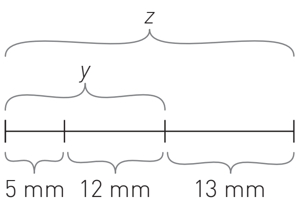
What do the following shapes have in common?



0-6. (from a previous course)

Calculate the missing information in each diagram.

a. 

b. 

Reflection & Practice continues on page 8.

0-7. (from a previous course)
A class is working on decimal operations. The teacher asked students to share their favorite mistakes. One mistake from each operation is shown. Choose one operation and explain the mistake.

ADDITION MISTAKE

```
  1 1
 12.347
+  9.28
 13.275
```

SUBTRACTION MISTAKE

```
 17.007
- 6.320
 11.327
```

MULTIPLICATION MISTAKE

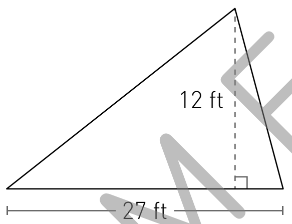
```
   1 34
    1 2
   12.45
 ×  8.40
  10,000
  149,800
+ 996,000
10,458.00
```

DIVISION MISTAKE

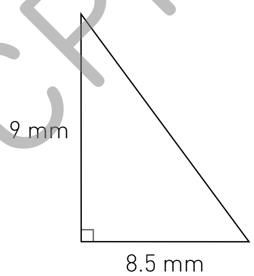
```
28.896 ÷ 2.4

2.4)28.896

      1,204
24)28,896
  -24
    48
   -48
     09
     -0
      96
     -96
       0
```

0-8. (from a previous course)
Determine the area of the following triangles. Show your work.

a.



b.



0-9.

A mathography is a history of mathematics in your life. Write a letter about yourself to your teacher. The letter will help your teacher get to know you as an individual.

a. **You:** Introduce yourself using the name you like to be called. Describe your hobbies, talents, and interests. State your goals or dreams. What are you proud of? What else would you like to share?

b. **You as a Student:** How can school help you reach your life goals? Is college a necessary step for your future? Identify the school activities, teams, events, etc. you would like to be a part of this year. What activities or groups have you been a part of in previous years?

c. **You as a Math Student:** Describe your most memorable moment in math and explain why you remember it. State your favorite math topic and your least favorite. Explain how you feel about math this year. Feel free to include images or drawings to help explain your feelings or describe yourself and your experiences.

Four 4s

0.1.2 How can I effectively communicate with my team?

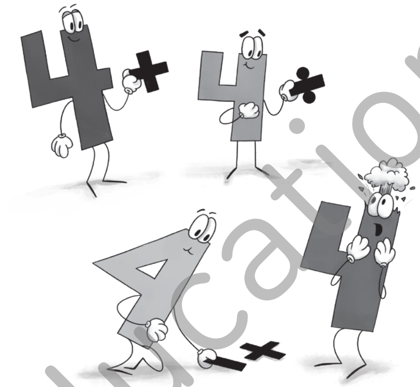
Launch

Assign team roles by last name using the Lesson 0.1.2 Resource Page. Then clear your workspace for a building activity.

Your teacher will call the Representatives up for a Huddle to reveal a secret shape. If you are called to see the shape, your job is to describe the shape to your teammates so that they can build it within the time limit your teacher sets. However, you cannot help your teammates build the shape, you can only talk. Additionally, you can only look at the shape twice unless your teacher tells you otherwise. If your team builds the shape within the time limit, call your teacher to verify it was built correctly. Is your team ready for the challenge?

Explore

0-10.



Representative:

Investigator:

Coordinator:

Organizer:

- When you ________________, that made me think to ________________________.
- That's a good idea, because ________________________________.
- What if we start with your idea and change ________________________?
- What would happen if we tried ________________________________?
- That did not work, but what I learned is ________________________.
- Have you thought about ________________________________?
- What do you think about________________________________?
- Will you explain ________________________________?
- When I see ________________, I think ________________. What do you think?
- When you said ________________, did you mean ________________________?

Closure

The Organizer should collect an envelope for your team. Follow the steps given to reflect on your communication during the lesson. One at a time, each team member will draw a strip of paper from the envelope. They should read the statement or question on the paper, respond to it, and pass it around so everyone has a chance to respond. After everyone has responded to one strip, another team member draws the next. Continue until every member has drawn a prompt and all members have responded to each prompt.

Reflection & Practice

0-14.

Mathematicians look for and make use of structure. Consider the structure of the expression 7×25 as you evaluate it mentally. What is the product, and how did you calculate it?

0-15.

I can communicate effectively and provide appropriate feedback to my teammates.

Sasha wrote the expression $4 + 4 \div 4 + 4$ to represent the value 6. This is not correct. What feedback would you give her?

0-16.

I can evaluate numerical expressions.

Write four expressions and their values using only three 3s. For example, $3 + 3 \div 3$ equals 4.

0-17. (from a previous course)
A team of students is working on a problem and they decide to multiply two fractions to calculate their answer. The Organizer's work is shown.

$$\frac{5}{6} \cdot \frac{3}{4} = \frac{15}{24} = \frac{5}{8}$$

a. The Investigator and Representative check the Organizer's work using division, and the Coordinator uses an area model. Which of the three methods would you have used to check the Organizer's work? Explain. **For additional support, refer to the Methods & Meanings box "Multiplying Fractions" on page 216.**

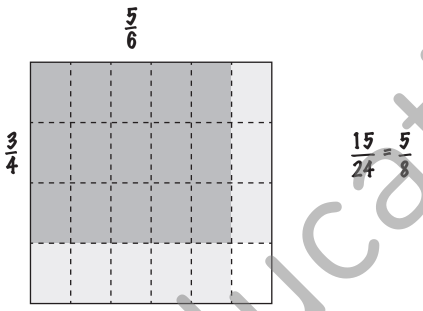
REPRESENTATIVE

$$\frac{5}{8} \div \frac{3}{4} = \frac{5}{8} \times \frac{4}{3} = \frac{20}{24} = \frac{5}{6}$$

INVESTIGATOR

$$\frac{5}{8} \div \frac{3}{4} = \frac{\frac{5}{8}}{\frac{3}{4}} \cdot \frac{\frac{4}{3}}{\frac{4}{3}} = \frac{\frac{20}{24}}{1} = \frac{20}{24} = \frac{5}{6}$$

COORDINATOR

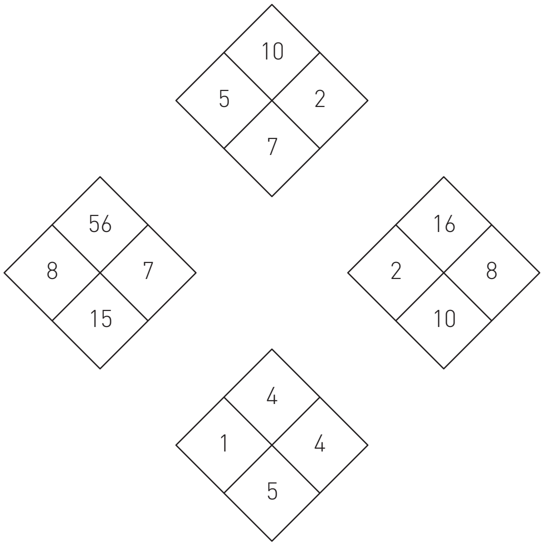


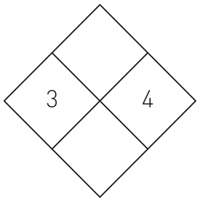
b. Does the rest of the team agree with the Organizer's answer? Explain.

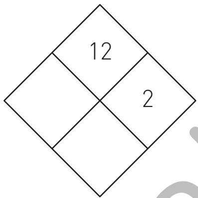
Reflection & Practice continues on page 14.

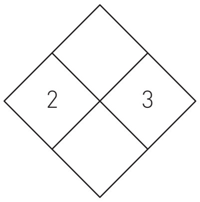
0-18.

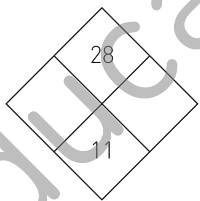
Recognizing patterns is an important problem-solving skill in mathematics. The following diagrams are examples of Diamond Problems. All Diamond Problems have the same patterns. Look for the patterns in the four completed Diamond Problems and use what you discover to complete the Diamond Problems in parts (a) through (d).



a. 

c. 

b. 

d. 

0-19.

Collaboration and teamwork are essential pieces for learning mathematics well. What makes a good teammate? What role can you play in effective collaboration?

0.1.3 Power in Numbers
Is there another perspective?

Launch

Each member of the team will need a different-colored writing utensil. Gather around a table or desk with your team and await further instructions.

Explore

0-20.

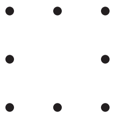


FIGURE 1

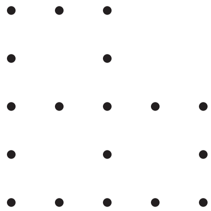


FIGURE 2

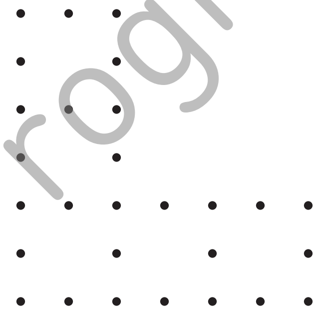


FIGURE 3

0-21.

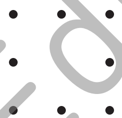


FIGURE 1

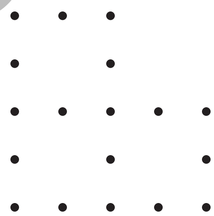


FIGURE 2

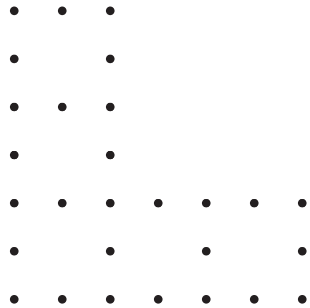


FIGURE 3

Representative:
Investigator:
Coordinator:
Organizer:

Closure

Throughout this course, you will be asked to reflect on what and how you learn. The Reflection Journal titled "Lesson 0.1.3: Valuing Perspectives" is on the following page. Read the prompt and write a response.

Reflection Journal

Lesson 0.1.3: Valuing Perspectives

Think about what you learned from your teammates' different perspectives or approaches to solving a problem.

- How did teamwork help you complete the tasks in the lesson?
- What did you learn from a classmate that you do not think you would have learned if you worked independently?

Reflection & Practice

0-23.

Mathematicians look for and make use of structure. Look at the structure of the following equations. Use any patterns you see to complete the remaining equations.

$1^2 + 1 = 2$

$2^2 + 2 = 6$

$3^2 + 3 = 12$

$4^2 + 4 = 20$

$5^2 + 5 =$

$6^2 + 6 =$

$7^2 + 7 =$

0-24.

I can value teamwork and different perspectives.

One of your goals for this course is to be a participating team member.

a. Think about your work with your team so far in this class. In what ways have you been a participating team member? Explain your answer.

b. What will you do to make sure you are an effective, participating team member in upcoming lessons? Explain.

0-25.

I can extend patterns and describe what I see in numbers and words.

Examine the figures shown and answer parts (a) through (c). Figure 4 is intentionally left blank.

FIGURE 1 FIGURE 2 FIGURE 3 FIGURE 4

a. What pattern do you see from figure to figure?

b. Draw Figure 4. Use color or highlighting to show how it fits your description in part (a).

c. Without drawing each figure, explain how you can calculate the number of dots in Figure 35.

Reflection & Practice continues on page 20.

0-26. (from a previous course)

Evaluate each expression for the given variable.

For additional support, refer to the Methods & Meanings box "Evaluating Algebraic Expressions" on page 217.

a. $3a - 7$ when $a = 4$

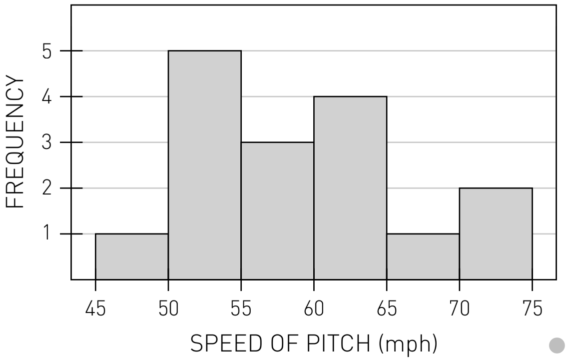
b. $8 + m^3$ when $m = 2$

c. $13 + (3n)$ when $n = 4$

d. $\frac{x}{3} + 2$ when $x = 6$

0-27. (from a previous course)

Craig is practicing pitching his baseball. He kept track of the speed of each of his throws yesterday and made the histogram shown.



a. Can you tell the speed of Craig's fastest pitch? Explain.

b. Between what speeds does Craig usually pitch?

0-28. (from Lesson 0.1.2)

In Lesson 0.1.2, you used four 4s and mathematical operations to write expressions for several numbers. Choose a number from part (a) and then how many times that number will repeat in part (b). Then complete part (c) based on your choices. Write your chosen numbers in the blank spaces provided.

a. Choose a number. _____ **(2, 3, 5, 6, 8)**

b. How many of that number will you use? _____ **(3, 4, 5, 6)**

c. Use your number choices and any operations to write today's date. For example, if today's date is April 2 and you choose four 2s, you could write $2 \div 2 + 2 \div 2 = 2$ and $2 + 2 + 2 - 2 = 4$ to get 04/02 as the date.

_______________________ / _______________________

Month Day

Typical Mathlete

0.1.4 How can I persevere through struggle?

Launch

Your teacher will give you five sheets of paper. Your team will have 10 minutes to build the tallest tower that you can. You cannot use any other supplies, but you can manipulate the paper in any way you find helpful.

Explore

0-29.

Organizer

- Get supplies for your team, and make sure that your team cleans up.
- The teacher may call you over to give you extra information to share with your team.
- Remind everyone in your team to record the ideas neatly and completely.

Investigator

- Listen for statements and reasons. *"Can you explain why you think that?"* or *"Can you show what part of the dot plot supports your idea?"*
- Make sure that everyone understands what to do. *"Does anyone have an idea how to explain what 'typical' means in this case?"* or *"What does this question mean?"*
- Call the teacher over for team questions. *"No one has an idea what 'elite' means? Should I call the teacher?"*

Representative

- Answer questions asked of the team.
- Report your team's ideas to the class.

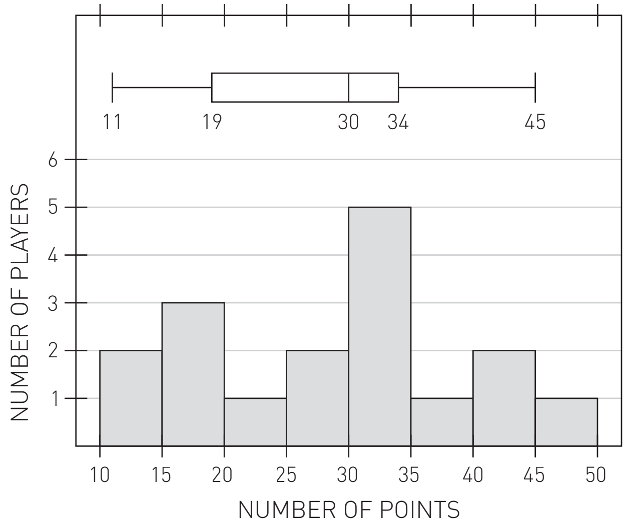
Coordinator

- Listen for statements and reasons. *"Can you explain why you think that?"* or *"Can you show that with a diagram?"*
- Help your team decide how to organize their ideas. *"What information do we need to include?"*
- Make sure that everyone understands your team's answer before you move on. *"Do we all agree that this is what 'typical' means?"* or *"I'm not sure I get it yet. Can someone explain?"*
- Make sure that each member of your team has a job and knows what they should be working on.

Representative:
Investigator:
Coordinator:
Organizer:

Closure

Analyze the histogram and box plot and be prepared to answer questions with your team about the data.



Reflection & Practice

0-30.

Mathematicians reason abstractly and quantitatively. Use mental math to place $\frac{4}{11}$, $\frac{2}{9}$ and $\frac{3}{10}$ in order from least to greatest.

0-31.

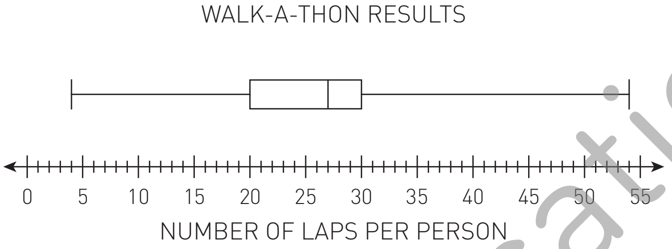
I can persevere with my team.

Describe a time when something was difficult. How did you persevere and overcome the difficulty? What are some ways you can apply that to class?

0-32.

I can informally describe the center of a data set.

Participants of an annual fundraiser raise money by walking. The more laps they complete, the more money they raise. The box plot shows the number of laps completed by the participants of the last fundraiser.



a. Padma says, *"The typical participant walked 30 laps."* Do you agree with Padma's statement? Explain.

b. Sam says a participant who walked 25 laps is typical, but a participant who walked 35 laps is not typical. Do you agree? Explain.

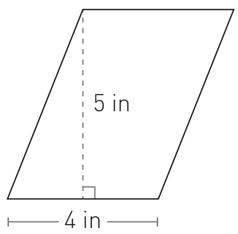
0-33. (from a previous course)

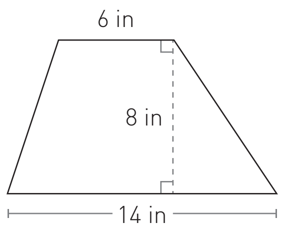
Solve each of the following equations. Show your work.

a. $3.5 + x = 7.8$

b. $q - \frac{2}{3} = \frac{3}{4}$

0-34. (from a previous course)
Calculate the area of each of the following shapes.
For additional support, refer to the Methods & Meanings box "Area of Polygons" on page 218.

a. 

b. 

0-35.
Learning new material can be stressful, and it can be exciting. What is one thing that causes you stress when learning something new? What is one thing you enjoy about learning something new?

0.1.5 Imagine It Is Possible
How can I see this happening?

Launch

Your teacher will share a doodle with you. When instructed to do so, complete the doodle independently. Be prepared to discuss your doodle with your team.

Explore

Representative:
Investigator:
Coordinator:
Organizer:

Closure

Think about the different perspectives shared during this lesson. Identify how you think different perspectives make your team stronger. Be prepared to share one idea with your team.

Reflection & Practice

0-39.

Mathematicians look for and express regularity in repeated reasoning. Tara evaluated the following differences. Her work is shown.

22 – 8	35 – 18	66 – 38
24 - 10 = 14	37 - 20 = 17	68 - 40 = 28

a. Explain Tara's method.

b. Adapt Tara's method to calculate 124 – 37.

0-40.

I can value different perspectives.

Tristan and his team were working on a problem, and they all got the same correct answer. Tristan discovered a different way to solve the problem. The team asks Tristan to explain his method so they can understand a different perspective, but Tristan says, *"The teacher said it is okay to have different methods, and we all got the same answer, so it doesn't matter."* Do you think Tristan should explain his method? Explain.

0-41.

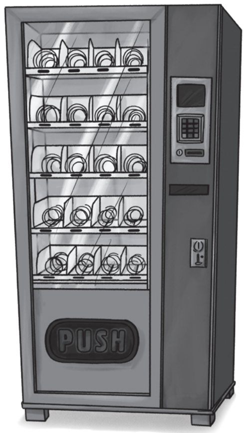
I can identify two-dimensional shapes from three-dimensional figures.

Kukulcán (see illustration) is an ancient structure located in Mexico.

a. If you were to stand on the X and look at the pyramid, what shape would represent the outline of the pyramid the best?

b. If you were in the helicopter directly over the pyramid, what shape would represent the outline of the pyramid the best?

0-42. (from a previous course)
Vending machines, like the one pictured, provide snacks and other products to consumers. Each slot (from the front to the back) will hold 12 products. Celine says you need 48 snacks to fill the machine shown. Do you agree? Explain.



0-43. (from a previous course)
Timon is calculating his earnings from his lawn care business. He mowed five yards in eight hours and earned $165 for the work on these five yards. Use this information to answer parts (a) and (b). **For additional support, refer to the Methods & Meanings box "Unit Rate" on page 219.**

a. Calculate the unit rate in terms of hours per yard.

b. Calculate the unit rate in terms of dollars per yard.

0-44. (from Lesson 0.1.3)
Consider the figures shown and complete parts (a) through (c).

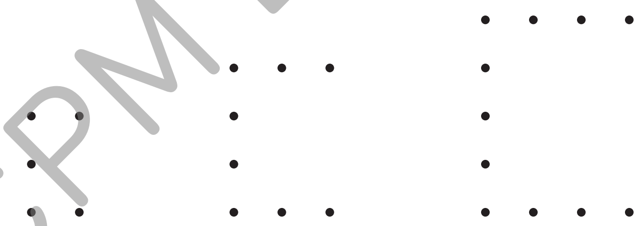


FIGURE 1 FIGURE 2 FIGURE 3

a. What pattern do you see? Describe it with words.

b. Draw Figure 4 and Figure 5.

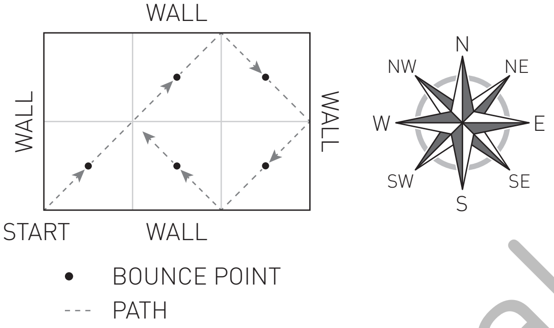
c. Without drawing each figure, explain how you can calculate the number of dots in Figure 10.

0.1.6 Boun-C-Hows
What patterns can I recognize?

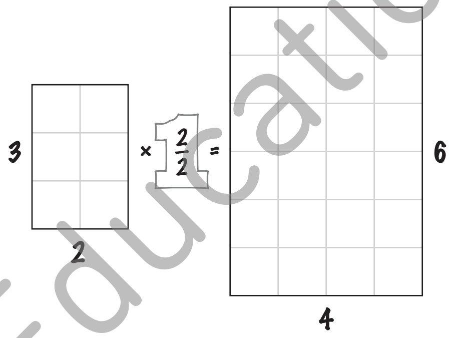
Launch Your teacher will give your team a household item. Be prepared to discuss common and creative ways you might use the object.

Explore

0-45.



0-46.



Representative:

Investigator:

Coordinator:

Organizer:

Closure

Reflect on the work you and your teammates did today.

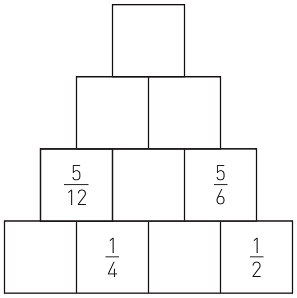
- What did you learn from incorrect predictions or ideas?
- How did being incorrect inform you about what to do next?
- Did you ever give up, or did you persevere and continue working?

Think about these questions and discuss your responses with your team. Then work with your team to explain why learning from incorrect ideas and persevering are important to developing a growth mindset.

Reflection & Practice

0-47.

Mathematicians look for and make use of structure. The number in each box of this number puzzle is the sum of the two boxes immediately beneath it. Fill in the missing numbers.



0-48.

I can identify a growth mindset.

Smita and Rao are playing the following Guess My Number game.

> *When you double a number and add four, you get 16. What is the number?*

Smita tries 3 and gets 10. *"That's too small. I'll try 5 next."*

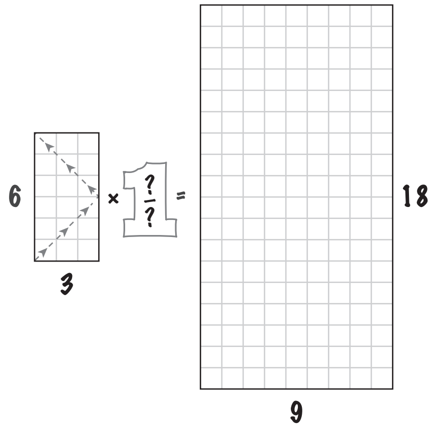
Rao tries 40 and gets 84. *"That's too big. I give up!"*

Who is exhibiting a growth mindset? Explain.

0-49.

I can use the Giant One to write equivalent ratios.

Josiah is trying to determine if a 9 × 18 trampoline room will have the same winner as a 3 × 6 trampoline room. Their work is shown.



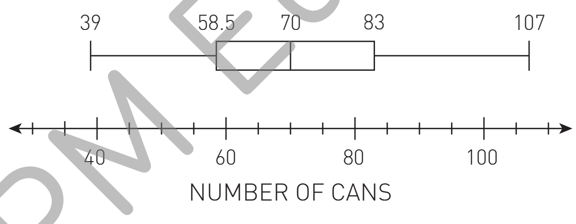
a. Can Josiah use a Giant One in this situation? If so, complete the missing numbers in the Giant One.

b. Will the 9 × 18 room have the same winner as the 3 × 6 room? How do you know?

0-50. (from Lesson 0.1.4)

Mt. Rose Middle School collected canned food to donate to a local charity. Each classroom kept track of how many cans it collected. The principal displayed the data in the box plot. **For additional support, refer to the Methods & Meanings box "Box Plots" on page 220.**

CANS COLLECTED BY CLASSROOM



a. The principal claimed that the typical classroom collected 80 cans of food. Do you agree? Explain.

b. The students in Ms. Bee's classroom collected 107 cans of food. Ms. Bee said that this amount of canned food was not typical for the school. Do you agree? Explain.

Reflection & Practice continues on page 34.

0-51. (from a Lesson 0.1.5)
What shape would you see if you looked down at this lamp from the top? Explain your reasoning.

0-52.
What games do you like to play that rely on chance or probability?

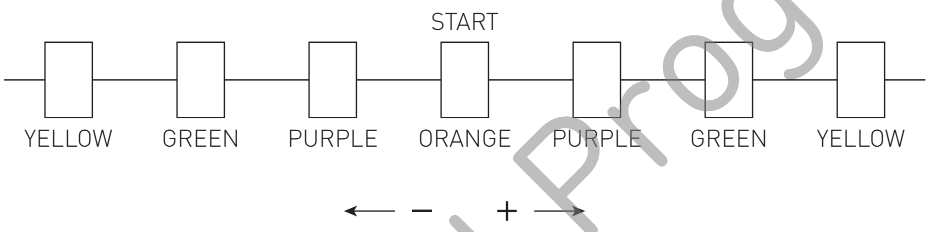
0.1.7 Color-Rama
What is the best strategy?

Launch

You have been selected for a mission to Mars and will be away for at least two years. You can take one personal item with you. What will you take? Be prepared to explain your selection to your team.

Explore

0-53.



Representative:
Investigator:
Coordinator:
Organizer:

Closure

With your team, discuss what makes a game fair. Then think about how to change the rules of Color-Rama to make it a fair game. Decide on any changes to the rules that you would recommend. Focus on communicating your ideas clearly and effectively as a team.

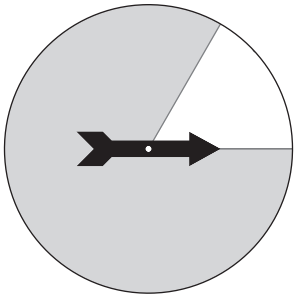
a. Play the game a few times with your new rules. Be prepared to describe the changes you made and explain your reasons for making those changes.

b. Is your new game fair? If not, could you make it fair? Work with your team to explain how you think your game is fair or why you cannot make it fair.

Reflection & Practice

0-57.

Mathematicians reason abstractly and quantitatively. Jorge spins the spinner shown. Is he more likely to land on gray or white? How do you know?



0-58.

I can communicate effectively with my teammates.

Consider the following scenarios.

a. You do not understand what a teammate is explaining. How could you respond?

b. A teammate says, *"Ahh, this is too difficult and I've tried everything. I give up."* How could you respond?

c. A teammate shares an interesting perspective that you have not considered before. How could you respond?

0-59.

I can determine if a game is fair.

Think about the following games and decide whether they are fair. Explain your reasoning.

a. Two players take turns rolling one dice. If a three is rolled, the younger player wins. Otherwise, the older player wins.

b. Two players take turns flipping a coin. Player 1 earns a point if the coin lands on heads. Player 2 earns a point if the coin lands on tails. The player with the most points after ten flips wins.

c. Think of the spinner from problem 0-57 as a dartboard. One player wearing a blindfold throws one dart at the dartboard. If the dart lands on the white section, they win.

0-60. (from a previous course)
A standard ruler is 12 inches long. This is approximately 30.48 centimeters. How many centimeters are in one inch?

0-61. (from Lesson 0.1.3)
Study the figures shown and complete parts (a) and (b).

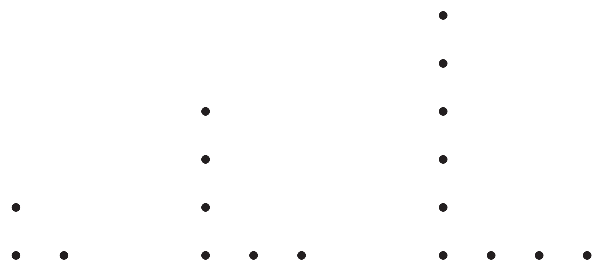


FIGURE 1 FIGURE 2 FIGURE 3

a. Draw Figures 4 and 5.

b. How many dots would be in Figure 30? Explain how you know.

0.1.8 Community Circle
How does respect look?

Launch

Answer your teacher's Door Question, then find an open spot in the circle and prepare for a class discussion. You will need a writing utensil and your Mathematician's Notebook.

Explore

0-63.

When I ______________________________ ,

people often think ______________________________ ,

but I'm just ______________________________ .

Representative:

Investigator:

Coordinator:

Organizer:

Closure

Do you agree or disagree with the following statements? Be prepared to explain why.

When someone shows me respect, it always feels good.

When I am showing someone else respect, it always feels good.

Reflection & Practice

0-64.

Mathematicians look for and express regularity in repeated reasoning. What are the next two numbers in this sequence? Explain your reasoning.

1, 1, 2, 3, 5, 8, 13, 21, ________, ________

0-65.

I can understand how my actions contribute to a respectful learning environment.

What is one way you show respect to others? Why do you think that is respectful?

0-66.

Do all people show respect the same way? Give an example.

0-67. (from Lesson 0.1.7)

List the following events from *least* likely to *most* likely.

I. The chance that you will be the Organizer tomorrow.

II. The chance that the sun will rise tomorrow.

III. The chance of randomly pulling a blue marble from a bag of 4 blue marbles and 4 red marbles.

IV. The chance that tomorrow will be Saturday if today is Tuesday.

0-68. (from Lesson 0.1.1)

Four students on a team worked on different problems. Review their work and complete parts (a) and (b).

SAMANTHA

$$\frac{9}{10} - \frac{11}{15} = \frac{27}{30} - \frac{22}{30} = \frac{5}{30}$$

KRIS

$$5\frac{2}{3} \times \frac{3}{4} = \frac{17}{3} \times \frac{3}{4} = \frac{51}{12}$$

JUAN

$$\left(\frac{2}{3}\right)\left(\frac{7}{9}\right) = \frac{14}{27}$$

XU

$$\frac{5}{8} + \frac{7}{12} = \frac{15}{24} + \frac{14}{24} = \frac{29}{24}$$

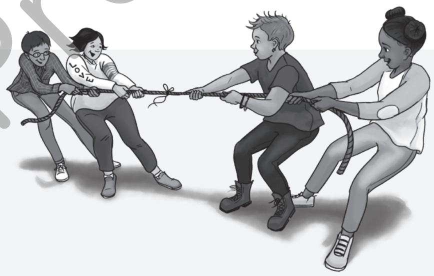
a. What do all four problems have in common?

b. Pick at least two problems and identify what they have in common.

0-69.

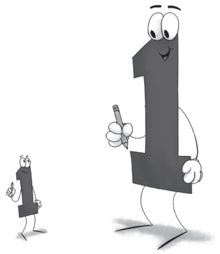
Throughout this chapter, you engaged in math tasks and worked with your team to develop productive team habits. Reflect on your work in this chapter and identify your favorite activities. Explain why you consider them your favorites.

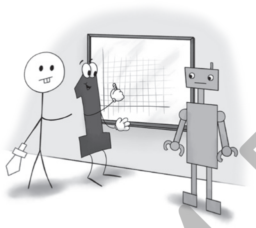
Chapter 1



You are now ready to begin your exciting journey as you dive deeper into the world of mathematics in *Inspiring Connections Course 2!* Some of the concepts may be new and even a little challenging. However, you are not expected to reach perfection and you will not be alone! In this course, you will have the opportunity to use rough draft thinking, team collaboration, class discussions, and teacher guidance. All of these will make the journey that much more exciting and help you deepen your understanding of the beauty in the mathematics you will encounter.

Chapter 1 Table of Contents





Chapter 1 Learning Targets

The following clusters will be highlighted in this chapter.

RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.

EE.B Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

NS.A Apply and extend previous understandings of operations with fractions.

SP.C Investigate chance processes and develop, use, and evaluate probability models.

Lesson	Learning Target	N—Not yet, W—Working on it, Y—Yes, I can! Include comments or a plan for improvement.
1.1.1	I can determine the size of a scaled object. (RP.A)	
1.1.2	I can analyze a proportional relationship to make a prediction. (RP.A)	
1.1.3	I can use a unit rate to make a prediction. (RP.A, EE.B)	
1.1.4	I can reason proportionally. (RP.A)	
1.1.5	I can determine if two ratios form a proportion. (RP.A)	
1.1.6	I can solve proportions by reasoning about the quantities. (EE.B)	
1.2.1	I can describe the result of removing negative values or adding positive values. (NS.A)	
1.2.2	I can use integer tiles to add and subtract positive and negative integers. (NS.A)	
1.2.3	I can explain why subtracting a negative is the same as adding. (NS.A)	
1.2.4	I can multiply integers using hot and cold cubes. (NS.A)	
1.2.5	I can divide integers. (NS.A)	
1.2.6	I can solve problems with integers using the four operations. (NS.A)	
1.2.7	I can determine a number given clues or by using an expression or equation. (EE.B)	
1.3.1	I can interpret points on proportional graphs in terms of the situation. (RP.A)	
1.3.2	I can make connections between scaling, proportions, integer operations, and graphing. (RP.A)	

1.1.1 Giant Pencils
How can I determine the length?

Launch

Take a pencil out of your backpack. Do a Dyad with a teammate to describe how to distinguish your pencil from theirs.

Explore

Closure If a giant were 50 ft tall, how long would their pencil be? Work with your team to devise a strategy to answer this question as accurately as possible. Be prepared to justify your strategy and solution.

Reflection & Practice

1-4.

Mathematicians look for and make use of structure. The model for a new building is 14 inches tall. The ratio (in inches)of the model to the actual building is 1:24. Use mental math to determine the height of the actual building.

1-5.

I can determine the size of a scaled object.

Estimate the length of the pencil in the picture. Explain your reasoning.

1-6.

Jack is 6 ft 2 in tall, and his shoe is 12.5 in long. Charley is 5 ft 6 in tall. How long do you think Charley's shoe is? Explain.

1-7. (from a previous course)

Write three equivalent ratios to represent 28%.

1-8. (from Lesson 0.1.3)
Study the figures shown and complete parts (a) through (d).

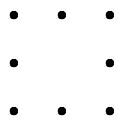


FIGURE 1

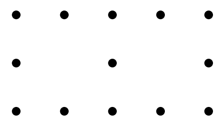


FIGURE 2

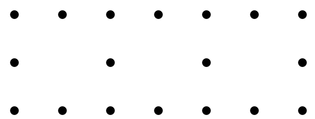


FIGURE 3

a. Draw Figures 4 and 5.

b. How are the figures growing from figure to figure? Describe the growth in more than one way.

c. How many dots would be in Figure 10? How do you know?

d. How many dots would be in Figure 30? Describe the figure without drawing it.

1-9.
List three things you know about equivalent ratios.

1.1.2 Penny Tower
How big is a million?

Launch

Prepare your team to reason abstractly and quantitatively about the clues your teacher provides.

Explore

Closure

The relationship between the number of pennies in a stack and the height of that stack is an example of a **proportional relationship**. The Giant Pencil lesson is another example of a proportional relationship. What do you think *proportional relationship* means? Describe at least two ways the Penny Tower and Giant Pencil lessons have similar math.

Reflection & Practice

1-14.

Mathematicians reason abstractly and quantitatively. Estimate how many pennies are in the arrangement shown in this picture.

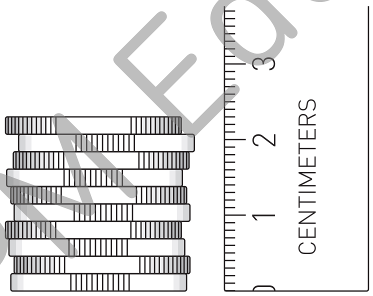
1-15.

I can analyze a proportional relationship to make a prediction.

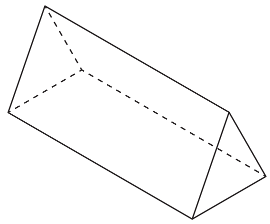
Adrian wrote 1.5(1,000,000) = 1,500,000 mm when calculating the height of one million pennies. How many pennies would be in a 2,295,000 mm penny tower?

1-16.

The image shows a stack of Euros (a kind of coin used in Europe). How tall is a stack of 1 million Euros?

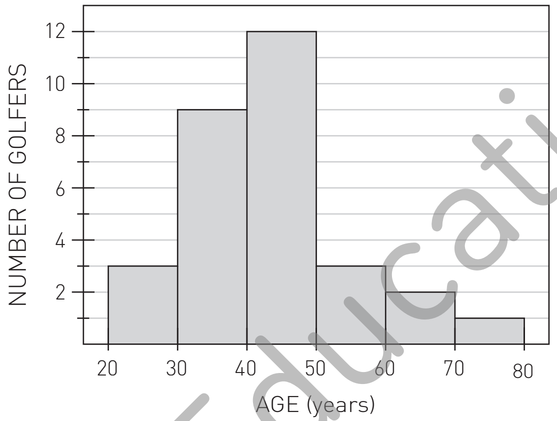


1-17. (from Lesson 0.1.5)
Jameson and LaRue are discussing different three-dimensional objects. They disagree on the name of the object shown. Jameson insists that it is a triangular prism, but LaRue is not convinced. LaRue says, *"The base is a rectangle! It has to be a rectangular prism."*



Help them decide who is correct. Be sure to justify your reasoning.

1-18. (from Lesson 0.1.4)
The ages of golfers participating in a golf tournament are shown in the histogram.



How old is a typical golfer in this tournament? Explain.
For additional support, refer to the Methods & Meanings box "Histograms" on page 221.

1-19. (from Lesson 0.1.1)
Choose two of the following expressions and explain what they have in common.

Expression A: $4 \times \frac{5}{8}$

Expression B: $6\frac{3}{4} - 4\frac{2}{3}$

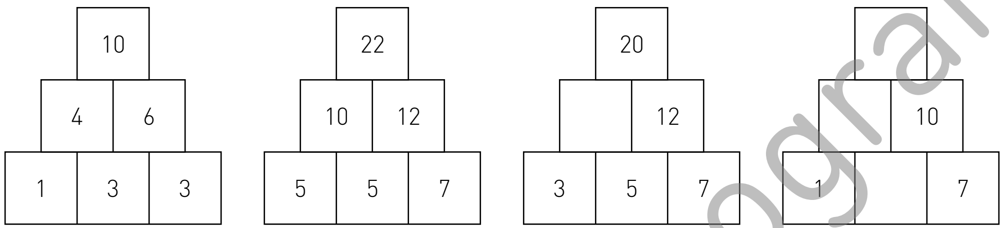
Expression C: $\frac{11}{12} + \frac{11}{12} + \frac{11}{12} + \frac{11}{12}$

Expression D: $2\frac{3}{5} \times 7\frac{2}{3}$

1.1.3 Hot Diggity Dog!
How can I predict the outcome?

Launch

Mathematicians look for and make use of structure. Look for a pattern in the structure of the first two number puzzles. Use the same pattern to complete the missing numbers in the third and fourth number puzzles.



Explore

1-20.

I know _____ is too low.

I know _____ is too high.

_____ is my team's best estimate.

Closure

Throughout this course, you will be asked to set math learning goals and evaluate your progress. You will write your goals and reflect on your progress in your Mathematician's Notebook.

The Goal Journal titled "Lesson 1.1.3: Goal Journal 1" is located on the following page. Read the prompt and write a response.

Goal Journal

Lesson 1.1.3: Goal Journal 1

Research shows that stress inhibits memory retrieval and updating memories with new learning (Vogel, S., Schwabe, L., 2016).

Use the following questions and sentence frame to help form a stress-management goal.

- What is one thing you can do to reduce stress when you have too much to do?
- Who could you talk to when you are stressed?

By the end of Chapter 1, I will ______ by ______.

Lesson 1.1.3: Goal Journal 1 (vol 1, p 58)
Lesson 2.2.2: Goal Journal 2 (vol 1, p 154)

Reflection & Practice

1-26.

Mathematicians reason abstractly and quantitatively. If a group of people eat 100 hot dogs in 12 minutes, approximately how many hot dogs are eaten each minute? Explain your reasoning.

1-27.

I can use a unit rate to make a prediction.

A big store sells hot dogs in its food court and has not raised the price of its hot dogs since opening in 1984. The price has remained constant at $1.50 per hot dog.

a. How much would six hot dogs cost you and your friends?

b. If a store collected $682.50 for one day of hot dog sales, how many hot dogs did they sell? How do you know?

1-28.

Mark and Krista had a typing race. Mark typed 25 letters on his keyboard in 10 seconds, and Krista typed 30 letters in 15 seconds.

a. Who typed faster?

b. How long will it take each person to type 40 letters?

c. If they typed for 1 minute, how many letters would each person type?

1-29. (from Lesson 1.1.1)

Hall of Fame baseball player Babe Ruth stood 6 ft 2 in tall. He used one of the largest bats in major league baseball at $35\frac{3}{4}$ in long.

A statue of his bat stands outside the Louisville Slugger baseball bat factory in Louisville, Kentucky. The statue is 120 ft tall. How tall should the statue of Babe Ruth be so it will maintain its proportionality with the bat?

Reflection & Practice continues on page 60.

1-30. (from a previous course)
Jahna measured the heights of the sunflowers growing in her backyard. The heights (in inches) are: 34, 48, 52, 61, 76, 76, 61, 84, 61, 39, 83, 61, 79, 81, 56, and 88.

a. Calculate the mean and median of the heights. **For additional support, refer to the Methods & Meanings box "Measures of Central Tendency" on page 222.**

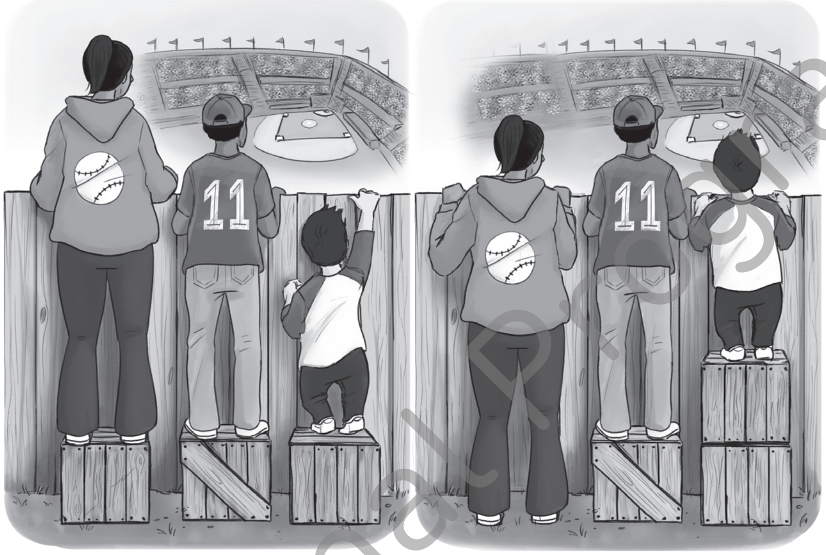
b. Create a histogram to represent this data. Your histogram should have four bins, each with a width of 15.

1-31. (from Lesson 0.1.7)
Mikale invited you to play a game with a six-sided dice labeled with the numbers 1 through 6. He explained the rules, *"You win if you roll an even number. I win if I roll an odd number."* Is this a fair game? Why or why not?

1.1.4 Fair Fare Car Share
What is your fair share?

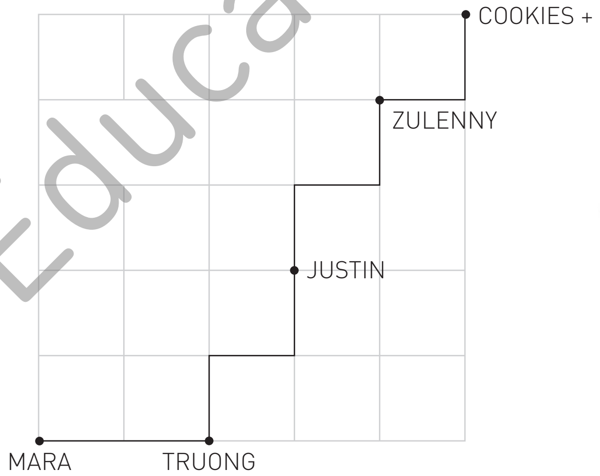
Launch

Discuss with your team how each image could represent fairness.



Explore

1-32.



Closure The Reflection Journal titled "Lesson 1.1.4: Revising My Thinking" is located on the following page. Read the prompt and write a response.

Reflection Journal

Lesson 1.1.4: Revising My Thinking

In this lesson, you engaged in *rough draft talk* and revised or improved your thinking with the help of your classmates. Complete the following sentences as you reflect on the lesson and your team's collaboration throughout the lesson.

- At first, I thought _____ about the problem.
- As a team, we tried _____.
- I revised my thinking when _____.
- The class discussion helped me realize _____.
- We checked our work by _____.

Reflection & Practice

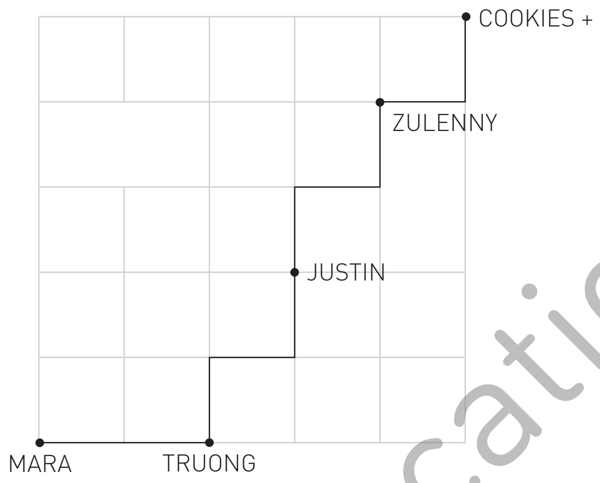
1-34.

Mathematicians reason abstractly and quantitatively. At a doggy party, five short-haired dogs equally shared three bowls of water, and six long-haired dogs equally shared two bowls of water. The bowls were the same size and were empty when the dogs were done. Who drank more water, a short-haired or a long-haired dog? How do you know?

1-35.

I can reason proportionally.

Mara, Truong, Justin, and Zulenny debated ways to pay for their trip home.



Justin proposes a way to split the costs of the ride home. He says, *"Everyone should pay their fair portion, but no one should pay for a ride they can piggyback. Zulenny got a car home for $3, and I can piggyback by riding with her to her house. Then from her house, I could get a car to my house. Since I live three blocks from Zulenny, my ride would cost $4.50."*

Why does Justin say his ride from Zulenny's house to his house will cost $4.50?

Reflection & Practice continues on page 66.

1-36.

On another outing, the four friends combined their money and bought 24 specialty ice cream sandwiches. The amount each friend contributed to the purchase and the number of sandwiches they took from the pack is shown in the table. Did they all pay the same amount per sandwich? If yes, show how you know. If not, who paid the most per sandwich?

Person	Number of Sandwiches Taken	Money Paid ($)
Zulenny	4	3
Justin	7	5.25
Truong	8	6
Mara	5	3.75

1-37. (from Lesson 0.1.2)

Four friends are playing Four 4s.

a. Dave says $\frac{4 \times 4 \times 4}{4}$ is equivalent to $\frac{4}{4} \times \frac{4}{4} \times \frac{4}{4}$, which equals 1. Cat says $\frac{4 \times 4 \times 4}{4}$ is equivalent to $\frac{64}{4}$, which equals 16. Who do you agree with? Why?

b. Stephanie says $4 - 4 - 4 + 4 = 0$. Show or explain why they are correct.

1-38. (from Lesson 1.1.3)

For the Science Fair, Kadisha is growing plants under different soil conditions. She is recording her observations from one plant as part of her project. Her data is shown in the table.

Week	Height (in)
0	0
8	6
12	9
18	13.5
22	16.5
32	24

Based on this data, predict the height of the plant after one year (52 weeks).

1-39. (from a previous course)
The daily high temperatures in degrees Fahrenheit for the last two weeks in Grand Forks, North Dakota were 7, 1, −3, 0, 4, −1, 2, 5, 7, 7, 3, −2, −4, and −5.

a. Calculate the median temperature.

b. What are the first and third quartiles (Q1 and Q3)? **For additional support, refer to the Methods & Meanings box "Quartiles and Interquartile Range (IQR)" on page 223.**

c. What is the interquartile range (IQR)?

1.1.5 Cooking Ratios
How can I prove two ratios form a proportion?

Launch

Mathematicians look for and make use of structure. Your teacher will display a numerical expression for a *Number Talk*. Think silently about how you might use the structure of the numerical expression to determine the expression's value. Extend one finger close to your chest when you have an answer with a justification.

Number Talks help build number sense and encourage working flexibly with numbers. Keep an open mind during *Number Talks*, and do not be afraid to try different strategies and make mistakes. Taking risks can help you develop a growth mindset, which can be empowering in your mathematical journey.

Explore

1-40.

Food	Common Ratio
Rice	1 part rice to 2 parts water
Cookies	2 parts sugar to 3 parts flour
Biscuits	5 parts flour to 3 parts water

1-42.

RICKY MADE RICE

$$\frac{1\text{ c rice}}{2\text{ c water}} \cdot \frac{5}{5} = \frac{5\text{ c rice}}{10\text{ c water}}$$

CHUI MADE COOKIES

$$\frac{2\text{ c sugar} \overset{+1}{}}{3\text{ c flour} \underset{+1}{}} = \frac{3\text{ c sugar}}{4\text{ c flour}}$$

BERTA MADE BISCUITS

$$\times 1\tfrac{2}{3}\ \frac{5\text{ c flour}}{3\text{ c water}} = \frac{7.5\text{ c flour}}{4.5\text{ c water}}\ \times 1\tfrac{2}{3}$$

Closure Your teacher will give you an Exit Ticket to complete as part of the Closure.

Reflection & Practice

1-43.

Mathematicians look for and express regularity in repeated reasoning. Fill in the boxes to create equivalent ratios. **For additional support, refer to the Methods & Meanings box "Equivalent Ratios" on page 224.**

$$\frac{\square}{10} = \frac{9}{\square} = \frac{\square}{30} = \frac{\square}{\square}$$

1-44.

I can determine if two ratios form a proportion.

Do these ratios form a proportion? Justify your conclusion.

a. $\frac{1}{3} = \frac{7}{21}$

b. $\frac{6}{12} = \frac{7}{13}$

c. $\frac{12\frac{2}{5}}{7} = \frac{10}{4}$

1-45.

Lyn wants to bake a large batch of cookies using a 2 parts sugar to 3 parts flour ratio. She jots down some calculations to determine how much flour and sugar she will need. It does not take long before she realizes she made a mistake. Explain Lyn's mistake.

$$\frac{\text{2 cups of sugar}}{\text{3 cups of flour}} \cdot \frac{4}{4} = \frac{\text{6 cups of sugar}}{\text{7 cups of flour}}$$

1-46. (from Lesson 1.1.3)

A robotic machine that wraps candy for the Moonburst Candy Company can wrap an astonishing 434.5 candies in 5.5 minutes.

a. Calculate the unit rate of candies per minute.

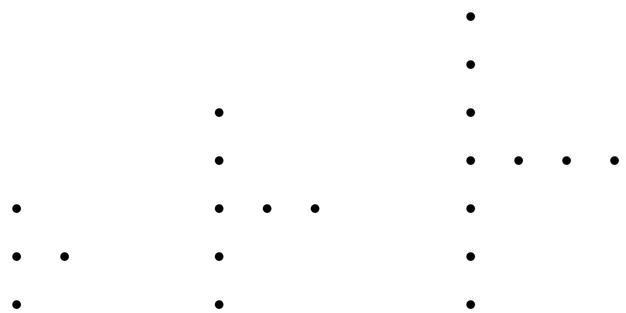
b. How many candies would be wrapped from 8:00 a.m. to 12:00 noon?

1-47. (from a previous course)
Solve each of the following equations. Show your work.

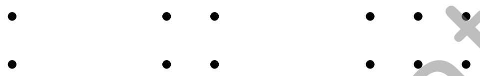
a. $x - 13 = 49$

b. $4m = 68$

1-48. (from Lesson 0.1.3)
Study the figures in parts (a) and (b). Sketch Figures 4 and 5, then predict how many dots will be in Figure 100.



a. FIGURE 1 FIGURE 2 FIGURE 3



b. FIGURE 1 FIGURE 2 FIGURE 3

Puzzling Proportions

1.1.6 What is the relationship between the numbers?

Launch

Your teacher will display word analogies. You will need to fill in the blanks with words that you think complete each analogy.

Explore

Closure

With an elbow partner, use Reciprocal Teaching to explain how you would estimate the value of the variable and how you would solve the proportion. You do not need to solve the proportion; just explain your estimation and solving strategies.

Partner A

$$\frac{7.6}{8} = \frac{x}{12}$$

Partner B

$$\frac{15}{y} = \frac{2.8}{0.7}$$

Reflection & Practice

1-51.

Mathematicians look for and make use of structure. Based on the ratio $\frac{48}{20}$, what is a reasonable estimate for the value of x?

$$\frac{48}{20} = \frac{x}{7}$$

1-52.

I can solve proportions by reasoning about the quantities.

Complete Stephan's work to determine how much flour he needs to make biscuits and cookies.

a. **Biscuits:** $\frac{\text{3 cups of flour}}{\text{1 cup of fat}} = \frac{x}{1\frac{1}{3}\text{ cups of fat}}$

b. **Cookies:** $\frac{\text{2 cups of fat}}{\text{3 cups of flour}} = \frac{\text{3 cups of fat}}{y}$

1-53.

Jazmine solved the proportion shown. Did they get the correct answer? If it is correct, explain how you know. If it is incorrect, explain what they might have done wrong and how to solve it correctly.

$$\frac{25}{80} = \frac{15}{x}$$

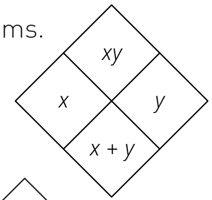
$$\frac{25}{80} \cdot \boxed{\frac{\frac{3}{5}}{\frac{3}{5}}} = \frac{15}{48} \qquad x = 48$$

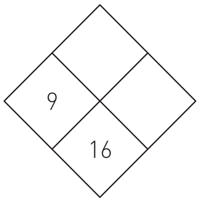
1-54. (from Lesson 0.1.5)

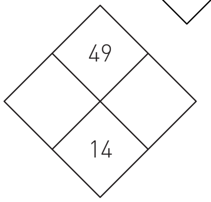
Imagine cutting a three-dimensional object into two parts, and the cut side is circular. List five objects that would fit this description.

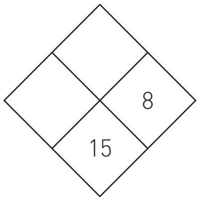
1-55.

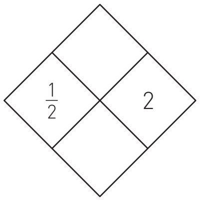
Complete the following Diamond Problems. The pattern used in the Diamond Problems is shown.



a.


c.


b.


d.


1-56.

Which do you prefer to work with, decimals or fractions? Does it depend on the type of problem? Explain your choice.

1.2.1 Keep Cool
How can I change temperatures?

Launch

Mathematicians look for and express regularity in repeated reasoning. What do you notice in the equations shown? What do you wonder?

$3 + 2 = 5$	$3 - 3 = 0$
$3 + 1 = 4$	$3 - 2 = 1$
$3 + 0 = 3$	$3 - 1 = 2$
$3 + (-1) = 2$	$3 - 0 = 3$
$3 + (-2) = 1$	$3 - (-1) = 4$
$3 + (-3) = 0$	$3 - (-2) = 5$

Explore

1-57.

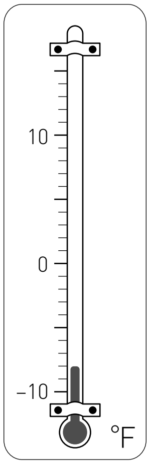
Closure

Regina noticed that adding a hot cube or taking away a cold cube had the same effect on the temperature of Marcellus's drink. In your own words, explain why removing a cold cube has the same effect as adding a hot cube to Marcellus's drink.

Reflection & Practice

1-62.

How close is the current temperature where you live to the temperature shown on the thermometer? If this thermometer represents the current temperature somewhere else in the world, where might it be?



1-63.

I can describe the result of removing negative values or adding positive values.

Tonia remembered that her 6th grade teacher never used the word "negative" and avoided negative phrases. Instead, he would say, *"The opposite of _____."* For example, instead of saying that a comment was hurtful, he would say it was, *"the opposite of supportive."* This extended to mathematics. When he saw -4 in a problem, he would say, *"the opposite of four."* If he saw $- -4$, he would say, *"the opposite of the opposite of four."*

a. Thinking about this as Tonia's teacher would, do you think, *"the opposite of the opposite of four,"* should be positive or negative? Explain your reasoning.

b. How would he say $- - -4$?

c. Is the value in part (b) positive or negative?

1-64.

Vanessa says you can raise the temperature of Marcellus's drink by 4 degrees in at least two different ways: you can add four hot cubes or take out four cold cubes.

a. How can Vanessa lower the temperature by 6 degrees?

b. What is one combination of hot and cold cubes that would lower the temperature by 6 degrees?

1-65. (from a previous course)
Sam has $2\frac{3}{4}$ yards of fabric. He is working on a project that requires several $\frac{5}{8}$-yard pieces of fabric. How many $\frac{5}{8}$-yard pieces can he cut from the fabric he has?

1-66. (from Lesson 1.1.2)
Ghana produced special gold coins to commemorate its declaration as a republic when it declared its freedom from British rule. These are coins that specialty stores package to send to collectors for a fee. Their thickness is shown in the table.

Number of Coins	Thickness (cm)
1	0.22
5	1.1
8	1.76
14	3.08
25	5.5
30	6.6
42	9.24

Where is the unit rate shown in the table? How do you know?

Reflection & Practice continues on page 80.

1-67. (from Lesson 1.1.6)
James lives in Columbus, OH and wants to know how far he is from Indianapolis, IN. On his map, the two cities are $1\frac{3}{4}$ inches apart. At the bottom of the map, he sees the scale shown.

1 inch

100 miles

James writes the proportion $\frac{0.25 \text{ inch}}{25 \text{ miles}} = \frac{1.75 \text{ inches}}{x \text{ miles}}$ to calculate the distance from Columbus to Indianapolis.

His sister disagrees and says the proportion should be $\frac{1 \text{ inch}}{100 \text{ miles}} = \frac{1.75 \text{ inches}}{x \text{ miles}}$.

Who do you agree with? Explain.

1.2.2 Recording Marcellus's Modifications
How can I show my thinking?

Launch

Several Launch activities in this course will focus on data literacy. For these Launch activities, a graph or an *infographic* (informational graphic) will be displayed and your teacher will lead you through a Talk-Write-Discuss. Use an electronic device to access the infographic.

Explore

1-73.

a. $8 + 3 =$

b. $8 + -3 =$

c. $8 - 3 =$

d. $8 - +3 =$

e. $-8 + 3 =$

f. $3 + 8 =$

g. $3 + -8 =$

h. $3 - 8 =$

i. $3 - +8 =$

j. $-3 + 8 =$

Closure

Gina was working on the previous problems when she had a new idea. *"Look,"* she boasted, *"I can use these ideas to add large numbers quickly without even picking up a pencil."* She wrote down each of the following expressions and calculated each answer in less than 5 seconds. Talk with your team about how she could have done this.

a. $583.6 + 212.72 + (-583.6)$

b. $313\frac{6}{11} + (-300)$

c. $212 + (-150.75)$

Reflection & Practice

1-74.

What does x equal in the equation $x + 6 = 0$?

1-75.

I can use integer tiles to add and subtract positive and negative integers.

Complete the table.

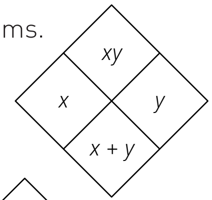
Equation	What happened with cold and hot cubes?	Integer Tile diagram
$2 + (-4) =$		
$6 + (-4) =$		
$6 - (-4) =$		
$-7 + (-2) =$		
$-7 - (-2) =$		

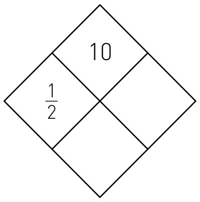
1-76. (from Lesson 1.1.3)

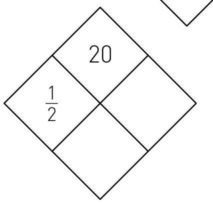
Ben has an idea for a game show called Dollar Drive. He will ask his passengers in his rideshare car basic math questions as they travel to their destination. Ben rewards his passengers \$10 for each correct answer along the way with no penalty for incorrect answers. Write an equation to represent how much money someone could make, m, after answering q questions correctly.

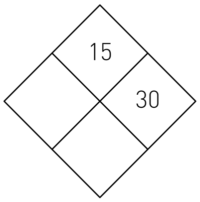
1-77.

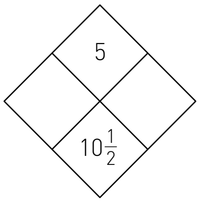
Complete the following Diamond Problems. The pattern used in the Diamond Problems is shown.



a.


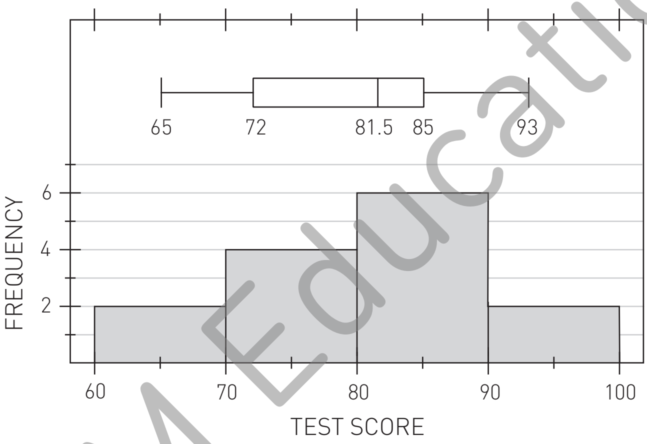
c.


b.


d.


1-78. (from Lesson 0.1.4)

Ms. Finley created a combination histogram and box plot to display her students' test scores. Based on the graph, what are two conclusions you can make about the test scores?



1.2.3 Adding Nothing
How can adding zero help?

Launch

Mathematicians model with mathematics. Your teacher will assign the class an integer to model with integer tiles. Model this number in a way that is different from your teammates' models.

Explore

Closure

Discuss the following questions with your team.

a. What is the result when you subtract a negative number?

b. How does adding zero(s) with integer tiles help you subtract a negative number? You can use the expression 3 – (–4) to explain your thinking.

Reflection & Practice

1-83.

Mathematicians reason abstractly and quantitatively. Which statement about the temperatures −6 °C and 7 °C is true?

A. 7 °C is 1 °C hotter than −6 °C.

B. 7 °C is 1 °C colder than −6 °C.

C. 7 °C is 13 °C hotter than −6 °C.

D. 7 °C is 13 °C colder than −6 °C.

1-84.

I can explain why subtracting a negative is the same as adding.

Determine the resulting temperature in °M. Check your work by modeling each with integer tiles.

a. $7 + -2 =$

b. $7 - 2 =$

c. $7 - -2 =$

d. $7 - +2 =$

e. $-7 + 2 =$

1-85. (from Lesson 1.1.5)

Nola is preparing to make her favorite gumbo recipe. To start, she gets out her vegetable oil and flour. She will need $8\frac{3}{4}$ cups of flour and 5 cups of vegetable oil to make her base (called a roux). She is making a big pot for a family gathering, so this is four times the original recipe.

a. What is the ratio of flour to oil in the original recipe?

b. If she decides to make six times the original recipe, show two ways that she can calculate the amount of each ingredient.

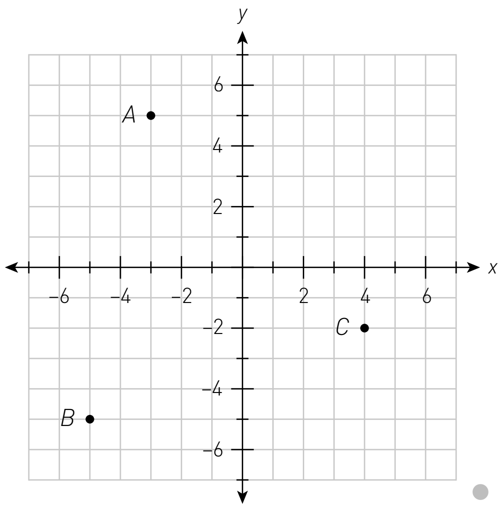
1-86. (from a previous course)

Use the graph to complete the following parts.

a. The coordinates (the *x*- and *y*-values) for point *A* are (–3, 5). Explain how these numbers tell you the position of point *A* using the graph.

b. Name the coordinates (*x*, *y*) for points *B* and *C*.

c. If Samantha moved point *A* down 9 units and right 6 units, at what point would she end up?



1-87.

One important aspect of mathematics is to create viable arguments and critique the reasoning of others. What are your initial reactions to critique? Write about a time when someone else's critique or suggestions helped you to improve.

1.2.4 Grouping Cubes
How can I multiply integers?

Launch

Mathematicians construct viable arguments and critique the reasoning of others. Your teacher will display an image for a *Which One Is Unique?* activity. Be prepared to construct an argument for which one you believe is unique.

A *Which One Is Unique?* activity is a type of Math Chat. Math Chats have a routine in which you think silently and then extend one finger close to your chest when you have a response and justification. Extend additional fingers for multiple responses.

Explore

1-88.

1-90.

a. Adding two groups of six cold cubes [lowers/raises] the temperature by _____ °M. The equation is 2(_____) = –12.

b. Removing four groups of 7 hot cubes [lowers/raises] the temperature by _____ °M. The equation is _____.

c. Removing five groups of three cold cubes [lowers/raises] the temperature by _____ °M. The equation is _____.

d. Removing one group of six cold cubes [lowers/raises] the temperature by _____ °M. The equation is _____.

Closure Use your understanding of grouping cubes to explain why $(-1)(-1) = 1$.

Reflection & Practice

1-92.

Tonia's teacher read −4(−5) as, *"The opposite of four groups of the opposite of five."* Does this help you see why the product must be +20? Why?

1-93.

I can multiply integers using hot and cold cubes.

You found a new way to group the hot and cold cubes. You discovered that you can group both hot and cold cubes in groups of three or four and also use individual cubes.

a. With this setup, how can you raise the temperature by 6 °M?

b. Imagine that you started at a temperature of −2 °M and raised the temperature by 6 °M. What is the new temperature?

c. Imagine you started at −2 °M and raised the temperature *to* 6 °M. How many degrees did you raise the temperature by?

d. Using the grouping system described, how could you raise the temperature from −2 °M to 6 °M?

1-94. (from Lesson 1.2.2)

Complete the table to calculate the following sums.
For additional support, refer to the Methods & Meanings boxes "Integer Addition and Subtraction" on pages 225 and 226.

Sum	Integer Tile Diagram	Result
3 + (−4)		
−5 + 5		
−5 + (−3)		
−4 + (−4)		

1-95. (from Lesson 1.1.5)
When filling her bird feeder, Sonja noticed that she paid $27 for 4 pounds of birdseed. *"Next time, I'm going to buy 8 pounds instead so I can make it through the spring. That should cost $54."*

a. Does Sonja's assumption that doubling the amount of birdseed would double the price make sense? Why or why not?

b. To check her assumption, she found a receipt for 1 pound of birdseed. She started the table shown. Complete her table.

Weight (pounds)	Cost ($)
0	
1	6.75
2	
3	
4	27
5	
6	
7	
8	

1-96. (from a previous course)
Fill in the missing parts of the table.

Distance Driven (miles)	Fuel Used (gallons)
	1
72	3
96	
	9
384	

Reflection & Practice continues on page 94.

1-97. (from Lesson 0.1.3)
Design a sequence of figures made of dots that follow a pattern.

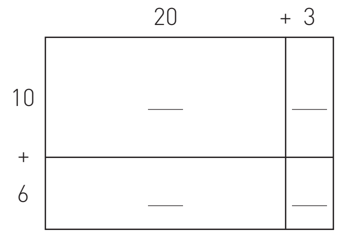
a. Draw the first three figures using your pattern.

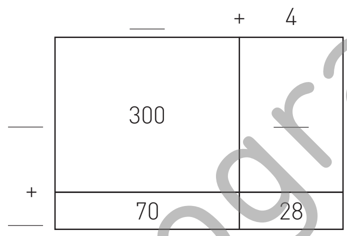
b. How many dots are in Figure 30? Explain how you know.

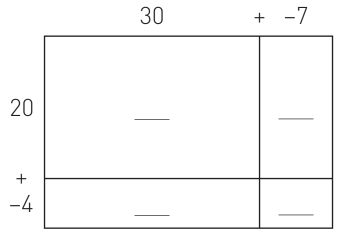
1.2.5 Understanding Division
How can I divide integers?

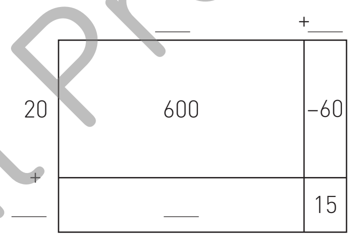
Launch

Work with your team to complete the following generic rectangles and answer the questions.

a.


c.


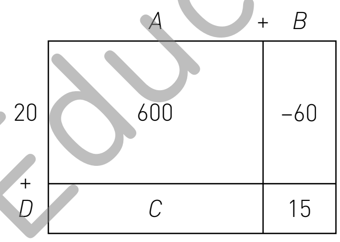
b.


d.


e. How did you determine the missing values in parts (c) and (d)?

Explore

1-99.



Closure

You likely know that $3(-5) = -15$ and $-3(-5) = 15$, but what about division? What can you say about $\frac{-15}{3}$ or $\frac{-15}{-5}$? What can you say about these more general statements?

$\frac{\text{negative number}}{\text{positive number}}$ $\frac{\text{positive number}}{\text{negative number}}$ $\frac{\text{negative number}}{\text{negative number}}$ $\frac{\text{positive number}}{\text{positive number}}$

Reflection & Practice

1-102.

Tonia's 6th grade math teacher was relentlessly optimistic. He never uttered a negative thing, and he even refused to say the word "negative." A rude comment was never negative; it was *"the opposite of supportive."* This optimism transferred over to his mathematics. Whenever he saw a "–" sign, he would say, *"the opposite of."* So, when he saw –5, he said, *"the opposite of 5."* When there were two "–" signs in a row, like in –(–5), he would say, *"the opposite of the opposite of 5."*

a. What would he say for – – –(–5)?

b. In terms of Marcellus's hot and cold cubes, is the temperature from part (a) hot or cold? Explain how you know.

1-103.

I can divide integers.

What number belongs in each box? Show or explain your work for each.

a. $-20 \div -4 = \square$

b. $-20 \div \square = -4$

c. $-20 \div \square = 4$

1-104. (from Lesson 1.2.4)

Determine the missing values.

a. $-4 \cdot 5 = \square$

b. $-4 \cdot \square = 20$

c. $4 \cdot \square = 20$

1-105. (from Lesson 1.1.6)

Solve for the unknown value in each proportion.

a. $\frac{x}{12} = \frac{20}{30}$

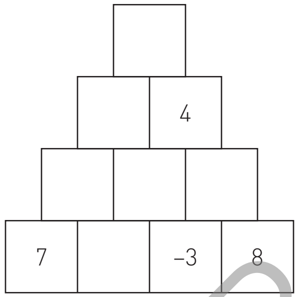
b. $\frac{13}{40} = \frac{m}{100}$

1-106. (from Lesson 1.2.3)
Use the idea of hot and cold cubes to explain why $-5 - (-5)$ is the same as $-5 + +5$. **For additional support, refer to the Methods & Meanings box "Connecting Integer Addition and Subtraction" on page 227.**

1.2.6 Tug-O-War
How can I compose numbers?

Launch

Mathematicians look for and make use of structure. The number in each box of this number puzzle is the sum of the two boxes immediately beneath it. Fill in the missing numbers.



Explore

1-107.

1-109.

Player	Start	Spinner 1	Spinner 2	Equation	Move
Player 1	0	−2	1	−2 − 1 = −3	0 + −3 = −3
Player 2	−3	−3	−5		= −11
Player 1		−2	−2		
Player 2	−10				= −13

Closure The Reflection Journal titled "Lesson 1.2.6: Growth Mindset" is located on the following page. Read the prompt and write a response.

Reflection Journal

Lesson 1.2.6: Growth Mindset

Thomas Edison said, "Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time." Take time to reflect and write about how you respond to challenges. Use the following sentence frames to form your thoughts.

- I give up when ______.
- I try one more time when ______.
- If I am not successful on my first attempt, I ______.

Reflection & Practice

1-111.

Write an equation that uses the number –6 and has a negative solution.

1-112.

I can solve problems with integers using the four operations.

Juan and Maria were playing tug-o-war, but they only filled in some of the details. Fill in the missing details.

Player	Start	Spinner 1	Spinner 2	Equation	Move
Juan	0	–2	–5	–2(–5) = 10	0 +10 = 10
Maria	10	–3	–3	–3(–3) = 9	
Juan		–2	3		
Maria	14				= 9

1-113.

Maria wrote her notes for each row vertically. For example, this is how she recorded her work for row 2.

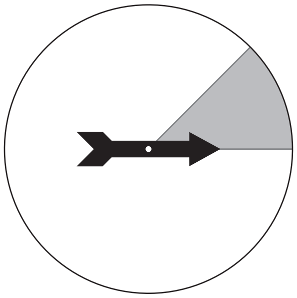
$$10 + (-3)(-3)$$
$$= 10 + 9$$
$$= 19$$

a. How would Maria write her work for row 3?

b. Why might it be helpful to write out your work vertically like Maria does when evaluating an expression?

Reflection & Practice continues on page 104.

1-114. (from Lesson 0.1.7)
Use the spinner shown to complete parts (a) and (b).

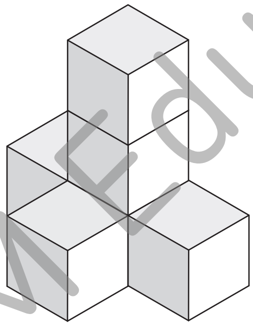


a. If you spin this spinner, is it more likely to land on gray or white? Explain.

b. Meredith and Carmen are playing a game with this spinner. Meredith wins if it lands on white, and Carmen wins if it lands on gray. Carmen says, *"This game is not fair!"* Is she correct? Why or why not?

1-115. (from Lesson 1.1.4)
Jonah is working with the distance and rate formula from a previous course. He is using the equation $d = 65t$ where d is the number of miles driven, and t is the number of hours. If the vehicle travels for $3\frac{1}{2}$ hours, how many miles will it have driven? Write and solve an equation to calculate your answer.

1-116. (from Lesson 0.1.5)
Sketch what the following figure looks like from the top.



1.2.7 Guess My Number
What is my number?

Launch

Mathematicians look for and make use of structure. There were 18 dots visible in the following image until they were accidentally covered with paint. If both paint stains cover the same number of dots, how many dots are under each paint stain? Silently think about this answer and wait for your teacher to call on someone to share their answer.

Explore

1-117.

Closure

In this Closure, you will complete a **Dakabibi**. A Dakabibi is a puzzle where you are given a set of numbers and several empty boxes that need to be filled while meeting certain conditions. You will see this type of puzzle many times throughout this course.

Complete the Dakabibi in parts (a) and (b).

a. Using the digits 1 through 9 at most once each, make at least one true equation.

$$\square \times \square + \square = \square\,\square$$

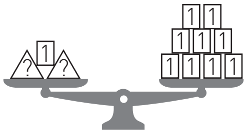
b. This time, use the digits –9 through 9 at most once each to make at least one true equation that contains one or more negative numbers. A box with a –1 followed by a box with a 9 represents –19.

$$\square \times \square + \square = \square\,\square$$

Reflection & Practice

1-119.

Mathematicians reason abstractly and quantitatively. The scale is balanced, so what number must a triangle represent?



1-120.

I can determine a number given clues or by using an expression or equation.

When I double my number and add one, I get nine. What is my number?

1-121.

Solve for x in the tape diagram.

x	x	4
10		

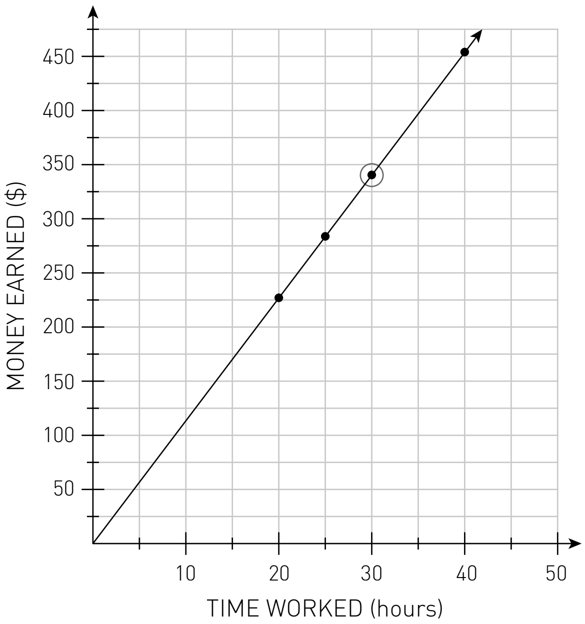
1-122. (from Lesson 1.1.4)

Fill in the missing value to make the ratios equivalent.
For additional support, refer to the Methods & Meanings box "Equivalent Fractions" on page 228.

a. $\frac{?}{100} \cdot \frac{?}{?} = \frac{?}{60}$

b. $\frac{?}{20} \cdot \frac{?}{?} = \frac{?}{110}$

1-123. (from Lesson 1.1.2)
Yolanda is working as a lab technician. She uses this graph to keep track of her hours worked and money earned.



a. What does the circled point represent?

b. Calculate the unit rate in dollars earned per hour.

1-124.
The spilled paint problem in the Launch for this lesson, the Guess My Number game, and the balance and tape diagram in this Reflection & Practice are similar in important ways. How are they similar? How are they different?

1.3.1 Interpreting Graphs
How can a graph tell a story?

Launch

Mathematicians look for and make use of structure. Your teacher will display an expression. How does the structure of the expression help you evaluate it? What is its value?

Explore

Closure Complete challenges created by your classmates.

Reflection & Practice

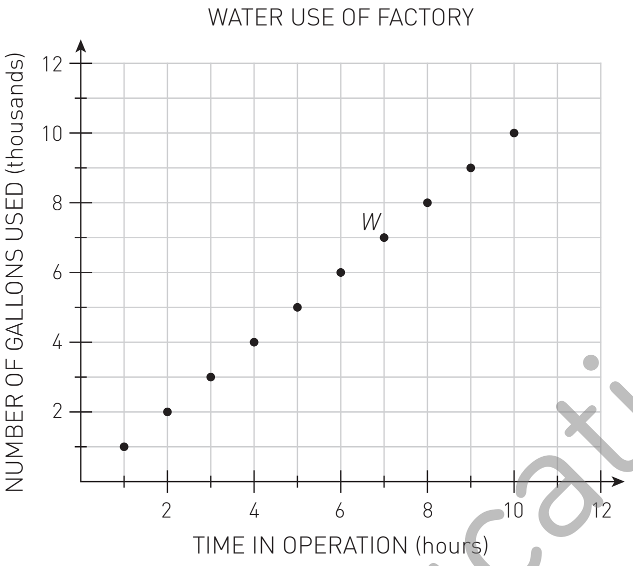
1-126.

Herida's class is having a Pizza Party. The 14 students who like dogs shared six large pizzas equally, and the six students who like cats shared two large pizzas equally. Who got to eat more pizza, a dog person or cat person? Explain your reasoning.

1-127.

I can interpret points on proportional graphs in terms of the situation.

Consider the graph shown.



a. What is the graph about? What situation does it represent?

b. Select true or false for each of the following.

i. T/F: The factory uses 4 gallons of water when it is in operation for 4,000 hours.

ii. T/F: The factory uses 9,000 gallons of water when it is in operation for 9 hours.

iii. T/F: The factory uses 0 gallons of water when it is not in operation.

c. What are some ways to conserve water?

1-128.

Four students in a team were wondering about the water usage graph from problem 1-127, and each asked a different question. Answer their questions in any order.

R: How many gallons of water are used in 1 hour?

I: If the factory used 6,500 gallons of water last Wednesday, how many hours did it operate?

C: If the factory pipes were clogged and the factory could only use one-third as much water, how much water would it use in nine hours?

O: What does point *W* represent?

1-129. (from a previous course)

Electricity for household use is usually measured in kilowatts per hour (kWh).

a. If a family in the month of April (30 days) uses 840 kWh of electricity, how much are they using per day?

b. What are some ways to be more energy conscious?

1-130. (from a previous course)

Using the digits 0 through 9 at most once each, fill in the boxes in the equation below to make a true equation. **For additional support, refer to the Methods & Meanings box "Dakabibi" on page 229.**

$$\square\left(\square+\square\right)=\square$$

1-131. (from Lesson 1.2.7)

Maria was playing a game with her brother. She said, *"I am thinking of a number. When you multiply my number by six and add seven, you get twenty-five. What is my number?"*

a. What is Maria's number?

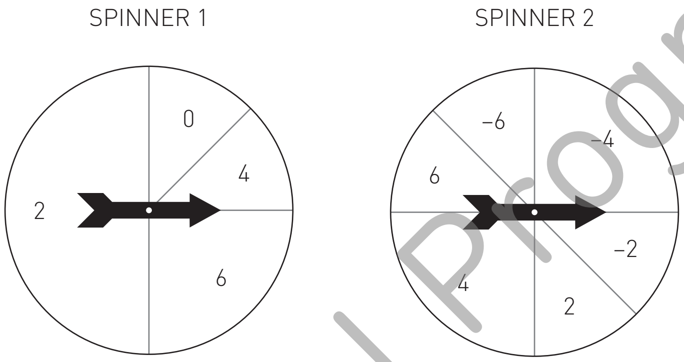
b. Explain how you figured out your answer to Maria's number puzzle.

Marcellus the Giant

1.3.2 How do graphs, scale, and proportions connect?

Launch

Given the following spinners, is it more likely to spin a 2 on Spinner 1, or a 2 or –2 on Spinner 2? Explain your thinking.



Explore

Closure

The Reflection Journal titled "Lesson 1.3.2: My Journey as a Mathematician" is located on the following page. Read the prompt and write a response.

Reflection Journal

Lesson 1.3.2: My Journey as a Mathematician

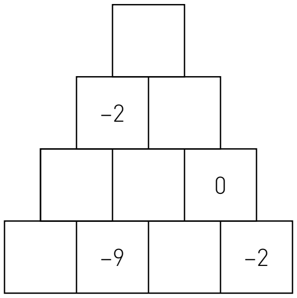
As a growing mathematician, you are expected to understand certain concepts by the end of the year, such as fluently working with integers, reasoning about proportional relationships, interpreting data in graphs, and solving linear equations.

There may be areas in mathematics where you are proud of your skills. You may also have areas for growth. Reflect on each of these areas. Write about how you can strengthen your areas of growth and flourish as a young mathematician.

Reflection & Practice

1-133.

Mathematicians look for and make use of structure. The number in each box of this number puzzle is the sum of the two boxes immediately beneath it. Fill in the missing numbers.



1-134.

I can make connections between scaling, proportions, integer operations, and graphing.

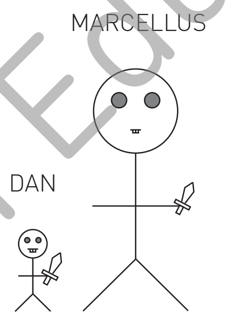
Dan's hand is 8 inches long, and Marcellus's hand is 45 inches long.

a. How many times longer is Marcellus's hand than Dan's?

b. If Dan's hat is 4 inches tall, how tall is Marcellus's hat?

1-135.

Compared to Dan, is Marcellus drawn to scale? Why or why not?



Reflection & Practice continues on page 118.

1-136. (from Lesson 1.1.4)
Mark walks $\frac{1}{2}$ mile in $\frac{1}{4}$ of an hour. Use this information to answer the questions.

a. How far does he walk in 1 hour?

b. How long does it take him to walk 1 mile?

c. How does his speed compare to someone walking $\frac{1}{3}$ of a mile in $\frac{1}{5}$ of an hour?

1-137. (from Lesson 1.2.7)
Thu wants to play Guess My Number. She states, *"When I triple my number and add five, I get twenty-six. What is my number?"* What is Thu's number? Show how you know.

1-138.
List three things you learned in this chapter, two things that you already knew, and one thing you would like to understand better.

Chapter 1 Vocabulary

Additive inverse

Coordinate graph

Equation

Equivalent ratios

Giant one

Growth

Integer

Opposite

Proportion

Proportional relationship

Rate

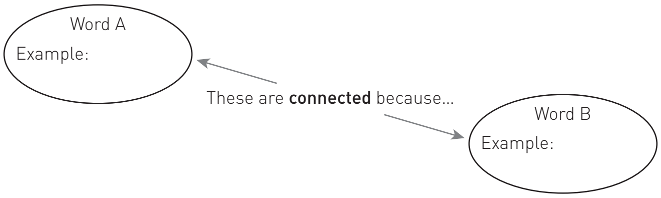
Ratio

Zero pair

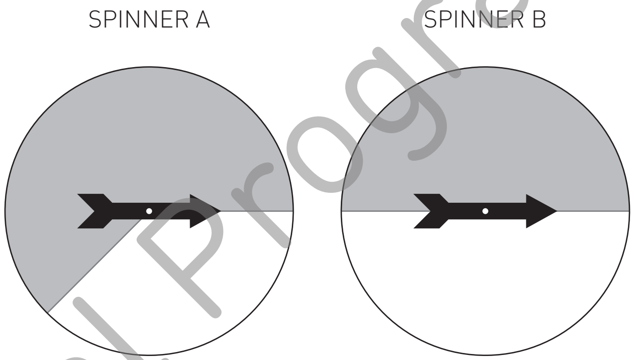
Chapter 1 Closure

The last section of each chapter is a Chapter Closure. This section gives you the chance to reflect on the chapter, summarize your learning, and make mathematical and real-world connections. There are four options in each Chapter Closure. Your teacher will let you know which option(s) you are using to close the chapter.

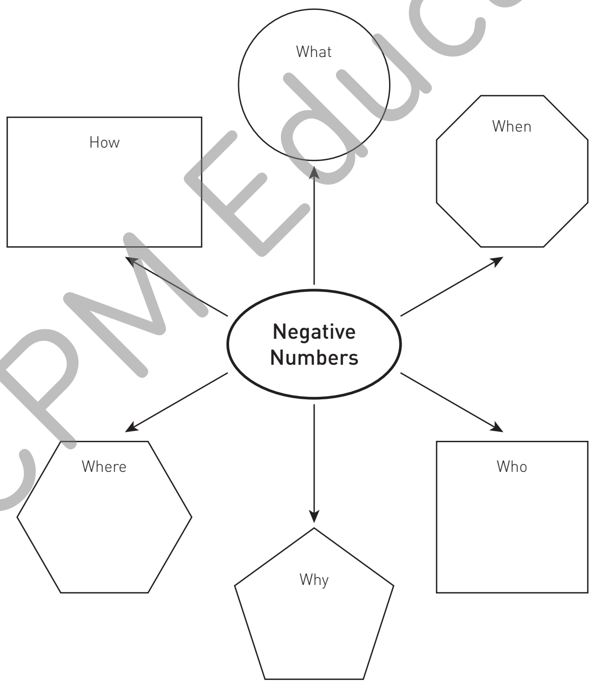
Making Connections



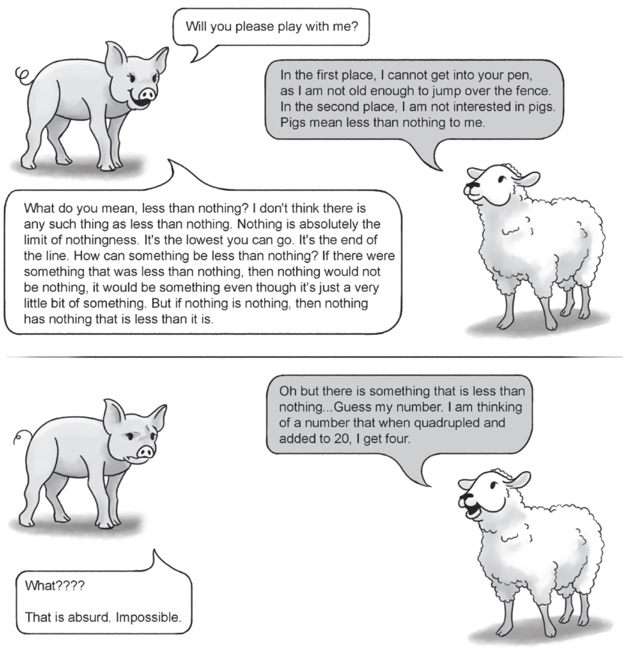
Checking Understanding



Summarizing Learning



Considering Perspectives



Checking Understanding

What have I learned?

Launch

Look at the following student work and think silently. What does this student know? What mistake is this student making?

At a local hot-dog eating contest, one contestant eats 4 hot dogs in 5 minutes. What is the unit rate for hot dogs eaten per minute?

$$\frac{4 \text{ hot dogs}}{4} \qquad \frac{5 \text{ minutes}}{4}$$

$$= 1.25 \text{ hot dogs/minute}$$

Explore

Closure

The Reflection Journal titled "Chapter 1 Closure: Teamwork" is located on the following page. Read the prompt and write a response.

Reflection Journal

Chapter 1 Closure: Teamwork

Working as a team during class can be challenging, but it has numerous benefits you will learn about and experience this year.

Write about your experiences in class to this point. Think about collaboration and teamwork in math class and answer the following questions.

- How has working with your team helped you to understand the mathematics better?
- What are the challenges of working with your team?
- How can you be a better team member and contribute positively to your team?

Reflection & Practice

The end of a chapter is a good time to reflect on what you have accomplished so far. Take some time now to review your progress on the Chapter 1 Learning Targets listed at the beginning of the chapter. Then use the following table to support your learning.

Closure Problem (Cluster)	Learning Targets	Need Help?	More Practice
CU 1-139 CU 1-140 (RP.A)	I can analyze a proportional relationship to make a prediction. I can use a unit rate to make a prediction.	• Lesson 1.1.2 • Lesson 1.1.3 • Equivalent Ratios Methods & Meanings (1.1.5) • Equivalent Fractions Methods & Meanings (1.2.7)	• Problems 1-15, 1-16, 1-27, 1-28, 1-38, 1-46, 1-66, 1-76, 1-95, 1-96, 1-123
CU 1-141 CU 1-142 (EE.B)	I can extend patterns and describe what I see in numbers and words. I can determine a number given clues or by using an expression or equation.	• Lesson 0.1.3 • Lesson 1.2.7	• Problems 0-25, 0-44, 0-61, 1-8, 1-48, 1-97, 1-120, 1-121, 1-131, 1-137
CU 1-143 CU 1-144 (NS.A)	I can describe the result of removing negative values or adding positive values. I can use integer tiles to add and subtract positive and negative integers.	• Lesson 1.2.1 • Lesson 1.2.2 • Integer Methods & Meanings (1.2.2) • Integer Addition and Subtraction Methods & Meanings (1.2.4) • Connecting Integer Addition and Subtraction Methods & Meanings (1.2.5)	• Problems 1-63, 1-64, 1-74, 1-75, 1-84, 1-94
CU 1-145 CU 1-146 (SP.C)	I can determine if a game is fair.	• Lesson 0.1.7	• Problems 0-59, 0-67, 1-31, 1-114

RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.

EE.B Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

NS.A Apply and extend previous understandings of operations with fractions.

SP.C Investigate chance processes and develop, use, and evaluate probability models.

Checking Understanding

CU 1-139. (from Lesson 1.1.2)

The John Hancock building in Chicago is 100 floors tall, 1,128 feet high, and has 1,600 steps.

a. If you climbed 100 steps, how far above the ground would you be?

b. What floor would you be on if you were on step 100?

c. How many steps does it take to get to 1,000 feet above the ground?

d. How many steps would it take to get to the 40th floor?

CU 1-140. (from Lesson 1.1.3)

You buy 37.5 ounces of Very Chocolatey Bites for $4.50.

a. What is the cost per ounce?

b. If the cost per ounce were to stay the same, what would it cost for a 50-ounce bag?

c. If you were to spend $3.36, how many ounces could you buy?

CU 1-141. (from Lesson 0.1.3)

Study the figures shown and draw Figures 0, 4, and 7. Describe how the dot arrangements change from figure to figure.

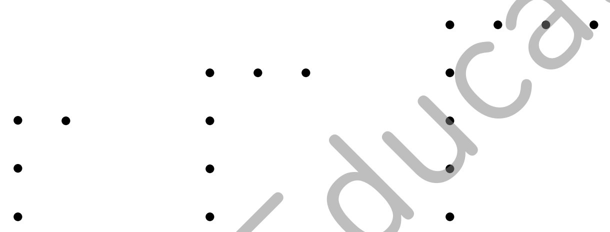


FIGURE 1 FIGURE 2 FIGURE 3

CU 1-142. (from Lesson 1.2.7)

When I triple my number, add negative 2, and subtract my number, I get –12. What is my number? Explain your reasoning.

CU 1-143. (from Lesson 1.2.1)

The temperature of Marcellus's drink is –1 °M.

a. Add 17 hot cubes. What is the resulting temperature?

b. After adding 17 hot cubes, add 2 hot cubes and remove 2 cold cubes. What is the resulting temperature?

c. The next day, the starting temperature of Marcellus's drink was 17 °M. An unknown number of cold cubes were added, bring the temperature to –11 °M. How many cold cubes were added to Marcellus's drink?

CU 1-144. (from Lesson 1.2.2)

Using the digits –9 through 9 at most once each, fill in the boxes to make a true equation. Then draw integer tiles to prove you are correct.

$$\square + \square + \square + \square + \square = 1$$

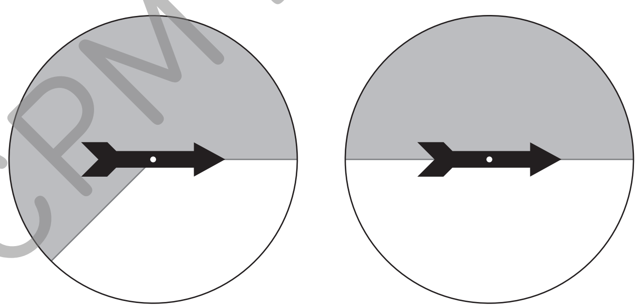
CU 1-145. (from Lesson 0.1.7)

Diane invited you to play a game with a six-sided dice labeled with the numbers 1 through 6. Diane explained, *"I win if you roll an even number or I roll an odd number. You win if I roll a 1."* Is this a fair game? Why or why not?

CU 1-146. (from Lesson 0.1.7)

Diane has another game to play with you. She gives you Spinner B, keeps Spinner A, and explains, *"We each spin at the same time. Landing on gray is worth 1 point, and landing on white is worth 0 points. Whoever has the most points after ten spins wins."* Is this game fair? Explain your reasoning.

SPINNER A SPINNER B



See page 128 for Checking Understanding Answers.

Checking Understanding Answers

CU 1-139.

a. 70.5 feet

b. 6th floor

c. 1,418.44 steps

d. 640 steps

CU 1-140.

a. $0.12

b. $6.00

c. 28 ounces

CU 1-141.

Responses may vary. For example, two dots are added to each figure: one on the far right and one on the bottom.

CU 1-142.

−5; Explanations may vary.

CU 1-143.

a. 16 °M

b. 20 °M

c. 28 cold cubes

CU 1-144.

Responses vary. For example,: $-3 + -5 + 8 + 5 + -4 = 1$.

CU 1-145.

no; Diane has many more ways to win.

CU 1-146.

no; Spinner A has more gray area than Spinner B, and, therefore has a greater chance of winning.

Checking Understanding

CU 2-136. (from Lessons 1.1.4 and 2.3.5)
Patrick was cooking cupcakes for his friend's birthday party. The recipe called for $\frac{2}{3}$ cups of sugar and $\frac{1}{6}$ cups of butter. Patrick accidentally put 1 cup of butter in the mix.

a. How much sugar does Patrick need to put in the mix to have the same ratio of sugar to butter that the recipe calls for?

b. The original recipe calls for $\frac{1}{2}$ cups of cocoa powder. How many cups of cocoa powder does he need for the enlarged mix?

CU 2-137. (from Lesson 2.3.5)
A copy machine can print out 1.3 pages per second. How many copies can it print out in 1 minute? Write and solve a proportion to calculate the solution and show your work.

CU 2-138. (from Lesson 2.1.2)
Given the fractions shown, place them into two categories: terminating decimals or repeating decimals. Explain your reasoning.

$\frac{3}{7}$ $\quad \frac{1}{2}$ $\quad \frac{1}{3}$ $\quad \frac{3}{8}$ $\quad \frac{13}{9}$ $\quad \frac{5}{6}$ $\quad \frac{6}{15}$ $\quad \frac{7}{20}$ $\quad \frac{9}{25}$

CU 2-139. (from Lesson 2.1.1)
Miranda thinks she has figured out a strategy that makes it easy to convert from a fraction to a decimal. She uses place values. So, for $\frac{4}{25}$, she multiplies by the Giant One $\frac{4}{4}$ to get $\frac{16}{100}$. She knows she can write this as 0.16 because it is read as "sixteen-hundredths."

Her elbow partner tries this with $\frac{81}{125}$. She uses $\frac{8}{8}$ and gets $\frac{648}{1,000}$. Knowing her place values, she writes 0.648.

However, when both girls get to $\frac{4}{15}$, they are not quite sure what to do.

a. Explain why their strategy might not be the best for this fraction.

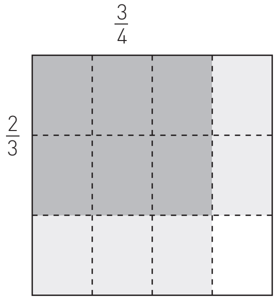
b. What should they do to convert this to a decimal?

c. What do you notice about the decimal?

Multiplying Fractions (from Lesson 0.1.2)

You can calculate the product of two fractions, such as $\frac{2}{3}$ and $\frac{3}{4}$, by multiplying the numerators (the numbers above the fraction bar) together and dividing that by the product of the denominators (the numbers below the fraction bar). So $\frac{2}{3} \cdot \frac{3}{4} = \frac{6}{12}$, which is equivalent to $\frac{1}{2}$. Similarly, $\frac{4}{7} \cdot \frac{3}{5} = \frac{12}{35}$. If you write this method in algebraic terms, you would say that $\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$.

The reason this rule works can be seen using an area model of multiplication. The example shown represents $\frac{2}{3} \cdot \frac{3}{4}$. The product of the denominators ($3 \cdot 4 = 12$) is the total number of small rectangles, while the product of the numerators ($2 \cdot 3 = 6$) is the number of the small rectangles that are double-shaded.



Evaluating Algebraic Expressions (from Lesson 0.1.3)

An **algebraic expression** is a combination of numbers and variables connected by mathematical operations. For example, $4x$, $3(x - 5)$, and $4x - 3y + 7$ are algebraic expressions.

Addition and subtraction separate expressions into parts called **terms**. For example, the expression $4x - 3y + 7$ has three terms: $4x$, $-3y$, and 7.

A more complex expression is $2x + 3(5 - 2x) + 8$. It also has three terms: $2x$, $3(5 - 2x)$, and 8. But the term $3(5 - 2x)$ has another expression, $5 - 2x$, inside the parentheses. The terms of this inner expression are 5 and $-2x$.

To **evaluate** an algebraic expression for particular values of variables, replace the variables in the expression with their known numerical values inside parentheses, then follow the Order of Operations to determine a single value for the expression. Replacing the variables with their known values is called **substitution**.

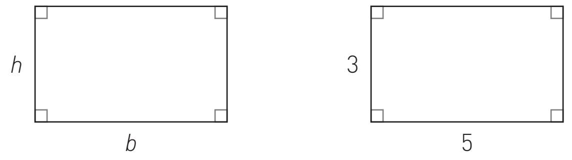
For example, to evaluate $4x - 3y + 7$ for $x = 2$ and $y = 1$, replace x and y with (2) and (1), respectively, then follow the Order of Operations.

$$x = \boxed{2} \qquad y = \boxed{1}$$

$$\begin{aligned} & 4x - 3y + 7 \\ &= 4(2) - 3(1) + 7 \\ &= 8 - 3 + 7 \\ &= 12 \end{aligned}$$

Area of Polygons (from Lesson 0.1.4)

The **area of a rectangle** with base length b and height length h is $A = b \cdot h$.

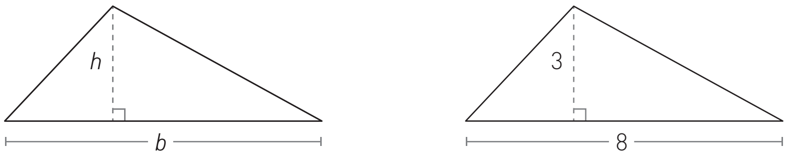


$b = 5$ units

$h = 3$ units

$A = 5 \cdot 3 = 15$ square units

The **area of a triangle** is half the area of a parallelogram with the same base and height. If the base of the triangle is length b and the height is length h, then the area of the triangle is $A = \frac{1}{2}b \cdot h$.

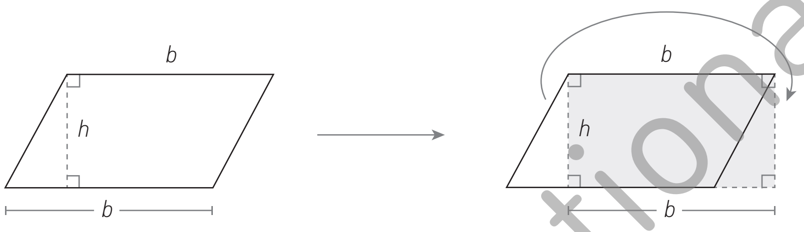


$b = 8$ units

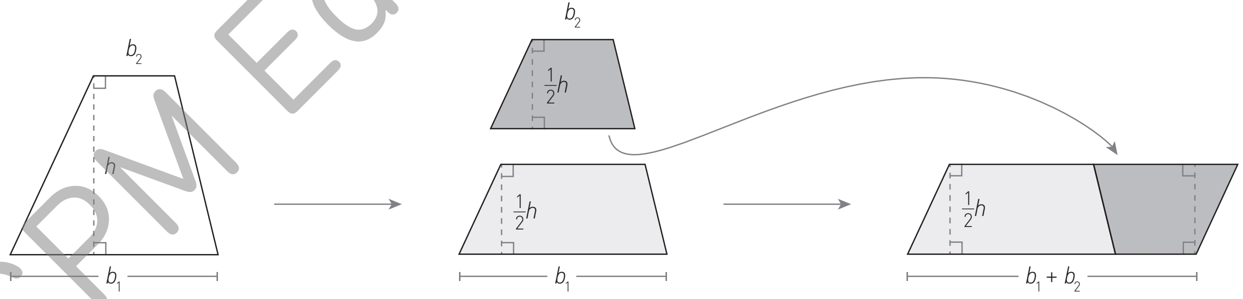
$h = 3$ units

$A = \frac{1}{2} \cdot 8 \cdot 3 = 12$ square units

A parallelogram can be rearranged into a rectangle with the same base length and height. Therefore, to determine the **area of a parallelogram**, calculate the product of the length of the base (b) and the height (h), or $A = b \cdot h$.



To calculate the **area of a trapezoid**, rearrange the trapezoid into a parallelogram with the same area. For example, divide the height of the trapezoid in half parallel to its two bases to create two smaller trapezoids. Rotate and translate one of the trapezoid parts and combine it with the other part into a parallelogram as shown. Then calculate the area of the parallelogram. If the trapezoid has height length h, base length b_1, and base length b_2, then $A = \frac{1}{2}h \cdot (b_1 + b_2)$.



Unit Rate (from Lesson 0.1.5)

A **rate** is a ratio that compares the amount one quantity changes as another quantity changes.

$$\text{rate} = \frac{\text{change in one quantity}}{\text{change in another quantity}}$$

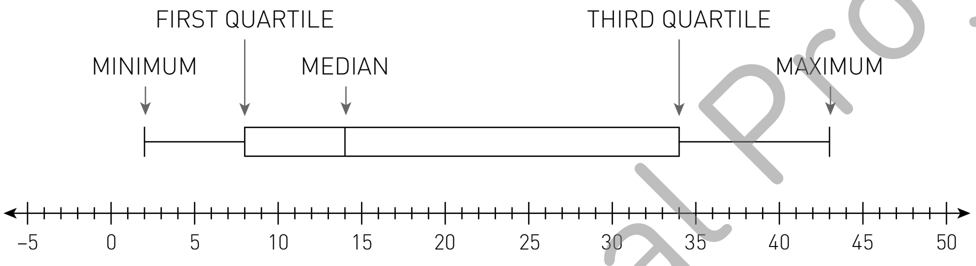
A **unit rate** is a rate that compares the change in one quantity to a single unit change in another quantity. For example, *miles per hour* is a unit rate because it compares the change in miles to the change in time of one hour. If an airplane flies 3,000 miles in 5 hours and uses 6,000 gallons of fuel, you can compute several unit rates.

- gallons used per hour: $\frac{\text{6,000 gallons}}{\text{5 hours}} = \frac{\text{1,200 gallons}}{\text{1 hour}}$
- gallons used per mile: $\frac{\text{6,000 gallons}}{\text{3,000 miles}} = \frac{\text{2 gallons}}{\text{1 mile}}$
- distance traveled per hour: $\frac{\text{3,000 miles}}{\text{5 hours}} = \frac{\text{600 miles}}{\text{1 hour}}$

Box Plots (from Lesson 0.1.6)

A **box plot** displays a summary of data using the median, first quartile, third quartile, minimum, and maximum of the data. These five values are together known as the **five-number summary**. The box in a box plot contains the middle half of the data. The right horizontal line segment represents the top 25% of the data, and the left horizontal line segment represents the bottom 25% of the data. A box plot shows graphically how the data is spread.

To construct a box plot, draw vertical line segments above the median, first quartile, and third quartile on a number line. Then connect the line segments from the first and third quartiles to form a rectangle. This is the box of the box plot. Next, place a vertical line segment above the number line at the maximum and minimum data values. Connect the minimum data value to the first quartile and the maximum value to the third quartile using horizontal line segments drawn from the center of each vertical line segment. A box plot is shown for the following data set: 2, 7, 9, 12, 14, 22, 32, 36, and 43.

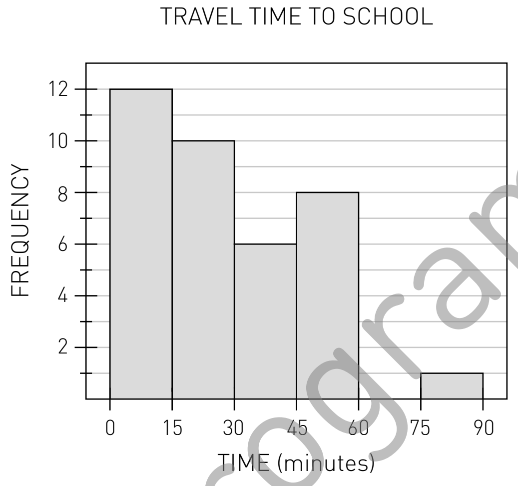


Histograms (from Lesson 1.1.2)

A **histogram** is similar to a dot plot except that each bar represents data in an interval. The intervals for the data are shown on the horizontal axis. The frequency (number of pieces of data in each interval) is represented by the height of a bar above the interval. Each interval is also called a **bin**.

The values on the horizontal axis represent the lower end of each interval. For example, the histogram shows that 10 students take at least 15 minutes but less than 30 minutes to get to school.

Histograms and dot plots are used for displaying numeric data with an order. A histogram is not a bar graph. Bar graphs are used for data in categories, where order of the categories generally does not matter.



Measures of Central Tendency (from Lesson 1.1.3)

Numbers that locate or approximate the center of a set of data are called the **measures of central tendency**. The mean and the median are measures of central tendency.

The **mean** is the arithmetic average of a data set. One way to compute the mean is to add the data points together and then divide the sum by the number of data points.

The **median** is the middle number in a data set that has been ordered numerically. If there is an even number of values, the median is the average (mean) of the two middle numbers.

Example:
Suppose the following data set represents the number of home runs hit by the best seven players on a Major League Baseball team.

16, 26, 21, 9, 13, 15, 9

The mean is $\frac{16+26+21+9+13+15+9}{7} = \frac{109}{7} \approx 15.57$.

The median is 15, since, when the data points are arranged in order (9, 9, 13, 15, 16, 21, 26), the middle number is 15.

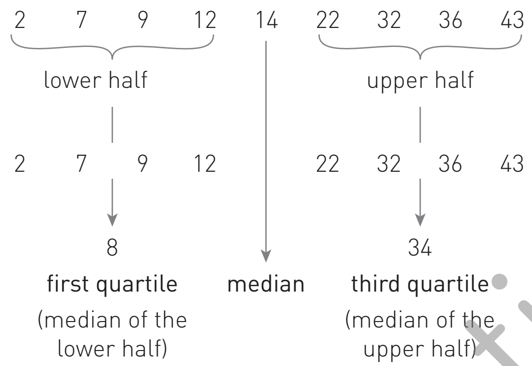
Quartiles and Interquartile Range (IQR) (from Lesson 1.1.4)

Quartiles are values that divide a data set into four equal parts. The prefix *quar-* (as in *quarter*) refers to fourths. The median is the quartile in the middle of a data set and splits the data into two halves. The **first quartile** is the middle of the lower half, and the **third quartile** is the middle of the upper half.

Suppose you have the following data set.

22, 43, 14, 7, 2, 32, 9, 36, 12

To determine the quartiles, first place the data in order from least to greatest. Then, divide the data into halves by determining the median of the data set. Next, determine the medians of the lower and upper halves of the data set. Note that if there are an odd number of data values, the median is not included in either half of the data set. See the following example.



Range is one way to measure the spread of a data set; **interquartile range (IQR)** is another. Statisticians often prefer using the IQR to measure spread because it is not affected much by outliers or non-symmetrical distributions. The IQR is the range of the middle 50% of the data. It is calculated by subtracting the first quartile from the third quartile. In this case, the IQR is 34 – 8 = 26.

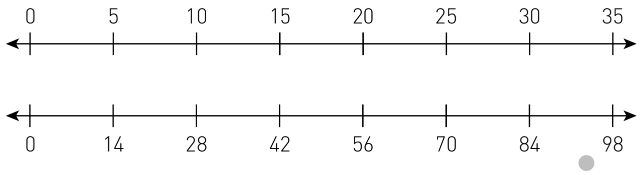
Equivalent Ratios (from Lesson 1.1.5)

A ratio is a comparison of two quantities by division. A ratio can be written in words, as a fraction, or with colon notation.

For example, suppose there are 28 students in a math class, and 10 of them wear glasses. You can write the ratio of the number of students who wear glasses to the total number of students in the class as 10 to 28, 10:28, or $\frac{10}{28}$.

Ratio tables and double number lines are useful representations when writing equivalent ratios. For example, the ratio table and double number line show several ratios equivalent to 10:28.

10	5	15	20	30
28	14	42	56	84



These equivalent ratios can be written in fraction form as well.

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

A Giant One is a useful strategy for writing equivalent ratios in fraction form.

$$\frac{10}{28} \cdot \frac{2}{2} = \frac{20}{56}$$

Integer Addition and Subtraction (from Lesson 1.2.4)

Recall that **integers** are positive and negative whole numbers and zero.

…, −3, −2, −1, 0, 1, 2, 3, …

Integer Addition

You have been introduced to two ways to think about addition: cold and hot cubes and integer tiles. Both involve determining if any of the numbers combine to make zero. If a cold cube (−1) is combined with a hot cube (+1), there is no change in temperature. Similarly, if a − tile is combined with a + tile, the result is −1 + 1 = 0. Identifying zeros helps you determine how many remaining positive or negative tiles remain, giving you the result.

$$\xrightarrow{1}$$

$$\xleftarrow{-1}$$

EXAMPLE 1

5 + (−3)

↓ Create first term using integer tiles.

\+ + + + +

↓ Create second term using integer tiles.

\+ + + + +
− − −

↓ Remove zero pairs.

\+ + $\boxed{\begin{matrix}+ + +\\ − − −\end{matrix}}$

↓ Rewrite as an equation.

5 + (−3) = 2

EXAMPLE 2

−5 + (2)

↓ Create first term using integer tiles.

− − − − −

↓ Create second term using integer tiles.

− − − − −
\+ +

↓ Remove zero pairs.

− − − $\boxed{\begin{matrix}− −\\ + +\end{matrix}}$

↓ Rewrite as an equation.

−5 + (2) = −3

EXAMPLE 3

−6 + (−2)

↓ Create first term using integer tiles.

− − − − − −

↓ Create second term using integer tiles.

− − − − − −
− −

↓ Rewrite as an equation.

−6 + (−2) = −8

Integer Addition and Subtraction continues on page 226.

Integer Addition and Subtraction (from Lesson 1.2.4)

Recall that **integers** are positive and negative whole numbers and zero.

..., −3, −2, −1, 0, 1, 2, 3, ...

Integer Subtraction
Subtracting integers is similar to integer addition, except that instead of adding the second integer, you remove the second integer. Sometimes this removal requires adding extra zeros with integer tiles.

EXAMPLE 1

$-3 - (-2)$

Create first term using integer tiles.

− − −

Remove two negatives.

− $\boxed{- -}$

Rewrite as an equation.

$-3 - (-2) = -1$

EXAMPLE 2

$-5 - (2)$

Create first term using integer tiles.

− − − − −

Cannot remove two positives, so add zero pairs.

− − − − − + +
− −

Remove two positives.

− − − − − $\boxed{+ +}$
− −

Rewrite as an equation.

$-5 - (2) = -7$

EXAMPLE 3

$3 - (-3)$

Create first term using integer tiles.

+ + +

Cannot remove three negatives, so add zero pairs.

+ + + + + +
− − −

Remove three negatives.

+ + + + + +
$\boxed{- - -}$

Rewrite as an equation.

$3 - (-3) = 6$

Connecting Integer Addition and Subtraction (from Lesson 1.2.5)

Notice the relationships between addition problems and subtraction problems in the following pairs of equations.

$$-3 - (-2) = -1 \text{ and } -3 + 2 = -1$$

$$-5 - (2) = -7 \text{ and } -5 + (-2) = -7$$

$$3 - (-3) = 6 \text{ and } 3 + 3 = 6$$

$$2 - (-8) = 10 \text{ and } 2 + 8 = 10$$

These relationships happen because removing a negative amount gives an identical result to adding the same positive amount, and vice versa. Subtracting one integer from another is the same as adding the first integer and the *opposite* (more formally, the **additive inverse**) of the second integer. Some examples are provided.

$$-2 - (7) = -2 + (-7) = -9$$

$$2 - (-3) = 2 + 3 = 5$$

$$-8 - (-5) = -8 + (5) = -3$$

$$2 - (9) = 2 + (-9) = -7$$

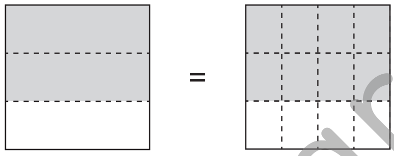
Equivalent Fractions (from Lesson 1.2.7)

Fractions that are equal, but written in different forms, are called **equivalent fractions**. Rewriting a fraction in an equivalent form is useful when you want to compare two fractions or when you want to combine portions that are divided into pieces of different sizes.

A Giant One is a useful strategy to create an equivalent fraction. To rewrite a fraction in a different form, multiply the original fraction by a fraction equivalent to 1.

$$\frac{2}{3} \cdot \frac{4}{4} = \frac{2 \cdot 4}{3 \cdot 4} = \frac{8}{12}$$

A picture can also demonstrate that these two fractions are equivalent:



Dakabibi (from Lesson 1.3.1)

A **Dakabibi** refers to a puzzle with a set of numbers and several empty boxes that need to be filled while meeting certain conditions. For example, using the digits 0 through 9 at most once, you can fill in the boxes in the following expression to make a difference that is as large as possible.

$$\square.\square\square\square - \square.\square\square\square$$

$$\boxed{9}.\boxed{8}\boxed{7}\boxed{6} - \boxed{1}.\boxed{2}\boxed{3}\boxed{4}$$

$$= 8.642$$

The term Dakabibi comes from the Twi phrase "adaka a bibiara ɛni mu," which translates literally to "a box that everything is not inside." This phrase is shortened to Dakabibi in this course. Twi is a language spoken in Ghana and is one of the more widely-used of over 50 languages spoken there. Like other West African languages, Twi is a tonal language, meaning that the pitch of a word can change what it means. A little less than a third of the Ghanaian population speaks Twi as a first or second language. Twi is not the most-spoken language in Ghana, but it is the language most spoken by Ghanaians in America.

Representative

Reports the team's thinking to the class

Answers questions asked of the team

"I am going to share _____ with the class. What else should I include?"

"I think our conclusion is that _____. Do we all agree?"

"I heard you say _____. Is that the same as _____?"

"How should we share our answer with the class?"

"When we report out to the class, I plan to say _____."

Coordinator

Tracks tasks and time

Helps the team agree on a strategy

"Okay, let's get back to work!"

"We have _____ minutes left!"

"What strategy should we start with?"

"Did we answer all parts of the question?"

"They said _____. Who agrees? Why or why not?"

Investigator

Asks teacher questions

Makes sure the team justifies their work

"We all seem to be stuck on _____. Should I call the teacher over?"

"What should I ask the teacher?"

"How can we justify this?"

"Can you please explain how you know that?"

"How do we know that is the answer?"

Organizer

Collects and returns materials

Ensures team members record their work

"What supplies do we need?"

"What do we need to solve this problem?"

"I will go get _____ if you will get _____."

"What _____ said seems to make sense to all of us. How should we record that?"

"How should we organize our work so that it will be clear to someone else?"

General Sentence Frames

Use these sentence frames to start, continue, or improve discussions throughout this course.

Collaborate

When you said _____, that made me think _____.

I think what you are saying is _____.

This part of _____ reminds me of _____.

That is an interesting idea that relates to _____.

That's a great idea. Which part of _____ does that represent?

_____ did not work, but what I learned is _____.

We have _____. Is _____ the next step?

Does anyone have a prediction or estimate to share?

Check-in

I see you are _____. Does that mean _____?

Let's take 1 minute to think independently.

I need a break. Does anybody else need a break?

[Name], you have been quiet. Do you feel excluded from the conversation?

When I [said/did] _____, how did that make you feel?

I am getting frustrated. Will you help me _____?

If you [see/hear] me _____, I need you to _____.

The team [is/is not] _____. Does that mean _____?

Broaden

_____ connects to _____ because _____.

Would it be easier to draw something?

We all agree that _____. Let's look around the room to see what other teams are thinking.

What do you think [Name] would say?

[Name]'s approach looks different from mine. How are our approaches similar?

I heard someone from another team say _____. How can we incorporate this?

What's another way to think about this?

Change

What if _____?

If we change _____, what else changes?

I checked this by _____. Can someone confirm this by checking another way?

Changing _____ to _____ might make this easier.

What would happen if we tried _____?

I heard someone say _____. Does that change how we approach this?

This reminds me of a problem we did before where we _____.

Challenge

I can see how _____ can be interpreted as _____ and _____.

Let's be sure to include multiple perspectives. What haven't we considered?

I don't think we included [Name]'s idea. How can we incorporate it?

I heard you say _____. Did you make some assumptions to come to that conclusion?

Can you explain _____ further?

What if we approached this by _____?

Refine

I heard you say _____. What does that mean?

_____ to me means _____. What does it mean to you?

What words come to mind when you [look at/think about] _____?

We are stuck on _____. Let's pause and look around the room for ideas.

Does anyone know how to _____?

If the task is to _____, are we finished?

We know _____. We're missing _____. What else?