Grade 6
Family Resource Bundle

Grade 6

ANSWER KEY Text #1 "Simone Biles"

by Marty Kaminsky 2016

1. RI.KID.2

PART A: Which statement best expresses the central idea of the text?

A. Simone Biles' positive attitude has come from her success in gymnastics and relatively easygoing life.
B. From a young age, Simone Biles was a natural gymnast and often didn't have to train for competitions.
C. Simone Biles' great attitude and commitment to the sport has helped her succeed in gymnastics.
D. Competitors are often frightened of Simone Biles because of her skills and serious attitude.

2. RI.KID.1

PART B: Which TWO details from the text best support the answer to Part A?

A. "She completes her routine with a full twisting double back. After flying high through the air, Simone lands on her feet, and the crowd roars." (Paragraph 3)
B. "Life was not always easy for Simone. Her birth mother was unable to care for her children." (Paragraph 7)
C. "On a field trip with her daycare class, six-year-old Simone was introduced to her sport at Bannon's Gymnastix." (Paragraph 8)
D. "'I loved the idea of flipping around, and the center saw something in me, so they sent home a letter to my parents encouraging me to join'" (Paragraph 9)
E. "In order to master the variety of skills needed to excel at the four events in her sport, Simone trains five to six hours a day, year-round." (Paragraph 12)
F. "'Remember to have as much fun as you can, but keep in mind, win or lose, you still have your whole life ahead. You can achieve anything that you put your mind to.'" (Paragraph 14)

3. RI.KID.3

Which of the following describes how the author introduces Simone Biles?

A. as a talented gymnast who impresses the crowd and judges
B. as a committed athlete who works nonstop for what she has
C. as a talented gymnast who isn't treated fairly by the judges
D. as a serious athlete who values winning over all else

4. RI.CS.5

How do paragraphs 5-6 contribute to the development of ideas in the text?

A. They show how long Simone Biles has been competing in gymnastics.
B. They help readers understand how hard Simone Biles has worked.

C. They stress that sometimes even Simone Biles doesn't win gold.
D. They emphasize Simone Biles' widespread success in gymnastics.

5. RI.KID.3

What is the connection between Biles' training and her success?

1. **Answers will vary; students should discuss how the author emphasizes the young age that Biles started training as well as her rigorous training schedule. When the author describes Biles' introduction to the sport, they state that at age 6, "she started copying the gymnasts, drawing the attention of the instructors" (Paragraph 8). Next, students should discuss how the author emphasizes the hard work required of Biles to maintain her skills, stating, "In order to master the variety of skills needed to excel at the four events in her sport, Simone trains five to six hours a day, year-round" (Paragraph 12). Overall, Biles has not only been training since she was six years old, but she also commits herself to train all day, every day. Both of which have contributed to her widespread success in gymnastics.**

ANSWER KEY Text #2 "Most Valuable Player"

by Sarah Van Arsdale 1988

1. RL.KID.2

PART A: Which of the following identifies the theme of the poem?

A. People want to be recognized.
B. Sometimes people don't mind when their skills go unrewarded.
C. The support of friends and family is important to succeed.
D. Rewards and trophies do not determine an individual's skill or success.

2. RL.KID.1

PART B: Which detail from the poem best supports the answer to Part A?

A. "I'd dust / it every day / and polish it once a week." (Lines 3-5)
B. "It would have a statue of a woman/ holding a bat'" (Lines 6-7)
C. "I'd read the inscription every morning." (Line 13)
D. "They'd hear the fans shout / 'Hey, some catch!'" (Lines 25-26)

3. RL.KID.3

What does having a trophy mean to the speaker?

A. It's proof that she is the best softball player.
B. It shows that she's just as athletic as the boys.
C. It's an item to show off to her friends.
D. It represents being great at softball.

4. RL.CS.4

How does the 'If,...I would…' structure in the poem develop the speaker's perspective towards her goals?

1. **Answer swill vary; students should discuss how the speaker, a softball player, describes how events would unfold "if" she had a trophy. This reveals to the reader that the speaker has yet to receive a trophy, but that it remains extremely important to her and remains a goal that she set for the future. For example, the speaker initially states, "If I had a trophy / I'd put it on the middle shelf / of my bookcase" (Lines 1-3). The speaker continues to speculate at how her life would be different if she had a trophy. This is emphasized by the speaker's repetition of "I would" throughout the text. The speaker's point of view allows the poem to take on a daydream-like quality, in which she imagines herself in a world where she does have a trophy and is recognized as the softball player she is.**

Related Media Links and Descriptions

Related Media #1: " Why is Simone Biles the World's Best Gymnast? "
Show this video to students to provide them with information about Simone Biles' skills as a gymnast. Why has Biles' been considered the best gymnast in the world? What sets her apart from other gymnasts? Why are her first place scores remarkable? (2:51)

Related Media #2: "Should All Children Get Participating Trophies? "
Show this video to students to start a discussion about who should receive trophies. Why do students think the speaker in the poem wants a trophy? Do students think the speaker would want all kids to receive trophies, whether or not they win? Why or why not? Do students think all players should receive trophies? (2:30)

Grab and Go Writing Checklists

Grades 6-9 Short Response

Informational /Explanatory	❑ Has a topic sentence that addresses the main question ❑ Includes ideas that support the topic sentence ❑ Cites at least two pieces of evidence from the text that most strongly support the ideas ❑ Elaborates and explains how the text evidence supports the topic and ideas ❑ Ends with concluding sentences or statement
Entire Response	❑ Has few errors in sentence formatting, capitalization, punctuation, and spelling.

Argument	❑ Has a claim that responds to the main question ❑ Includes ideas that support the claim ❑ Cites at least two pieces of evidence from the text that most strongly support the claim ❑ Elaborates and explains how the text evidence supports the ideas and the claim ❑ Ends with concluding sentences or statement
Entire Response	❑ Has few errors in sentence formatting, capitalization, punctuation, and spelling.

6.NS Interpreting a Division Computation

Alignments to Content Standards: 6.NS.B.2

Task

Use the computation shown below to find the products.

$$
\begin{array}{r}
189 \\
16\overline{)3024} \\
\underline{16} \\
142 \\
\underline{128} \\
144 \\
\underline{144} \\
0
\end{array}
$$

a. 189×16

b. 80×16

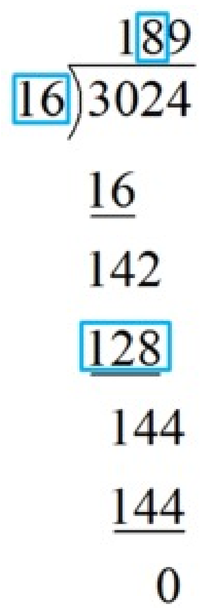
c. 9×16

Edit this solution

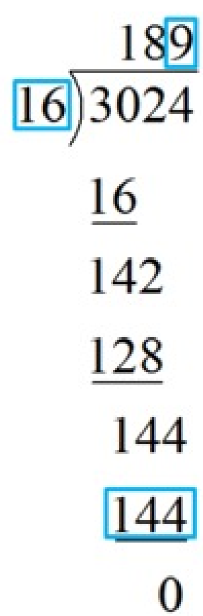
Solution

a. $189 \times 16 = 3024$. The computation shows that $3024 \div 16$ is 189 with a remainder of 0. So it must be that $189 \times 16 = 3024 + 0$.

b. $80 \times 16 = 1280$. We can see this in the second step of the division algorithm.



c. $9 \times 16 = 144$. We can see this in the last step of the division algorithm.



6.NS How many staples?

Alignments to Content Standards: 6.NS.B.2

Task

Can you find an inconsistency in the information on this box of staples? Explain.

IM Commentary

The goal of this task is to perform long division with remainder in a context. The teacher will likely need to provide multiple levels of support on this question. First there is a lot of information on the box of staples and the relevant information for the task is the total quantity of staples and number of staples in each strip. Secondly, it might be helpful to have some packages of staples on hand so that students can see how they are packaged, in particular that the strips come in pairs and that there are usually 24 strips per package. With this extra information, 5000 should be 24×210, the number of strips times the number of staples per strip. Lastly, we do not know whether or not the reported numbers are exact or rounded. While the numbers can not be correct if they are exact, they can be correct if they are rounded.

In addition to the multiplication argument indicated above, students can use long division to check that 5000 staples cannot be divided into equal groups of 210 staples. This argument is presented first as it does not require knowledge of how many strips are in the package: in fact, it leads us to the conclusion that there are most likely 24 strips of staples. Another argument (presented second), examining the factors of 5000 and of 210, shows that 5000 staples can not be divided into groups of 210 without finding the quotient or remainder for $5000 \div 210$.

The closest number to 210 which is a divisor of 5000 is 200. While the 5000 staples could be divided evenly into 25 strips with 200 staples each, the packaging makes it more convenient to have 24 strips of staples. We can check that $5000 \div 24 = 208\frac{1}{3}$. So 210 is a good estimate for the number of staples in each strip but the strips must be of different lengths if there are exactly 5000 total staples in the package. Students might enjoy dividing up some strips and counting the staples to see if there are actually 210 staples in each strip.

Solutions

Edit this solution

Solution: Long Division

We divide the 5000 staples total by the number of staples in each strip, 210:

$$
\begin{array}{r}
23 \\
210\,\overline{)\,5000} \\
\underline{4200} \\
800 \\
\underline{630} \\
170
\end{array}
$$

This shows that we can make 23 strips of 210 staples, with 170 staples left over. We cannot divide the 5000 staples evenly into strips of 210. If we try a smaller number of staples, such as 208, we find that we can make 24 strips with 208 staples, leaving 8 left over:

$$
\begin{array}{r}
24 \\
208\,\overline{)\,5000} \\
\underline{4160} \\
840 \\
\underline{832} \\
8
\end{array}
$$

It is possible that the box contains some strips (sixteen) with 208 staples and some strips (eight) with 209. This would be reasonable as then there are approximately 210 staples in each strip. It is also possible that there are 24 strips of 210 staples, leaving 40 staples more than the 5000 stated on the package. While they cannot be exact, the numbers on the package of staples could be accurate within rounding error.

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Solution: Factoring numbers

If there are 210 staples in each strip of staples and 5000 staples total then 5000 is a multiple of 210. Since 3 and 7 are factors of 210, this would mean that 3 and 7 are factors of 5000. But the only prime factors of 5000 are 5 and 2:

$$5000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5.$$

This means that there cannot be 210 staples in each strip and 5000 staples total in the package.

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Solution: Multiplication

If we are able to open the box of staples and look inside, we see that there are 24 strips of staples which come in pairs. If there are 210 staples per strip then the package would contain

$$24 \times 210 = 5040$$

staples. So this means that either there are not exactly 210 staples in each strip or there are not exactly 5000 staples in the package.

Lesson 1

Sprint

Side A

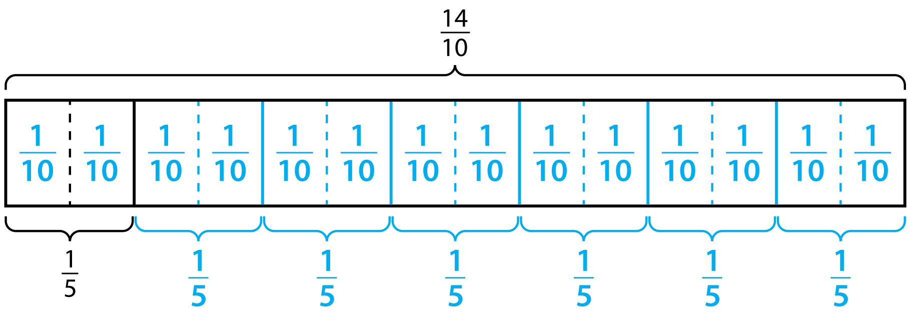
1. 2	12. 2	23. 4	34. 7
2. 5	13. 2	24. 7	35. 4
3. 2	14. 2	25. 7	36. 8
4. 3	15. 2	26. 7	37. 4
5. 3	16. 3	27. 4	38. 7
6. 2	17. 3	28. 4	39. 8
7. 2	18. 3	29. 6	40. 4
8. 4	19. 4	30. 6	41. 9
9. 3	20. 4	31. 6	42. 9
10. 3	21. 3	32. 9	43. 9
11. 2	22. 3	33. 8	44. 3

Side B

1. 3	12. 3	23. 7	34. 6
2. 2	13. 2	24. 7	35. 3
3. 3	14. 3	25. 7	36. 4
4. 2	15. 3	26. 7	37. 9
5. 2	16. 3	27. 9	38. 8
6. 5	17. 4	28. 9	39. 9
7. 2	18. 4	29. 6	40. 12
8. 2	19. 2	30. 6	41. 8
9. 2	20. 2	31. 6	42. 9
10. 4	21. 4	32. 8	43. 12
11. 3	22. 4	33. 9	44. 4

Understanding Division with Fractions

1 Complete the bar model to show how many $\frac{1}{5}$s make $\frac{14}{10}$.

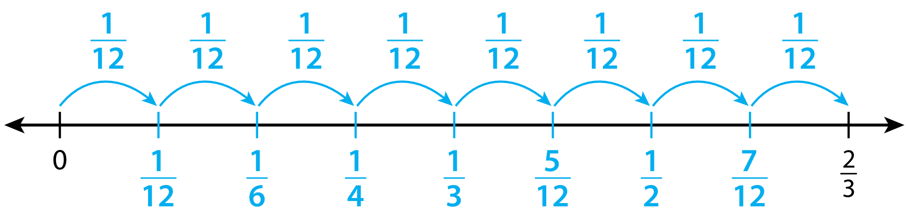


How many $\frac{1}{5}$s make $\frac{14}{10}$? **7**

Complete the equations.

$\frac{14}{10} \div$ $\frac{1}{5}$ $= 7$ **7** $\cdot \frac{1}{5} = \frac{14}{10}$

2 Use the number line to show $\frac{2}{3} \div \frac{1}{12}$.



What is the quotient? **8**

3 Which type of model do you like better, the bar model or the number line? Explain.

Answers will vary. Possible answer: I like the bar model because it is more visual to me. The boxes seem to represent the fractions in space, whereas the number line is mostly numbers.

Lesson 2

Sprint

Side A

1. 2	12. 12	23. 4	34. 40
2. 10	13. 12	24. 8	35. 54
3. 4	14. 1	25. 2	36. 5
4. 6	15. 3	26. 4	37. 56
5. 8	16. 5	27. 15	38. 4
6. 6	17. 2	28. 35	39. 7
7. 4	18. 4	29. 4	40. 9
8. 9	19. 1	30. 4	41. 72
9. 6	20. 2	31. 42	42. 84
10. 2	21. 4	32. 8	43. 5
11. 6	22. 3	33. 9	44. 6

Side B

1. 10	12. 3	23. 12	34. 64
2. 4	13. 9	24. 12	35. 45
3. 6	14. 2	25. 3	36. 9
4. 8	15. 1	26. 3	37. 48
5. 4	16. 1	27. 25	38. 9
6. 2	17. 5	28. 28	39. 1
7. 6	18. 5	29. 3	40. 5
8. 3	19. 3	30. 5	41. 12
9. 9	20. 3	31. 35	42. 36
10. 8	21. 3	32. 9	43. 4
11. 8	22. 4	33. 8	44. 7

Using Multiplication to Divide by a Fraction

Write the missing digits in the boxes to make each equation true.

1. $\frac{1}{2} \div \frac{2}{3} = \frac{1}{2} \times \frac{\boxed{3}}{2} = \frac{3}{\boxed{4}}$

2. $\frac{4}{5} \div \frac{1}{4} = \frac{4}{5} \times \frac{4}{\boxed{1}} = \frac{\boxed{16}}{\boxed{5}}$

3. $\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \times \frac{\boxed{4}}{\boxed{3}} = \frac{\boxed{8}}{15}$

4. $\frac{5}{6} \div \frac{5}{12} = \frac{5}{6} \times \frac{\boxed{12}}{\boxed{5}} = \frac{\boxed{60}}{30} = 2$

5. $\frac{3}{4} \div \frac{5}{7} = \frac{3}{4} \times \frac{\boxed{7}}{\boxed{5}} = \frac{\boxed{21}}{\boxed{20}}$

6. $1\frac{1}{3} \div \frac{3}{7} = \frac{\boxed{4}}{3} \times \frac{7}{\boxed{3}} = \frac{\boxed{28}}{\boxed{9}}$

7. $4\frac{\boxed{1}}{2} \div \frac{2}{5} = \frac{9}{2} \times \frac{\boxed{5}}{\boxed{2}} = \frac{\boxed{45}}{\boxed{4}}$

8. $3\frac{1}{2} \div \frac{\boxed{7}}{8} = \frac{7}{\boxed{2}} \times \frac{8}{7} = \frac{\boxed{56}}{\boxed{14}} = \boxed{4}$

9. $1\frac{2}{3} \div 2\frac{1}{4} = \frac{\boxed{5}}{3} \times \frac{\boxed{4}}{9} = \frac{\boxed{20}}{\boxed{27}}$

10. $3\frac{3}{5} \div 1\frac{3}{\boxed{4}} = \frac{18}{\boxed{5}} \times \frac{4}{7} = \frac{\boxed{72}}{\boxed{35}}$

11. Write a word problem that could be solved by the equation in problem 8.

    Answers will vary.

Multiplication of Fractions I—Round 1 [KEY]

Directions: Determine the product of the fractions.

1.	$\frac{1}{2}\times\frac{3}{4}$	$\frac{3}{8}$	16.	$\frac{8}{9}\times\frac{3}{4}$	$\frac{24}{36}=\frac{2}{3}$
2.	$\frac{5}{6}\times\frac{5}{7}$	$\frac{25}{42}$	17.	$\frac{3}{4}\times\frac{4}{7}$	$\frac{12}{28}=\frac{3}{7}$
3.	$\frac{3}{4}\times\frac{7}{8}$	$\frac{21}{32}$	18.	$\frac{1}{4}\times\frac{8}{9}$	$\frac{8}{36}=\frac{2}{9}$
4.	$\frac{4}{5}\times\frac{8}{9}$	$\frac{32}{45}$	19.	$\frac{3}{5}\times\frac{10}{11}$	$\frac{30}{55}=\frac{6}{11}$
5.	$\frac{1}{4}\times\frac{3}{7}$	$\frac{3}{28}$	20.	$\frac{8}{13}\times\frac{7}{24}$	$\frac{56}{312}=\frac{7}{39}$
6.	$\frac{5}{7}\times\frac{4}{9}$	$\frac{20}{63}$	21.	$2\frac{1}{2}\times3\frac{3}{4}$	$\frac{75}{8}=9\frac{3}{8}$
7.	$\frac{3}{5}\times\frac{1}{8}$	$\frac{3}{40}$	22.	$1\frac{4}{5}\times6\frac{1}{3}$	$\frac{171}{15}=11\frac{2}{5}$
8.	$\frac{2}{9}\times\frac{7}{9}$	$\frac{14}{81}$	23.	$8\frac{2}{7}\times4\frac{5}{6}$	$\frac{1682}{42}=40\frac{1}{21}$
9.	$\frac{1}{3}\times\frac{2}{5}$	$\frac{2}{15}$	24.	$5\frac{2}{5}\times2\frac{1}{8}$	$\frac{459}{40}=11\frac{19}{40}$
10.	$\frac{3}{7}\times\frac{5}{8}$	$\frac{15}{56}$	25.	$4\frac{6}{7}\times1\frac{1}{4}$	$\frac{170}{28}=6\frac{1}{14}$
11.	$\frac{2}{3}\times\frac{9}{10}$	$\frac{18}{30}=\frac{3}{5}$	26.	$2\frac{2}{3}\times4\frac{2}{5}$	$\frac{176}{15}=11\frac{11}{15}$
12.	$\frac{3}{5}\times\frac{1}{6}$	$\frac{3}{30}=\frac{1}{10}$	27.	$6\frac{9}{10}\times7\frac{1}{3}$	$\frac{1518}{30}=50\frac{3}{5}$
13.	$\frac{2}{7}\times\frac{3}{4}$	$\frac{6}{28}=\frac{3}{14}$	28.	$1\frac{3}{8}\times4\frac{2}{5}$	$\frac{242}{40}=6\frac{1}{20}$
14.	$\frac{5}{8}\times\frac{3}{10}$	$\frac{15}{80}=\frac{3}{16}$	29.	$3\frac{5}{6}\times2\frac{4}{15}$	$\frac{782}{90}=8\frac{31}{45}$
15.	$\frac{4}{5}\times\frac{7}{8}$	$\frac{28}{40}=\frac{7}{10}$	30.	$4\frac{1}{3}\times5$	$\frac{65}{3}=21\frac{2}{3}$

Multiplication of Fractions I—Round 2 [KEY]

Directions: Determine the product of the fractions.

1.	$\frac{5}{6} \times \frac{1}{4}$	$\frac{5}{24}$
2.	$\frac{2}{3} \times \frac{5}{7}$	$\frac{10}{21}$
3.	$\frac{1}{3} \times \frac{2}{5}$	$\frac{2}{15}$
4.	$\frac{5}{7} \times \frac{5}{8}$	$\frac{25}{56}$
5.	$\frac{3}{8} \times \frac{7}{9}$	$\frac{21}{72} = \frac{7}{24}$
6.	$\frac{3}{4} \times \frac{5}{6}$	$\frac{15}{24} = \frac{5}{8}$
7.	$\frac{2}{7} \times \frac{3}{8}$	$\frac{6}{56} = \frac{3}{28}$
8.	$\frac{1}{4} \times \frac{3}{4}$	$\frac{3}{16}$
9.	$\frac{5}{8} \times \frac{3}{10}$	$\frac{15}{80} = \frac{3}{16}$
10.	$\frac{6}{11} \times \frac{1}{2}$	$\frac{6}{22} = \frac{3}{11}$
11.	$\frac{6}{7} \times \frac{5}{8}$	$\frac{30}{56} = \frac{15}{28}$
12.	$\frac{1}{6} \times \frac{9}{10}$	$\frac{9}{60} = \frac{3}{20}$
13.	$\frac{3}{4} \times \frac{8}{9}$	$\frac{24}{36} = \frac{2}{3}$
14.	$\frac{5}{6} \times \frac{2}{3}$	$\frac{10}{18} = \frac{5}{9}$
15.	$\frac{1}{4} \times \frac{8}{11}$	$\frac{8}{44} = \frac{2}{11}$

16.	$\frac{3}{7} \times \frac{2}{9}$	$\frac{6}{63} = \frac{2}{21}$
17.	$\frac{4}{5} \times \frac{10}{13}$	$\frac{40}{65} = \frac{8}{13}$
18.	$\frac{2}{9} \times \frac{3}{8}$	$\frac{6}{72} = \frac{1}{12}$
19.	$\frac{1}{8} \times \frac{4}{5}$	$\frac{4}{40} = \frac{1}{10}$
20.	$\frac{3}{7} \times \frac{2}{15}$	$\frac{6}{105} = \frac{2}{35}$
21.	$1\frac{1}{2} \times 4\frac{3}{4}$	$\frac{57}{8} = 7\frac{1}{8}$
22.	$2\frac{5}{6} \times 3\frac{3}{8}$	$\frac{459}{48} = 9\frac{9}{16}$
23.	$1\frac{7}{8} \times 5\frac{1}{5}$	$\frac{390}{40} = 9\frac{3}{4}$
24.	$6\frac{2}{3} \times 2\frac{3}{8}$	$\frac{380}{24} = 15\frac{5}{6}$
25.	$7\frac{1}{2} \times 3\frac{6}{7}$	$\frac{405}{14} = 28\frac{13}{14}$
26.	$3 \times 4\frac{1}{3}$	$\frac{39}{3} = 13$
27.	$2\frac{3}{5} \times 5\frac{1}{6}$	$\frac{403}{30} = 13\frac{13}{30}$
28.	$4\frac{2}{5} \times 7$	$\frac{154}{5} = 30\frac{4}{5}$
29.	$1\frac{4}{7} \times 2\frac{1}{2}$	$\frac{55}{14} = 3\frac{13}{14}$
30.	$3\frac{5}{6} \times \frac{3}{10}$	$\frac{69}{60} = 1\frac{3}{20}$

6.NS Cup of Rice

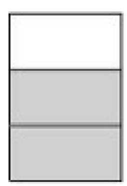
Alignments to Content Standards: 6.NS.A.1

Task

Tonya and Chrissy are trying to understand the following story problem for $1 \div \frac{2}{3}$:

One serving of rice is $\frac{2}{3}$ of a cup. I ate 1 cup of rice. How many servings of rice did I eat?

To solve the problem, Tonya and Chrissy draw a diagram divided into three equal pieces, and shade two of those pieces.



Tonya says, "There is one $\frac{2}{3}$-cup serving of rice in 1 cup, and there is $\frac{1}{3}$ cup of rice left over, so the answer should be $1\frac{1}{3}$."

Chrissy says, "I heard someone say that the answer is $\frac{3}{2} = 1\frac{1}{2}$. Which answer is right?"

Is the answer $1\frac{1}{3}$ or $1\frac{1}{2}$? Explain your reasoning using the diagram.

IM Commentary

One common mistake students make when dividing fractions using visuals is the confusion between remainder and the fractional part of a mixed number answer. In this problem, $\frac{1}{3}$ is the remainder with units “cups of rice” and $\frac{1}{2}$ has units “servings”, which is what the problem is asking for.

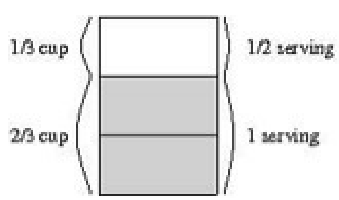
To see an annotated version of this and other Illustrative Mathematics tasks as well as other Common Core aligned resources, visit Achieve the Core.

Task based on a problem by Sybilla Beckmann, Mathematics for Elementary Teachers, Pearson 2010.

Edit this solution

Solution

In Tonya’s solution of $1\frac{1}{3}$, she correctly notices that there is one $\frac{2}{3}$-cup serving of rice in 1 cup, and there is $\frac{1}{3}$ cup of rice left over. But she is mixing up the quantities of servings and cups in her answer. The question becomes how many servings is $\frac{1}{3}$ cup of rice? The answer is “$\frac{1}{3}$ cup of rice is $\frac{1}{2}$ of a serving.”



It would be correct to say, "There is one serving of rice with $\frac{1}{3}$ cup of rice left over," but to interpret the quotient $1\frac{1}{2}$, the units for the 1 and the units for the $\frac{1}{2}$ must be the same:

There are $1\frac{1}{2}$ servings in 1 cup of rice if each serving is $\frac{2}{3}$ cup.

6.NS Traffic Jam

Alignments to Content Standards: 6.NS.A.1

Task

You are stuck in a big traffic jam on the freeway and you are wondering how long it will take to get to the next exit, which is $1\frac{1}{2}$ miles away. You are timing your progress and find that you can travel $\frac{2}{3}$ of a mile in one hour. If you continue to make progress at this rate, how long will it be until you reach the exit? Solve the problem with a diagram and explain your answer.

IM Commentary

It is much easier to visualize division of fraction problems with contexts where the quantities involved are continuous. It makes sense to talk about a fraction of an hour. The context suggests a linear diagram, so this is a good opportunity for students to draw a number line or a double number line to solve the problem. Linker cubes are also an appropriate tool to solve this problem. The linker cube solution suggests an algorithm for dividing fractions using a common denominator. The context of this problem would also work in the case where the dividend is smaller than the divisor, e.g. $\frac{1}{4} \div \frac{2}{3}$.

Solutions

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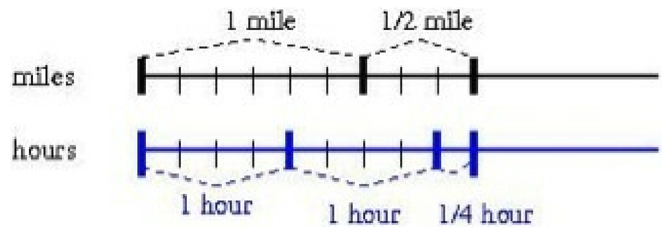
Solution: Number Line

Using a double number line where one line is measured in miles and the other one is measure in hours we get the following diagram.



In order to measure both $\frac{1}{2}$ miles and $\frac{1}{3}$ miles, we divide the 1 mile into $\frac{1}{6}$ mile pieces. This way we can find $1\frac{1}{2}$ miles and $\frac{2}{3}$ miles. Driving two $\frac{2}{3}$ mile stretches takes two hours. That leaves $\frac{1}{6}$ mile, which will take $\frac{1}{4}$ hour to drive. Therefore, it takes $2\frac{1}{4}$ hours to drive $1\frac{1}{2}$ miles.

Since we are asking "How many $\frac{2}{3}$ are there in $1\frac{1}{2}$?" this is a "How many groups?" division problem:

$$1\frac{1}{2} \div \frac{2}{3} = ?$$

We have found that the answer to this division problem is $2\frac{1}{4}$.

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Solution: Linker Cubes

Using linker cubes we need at least 6 linker cubes to represent 1 mile in order to divide the mile into thirds and halves at the same time. (Note: Any multiple of 6 would also work.) So $1\frac{1}{2}$ miles is represented by 9 linker cubes and $\frac{2}{3}$ of a mile is represented by 4 linker cubes. Now the question becomes: How many times do the 4 linker cubes ($\frac{2}{3}$ mile) fit into the 9 linker cubes ($1\frac{1}{2}$ miles)? The answer is $1+1+\frac{1}{4}=2\frac{1}{4}$. (see photo below)

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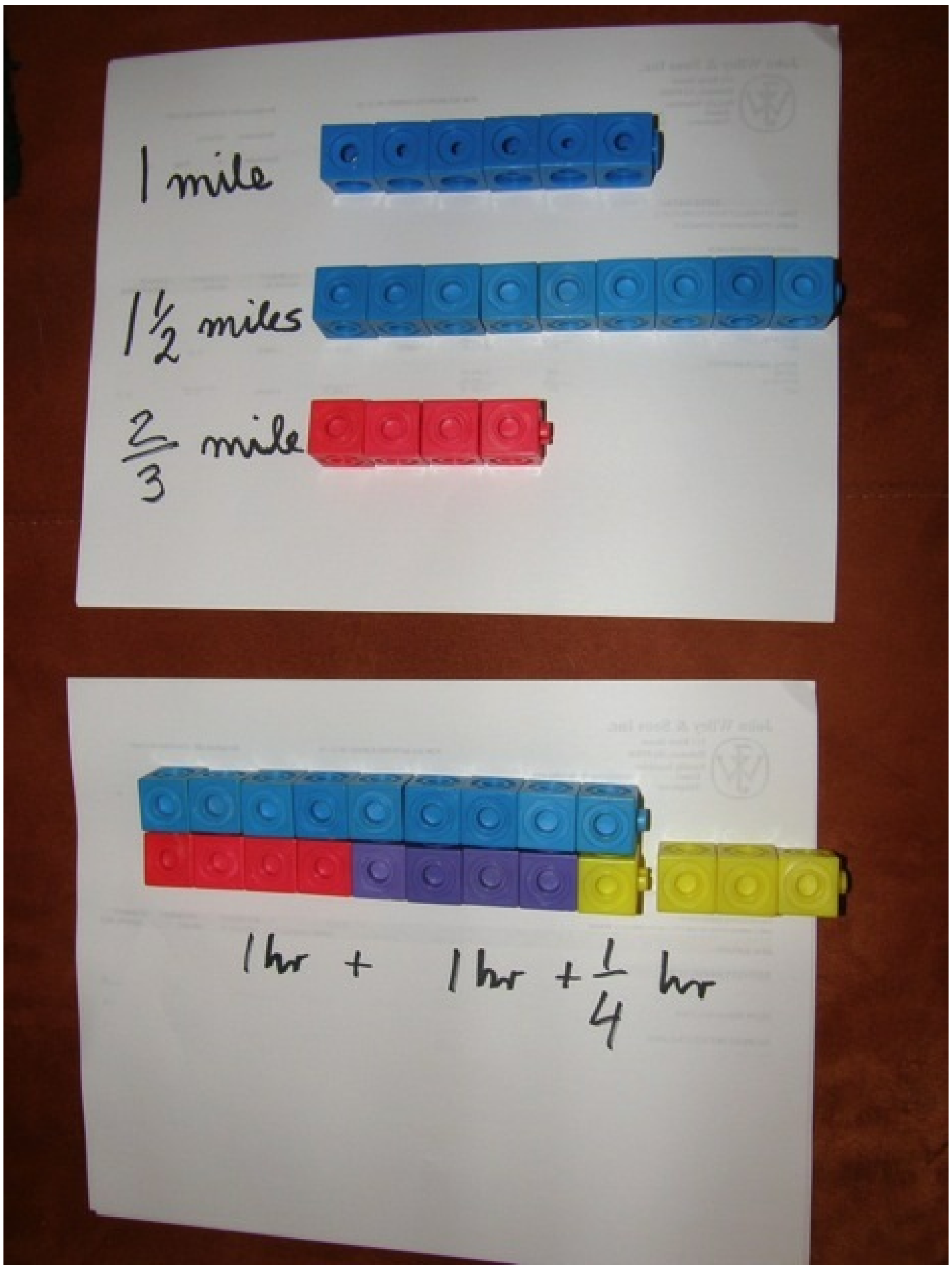
We have found that the answer to this division problem is $2\frac{1}{4}$.

Note: This problem could lead into a discovery of a “common denominator” procedure for dividing fractions: Find a common denominator of both fractions, then just divide the numerators: $1\frac{1}{2} \div \frac{2}{3} = \frac{9}{6} \div \frac{4}{6} = 9(\frac{1}{6}) \div 4(\frac{1}{6}) = 9 \div 4 = \frac{9}{4} = 2\frac{1}{4}$.



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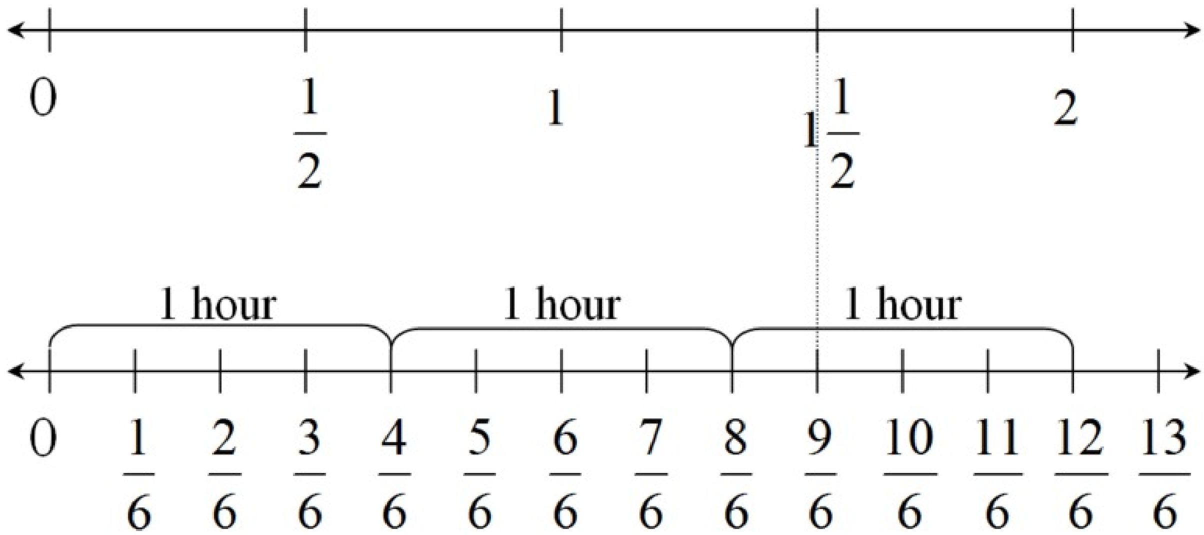
Solution: Number line solution



Since $1\frac{1}{2} = \frac{9}{6}$ and it takes an hour to travel $\frac{2}{3} = \frac{4}{6}$ miles, we can look at the number lines above and see that it will take $2\frac{1}{4}$ hours to travel the distance to the exit.

Since we are asking "How many $\frac{2}{3}$ are there in $1\frac{1}{2}$?" this is a "How many groups?" division problem:

$$1\frac{1}{2} \div \frac{2}{3} = ?$$

We have found that the answer to this division problem is $2\frac{1}{4}$.

6.NS Dan’s Division Strategy

Alignments to Content Standards: 6.NS.A.1

Task

Dan observes that

$$\frac{6}{10} \div \frac{2}{10} = 6 \div 2$$

He says,

I think that if we are dividing a fraction by a fraction with the same denominator, then we can just divide the numerators.

Is Dan’s conjecture true for all fractions? Explain how you know.

IM Commentary

The purpose of this task is to help students explore the meaning of fraction division and to connect it to what they know about whole-number division.

The Standards for Mathematical Practice focus on the nature of the learning experiences by attending to the thinking processes and habits of mind that students need to develop in order to attain a deep and flexible understanding of mathematics.

Certain tasks lend themselves to the demonstration of specific practices by students. The practices that are observable during exploration of a task depend on how instruction unfolds in the classroom. While it is possible that tasks may be connected to several practices, only one practice connection will be discussed in depth. Possible secondary practice connections may be discussed but not in the same degree of detail.

This particular task helps illustrate Mathematical Practice 3, “Construct viable arguments.” Students are asked to analyze a division problem and ascertain whether the strategy used will continue to work for all similar division problems. The student must explain their reasoning procedurally, conceptually or both. The explanations allow students to verbalize why their strategy is effective and how fraction division connects to whole-number division. Their explanation solidifies their understanding of rational number operations by building on their prior knowledge. Their use of prior knowledge when constructing viable arguments leads into the second part of MP 3, critiquing the reasoning of others. A possible classroom demonstration might be a student explaining multiple fraction division problems similar to Dan’s and expressing to other students why Dan is correct by showing how the common denominator allows for the numerators to be divided as in whole number operations. The teacher can then start generating questions such as “Will this work if the denominators are different? Why or why not?” This type of math talk in the classroom is built through collaborative problem solving and dialogue.

Solutions

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Solution: A procedural explanation and a conceptual one.

Yes, Dan's rule is correct for all fractions.

Explaining with analogies: One way of explaining why the rule is correct is to bear in mind that $\frac{6}{10}$ refers to six "items", where the "item" is $\frac{1}{10}$.

$$\frac{6}{10} = 6\left(\frac{1}{10}\right),$$

so the original division problem can be rephrased as

$$6\left(\frac{1}{10}\right) \div 2\left(\frac{1}{10}\right).$$

The computation

$$6\left(\frac{1}{10}\right) \div 2\left(\frac{1}{10}\right) = 6 \div 2 = 3$$

follows the same logic as:

$$6 \text{ apples} \div 2 \text{ apples} = 6 \div 2 = 3.$$

We would probably not write it as $6 \text{ apples} \div 2 \text{ apples}$; instead we might have a situation where we have 6 apples and want to know how many groups of 2 apples we can make. Since we can make 3 groups with 2 apples in each group, the answer is 3. There was nothing special about the apples, the same reasoning applies to any "objects":

How many groups of 2 peaches can I make if I have 6 peaches?

How many groups of $2 dollars can I make if I have $6?

How many groups of 2 tenths can I make if I have 6 tenths?

When we divide a quantity consisting of m units divided into groups of size n of the *same units*, then the result does not depend on what the units are. The answer is found by dividing the number m by the number n.

In summary, Dan's rule is true not only for dividing fractions with the same denominator, but also for any division of one quantity (number of units) by another quantity with the same units. In all cases, we find the answer by dividing the numbers, and the kind of unit does not matter.

Explaining with symbols: Dan might have made his conjecture based on using the "invert and multiply" rule:

$$\frac{6}{10} \div \frac{2}{10} = \frac{6}{10} \times \frac{10}{2} = \frac{6 \times 10}{2 \times 10} = \frac{6}{2} = 6 \div 2.$$

This works just as well for any denominator $d \neq 0$. If m and n are any integers and $n \neq 0$, then:

$$\frac{m}{d} \div \frac{n}{d} = \frac{m}{d} \times \frac{d}{n} = \frac{m \times d}{n \times d} = \frac{m}{n} = m \div n.$$

Submitted by J. Madden. This solution was developed by the 12 middle- and secondary-school teachers in the "LaMSTI On-Ramp Course" at LSU, with major contributions from N. Revaula.

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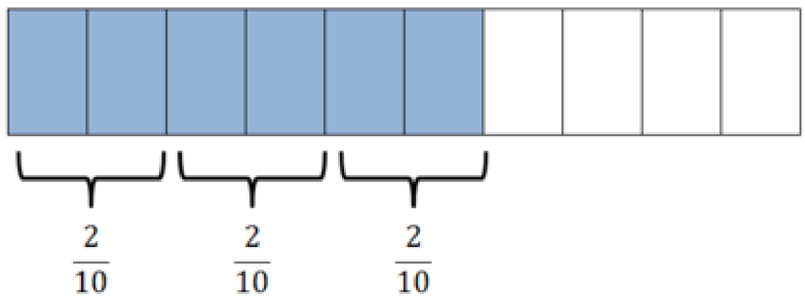
Solution:

A diagram helps make this clear:



There are 6 tenths shaded, and we want to know how many groups of 2 tenths we can make; there are 3 such groups. We can see that there is nothing special about the fact that the small rectangles represent tenths; the same reasoning would work for any denominator.

MS Science Answer Key
Assignment #1

Part I

1. Watch the following videos to observe the phenomenon we will be exploring in this lesson.
    a. April 7, 2013 - Kansas https://bit.ly/2UR9cdF
    b. October 5, 2010 - Arizona https://bit.ly/3aSZUn9
    c. June 10, 2013 - Canada https://bit.ly/3aUqmfZ

2. Complete the *Notice and Wonder* chart below.
    a. What do you notice in the videos? Write down as many observations as possible in the *Notice* column.
    b. What do the videos make you wonder? Write down questions you have about what you observed in the *Wonder* column.

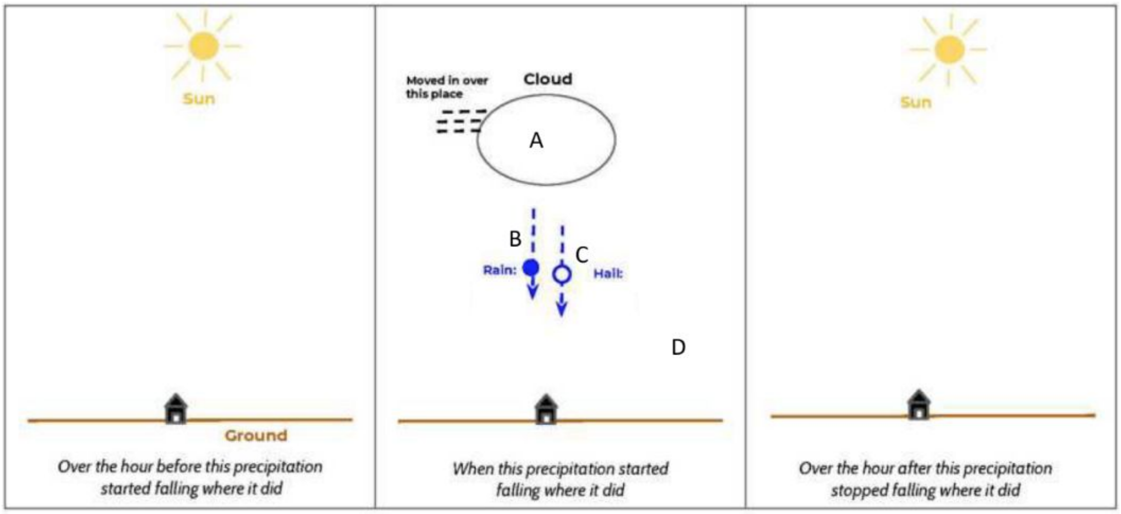
Notice	Wonder
Responses will vary. Can include: • *It looked like big pieces of ice or snow were falling in all the videos, but the size of them looked different in each of the three cases.* • *When it hit the ground, it bounced really high in the first and second videos. It made noise when it hit things in those videos.* • *The plants in the area had green leaves (e.g., grass, flowers, trees).* • *There was wind at some point in all of them. It was very strong in the second one (Arizona), and there was some in the first one (Kansas).* • *There was rain at one point along with the hail in the second one (Arizona), and there was rain before the hail in the third one (Canada), and it looked like the ground was wet in the first one—-maybe from previous rain.* • *It seemed windy in the second video. And there was a moment in the third video when the tarp on the ground seemed to flap a lot.* • *It didn't seem to last very long in all three cases.*	*Responses will vary.* • ***Hail:** How does hail form, why do different things (hail, snow, or rain) sometimes form in clouds, and what keeps them up there?* • ***Wind:** Why is there a lot of wind in some storms?* • ***Clouds:** What is going on in the clouds?* • ***Snow and blizzards:** Where does the water come from in a blizzard (when it seems to be freezing cold), and how do blizzards form?* • ***Hurricanes:** What causes hurricanes?* • ***Rain:** Why does it rain heavily sometimes in some places and not in others?* • ***Elevation and temperature:** How does the temperature higher up in the air compare to the air closer to the ground?*

3. Share your noticings and wonderings with a classmate or family member.

Part 2

1. **Precipitation** is a way to refer to any liquid or solid forms of water that fall to the ground from above.
    a. Watch a video (https://bit.ly/2y22M2g) reviewing states of matter at the particle level.

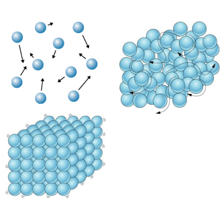
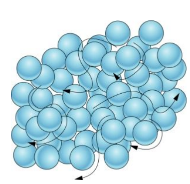
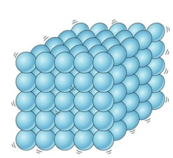
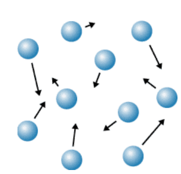
    b. Use this model of the precipitation events observed in Part 1 to answer the discussion questions below.



i. Where do you think the cloud that appeared when the precipitation occurred came from?
Answers will vary.

ii. Why would a cloud appear when precipitation occurs?
Answers will vary.

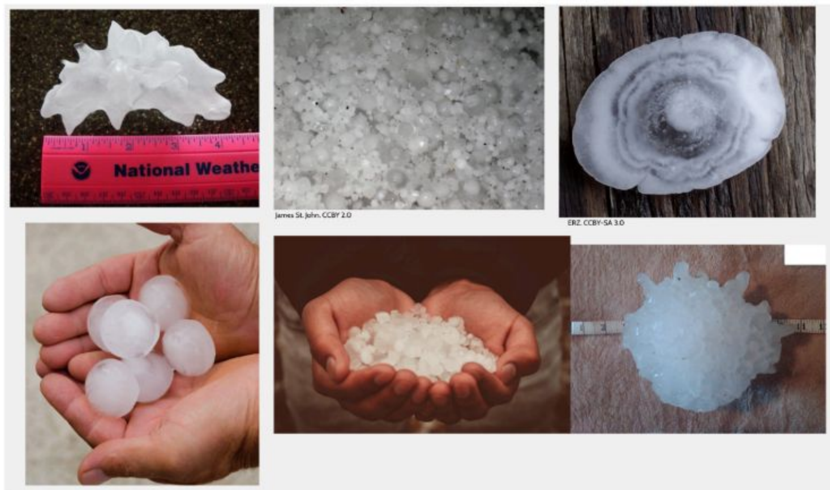
iii. Imagine you had a microscope strong enough to see matter at the particle level. Draw what you think it looks like at the particle level for each labeled part of the model. (A: Inside cloud, B: Rain, C: Hail, D: Air)

A	B	C	D
 *Combination of solid, liquid, and gas particles*	 *Liquid*	 *Solid*	 *Gas*

Assignment #2

Part I

1. Look at the images of different hailstones and write down what you notice and what questions the photos make you wonder about in the chart below.



Notice	Wonder
Answers will vary. May include: • *Some are smooth and some are spiky on the surface.* • *They range in size from the size of peas to the size of baseballs.* • *The larger ones have (3-4) rings and look like solid ice throughout their insides.*	*Answers will vary. May include:* • *I don't get why some are spiky and some are smooth.* • *Why don't they melt on the way down?* • *How could they be different sizes?*

2. Considering your observations:
   a. When do you think hail storms happen most frequently in the United States?
   Answers will vary. (e.g. winter or cold months due to hailstones being made of ice)

   b. What do you think the weather conditions are like during a hail storm?
   Answers may vary. (e.g. cold, windy, cloudy, rainy)

Part 2

1. Look at the Weather Data handout for the Fort Scott hailstorm.

   a. Based on Chart A, during what season(s) did most hailstorms occur? Does this support your prediction from Part 1?
   Most hailstorms occur during the spring and summer months. Answers comparing to prediction will vary.

   b. What was the date and time for the hailstorm in Fort Scott, KS?
   April 7, 2013 at 4:25 PM

   c. Using Chart B, what was the approximate temperature when the hailstorm occurred? Does this support your prediction from Part 1?
   Temperature is about 59 degrees Fahrenheit during the hailstorm. Answers comparing to prediction will vary.

   d. Using Chart B, what was happening with the wind around the time that the hailstorm occurred?
   The wind speed and wind gust increased around the time of the hailstorm.

2. Look at data from the two hail storms that occured in Phoenix, AZ on October 5.

   a. Based on all the data you've reviewed so far,

      i. How would you describe the typical temperature during a hailstorm?
      Temperature is relatively warm (above 55 degrees Fahrenheit) during the hailstorm. Answers comparing to prediction will vary.

      ii. Relative humidity is the quantity of water in air compared to the utmost amount of water the air can take in. How would you describe the typical relative humidity during a hailstorm?
      Humidity is relatively high when it hails. The humidity goes up around the time of a hailstorm.

      iii. How would you describe the wind during a hailstorm?
      There are changes in wind when it hails.

Assignment #3

Part I

1. Watch the video titled "Hail and Hailstones" (https://bit.ly/3aTfqiL).

2. Based on what you learned from the video, why do you think hail storms tend to happen when there are warmer temperatures even though they are made of ice?
Answers will vary but might make the connection that warm air rising creates the air movement needed (wind) for hailstones to form in clouds.

Part 2

1. Read the article titled **"After a freak hailstorm turned a beach white, we look at what causes hail and if it's dangerous"**.

2. Draw a diagram that shows how hailstorms are formed. Include pictures, labels, and directional arrows.

   Diagram should be similar to the diagram found in the article and should include:
   - *A depiction of hail formation in a cloud*
   - *Air movement*
   - *Temperature differences at different altitudes*

3. Explain how the data you analyzed in Part 2 supports what you learned in the video and article. Why wouldn't you expect more hailstorms to happen during winter when cold temperatures are occuring?
We saw relatively warm temperatures during the times hailstorms occur. The warm air from near the ground rises and causes the upward movement of air. That air lifts water droplets higher into the sky where they reach temperatures below freezing and form into ice. This happens again and again until the ice (hailstones) are too heavy and start to fall. This type of air movement happens more on warm, sunny days because the air right above the ground gets warmed up more by the Sun on those days.