Grade 7
Family Resource Bundle

Grade 7

ANSWER KEY Text #1 "Klondike Gold Rush"

by Anonymous 1898

1. RI.CS.4

PART A: In paragraph 2, what does the phrase "miners of all shapes and sizes" mean?

A. Many people were invited.
B. People with supplies traveled to the Yukon.
C. People experienced discrimination.
D. Many types of people traveled to the Yukon.

2. RI.KID.3

PART B: What additional idea does the reader understand from the phrase in Part A?

A. a large number of miners arrived
B. most miners had gold field experience
C. a large number of miners were rejected
D. most miners could handle the hard labor

3. RI.CS.4

PART A: What is the meaning of "pamphlets" as it is used in paragraph 3 of "Klondike Gold Rush"?

A. tokens for miners
B. stocked wagons
C. guides for miners
D. camping kits

4. RI.KID.1

PART B: Which detail from paragraph 3 helps the reader understand the meaning of "pamphlets"?

A. "Most stampeders knew little or nothing about where they were going"
B. "This included food, clothing, tools, and camping, mining and transportation equipment."
C. "Helping the outfitters in this regard were the Northwest Mounted Police"
D. "This was roughly one ton of goods per person."

5. RI.KID.2

PART A: Based on the information from "Klondike Gold Rush," which sentence states a central idea of the article?

A. Most miners were pleased with the outcome of the gold rush.

B. Most miners labored hard for very little gain.
C. Work in the Yukon Territory was worth the danger of traveling there.
D. The gold rush hurt many small businesses.

6. RI.KID.1

PART B: Which TWO sentences from the article provide the best evidence for the answer in Part A?

A. "Outfitters sprang up overnight that were happy to sell the stampeders whatever they needed to get started." (Paragraph 3)
B. "Towns such as Seattle made fortunes outfitting the miners." (Paragraph 3)
C. "Those who made it across the passes found themselves at Bennett Lake." (Paragraph 8)
D. "Many stampeders headed home, some worked for others on the claims, and still others stayed to work in Dawson City." (Paragraph 9)
E. "The work that was necessary to retrieve the gold was incredible." (Paragraph 10)
F. "The biggest boom to hit this part of the world was a huge bust for the miners.) (Paragraph 11)

7. RI.KID.3

PART A: Based on evidence in the article, why did so few miners stay in the Klondike to mine gold after arriving?

A. The conditions for mining were difficult.
B. Many laws outlawed miners.
C. The lack of wildlife made mining nearly impossible.
D. The value of gold dropped significantly.

8. RI.KID.1

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

A. "helping the outfitters in this regard were the Northwest Mounted Police" (Paragraph 3)
B. "The Chilkoot Pass trail was steep and hazardous." (Paragraph 6)
C. "Here, boats had to be built" (Paragraph 8)
D. "Most of the gold was not at the surface" (Paragraph 10)

9. RI.KID.3

PART A: Based on the information in "Klondike Gold Rush," how did most miners reach the Yukon territory?

A. by boat and by train
B. by train and using pack animals
C. by boat and by walking overland
D. by train and by walking overland

10. RI.KID.1

PART B: Which paragraph offers evidence for the answer to Part A?

A. Paragraph 2
B. Paragraph 5
C. Paragraph 9
D. Paragraph 10

11. RI.CS.5

PART A: How does the author mainly organize paragraphs 1-2 in the article "Klondike Gold Rush"?

A. chronological order
B. cause and effect
C. problem and solution
D. compare and contrast

12. RI.KID.1

PART B: Which description best illustrates how the structure in Part A is achieved?

A. "The Klondike gold rush began in July of 1897" (Paragraph 1)
B. "The press was alerted" (Paragraph 1)
C. "miners of all shapes and sizes" (Paragraph 2)
D. "Only 30,000 completed the trip" (Paragraph 2)

ANSWER KEY Text #2 excerpt from *A Woman Who Went to Alaska*

by Mary Kellogg Sullivan 1902

1. RI.CS.4

PART A: As used in paragraph 3 of the passage from A Woman Who Went to Alaska, what is the meaning of the word "oppressive"?

A. unjustly harsh
B. occasionally flexible
C. unexpectedly angry
D. appropriately demanding

2. RI.KID.1

PART B: Which phrase from paragraph 3 in the passage from A Woman Who Went to Alaska helps the reader understand the meaning of the word "oppressive"?

A. "Canadian Dominion government"
B. "arbitrary and strictly enforced"
C. "prospect for gold"

D. "he visits the recorder's office"

3. RI.KID.3

PART A: Which statement best describes the Canadian government's treatment of the miners in the passage from A Woman Who Went to Alaska?

A. a controlling government that takes advantage of the miners
B. a fair government that wants the miners to succeed without assistance
C. a disorganized government that fails to set appropriate rules for the miners
D. an irresponsible government that is indifferent to the miners

4. RI.IKI.8

PART B: Which THREE actions does the government take that provide evidence for the answer to Part A?

A. charging high taxes on mined gold
B. encouraging fishing and hunting
C. enforcing a nightly curfew
D. requiring multiple licenses and permits
E. seizing property known to contain gold
F. assisting newcomers seeking a claim
G. banning the use of explosives

Related Media Links and Descriptions

Related Media #1: "The Devastating Effects of Gold Mining"
Show this video to students to learn more about the costs of mining gold. Ask students to discuss whether or not they think the costs of mining gold outweigh the benefits that it provides. How do students think the negative effects of gold mining have changed over the years? (4:30)

Related Media #2: " A Woman Who Went to Alaska, Trailer"
Show this audiobook trailer of "A Woman Who Went to Alaska" to provide students with additional information on Mary Kellogg Sullivan's book and the experiences that inspired it. Ask students to discuss what makes Sullivan's perspective on the Gold Rush unique. (1:20)

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.

7.RP Cooking with the Whole Cup

Alignments to Content Standards: 7.RP.A.1

Task

Travis was attempting to make muffins to take to a neighbor that had just moved in down the street. The recipe that he was working with required $\frac{3}{4}$ cup of sugar and $\frac{1}{8}$ cup of butter.

a. Travis accidentally put a whole cup of butter in the mix.

> i. What is the ratio of sugar to butter in the original recipe? What amount of sugar does Travis need to put into the mix to have the same ratio of sugar to butter that the original recipe calls for?
>
> ii. If Travis wants to keep the ratios the same as they are in the original recipe, how will the amounts of all the other ingredients for this new mixture compare to the amounts for a single batch of muffins?
>
> iii. The original recipe called for $\frac{3}{8}$ cup of blueberries. What is the ratio of blueberries to butter in the recipe? How many cups of blueberries are needed in the new enlarged mixture?

b. This got Travis wondering how he could remedy similar mistakes if he were to dump in a single cup of some of the other ingredients. Assume he wants to keep the ratios the same.

> i. How many cups of sugar are needed if a single cup of blueberries is used in the mix?

ii. How many cups of butter are needed if a single cup of sugar is used in the mix?

iii. How many cups of blueberries are needed for each cup of sugar?

IM Commentary

While the task as written does not explicitly use the term "unit rate," most of the work students will do amounts to finding unit rates. A recipe context works especially well since there are so many different pair-wise ratios to consider.

This task can be modified as needed; depending on the choice of numbers, students are likely to use different strategies which the teacher can then use to help students understand the connection between, for example, making a table and strategically scaling a ratio.

The choice of numbers in this task is already somewhat strategic: in part (a), the scale factor is a whole number and in part (b), the scale factors are fractions. Because of this difference, students will likely approach the parts of the task in different ways. The teacher can select and sequence a discussion of the different approaches to highlight the structure of the mathematics and allow for connections to proportional relationships.

This task was submitted by Travis Lemon for the first IMP task writing contest 2011/12/12-2011/12/18.

Solutions

Edit this solution

Solution: Solution

a. i. The ratio of cups of sugar to cups of butter is $\frac{3}{4} : \frac{1}{8}$. If we multiply both numbers in the ratio by 8, we get an equivalent ratio that involves 1 cup of butter.

$$8 \times \frac{3}{4} = 6$$

and

$$8 \times \frac{1}{8} = 1$$

In other words, $\frac{3}{4} : \frac{1}{8}$ is equivalent to $6 : 1$, and so six cups of sugar is needed if there is one cup of butter.

ii. In the previous part we saw that we have 8 times as much butter, so all the ingredients need to be increased by a factor of 8. That is, the quantity of each ingredient in the original recipe needs to be multiplied by 8 in order for all the ratios to be the same in the new mixture.

iii. The ratio of cups of blueberries to cups of butter is $\frac{3}{8} : \frac{1}{8}$ in the original recipe, so Travis will need to add $8 \times \frac{3}{8} = 3$ cups of blueberries to his new mixture.

b. i. The ratio of cups of sugar to cups of blueberries is $\frac{3}{4} : \frac{3}{8}$. If we multiply both numbers in the ratio by $\frac{8}{3}$, we get an equivalent ratio.

$\frac{8}{3} \times \frac{3}{4} = 2$ and $\frac{8}{3} \times \frac{3}{8} = 1$.

Since $\frac{3}{4} : \frac{3}{8}$ is equivalent to $2 : 1$, two cups of sugar is needed if there is one cup of blueberries.

ii. The ratio of cups of butter to cups of sugar is $\frac{1}{8} : \frac{3}{4}$. If we multiply both numbers in the ratio by $\frac{4}{3}$, we get an equivalent ratio.

$\frac{4}{3} \times \frac{1}{8} = \frac{1}{6}$ and $\frac{4}{3} \times \frac{3}{4} = 1$.

In other words, $\frac{1}{8} : \frac{3}{4}$ is equivalent to $\frac{1}{6} : 1$, and $\frac{1}{6}$ cup of butter is needed if there is one cup of sugar.

iii. The ratio of cups of blueberries to cups of sugar is $\frac{3}{8} : \frac{3}{4}$. If we multiply both numbers in the ratio by $\frac{4}{3}$, we get an equivalent ratio.

$\frac{4}{3} \times \frac{3}{8} = \frac{1}{2}$ and $\frac{4}{3} \times \frac{3}{4} = 1$.

Since $\frac{3}{8} : \frac{3}{4}$ is equivalent to $\frac{1}{2} : 1$, Travis would need $\frac{1}{2}$ cup of blueberries if there is one cup of sugar.

Instructional Note: For part (b), I have encouraged students to think about unit fractions as an intermediate step to developing an understanding of how to multiply by fractions. With the emphasis on unit fractions in the CCSSM, I decided to use this approach this year and have found success. Students see the value of scaling to a unit fraction and then going from there.

For example, if a student realizes that $\frac{3}{8}$ needs to become 1 to answer part (b.i), she can first take $\frac{1}{3}$ of the amount to create a unit fraction of $\frac{1}{8}$ and then multiply this by 8 to create 1.

The composite result of these calculations is equivalent to multiplying by $\frac{8}{3}$. Students often find that the two calculations (taking $\frac{1}{3}$ of the amount to create a unit fraction of $\frac{1}{8}$ and then multiply this by 8) made independently are more mentally accessible, which makes them a nice intermediate step in understanding the composite calculation of multiplying by the reciprocal.

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Solution: Using tables

a. i. The ratio of cups of sugar to cups of butter is $\frac{3}{4} : \frac{1}{8}$. If we set up a table, we can successively double the amounts:

cups of sugar	$\frac{3}{4}$	$\frac{6}{4}$	$\frac{12}{4}$	$\frac{24}{4} = 6$
cups of butter	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{4}{8}$	$\frac{8}{8} = 1$

So six cups of sugar is needed if there is one cup of butter.

ii. In the previous part, we had to double the quantities three times: $2 \cdot 2 \cdot 2 = 8$. So Travis needs 8 times as much butter as the original recipe required. If we want to keep all the ingredients in the same ratio, Travis needs to multiply the amount of each ingredient by 8.

iii. The ratio of cups of blueberries to cups of butter is $\frac{3}{8} : \frac{1}{8}$ in the original recipe, so Travis will need to add $8 \cdot \frac{3}{8} = 3$ cups of blueberries.

b. i. It is much harder to solve this problem using a table because the scale factor

is no longer a whole number. Students who solved the first part using a table may need guidance from their classmates or the teacher to see that multiplying both numbers in the ratio by the reciprocal of the amount of blueberries will give an equivalent ratio with 1 cup of blueberries. Here is where the teacher should highlight the importance of being able to find a unit rate.

The ratio of cups of sugar to cups of blueberries is $\frac{3}{4} : \frac{3}{8}$. If we multiply both numbers in the ratio by $\frac{8}{3}$, we get an equivalent ratio.

$\frac{3}{4} \times \frac{8}{3} = 2$ and $\frac{3}{8} \times \frac{8}{3} = 1$.

So two cups of sugar is needed if there is one cup of blueberries.

ii. The ratio of cups of butter to cups of sugar is $\frac{1}{8} : \frac{3}{4}$. If we multiply both numbers in the ratio by $\frac{4}{3}$, we get an equivalent ratio.

$\frac{1}{8} \times \frac{4}{3} = \frac{1}{6}$ and $\frac{3}{4} \times \frac{4}{3} = 1$.

So $\frac{1}{6}$ cup of butter is needed if there is one cup of sugar.

iii. The ratio of cups of blueberries to cups of sugar is $\frac{3}{8} : \frac{3}{4}$. If we multiply both numbers in the ratio by $\frac{4}{3}$, we get an equivalent ratio.

$\frac{3}{8} \times \frac{4}{3} = \frac{1}{2}$ and $\frac{3}{4} \times \frac{4}{3} = 1$.

So $\frac{1}{2}$ cup of blueberries is needed if there is one cup of sugar.

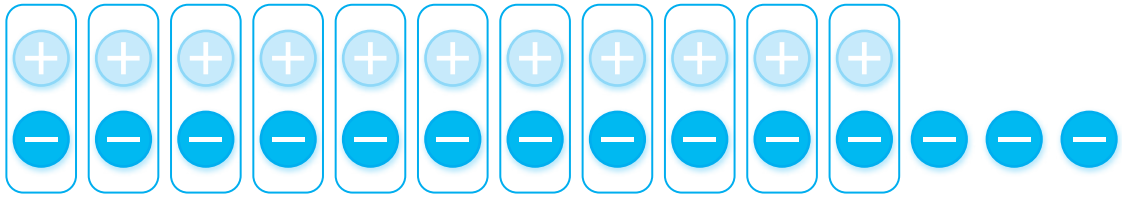
Understanding Addition with Negative Integers

1. Between the time Iko woke up and lunchtime, the temperature rose by 11°. Then by the time he went to bed, the temperature dropped by 14 °.

Write an addition expression for the temperature relative to when Iko woke up.

11 + (−14)

Draw a model using integer chips and circle the zero pairs.



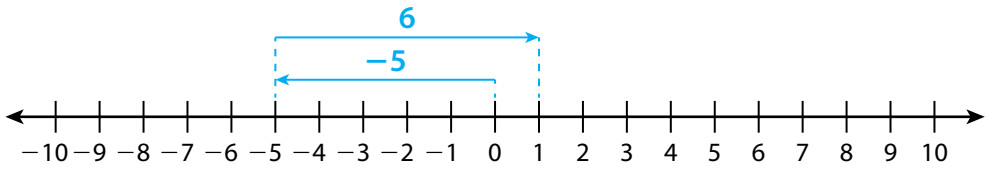
What is the value of the remaining integer chips after the zero pairs are removed?

−3

What is the net change in the temperature relative to when Iko woke up?

−3°, or a loss of 3°

2. Complete the number line model to find (−5) + 6.



(−5) + 6 = 1

How would the number line model be different if you wanted to find (−5) + (−6)?

Possible answer: I would start the same way, by drawing an arrow from 0 to −5. Then I would draw an arrow from −5 to −11 to show adding −6.

Understanding Addition with Negative Integers *continued*

➤ **For problems 3–5, consider the sum 4 + (−8).**

3 Explain how you can use a number line to find the sum.

Possible answer: I can draw a number line with the first arrow pointing left from 0 to 4, then draw an arrow 8 units to the left from 4 to −4. The arrow ends at −4, so the sum is −4.

4 Explain how you can use chips to determine the sum.

Possible answer: I can use 4 positive chips and 8 negative chips. I can group zero pairs, then count the remaining chips. There are 4 negative chips remaining, so the sum is −4.

5 Does it matter what order you add the numbers in the problem? Explain how chips and number lines support your answer.

No; Possible answer: On the number line, I can draw an arrow from 0 to −8, then draw an arrow from −8 to −4. Using the chips, I could use 8 negative chips and then 4 positive chips. I will make the same number of zero pairs, and there will still be 4 negative chips remaining.

6 Write an addition expression that has a value of −8.

Possible answer: 5 + (−13)

Understanding Subtraction with Negative Integers

1 Mary takes 9 grapes from Rohin and then decides to give 4 back.

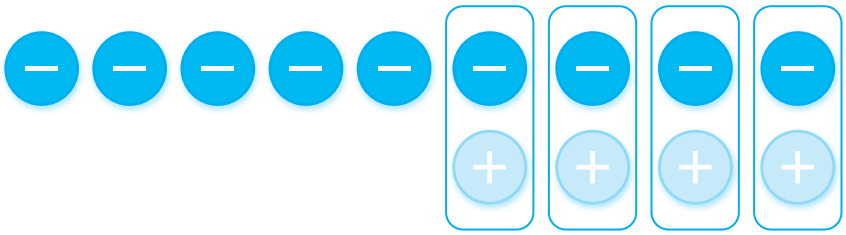
Write a subtraction problem to describe how many grapes Rohin has. $-9 - (-4)$

Draw a model for the subtraction problem using integer chips.

How many negative integer chips did you cross out? 4

Write the subtraction as addition. $-9 + 4$

Draw a model for the addition problem using integer chips.



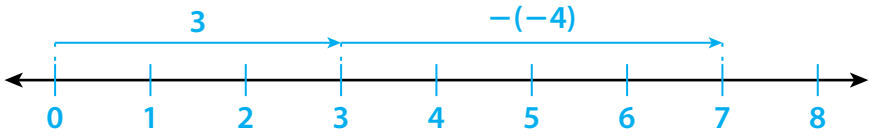
How do the two integer chip models show that $-9 - (-4)$ is the same as $-9 + 4$?

They both show that when you start with -9, you can take away -4 or add 4. In each model, you get rid of 4 negative integer chips and you have 5 negative integer chips left.

What is the change in the number of grapes Rohin has? -5

Understanding Subtraction with Negative Integers *continued*

2 Jin is 3 floors above ground level in a hotel. Leila is on a parking level of the hotel that is 4 floors below ground level. How many floors apart are they? Draw a number line model to show $3 - (-4)$.



What is $3 - (-4)$? 7

What is the meaning of this answer in the context of the problem?

Jin and Leila are 7 floors apart.

Rewrite $3 - (-4)$ as an addition problem. $3 + 4 = 7$

3 The variables a and b represent positive numbers. When you find the difference $a - (-b)$, do you expect the result to be less than or greater than a? What if a is negative and b is positive? Explain.

Possible answer: Whether a is positive or negative, I can write $a - (-b)$ as $a + b$, so I am always adding a positive value to a. The difference will always be greater than a.

Understanding Multiplication with Negative Integers

➤ **Practice multiplying negative integers.**

1 Find each product. Then describe any patterns you notice.

$3 \cdot (-7) =$ **−21**

$2 \cdot (-7) =$ **−14**

$1 \cdot (-7) =$ **−7**

$0 \cdot (-7) =$ **0**

$(-1) \cdot (-7) =$ **7**

$(-2) \cdot (-7) =$ **14**

$(-3) \cdot (-7) =$ **21**

Possible answer: The product of a positive number and a negative number is always negative, and the product of two negative numbers is always positive.

2 Solve each problem. Explain how you determined the sign of the products.

$(-3)(9) =$ **−27**

$(-8)(-5) =$ **40**

$(-5)(-6) =$ **30**

$(-1)(2)(-6) =$ **12**

$(-2)(-4)(-7) =$ **−56**

$(-3)(-4)(-3)(-1) =$ **36**

Possible answer: The product of two negative numbers is positive. The product of a positive number and a negative number is negative. The product of three negative numbers is negative because the product of the first two factors is positive. That positive factor is then multiplied by a negative number, resulting in a negative product. The product of four negative numbers is positive because the product of each pair of negative factors is positive and then the product of two positive numbers is positive.

Understanding Multiplication with Negative Integers *continued*

3 Use the distributive property to show why the product $(-6)(-3)$ is positive. The first step is done for you.

$(-6)(-3) + (-6)(3) = (-6)[(-3) + 3]$

$(-6)(-3) + (-6)(3) = (-6)(0)$

$(-6)(-3) + (-6)(3) = 0$

$(-6)(-3) + (-18) = 0$

$(-6)(-3) = 18$

4 Mark's work to simplify $(-3)(-5)(-2)$ is shown. Explain his error and show how to find the correct product.

$(-3)(-5)(-2) = (-15)(-2) = 30$

Possible answer: The product of two negative numbers is positive, so $(-3)(-5) = 15$. The problem $(-3)(-5)(-2)$ can be rewritten as $(15)(-2)$ instead of $(-15)(-2)$. The product of a positive number and a negative number is negative, so $(15)(-2) = -30$.

Integer Addition—Round 1 [KEY]

Directions: Determine the sum of the integers, and write it in the column to the right.

1.	$8 + (-5)$	**3**
2.	$10 + (-3)$	**7**
3.	$2 + (-7)$	**−5**
4.	$4 + (-11)$	**−7**
5.	$-3 + (-9)$	**−12**
6.	$-12 + (-7)$	**−19**
7.	$-13 + 5$	**−8**
8.	$-4 + 9$	**5**
9.	$7 + (-7)$	**0**
10.	$-13 + 13$	**0**
11.	$14 + (-20)$	**−6**
12.	$6 + (-4)$	**2**
13.	$10 + (-7)$	**3**
14.	$-16 + 9$	**−7**
15.	$-10 + 34$	**24**
16.	$-20 + (-5)$	**−25**
17.	$-18 + 15$	**−3**

18.	$-38 + 25$	**−13**
19.	$-19 + (-11)$	**−30**
20.	$2 + (-7)$	**−5**
21.	$-23 + (-23)$	**−46**
22.	$45 + (-32)$	**13**
23.	$16 + (-24)$	**−8**
24.	$-28 + 13$	**−15**
25.	$-15 + 15$	**0**
26.	$12 + (-19)$	**−7**
27.	$-24 + (-32)$	**−56**
28.	$-18 + (-18)$	**−36**
29.	$14 + (-26)$	**−12**
30.	$-7 + 8 + (-3)$	**−2**
31.	$2 + (-15) + 4$	**−9**
32.	$-8 + (-19) + (-11)$	**−38**
33.	$15 + (-12) + 7$	**10**
34.	$-28 + 7 + (-7)$	**−28**

Integer Addition—Round 2 [KEY]

Directions: Determine the sum of the integers, and write it in the column to the right.

1.	$5 + (-12)$	-7
2.	$10 + (-6)$	4
3.	$-9 + (-13)$	-22
4.	$-12 + 17$	5
5.	$-15 + 15$	0
6.	$16 + (-25)$	-9
7.	$-12 + (-8)$	-20
8.	$-25 + (-29)$	-54
9.	$28 + (-12)$	16
10.	$-19 + (-19)$	-38
11.	$-17 + 20$	3
12.	$8 + (-18)$	-10
13.	$13 + (-15)$	-2
14.	$-10 + (-16)$	-26
15.	$35 + (-35)$	0
16.	$9 + (-14)$	-5
17.	$-34 + (-27)$	-61

18.	$23 + (-31)$	-8
19.	$-26 + (-19)$	-45
20.	$16 + (-37)$	-21
21.	$-21 + 14$	-7
22.	$33 + (-8)$	25
23.	$-31 + (-13)$	-44
24.	$-16 + 16$	0
25.	$30 + (-43)$	-13
26.	$-22 + (-18)$	-40
27.	$-43 + 27$	-16
28.	$38 + (-19)$	19
29.	$-13 + (-13)$	-26
30.	$5 + (-8) + (-3)$	-6
31.	$6 + (-11) + 14$	9
32.	$-17 + 5 + 19$	7
33.	$-16 + (-4) + (-7)$	-27
34.	$8 + (-24) + 12$	-4

Integer Subtraction—Round 2 [KEY]

Directions: Determine the difference of the integers, and write it in the column to the right.

1.	$3 - 2$	1
2.	$3 - 3$	0
3.	$3 - 4$	-1
4.	$3 - 5$	-2
5.	$3 - 6$	-3
6.	$3 - 9$	-6
7.	$3 - 10$	-7
8.	$3 - 20$	-17
9.	$3 - 80$	-77
10.	$3 - 100$	-97
11.	$3 - (-1)$	4
12.	$3 - (-2)$	5
13.	$3 - (-3)$	6
14.	$3 - (-7)$	10
15.	$3 - (-17)$	20
16.	$3 - (-27)$	30
17.	$3 - (-127)$	130
18.	$13 - (-6)$	19
19.	$24 - (-8)$	32
20.	$5 - (-23)$	28
21.	$61 - (-3)$	64
22.	$58 - (-5)$	63

23.	$(-8) - 5$	-13
24.	$(-8) - 7$	-15
25.	$(-8) - 9$	-17
26.	$(-15) - 9$	-24
27.	$(-35) - 9$	-44
28.	$(-22) - 22$	-44
29.	$(-27) - 27$	-54
30.	$(-14) - 21$	-35
31.	$(-22) - 72$	-94
32.	$(-311) - 611$	-922
33.	$(-345) - 654$	-999
34.	$(-2) - (-1)$	-1
35.	$(-2) - (-2)$	0
36.	$(-2) - (-3)$	1
37.	$(-2) - (-4)$	2
38.	$(-2) - (-8)$	6
39.	$(-20) - (-45)$	25
40.	$(-24) - (-13)$	-11
41.	$(-13) - (-24)$	11
42.	$(-5) - (-3)$	-2
43.	$(-3) - (-5)$	2
44.	$(-1{,}034) - (-31)$	$-1{,}003$

Integer Subtraction—Round 1 [KEY]

Directions: Determine the difference of the integers, and write it in the column to the right.

1.	$4 - 2$	2
2.	$4 - 3$	1
3.	$4 - 4$	0
4.	$4 - 5$	-1
5.	$4 - 6$	-2
6.	$4 - 9$	-5
7.	$4 - 10$	-6
8.	$4 - 20$	-16
9.	$4 - 80$	-76
10.	$4 - 100$	-96
11.	$4 - (-1)$	5
12.	$4 - (-2)$	6
13.	$4 - (-3)$	7
14.	$4 - (-7)$	11
15.	$4 - (-17)$	21
16.	$4 - (-27)$	31
17.	$4 - (-127)$	131
18.	$14 - (-6)$	20
19.	$23 - (-8)$	31
20.	$8 - (-23)$	31
21.	$51 - (-3)$	54
22.	$48 - (-5)$	53

23.	$(-6) - 5$	-11
24.	$(-6) - 7$	-13
25.	$(-6) - 9$	-15
26.	$(-14) - 9$	-23
27.	$(-25) - 9$	-34
28.	$(-12) - 12$	-24
29.	$(-26) - 26$	-52
30.	$(-13) - 21$	-34
31.	$(-25) - 75$	-100
32.	$(-411) - 811$	$-1,222$
33.	$(-234) - 543$	-777
34.	$(-3) - (-1)$	-2
35.	$(-3) - (-2)$	-1
36.	$(-3) - (-3)$	0
37.	$(-3) - (-4)$	1
38.	$(-3) - (-8)$	5
39.	$(-30) - (-45)$	15
40.	$(-27) - (-13)$	-14
41.	$(-13) - (-27)$	14
42.	$(-4) - (-3)$	-1
43.	$(-3) - (-4)$	1
44.	$(-1{,}066) - (-34)$	$-1,032$

Integer Multiplication—Round 1 [KEY]

Directions: Determine the product of the integers, and write it in the column to the right.

1.	$-2 \bullet -8$	**16**
2.	$-4 \bullet 3$	**−12**
3.	$5 \bullet -7$	**−35**
4.	$1 \bullet -1$	**−1**
5.	$-6 \bullet 9$	**−54**
6.	$-2 \bullet -7$	**14**
7.	$8 \bullet -3$	**−24**
8.	$0 \bullet -9$	**0**
9.	$12 \bullet -5$	**−60**
10.	$-4 \bullet 2$	**−8**
11.	$-1 \bullet -6$	**6**
12.	$10 \bullet -4$	**−40**
13.	$14 \bullet -3$	**−42**
14.	$-5 \bullet -13$	**65**
15.	$-16 \bullet -8$	**128**
16.	$18 \bullet -2$	**−36**
17.	$-15 \bullet 7$	**−105**
18.	$-19 \bullet 1$	**−19**
19.	$12 \bullet 12$	**144**
20.	$9 \bullet -17$	**−153**
21.	$-8 \bullet -14$	**112**
22.	$-7 \bullet 13$	**−91**

23.	$-14 \bullet -12$	**168**
24.	$15 \bullet -13$	**−195**
25.	$16 \bullet -18$	**−288**
26.	$24 \bullet -17$	**−408**
27.	$-32 \bullet -21$	**672**
28.	$19 \bullet -27$	**−513**
29.	$-39 \bullet 10$	**−390**
30.	$43 \bullet 22$	**946**
31.	$11 \bullet -33$	**−363**
32.	$-29 \bullet -45$	**1,305**
33.	$37 \bullet -44$	**−1,628**
34.	$-87 \bullet -100$	**8,700**
35.	$92 \bullet -232$	**−21,344**
36.	$456 \bullet 87$	**39,672**
37.	$-143 \bullet 76$	**−10,868**
38.	$439 \bullet -871$	**−382,369**
39.	$-286 \bullet -412$	**117,832**
40.	$-971 \bullet 342$	**−332,082**
41.	$-773 \bullet -407$	**314,611**
42.	$-820 \bullet 638$	**−523,160**
43.	$591 \bullet -734$	**−433,794**
44.	$491 \bullet -197$	**−96,727**

Integer Multiplication—Round 2 [KEY]

Directions: Determine the product of the integers, and write it in the column to the right.

1.	$-9 \bullet -7$	**63**
2.	$0 \bullet -4$	**0**
3.	$3 \bullet -5$	**−15**
4.	$6 \bullet -8$	**−48**
5.	$-2 \bullet 1$	**−2**
6.	$-6 \bullet 5$	**−30**
7.	$-10 \bullet -12$	**120**
8.	$11 \bullet -4$	**−44**
9.	$3 \bullet 8$	**24**
10.	$12 \bullet -7$	**−84**
11.	$-1 \bullet 8$	**−8**
12.	$5 \bullet -10$	**−50**
13.	$3 \bullet -13$	**−39**
14.	$15 \bullet -8$	**−120**
15.	$-9 \bullet 14$	**−126**
16.	$-17 \bullet 5$	**−85**
17.	$16 \bullet 2$	**32**
18.	$19 \bullet -7$	**−133**
19.	$-6 \bullet 13$	**−78**
20.	$1 \bullet -18$	**−18**
21.	$-14 \bullet -3$	**42**
22.	$-10 \bullet -17$	**170**
23.	$-22 \bullet 14$	**−308**
24.	$-18 \bullet -32$	**576**
25.	$-24 \bullet 19$	**−456**
26.	$47 \bullet 21$	**987**
27.	$17 \bullet -39$	**−663**
28.	$-16 \bullet -28$	**448**
29.	$-67 \bullet -81$	**5,427**
30.	$-36 \bullet 44$	**−1,584**
31.	$-50 \bullet 23$	**−1,150**
32.	$66 \bullet -71$	**−4,686**
33.	$82 \bullet -29$	**−2,378**
34.	$-32 \bullet 231$	**−7,392**
35.	$89 \bullet -744$	**66,216**
36.	$623 \bullet -22$	**−13,706**
37.	$-870 \bullet -46$	**40,020**
38.	$179 \bullet 329$	**58,891**
39.	$-956 \bullet 723$	**−691,188**
40.	$874 \bullet -333$	**−291,042**
41.	$908 \bullet -471$	**−427,668**
42.	$-661 \bullet -403$	**266,383**
43.	$-520 \bullet -614$	**319,280**
44.	$-309 \bullet 911$	**−281,499**

7.NS, 7.EE Bookstore Account

Alignments to Content Standards: 7.NS.A.1 7.EE.B.4

Task

a. At the beginning of the month, Evan had $24 in his account at the school bookstore. Use a variable to represent the unknown quantity in each transaction below and write an equation to represent it. Then represent each transaction on a number line. What is the unknown quantity in each case?

i. First he bought some notebooks and pens that cost $16.

ii. Then he deposited some more money and his account balance was $28.

iii. Then he bought a book for English class that cost $34.

iv. Then he deposited exactly enough money so that he paid off his debt to the bookstore.

b. Explain why it makes sense to use a negative number to represent Evan's account balance when he owes money.

IM Commentary

Many people like to use debt to help students understand negative numbers. When doing so, it is important to keep in mind that representing debt with negative numbers is a convention, and that it would be possible to talk about debt without ever using negative numbers. For example, if I borrow $30 from my cousin, I owe her +30 dollars. If I give her $40, then she owes me +10 dollars. The reason it is so convenient to represent debt with negative numbers is that it allows us to use arithmetic and algebra to keep track of who owes what to whom. Despite the fact that it is convenient to do

so, it is not required simply by setting up a problem involving debt.

The purpose of this task is for students to use algebra and the number line to understand why it makes sense that we sometimes represent debt using negative numbers. If we agree that depositing money in an account adds a positive number to the balance, and buying somethings subtracts a positive number from the balance, then it is natural to represent debt with negative numbers.

The number line is an important mathematical model which helps students visualize numbers and make sense of addition and subtraction of numbers. In the middle school grades, it is important for them to develop the ability to perform arithmetic in a more abstract setting, paving the way for the development of algebraic reasoning. Thus in 6th grade they ''Apply and extend previous understandings of arithmetic to algebraic expressions'' (6.EE.A) and in the 7th grade students ''Solve real-life and mathematical problems using numerical and algebraic expressions and equations'' (7.EE.4). This task provides an opportunity for students to use the number line to explain arithmetic with the integers while at the same time representing these transactions with algebraic expressions. In other words, students are both increasing their understanding of arithmetic with numbers while working toward arithmetic with expressions which will be more fully developed in the 8th grade and in high school algebra.

This task assumes that students have already used the number line to represent signed numbers and that they know how to represent addition and subtraction of positive numbers on the number line. In other words, students should know that:

- For every number a on the number line there is a number $-a$ on the other side of zero that is equally distant from 0. These numbers are called opposites or additive inverses.
- To add a positive number b to a number a, you move b units to the right of a on the number line.
- To subtract a positive number b from a number a, you move b units to the left of a on the number line.

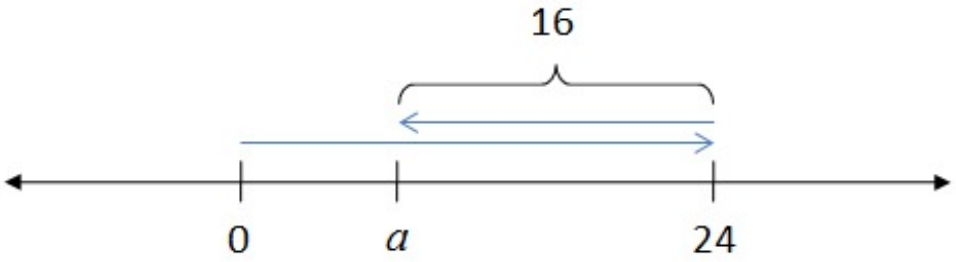
Putting this together with the fact that depositing money in the bookstore account means adding an amount to the account balance, and buying an item from the bookstore means subtracting an amount from the account balance leads us to see why it makes sense to represent debt with negative numbers.

Edit this solution

Solution

a. • He started with \$24 and spent \$16. Let a represent his account balance after he bought the notebook and pens. Then

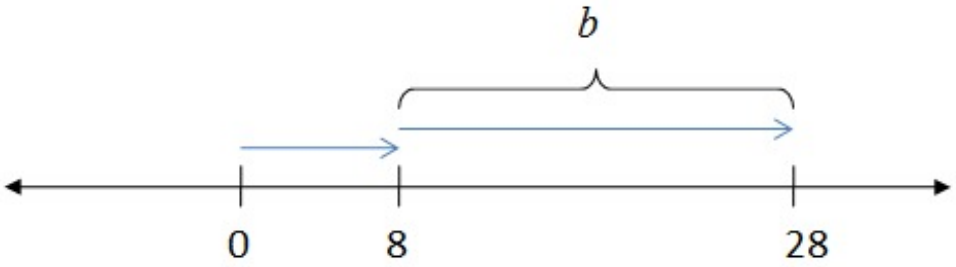
$$24 - 16 = a$$



His new account balance is \$8.

• He has \$8 in his account and then he deposited b dollars. His account balance is now \$28. Then

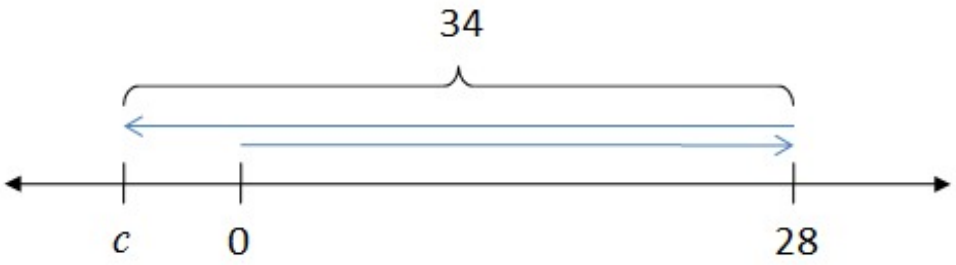
$$8 + b = 28$$



His deposited \$20 in his account.

• He has \$28 and spent \$34. Let c represent his account balance after he bought the book. Then

$$28 - 34 = c$$



His new account balance is -$6.

- He started with an account balance of -$6 and paid the debt off so his account balance is 0. If d is the amount money he deposited to pay off his debt, then

$$-6 + d = 0$$

He deposited $6.

b. It makes sense to use a negative number to represent Evan's account balance when he owes money. Here are two ways to look at it:

(1) We always take the current account balance and add a positive number to that if he makes a deposit or subtract a positive number from that if he buys items at the bookstore. If he spends more than he has in his account, then we are subtracting a bigger number from a smaller number, and the result is negative.

(2) We can also see in this context that if he deposits just enough money to pay off his debt, that means we are adding a positive number to his account balance and the result is 0. If you add two numbers together to get 0, then the numbers must be opposites. The opposite of a positive number is a negative number, so it makes sense to represent his account balance with a negative number when he owes money to the bookstore.

7.NS Differences of Integers

Alignments to Content Standards: 7.NS.A.1.c 7.NS.A.1.b 7.NS.A.1

Task

Ojos del Salado is the highest mountain in Chile, with a peak at about 6900 meters above sea level. The Atacama Trench, just off the coast of Peru and Chile, is about 8100 meters below sea level (at its lowest point).

a. What is the difference in elevations between Mount Ojos del Salado and the Atacama Trench?

b. Is the elevation halfway between the peak of Mount Ojos del Salado and the Atacama Trench above sea level or below sea level? Explain without calculating the exact value.

c. What elevation is halfway between the peak of Mount Ojos del Salado and the Atacama Trench?

IM Commentary

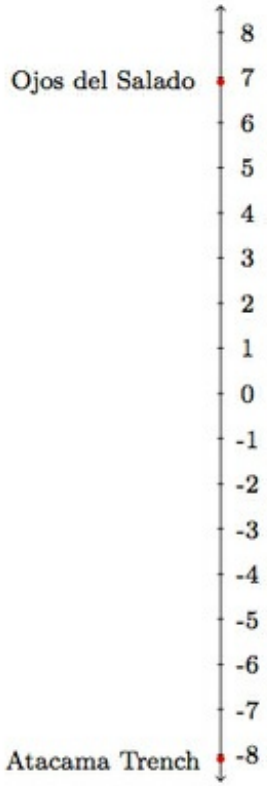
The goal of this task is to subtract integers in a real world context. It will be very helpful for students to use number lines for this task. In the solution they are drawn vertically to match the context of elevation but accurately labeled horizontal number lines are also appropriate. More information about the geographic features mentioned in the task statement can be found at

- http://en.wikipedia.org/wiki/Ojos_del_Salado
- http://en.wikipedia.org/wiki/Peru%E2%80%93Chile_Trench

Edit this solution

Solution

a. Below is a number line showing the elevation of these two locations. Each unit on the number line represents 1000 feet of elevation:



The number line indicates that to find the difference in elevation from the peak of Ojos del Salado to the bottom of the Atacama Trench, we need to add the elevation of Ojos del Salado above sea level to the depth of the Atacama Trench below sea level. In equations, we have

$$\begin{aligned} 6900 - (-8100) &= 6900 + 8100 \\ &= 15000. \end{aligned}$$

There is a difference of 15,000 meters between the altitudes of these two locations on the earth. In this equation, 8100 = -(-8100): subtracting -8100 is the same as adding

8100.

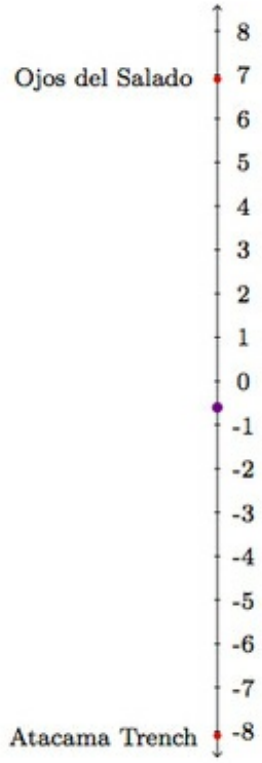
b. Since $8100 > 6900$, the depth of Atacama Trench is greater than the height of Ojos del Salado. If these quantities were the same, then the midpoint between them would be at sea level. Since the depth of Atacama Trench is greater, this means that the midpoint between these two quantities is negative or below sea level.

c. One way to find the elevation halfway between the mountain peak and trench floor is to divide the 15,000 foot difference between these by 2: 15,000 ÷ 2 = 7500. This means that the point midway between them will be 7500 feet below the mountain peak and 7500 feet above the ocean floor: 6900 - 7500 = -600 and similarly -8100 + 7500 = -600. So the elevation halfway between the mountain peak and trench floor is at -600 feet.

A second method uses an idea from statistics. The midpoint between 6900 and -8100 the mean of the two numbers:

$$\begin{aligned}\frac{6900+(-8100)}{2} &= \frac{6900-8100}{2}\\ &= \frac{-1200}{2}\\ &= -600.\end{aligned}$$

Halfway between the peak of Ojos del Salado and the bottom of the Atacama Trench is 600 meters below sea level. This is shown in the number line below:

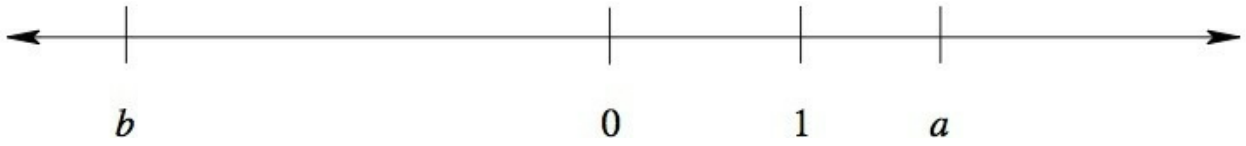


7.NS Operations on the number line

Alignments to Content Standards: 7.NS.A.1

Task

A number line is shown below. The numbers 0 and 1 are marked on the line, as are two other numbers a and b.



Which of the following numbers is negative? Choose all that apply. Explain your reasoning.

a. $a - 1$

b. $a - 2$

c. $-b$

d. $a + b$

e. $a - b$

f. $ab + 1$

IM Commentary

There is a distinction in the Common Core State Standards between a *fraction* and a *rational number*. Fractions are always positive, and when thinking of the symbol $\frac{a}{b}$ as a fraction, it is possible to interpret it as a equal-sized pieces where b pieces make one whole. The rational numbers are the set of fractions taken together with their opposites: understanding rational numbers requires understanding both fractions and signed numbers. The standard 7.NS.1 signals a significant shift from working exclusively with positive numbers to working with signed numbers. The focus of this task is on the nature of signed numbers rather than the "part-whole" interpretation of fractions.

The purpose of this task is to help solidify students' understanding of signed numbers as points on a number line and to understand the geometric interpretation of adding and subtracting signed numbers. This task (like all tasks featured on the Illustrative Mathematics website) assumes that the number line is drawn to scale.

Solution

a. a is greater than 1, so $a - 1$ is positive.

b. The distance between a and 1 appears to be less than the distance between 1 and 0, so it looks like a is less than 2. Thus $a - 2$ is negative.

c. b is negative, so $-b$ is positive.

d. The distance between a and 0 appears to be less than the distance between b and 0, so it looks like |a| is less than |b|. Since b is negative and a is positive, $a + b$ is negative.

e. $a - b = a + -b$. Since b is negative, $-b$ is positive. a is also positive. Thus, $a - b$ is positive.

f. Since |a| and |b| are both greater than 1, |ab| is also greater than 1 (this builds on the intuition students gained in fifth grade as in 5.NF.5). ab is negative since a is positive and b is negative. Thus, $ab + 1$ is negative.

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.

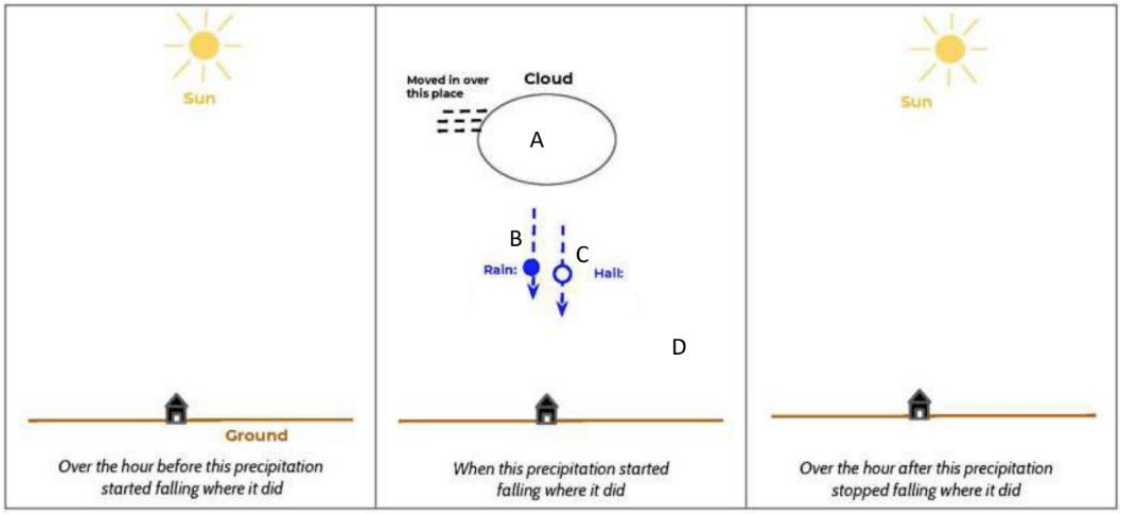
Notice	Wonder
Responses will vary. Can include: • *It looked like big pieces of ice or snow were falling in all the videos, but the size of them looked different in each of the three cases.* • *When it hit the ground, it bounced really high in the first and second videos. It made noise when it hit things 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.

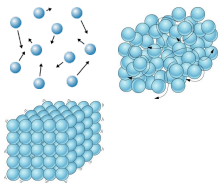
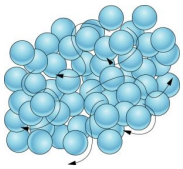
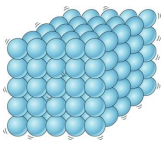
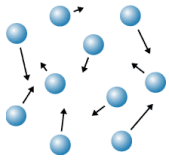
    b. Use this model of the precipitation events observed in Part 1 to answer the discussion questions below.



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.

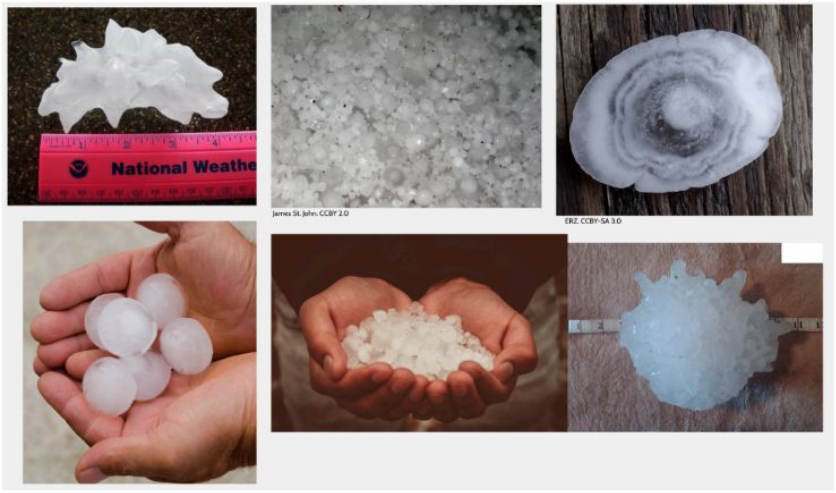
iii. Imagine you had a microscope strong enough to see matter at the particle level. Draw what you think it looks like at the particle level for each labeled part of the model. (A: Inside cloud, B: Rain, C: Hail, D: Air)

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.