Grade 7
Family Resource Bundle

Grade 7

ANSWER KEY Text #1 "Amigo Brothers"

by Piri Thomas 1978

1. RL.KID.2

PART A: Which of the following describes the theme of the short story?

A. Competing against friends can permanently alter a friendship.
B. Some friendships can't be damaged, not even by the strain of competition.
C. Competitions can drive people to act as they normally wouldn't.
D. The violent nature of sports can make it difficult to remain friends with competitors.

2. RL.KID.1

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

A. "'I just think it's cooler if we split right here. After the fight, we can get it together again like nothing ever happened.'" (Paragraph 30)
B. "When Felix finally left the theater, he had figured out how to psych himself for tomorrow's fight. It was Felix the Champion vs. Antonio the Challenger." (Paragraph 42)
C. "If Felix had any small doubt about their friendship affecting their fight, it was being neatly dispelled." (Paragraph 69)
D. "The sounds of their blows were loud in contrast to the silence of a crowd gone completely mute. The referee was stunned by their savagery." (Paragraph 95)

3. RL.KID.3

PART A: How do Antonio and Felix act around each other after they find out they will be fighting?

A. They grow suspicious of each other, afraid that one will cheat the other out of a win.
B. They decide to treat each other as purely competitors for the time being.
C. They are excited for each other, as they know they are both deserving of the win.
D. They show off their skills, hoping to scare the other one and keep them from competing.

4. RL.KID.1

PART B: Which quote from the text best supports the answer to Part A?

A. "They fooled around with a few jabs at the air, slapped skin, and then took off, running lightly along the dirty East River's edge." (Paragraph 8)
B. "Antonio then beat the air with a barrage of body blows and short devastating lefts with an overhead jaw-breaking right." (Paragraph 9)
C. "'In fact, since we found out it was going to be me and you, I've been awake at night, pulling punches on you, trying not to hurt you.'" (Paragraph 16)

D. **"'When we get into the ring, it's gotta be like we never met. We gotta be like two heavy strangers that want the same thing and only one can have it.'" (Paragraph 22)**

5. RL.CS.6

How does paragraph 45 contribute to readers' understanding of Antonio's perspective?

A. It shows that Antonio is willing to beat Felix no matter what it takes.
B. It expresses how confident Antonio feels in his ability to beat Felix.
C. It reveals that Antonio is worried about his friendship with Felix.
D. It reveals that Antonio is confident in the strength of his friendship with Felix.

6. RL.CS.4

What is the effect of time being described as "heavy" in paragraph 45?

1. **Answers will vary; students should discuss how by describing time as "heavy," the author emphasizes how difficult to bear the time leading up to the fight is for Antonio. For instance, in this passage Antonio is wondering, "How would the fight tomorrow affect his relationship with Felix" (Paragraph 45). As Felix is Antonio's best friend, considering a shift in their friendship is a heavy burden for him. Until Antonio and Felix fight, they will not know how their friendship will be affected.**

7. RL.CS.5

Re-read the passage where Felix and Antonio fight, starting at paragraph 69. How does the author build suspense during the fight?

0. **Answers will vary; students should discuss how the author structures the passage to emphasize how evenly matched Felix and Antonio are. Whenever one boy starts to gain an advantage in the fight, the other one quickly recovers. For instance, in the beginning of the fight, "Antonio slipped the punch and countered with one-two-three lefts that snapped Felix's head back" (Paragraph 69). However, Felix quickly recovers and "trap[s] him against the ropes just long enough to pour some punishing rights and lefts to Antonio's hard midsection" (Paragraph 71). This back-and-forth structure of the fight continues until the very end when, "Both pounded away. Neither gave an inch and neither fell to the canvas" (Paragraph 94). By deciding not to reveal who won the fight, the author highlights the efforts of the two friends, rather than the winner.**

ANSWER KEY Text #2 "Love and Friendship"

by Emily Brontë 1846

1. RL.KID.3

In the poem, what is the most significant difference between the rose-briar and the holly-tree?

A. The rose-briar is considered far more beautiful than the holly-tree.
B. The holly-tree is more resilient during winter than the rose-briar.
C. The rose-briar smells sweeter in spring than the holly-tree does in winter.
D. The holly-tree has prickly leaves for more of the year than the rose has thorns.

2. RL.KID.2

PART A: Which of the following best identifies a theme of the text?

A. Nature has many different elements, but they are all equally important.
B. The best friendships and romantic relationships are grounded in trust and loyalty.
C. Friendships are more reliable and therefore more valuable to pursue than romantic love.
D. Most people will experience challenging moments in life and will need love and friendship to survive them.

3. RL.KID.1

PART B: Which of the following quotes best supports the answer to Part A?

A. "Friendship like the holly-tree / The holly is dark when the rose-briar blooms" (Lines 2-3)
B. "The wild rose-briar is sweet in spring, / Its summer blossoms scent the air" (Lines 5-6)
C. "Yet wait till winter comes again / And who will call the wild-briar fair?" (Lines 7-8)
D. "Then scorn the silly rose-wreath now / And deck thee with the holly's sheen" (Lines 9-10)

4. RL.CS.4

RL.CS.5

How does the poem's rhyme scheme contribute to the overall tone and theme?

1. **Answers will vary; students should discuss how the rhyme scheme (ABCB DEFE GHGH) strengthens throughout the poem, mimicking a tone that strengthens in authority and demonstrativeness as the theme about the strength of friendship over love emerges. The first four lines of the poem do not follow a consistent end rhyme scheme (ABCB). While the word "tree" in line 2 does rhyme with "constantly" in line 4 — albeit only in the final syllable of the latter, making it a single rhyme — there is no rhyme between "briar" (Line 1) and "bloom" (Line 3). Lines 4-8 lines become more consistent, with lines 5 and 7 working as a slant rhyme and lines 6 and 8 fully rhyming. The final four lines follow a completely consistent end rhyme scheme, with lines 9 and 11 completely rhyming and lines 10 and 12 completely rhyming. Thus, the rhyme scheme evolves from an inconsistent**

beginning to a consistent end. This reflects the meaning of the poem; that is, friendship is more constant and reliable than love.

RELATED MEDIA LINKS and Descriptions

Related Media #1: Small Talk: Friendship

In this video, kids talk about what it means to be best friends. Ask students to discuss how kids define friendship and why friendship is important to them. What qualities do you look for in a friend? Why? (2:53)

Related Media #2: 26 Facts About the Science of Friendship- Mental Floss' The List Show
Compare the scientific facts on friendship presented in this video from John Green and Mental Floss with Bronte's themes of friendship. Are her theories scientifically true? Does it even matter? (9:27)

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 Robot Races

Alignments to Content Standards: 7.RP.A.2

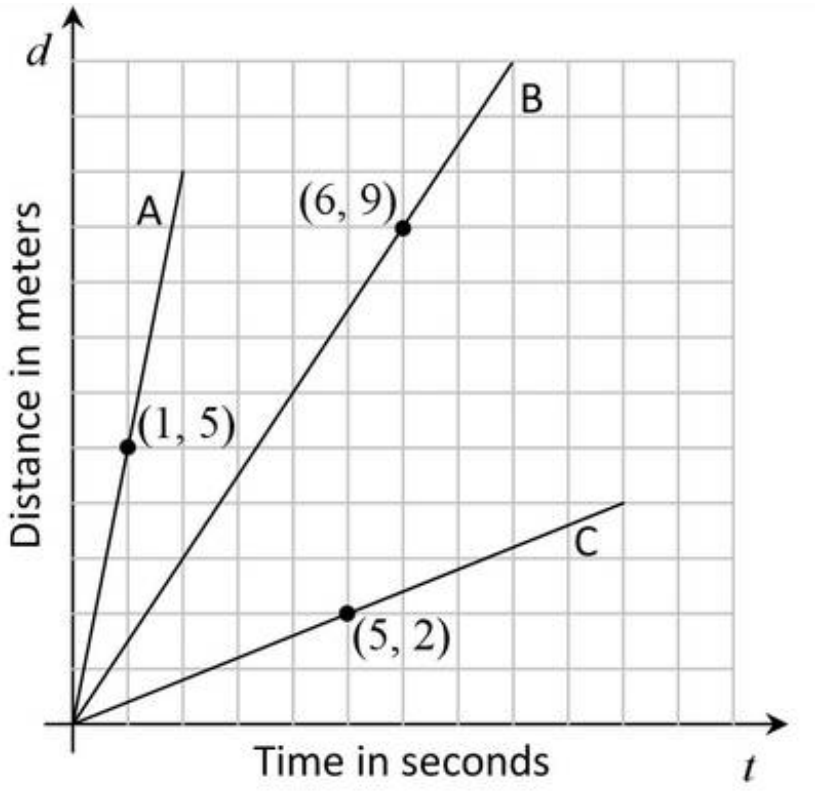
Task

Carli's class built some solar-powered robots. They raced the robots in the parking lot of the school. The graphs below are all line segments that show the distance d, in meters, that each of three robots traveled after t seconds.

a. Each graph has a point labeled. What does the point tell you about how far that robot has traveled?

b. Carli said that the ratio between the number of seconds each robot travels and the number of meters it has traveled is constant. Is she correct? Explain.

c. How fast is each robot traveling? How did you compute this from the graph?



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Solution

a. The point (1, 5) tells that robot A traveled 5 meters in 1 second.
The point (6, 9) tells that robot B traveled 9 meters in 6 seconds.
The point (5, 2) tells that robot C traveled 2 meters in 5 seconds.

b. Carli is correct. Whenever the ratio between two quantities is constant, the graph of the relationship between them is a straight line through (0,0). We can also say that for each robot, the relationship between the time and distance is a proportional relationship.

c. The speed can be seen as the d-coordinate of the graph when $t = 1$. This is the robot's unit rate:

Robot A traveled 5 meters per second, as shown by the point (1, 5) on its graph.
Robot B traveled 1.5 meters per second, as shown by the point (1, 1.5) on its graph.

Robot C traveled 0.4 meters per second, as shown by the point (1, 0.4) on its graph.

The speed of each robot can also be seen in the steepness of its graph, which is quantified as slope. But that perspective is not expected until grade 8.

Adding and Subtracting Positive and Negative Fractions and Decimals

➤ **Estimate each problem to check if the student's answer is reasonable. If not, cross out the answer and write the correct answer. Show your work.**

Problems	Student Answers
1 $1.3 - (-2.5)$	~~-1.2~~ 3.8 Possible estimate: $1 - (-3) = 1 + 3 = 4$ $1.3 - (-2.5) = 1.3 + 2.5 = 3.8$
2 $-3\frac{1}{6} + 6\frac{2}{3}$	~~$-3\frac{1}{2}$~~ $3\frac{1}{2}$ Possible estimate: $-3 + 7 = 4$ $-3\frac{1}{6} + 6\frac{2}{3} = 3\frac{1}{2}$
3 $-4.2 - (-2.9)$	-1.3 Possible estimate: $-4 - (-3) = -4 + 3 = -1$
4 $3\frac{1}{5} - 2\frac{1}{2} + 2\frac{3}{5}$	~~$-3\frac{1}{3}$~~ $3\frac{3}{10}$ Possible estimate: $3 - 3 + 3 = 0 + 3 = 3$ $3\frac{1}{5} - 2\frac{1}{2} + 2\frac{3}{5} = 3\frac{3}{10}$

Adding and Subtracting Positive and Negative Fractions and Decimals *continued*

Problems	Student Answers
5 $5.9 - 7.3 - 10.2$	~~11.6~~ -11.6 Possible estimate: $6 - 7 - 10 = -1 - 10$ $= -11$ $5.9 - 7.3 - 10.2 = -11.6$
6 $-5\frac{5}{6} - \left(-2\frac{1}{3}\right) + 5\frac{1}{6}$	$1\frac{2}{3}$ Possible estimate: $-6 - (-2) + 4 = -6 + 2 + 5$ $= -4 + 5$ $= 1$
7 $11.5 - 5.4 - 4.7$	~~-1.4~~ 1.4 Possible estimate: $12 - 5 - 5 = 7 - 5$ $= 2$ $11.5 - 5.4 - 4.7 = 1.4$
8 $-11\frac{1}{8} - 12\frac{1}{4} - \left(-21\frac{1}{2}\right)$	~~$2\frac{1}{8}$~~ $-1\frac{7}{8}$ Possible estimate: $-11 - 12 - (-22) = -11 - 12 + 22$ $= -23 + 22$ $= -1$ $-11\frac{1}{8} - 12\frac{1}{4} - \left(-21\frac{1}{2}\right) = -1\frac{7}{8}$

9 How does estimating an addition or subtraction problem help you know if an answer is reasonable?

Possible answer: I can use the estimate to determine if the correct answer is positive or negative. I can also determine if the estimate and the given answer are close.

Multiplying Negative Rational Numbers

➤ **Find the product of the rational numbers. The answers are mixed up at the bottom of the page. Cross out the answers as you complete the problems.**

1. $2 \times -\frac{7}{4}$

   $-3\frac{1}{2}$

2. $-\frac{1}{3} \times -\frac{6}{5}$

   $\frac{2}{5}$

3. $\frac{2}{5} \times -\frac{3}{4}$

   $-\frac{3}{10}$

4. $-2\frac{1}{3} \times \frac{5}{4}$

   $-2\frac{11}{12}$

5. $-\frac{3}{7} \times -1\frac{2}{3}$

   $\frac{5}{7}$

6. $-3\frac{5}{7} \times -2\frac{1}{2}$

   $9\frac{2}{7}$

7. $0.75 \times -\frac{4}{3}$

   -1

8. $-0.2 \times -\frac{2}{5}$

   $\frac{2}{25}$ or 0.08

9. $-0.35 \times -1\frac{3}{7}$

   $\frac{1}{2}$ or 0.5

10. $2.5 \times -3\frac{4}{5}$

    $-9\frac{1}{2}$ or -9.5

11. 0.2×-0.45

    -0.09

12. -0.25×-1.4

    0.35

13. -2.3×6.8

    -15.64

14. $-3.9 \times 5\frac{5}{9}$

    $-21\frac{2}{3}$ or $21.\overline{6}$

15. $-4.2 \times -6\frac{2}{7}$

    $26\frac{2}{5}$ or 26.4

Answers

$-21\frac{2}{3}$	-15.64	$-9\frac{1}{2}$	$-3\frac{1}{2}$	$-2\frac{11}{12}$
-1	$-\frac{3}{10}$	-0.09	$\frac{2}{25}$	0.35
$\frac{2}{5}$	$\frac{1}{2}$	$\frac{5}{7}$	$9\frac{2}{7}$	$26\frac{2}{5}$

Dividing Negative Rational Numbers

➤ **Find each quotient.**

1. $-5 \div \frac{5}{7}$

   -7

2. $-\frac{8}{9} \div \frac{2}{3}$

   $-1\frac{1}{3}$

3. $\frac{3}{10} \div -\frac{6}{7}$

   $-\frac{7}{20}$

4. $-2\frac{3}{4} \div 11$

   $-\frac{1}{4}$

5. $-4\frac{2}{7} \div -\frac{15}{16}$

   $4\frac{4}{7}$

6. $-1\frac{4}{7} \div -3\frac{2}{3}$

   $\frac{3}{7}$

7. $-8 \div 6.4$

   -1.25

8. $-\frac{3}{2} \div 0.5$

   -3

9. $-3\frac{1}{3} \div 1.2$

   $-2\frac{7}{9}$

10. $9.28 \div -3.2$

    -2.9

11. $0.056 \div -0.004$

    -14

12. $-0.28 \div 0.07$

    -4

13. Explain the steps you used to solve problem 11.

    Possible explanation: I changed the expression to $56 \div -4$ by multiplying the dividend and the divisor by 1,000.

Writing Rational Numbers as Repeating Decimals

➤ **Write each number as a repeating decimal.**

1. $\frac{1}{9}$

$0.\overline{1}$

2. $-\frac{2}{11}$

$-0.\overline{18}$

3. $\frac{7}{11}$

$0.\overline{63}$

4. $\frac{1}{3}$

$0.\overline{3}$

5. $2\frac{4}{9}$

$2.\overline{4}$

6. $-\frac{13}{6}$

$-2.1\overline{6}$

7. $-1\frac{5}{6}$

$-1.8\overline{3}$

8. $\frac{13}{99}$

$0.\overline{13}$

9. When the denominator of a proper fraction is 99, what do you notice about the repeating digit(s) in its decimal form?

Possible answer: The numerator tells the repeating digits.

For example, $\frac{28}{99} = 0.\overline{28}$.

Addition of Decimals – Round 1 [KEY]

Directions: Evaluate each expression.

1.	$5.1 + 6$	11.1
2.	$5.1 + 0.6$	5.7
3.	$5.1 + 0.06$	5.16
4.	$5.1 + 0.006$	5.106
5.	$5.1 + 0.0006$	5.1006
6.	$3 + 2.4$	5.4
7.	$0.3 + 2.4$	2.7
8.	$0.03 + 2.4$	2.43
9.	$0.003 + 2.4$	2.403
10.	$0.0003 + 2.4$	2.4003
11.	$24 + 0.3$	24.3
12.	$2 + 0.3$	2.3
13.	$0.2 + 0.03$	0.23
14.	$0.02 + 0.3$	0.32
15.	$0.2 + 3$	3.2
16.	$2 + 0.03$	2.03
17.	$5 + 0.4$	5.4
18.	$0.5 + 0.04$	0.54
19.	$0.05 + 0.4$	0.45
20.	$0.5 + 4$	4.5
21.	$5 + 0.04$	5.04
22.	$0.5 + 0.4$	0.9

23.	$3.6 + 2.1$	5.7
24.	$3.6 + 0.21$	3.81
25.	$3.6 + 0.021$	3.621
26.	$0.36 + 0.021$	0.381
27.	$0.036 + 0.021$	0.057
28.	$1.4 + 42$	43.4
29.	$1.4 + 4.2$	5.6
30.	$1.4 + 0.42$	1.82
31.	$1.4 + 0.042$	1.442
32.	$0.14 + 0.042$	0.182
33.	$0.014 + 0.042$	0.056
34.	$0.8 + 2$	2.8
35.	$0.8 + 0.2$	1
36.	$0.08 + 0.02$	0.1
37.	$0.008 + 0.002$	0.01
38.	$6 + 0.4$	6.4
39.	$0.6 + 0.4$	1
40.	$0.06 + 0.04$	0.1
41.	$0.006 + 0.004$	0.01
42.	$0.1 + 9$	9.1
43.	$0.1 + 0.9$	1
44.	$0.01 + 0.09$	0.1

Addition of Decimals – Round 2 [KEY]

Directions: Evaluate each expression.

1.	$3.2 + 5$	8.2
2.	$3.2 + 0.5$	3.7
3.	$3.2 + 0.05$	3.25
4.	$3.2 + 0.005$	3.205
5.	$3.2 + 0.0005$	3.2005
6.	$4 + 5.3$	9.3
7.	$0.4 + 5.3$	5.7
8.	$0.04 + 5.3$	5.34
9.	$0.004 + 5.3$	5.304
10.	$0.0004 + 5.3$	5.3004
11.	$4 + 0.53$	4.53
12.	$6 + 0.2$	6.2
13.	$0.6 + 0.02$	0.62
14.	$0.06 + 0.2$	0.26
15.	$0.6 + 2$	2.6
16.	$2 + 0.06$	2.06
17.	$1 + 0.7$	1.7
18.	$0.1 + 0.07$	0.17
19.	$0.01 + 0.7$	0.71
20.	$0.1 + 7$	7.1
21.	$1 + 0.07$	1.07
22.	$0.1 + 0.7$	0.8

23.	$4.2 + 5.5$	9.7
24.	$4.2 + 0.55$	4.75
25.	$4.2 + 0.055$	4.255
26.	$0.42 + 0.055$	0.475
27.	$0.042 + 0.055$	0.097
28.	$2.7 + 12$	14.7
29.	$2.7 + 1.2$	3.9
30.	$2.7 + 0.12$	2.82
31.	$2.7 + 0.012$	2.712
32.	$0.27 + 0.012$	0.282
33.	$0.027 + 0.012$	0.039
34.	$0.7 + 3$	3.7
35.	$0.7 + 0.3$	1
36.	$0.07 + 0.03$	0.1
37.	$0.007 + 0.003$	0.01
38.	$5 + 0.5$	5.5
39.	$0.5 + 0.5$	1
40.	$0.05 + 0.05$	0.1
41.	$0.005 + 0.005$	0.01
42.	$0.2 + 8$	8.2
43.	$0.2 + 0.8$	1
44.	$0.02 + 0.08$	0.1

Subtraction of Decimals – Round 1 [KEY]

Directions: Evaluate each expression.

1.	$55 - 50$	5
2.	$55 - 5$	50
3.	$5.5 - 5$	0.5
4.	$5.5 - 0.5$	5
5.	$88 - 80$	8
6.	$88 - 8$	80
7.	$8.8 - 8$	0.8
8.	$8.8 - 0.8$	8
9.	$33 - 30$	3
10.	$33 - 3$	30
11.	$3.3 - 3$	0.3
12.	$1 - 0.3$	0.7
13.	$1 - 0.03$	0.97
14.	$1 - 0.003$	0.997
15.	$0.1 - 0.03$	0.07
16.	$4 - 0.8$	3.2
17.	$4 - 0.08$	3.92
18.	$4 - 0.008$	3.992
19.	$0.4 - 0.08$	0.32
20.	$9 - 0.4$	8.6
21.	$9 - 0.04$	8.96
22.	$9 - 0.004$	8.996

23.	$9.9 - 5$	4.9
24.	$9.9 - 0.5$	9.4
25.	$0.99 - 0.5$	0.49
26.	$0.99 - 0.05$	0.94
27.	$4.7 - 2$	2.7
28.	$4.7 - 0.2$	4.5
29.	$0.47 - 0.2$	0.27
30.	$0.47 - 0.02$	0.45
31.	$8.4 - 1$	7.4
32.	$8.4 - 0.1$	8.3
33.	$0.84 - 0.1$	0.74
34.	$7.2 - 5$	2.2
35.	$7.2 - 0.5$	6.7
36.	$0.72 - 0.5$	0.22
37.	$0.72 - 0.05$	0.67
38.	$8.6 - 7$	1.6
39.	$8.6 - 0.7$	7.9
40.	$0.86 - 0.7$	0.16
41.	$0.86 - 0.07$	0.79
42.	$5.1 - 4$	4.1
43.	$5.1 - 0.4$	4.7
44.	$0.51 - 0.4$	0.41

Subtraction of Decimals – Round 2 [KEY]

Directions: Evaluate each expression.

1.	$66 - 60$	6
2.	$66 - 6$	60
3.	$6.6 - 6$	0.6
4.	$6.6 - 0.6$	6
5.	$99 - 90$	9
6.	$99 - 9$	90
7.	$9.9 - 9$	0.9
8.	$9.9 - 0.9$	9
9.	$22 - 20$	2
10.	$22 - 2$	20
11.	$2.2 - 2$	0.2
12.	$3 - 0.4$	2.6
13.	$3 - 0.04$	2.96
14.	$3 - 0.004$	2.996
15.	$0.3 - 0.04$	0.26
16.	$8 - 0.2$	7.8
17.	$8 - 0.02$	7.98
18.	$8 - 0.002$	7.998
19.	$0.8 - 0.02$	0.78
20.	$5 - 0.1$	4.9
21.	$5 - 0.01$	4.99
22.	$5 - 0.001$	4.999

23.	$6.8 - 4$	2.8
24.	$6.8 - 0.4$	6.4
25.	$0.68 - 0.4$	0.28
26.	$0.68 - 0.04$	0.64
27.	$7.3 - 1$	6.3
28.	$7.3 - 0.1$	7.2
29.	$0.73 - 0.1$	0.63
30.	$0.73 - 0.01$	0.72
31.	$9.5 - 2$	7.5
32.	$9.5 - 0.2$	9.3
33.	$0.95 - 0.2$	0.75
34.	$8.3 - 5$	3.3
35.	$8.3 - 0.5$	7.8
36.	$0.83 - 0.5$	0.33
37.	$0.83 - 0.05$	0.78
38.	$7.2 - 4$	3.2
39.	$7.2 - 0.4$	6.8
40.	$0.72 - 0.4$	0.32
41.	$0.72 - 0.04$	0.68
42.	$9.3 - 7$	2.3
43.	$9.3 - 0.7$	8.6
44.	$0.93 - 0.7$	0.23

Multiplication of Decimals – Round 1 [KEY]

Directions: Evaluate each expression.

1.	5×1	5
2.	5×0.1	0.5
3.	5×0.01	0.05
4.	5×0.001	0.005
5.	4×2	8
6.	4×0.2	0.8
7.	4×0.02	0.08
8.	4×0.002	0.008
9.	3×3	9
10.	3×0.3	0.9
11.	3×0.03	0.09
12.	0.1×0.8	0.08
13.	0.01×0.8	0.008
14.	0.1×0.08	0.008
15.	0.01×0.08	0.0008
16.	0.3×0.2	0.06
17.	0.03×0.2	0.006
18.	0.3×0.02	0.006
19.	0.03×0.02	0.0006
20.	0.2×0.2	0.04
21.	0.02×0.2	0.004
22.	0.2×0.02	0.004

23.	5×3	15
24.	5×0.3	1.5
25.	0.5×3	1.5
26.	0.5×0.3	0.15
27.	9×2	18
28.	9×0.2	1.8
29.	0.9×2	1.8
30.	0.9×0.2	0.18
31.	4×4	16
32.	4×0.4	1.6
33.	0.4×0.4	0.16
34.	0.8×0.6	0.48
35.	0.8×0.06	0.048
36.	0.8×0.006	0.0048
37.	0.08×0.006	0.00048
38.	0.7×0.9	0.63
39.	0.07×0.9	0.063
40.	0.007×0.9	0.0063
41.	0.007×0.09	0.00063
42.	1.2×0.3	0.36
43.	1.2×0.03	0.036
44.	1.2×0.003	0.0036

Multiplication of Decimals – Round 2 [KEY]

Directions: Evaluate each expression.

1.	9×1	9
2.	0.9×1	0.9
3.	0.09×1	0.09
4.	0.009×1	0.009
5.	2×2	4
6.	2×0.2	0.4
7.	2×0.02	0.04
8.	2×0.002	0.004
9.	3×2	6
10.	0.3×2	0.6
11.	0.03×2	0.06
12.	0.7×0.1	0.07
13.	0.07×0.1	0.007
14.	0.7×0.01	0.007
15.	0.07×0.01	0.0007
16.	0.2×0.4	0.08
17.	0.02×0.4	0.008
18.	0.2×0.04	0.008
19.	0.02×0.04	0.0008
20.	0.1×0.1	0.01
21.	0.01×0.1	0.001
22.	0.1×0.01	0.001

23.	3×4	12
24.	3×0.4	1.2
25.	0.3×4	1.2
26.	0.3×0.4	0.12
27.	7×7	49
28.	7×0.7	4.9
29.	0.7×7	4.9
30.	0.7×0.7	0.49
31.	2×8	16
32.	2×0.8	1.6
33.	0.2×0.8	0.16
34.	0.6×0.5	0.3
35.	0.6×0.05	0.03
36.	0.6×0.005	0.003
37.	0.06×0.005	0.0003
38.	0.9×0.9	0.81
39.	0.09×0.9	0.81
40.	0.009×0.9	0.0081
41.	0.009×0.09	0.00081
42.	1.1×0.5	0.55
43.	1.1×0.05	0.055
44.	1.1×0.005	0.0055

7.NS Distances Between Houses

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

Task

Aakash, Bao Ying, Chris and Donna all live on the same street as their school, which runs from east to west.

- Aakash lives $5\frac{1}{2}$ blocks to the west.
- Bao Ying lives $4\frac{1}{4}$ blocks to the east.
- Chris lives $2\frac{3}{4}$ blocks to the west.
- Donna lives $6\frac{1}{2}$ blocks to the east.

a. Draw a picture that represents the positions of their houses along the street.

b. Find how far is each house from every other house?

c. Represent the relative position of the houses on a number line, with the school at zero, points to the west represented by negative numbers, and points to the east represented by positive numbers.

d. How can you see the answers to part (b) on the number line? Using the numbers (some of which are positive and some negative) that label the positions of houses on the number line, represent these distances using sums or differences.

IM Commentary

The purpose of this task is for students to solve a problem involving distances between objects whose positions are defined relative to a specified location and to see how this kind of situation can be represented with signed numbers.

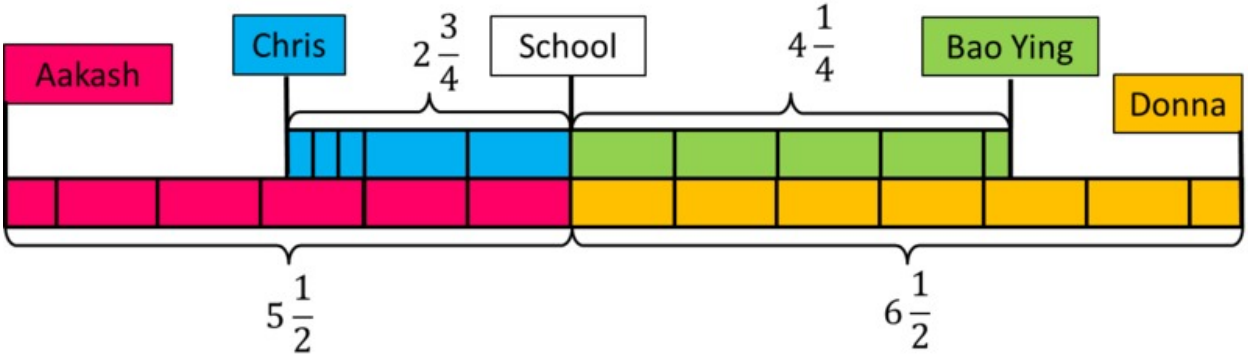
A full solution requires systematic listing of pairs of houses, a valid list of differences - either subtracting the smaller number from the larger, or taking absolute value of difference in any order - as well as computations which could be done by counting on the number line or subtracting fractions. Note as well the "twist" with the houses not in "alphabetical" order on the number line requires students to make sense of the problem (MP 1)attend to precision (MP 6).

This problem framework could be used with integer values (say to enhance understanding of 6.NS.5) or later for tasks involving the Pythagorean Theorem in the plane (8.G.8).

Edit this solution

Solution

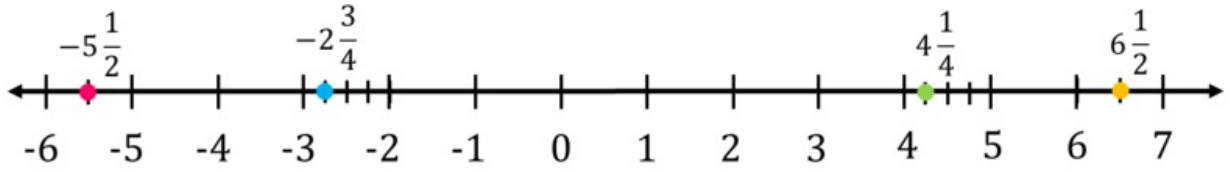
a. There are many ways to draw a picture that represents this situation. Here is one:



b. Here is a table that shows the distances between each of the student's houses.

	Bao Ying	Chris	Donna
Aakash	$9\frac{3}{4}$	$2\frac{3}{4}$	12
Bao Ying		7	$2\frac{1}{4}$
Chris			$9\frac{1}{4}$

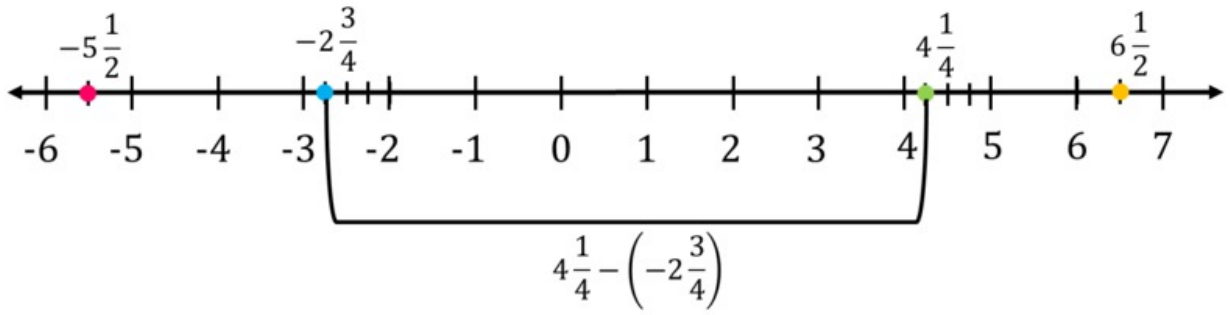
c. The colors show which point corresponds to which person in the first picture:



d. The distance between the houses is represented by the distance between the points that correspond to the houses on the number line. This can be computed by subtracting the numbers that represent the position of the house relative to the school. For example, to find the distance between Bao Ying and Chris, we subtract $-2\frac{3}{4}$ from $4\frac{1}{4}$:

$$4\frac{1}{4} - (-2\frac{3}{4})$$

We can communicate this more clearly by labeling the distance between the points with the difference of the numbers on the number line:



7.NS, 7.RP, 7.EE Drill Rig

Alignments to Content Standards: 7.NS.A.2 7.NS.A.3 7.RP.A 7.EE.B.4

Task

A water well drilling rig has dug to a height of –60 feet after one full day of continuous use.

a. Assuming the rig drilled at a constant rate, what was the height of the drill after 15 hours?

b. If the rig has been running constantly and is currently at a height of –143.6 feet, for how long has the rig been running?

IM Commentary

The purpose of this task is to provide a context for multiplying and dividing signed rational numbers, providing a means for understanding why the signs behave the way they do when finding products. It is possible to solve this problem with or without negative numbers, depending on how the numbers are interpreted. If depths below the earth are interpreted as negative numbers (in other words, as negative height above the earth's surface), then this problem provides a good context for multiplying and dividing negative numbers. If the teacher wishes for students to use negative numbers, students can be encouraged to model the problem with a number line: the most natural way to do this is to put 0 at the surface of the earth and represent depths below the earth with negative numbers. This has been incorporated into the statement of the problem in order to encourage this approach.

This task complements the work students do with proportional relationships in grade 7 because the problem can be solved by reasoning with a proportional relationship, as

shown in the first solution. For the first part of the task, students also need to make a conversion between days and hours. Because of the rate context (and signed numbers in the second solution) the teacher may wish to focus on setting up and understanding the problem, rather than on the arithmetic itself. In this case, use of calculators may be appropriate for this problem.

The information about the speed of drilling for a water rig is taken from the ''Cable tool drilling'' (section 7.4) of this Wikipedia article: http://en.wikipedia.org/wiki/Drilling_rig.

Solutions

Edit this solution

Solution: 2 Arithmetic with positive numbers

a. There are 24 hours in a day and so 15 hours is $15 \div 24 = \frac{5}{8}$ of a day. Since the rig drills 60 feet underground in a day, in $\frac{5}{8}$ of a day it will drill

$$\left(\frac{5}{8} \text{ days}\right) \times \left(60 \frac{\text{feet}}{\text{day}}\right) = \frac{300}{8} \text{ feet.}$$

So the rig will have drilled $\frac{300}{8} = 37.5$ feet underground in 15 hours.

b. The rig drills 60 feet underground per day so to find how long it has been running to go 143.6 feet underground, we need to calculate

$$(143.6 \text{ feet}) \div \left(60 \frac{\text{feet}}{\text{day}}\right) = \frac{143.6}{60} \text{ days.}$$

This is about 2.4 days. Alternatively, it is 57.44 hours.

Edit this solution

Solution: 1 Using a Proportional Relationship

a. We know that the rig drills at a constant rate, so there is a proportional relationship between the two quantities d, the height to which the drill has dug, and t, the number of days the drill runs. It drills at -60 feet per day, so we can represent this relationship with the equation:

$$-60t = d$$

Since 15 hours is $\frac{15}{24} = \frac{5}{8}$ days, we can use the equation to find d:

$$-60 \cdot \frac{5}{8} = d$$

Since the depth is the same whether we think of it as a positive depth below the surface or a negative height above the surface, we can find this value by multiplying $60 \cdot \frac{5}{8} = 37.5$ and then noting that the sign must be negative if we are representing positions below the surface of the earth by negative numbers. So $d = -37.5$ and the drill will be at height -37.5 feet after 15 hours.

b. Likewise, if we know the drill has dug to -143.6 feet, we can use the equation again, this time to find t:

$$-60t = -143.6$$

so $t = (-143.6) \div (-60)$. Since the amount of time would be the same if we were working with positive feet below the surface of the earth and a drill rate of 60 feet per day below the earth surface, we can find this value by dividing $143.6 \div 60$, which is about 2.4 days.

Solution: 3 Arithmetic with signed numbers

a. We can measure the elevation below and above the ground with signed numbers, taking positive numbers to represent elevation above the ground and negative numbers to represent elevation below the ground. The rig drills below the ground at 60 feet per day so after 15 hours it will be at an elevation of

$$(15 \text{ hours}) \times \left(-60 \frac{\text{feet}}{\text{day}}\right).$$

In order to calculate this, we need to convert hours to days. Since 15 hours is $\frac{15}{24} = \frac{5}{8}$ of day, after 15 hours the rig will be at an elevation of

$$\left(\frac{5}{8} \text{ days}\right) \times \left(-60 \frac{\text{feet}}{\text{day}}\right) = -\frac{300}{8} \text{ feet}.$$

So the rig will have drilled $\frac{300}{8} = 37.5$ feet below the ground.

b. Since the rig has drilled 143.6 feet under the ground, this is represented on our

number line by -143.6. It goes at a rate of 60 feet underground per day so this is $-60\frac{\text{feet}}{\text{day}}$. So the rig has been running for

$$(-143.6 \text{ feet}) \div \left(-60\frac{\text{feet}}{\text{day}}\right).$$

This is $\frac{-143.6}{-60}$ days. The rig has been running for a positive amount of time since it has drilled underground so this means that $\frac{-143.6}{-60} = \frac{143.6}{60}$ and this is the number of days the rig has been drilling. Alternatively, we will get the same answer if, instead of drilling into the ground, we are building up above the ground: so the two negative signs can be exchanged for two positive signs without changing the value of the answer.

Assignment #2

From what type of rocks is the Grand Canyon Composed?

Part 2

In order to better understand what kind of weathering broke apart the rock from which the Grand Canyon was formed, it's important to establish what we know about the kind of rocks the Grand Canyon is made from.

- Read Page 1 of the *Grand Canyon Rocks!* article.
- Describe each of the three types of rock using information from the article:
    - Igneous rocks:
      Formed when rock is super-heated, becomes molten, and then cools and hardens on or beneath Earth's surface.
    - Sedimentary rocks:
      Made of smaller pieces called sediments that pile into layers. Pressure cements the sediments into solid rock over time.
    - Metamorphic rocks:
      Rocks that have been changed under great heat and pressure

- Look at the images of the Grand Canyon below. Do you see any clues about what classification of rock the Grand Canyon might be made of? Use what you know about characteristics of different rock classifications and the article information to make an evidence-based claim.

https://commons.wikimedia.org/wiki/File:USA_09855_Grand_Canyon_Luca_Galuzzi_2007.jpg

https://pixabay.com/images/search/rock%20layers/

Is the Grand Canyon made of igneous rock, metamorphic rock, or sedimentary rock?	**What evidence from the images above supports your claim?**
I think the Grand Canyon is composed of…. *Answers may vary; however, article evidence should support sedimentary rock.*	The evidence that supports my claim is…. *I see layers in the rocks in the pictures of the Grand Canyon and the article says that sedimentary rock is formed by sediments being cemented together into layers.*

- Read pages 2-4 of the *Grand Canyon Rocks!* Article to learn more about the types of rocks found at the Grand Canyon and complete the table below with information about each type of rock.

Rock Name	Time Period Formed?	Environment Description	Types of Fossils Found
Precambrian Basement Rocks Rock Type: *Igneous & Metamorphic*	*1.8 billion years ago*	*Molten rock flowed as magma through cracks of metamorphic rock*	*Hard to find due to heat and pressure during formation*
Bright Angel Shale Rock Type: *Sedimentary*	*515 million years ago*	*Muddy, warm, shallow sea*	*Trilobites, brachiopods, crinoids*
Redwall Limestone Rock Type: *Sedimentary*	*340 million years ago*	*Shallow, warm, clear well lit sea*	*Corals, cephalopods, bryozoans, brachiopods*
Supai Group Rock Type: *Sedimentary*	*300 million years ago*	*Varied between beaches, dunes, and oceans*	*Brachiopods (oceans) Plant fossils (land)*
Hermit Shale Rock Type: *Sedimentary*	*280 million years ago*	*Broad coastal plain fed by multiple streams*	*Ferns, conifers, reptiles, insects*
Coconino Sandstone Rock Type: *Sedimentary*	*275 million years ago*	*Coastal dune fields (desert like)*	*Reptiles, spiders, scorpions*
Kaibab Limestone Rock Type: *Sedimentary*	*270 million years ago*	*Shallow, warm, well-lit clear sea with a sandy floor*	*Brachiopods, sponges, sharks, fish*

- Does this information support your earlier answer about the type of rock that composes the Grand Canyon? *Answers will vary. If the earlier answer was sedimentary: yes.*

Assignment #3

What type of weathering contributed to the formation of the Grand Canyon?

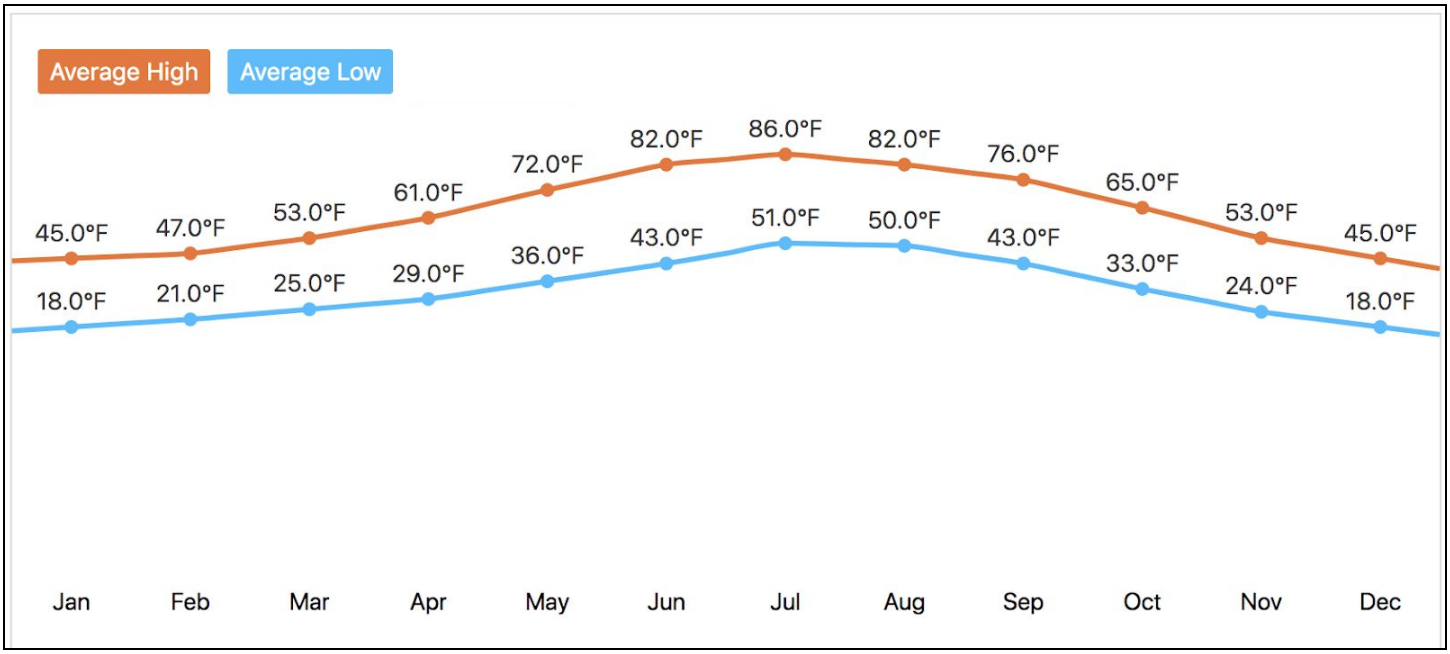
Part 1

Grand Canyon Climate

1. Examine the graph below. During which month is there the biggest difference between the average low temperature and the average high temperature? How much is the difference?

The biggest difference in average low and high temperature is in June. The difference is 39 degrees.

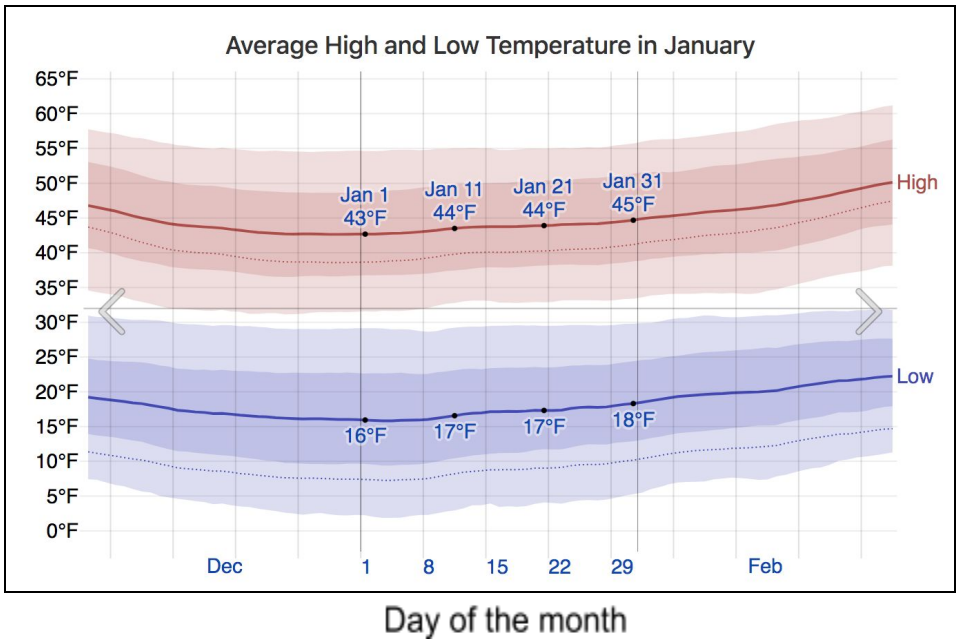
Grand Canyon Average Monthly High and Low Temperatures



2. One of the coldest months in the Grand Canyon is January. Examine the graph of January temperatures in the Grand Canyon below.

   Does the Grand Canyon ever experience temperature below and above freezing (32 degrees F) on the same day? Be sure to cite evidence from the graph.

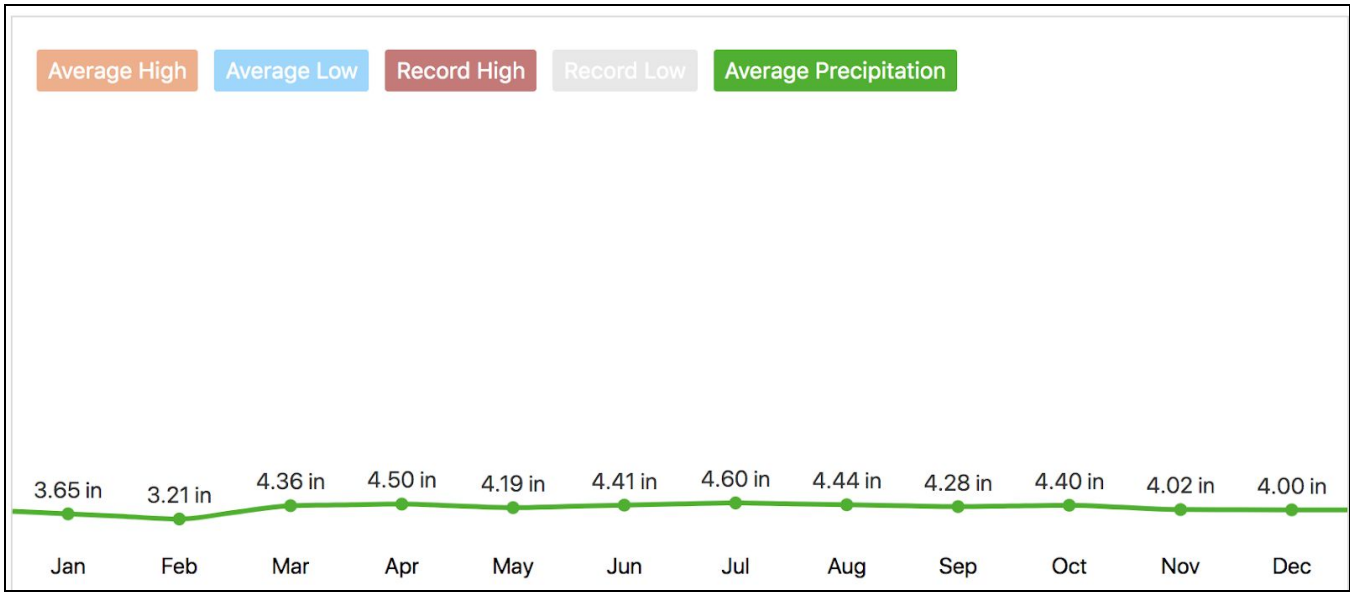
Yes, it is common for the Grand Canyon to experience temperatures below and above freezing on the same day in January. The low temperatures range from 16 degrees to 18 degrees (below freezing), while the high temperatures on the same days range from 43 degrees to 45 degrees (above freezing).



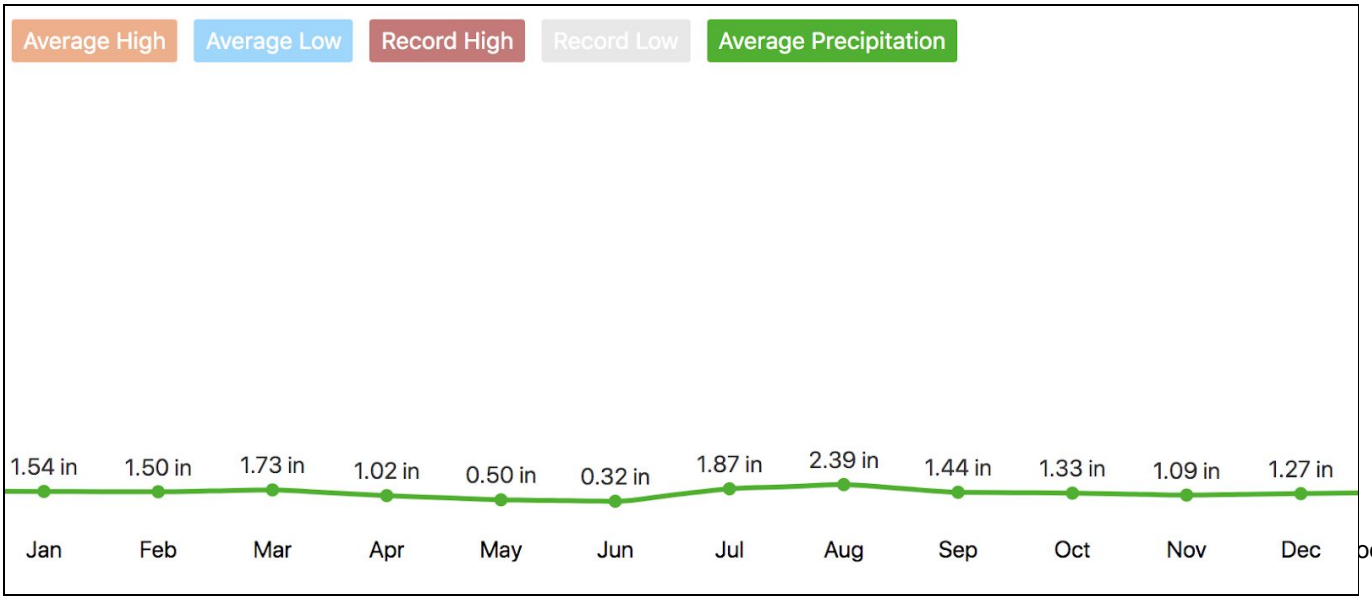
3. Examine the graphs below. Does it rain or snow (precipitation) at the Grand Canyon? How does the precipitation in the Grand Canyon compare to the precipitation in New York City?

Yes it rains and/or snows at the Grand Canyon. The precipitation at the Grand Canyon is higher than the average monthly precipitation in New York City. In fact, it is more than double.

Grand Canyon Average Monthly Precipitation



New York City Average Monthly Precipitation



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Summarize your observations, thoughts, and questions from **Part 1: Grand Canyon Climate**, in the space provided below.

See What are some of your observations?	**Think** What does each observation make you think about the Grand Canyon formation?	**Wonder** What questions do you have about each observation?
Answers will vary.	*Answers will vary.*	*Answers will vary.*

Part 2

- Read the text, *Weathering*.
    - As you read, use a yellow highlighter (or underline) to highlight ideas that you think connect to what you learned about the Grand Canyon's climate and might offer clues about the type of weathering that may have broken apart rock to form the Grand Canyon. Use green to highlight (or circle) ideas you don't understand or have questions about.

1) What ideas from the text do you think connect to what you learned about the Grand Canyon's climate? Be sure to explain why you think they connect.

Answers will vary. Some ideas that connect to the data above are:

- *Temperature changes*
- *Freeze-thaw*
- *Rainwater*

2) What questions do you have about the text?

Answers will vary.

- Now that you have read about the types of physical and chemical weathering, make an evidence-based claim below about at least one type of physical weathering and one type of chemical weathering you think could have broken apart rock to form the Grand Canyon.

Physical Weathering Claim

Claim	**Evidence** Consider rock and mineral composition and climate at the Grand Canyon.	**Reasoning** How does the evidence connect to the description of the physical weathering you claimed?
The type of physical weathering I think may have broken apart rock to form the Grand Canyon is… *Answers will vary.* *Example:* *Freeze-thaw*	*Answers will vary; however, students should cite evidence from the climate data and/or the Grand Canyon Rocks! Article.* *Example:* *Temperatures at the Grand Canyon often fall below and above freezing during the same day.* *It rains significantly more at the Grand Canyon than NYC.*	*Answers will vary; however, students should use information from the weathering article to connect the claim to the evidence.* *Example:* *Freeze thaw is a type of physical weathering caused when water gets into the cracks of rocks and then freezes, expands, and makes a bigger crack in the rock. Given the precipitation levels and temperature changes at the Grand Canyon, this process can happen over and over again.*

Chemical Weathering Claim

Claim	**Evidence** Consider rock and mineral composition and climate at the Grand Canyon.	**Reasoning** How does the evidence connect to the description of the chemical weathering you claimed?
The type of chemical weathering I think may have broken apart rock to form the Grand Canyon is… *Answers will vary.* *Example:* *Rainwater*	*Answers will vary; however, students should cite evidence from the climate data and/or the Grand Canyon Rocks! article.* *Example:* *The Grand Canyon averages over four inches of rain a month.* *The Grand Canyon is partly composed of limestone.*	*Answers will vary; however, students should use information from the weathering article to connect the claim to the evidence.* *Example:* *Since the Grand Canyon is a national park and not around a lot of pollution, I did not choose acid rain as an option. The area does get steady precipitation during the year and is composed of some limestone, which are easily weathered by slightly acidic rainwater.*