

Answers for 2.1

For use with pages 67–72

2.1 Skill Practice

1. rational number 2. 2
3. Zero is in the set of whole numbers, but not in the set of positive integers.
4. Positive number; the absolute value of a negative number is always positive.
5. 7 6. 0 7. -5
8. -2 9. 5 10. 8
11. -1 12. 3 13. -2
14. 3: whole number, integer, rational number, -5: integer, rational number, -2.4: rational number, 1: whole number, integer, rational number; -5, -2.4, 1, 3
15. 1.6: rational number, 1: whole number, integer, rational number, -4: integer, rational number, 0: whole number, integer, rational number; -4, 0, 1, 1.6
16. 0.25: rational number, -0.5: rational number, 0.2: rational number, -2: integer, rational number; -2, -0.5, 0.2, 0.25
17. $-\frac{2}{3}$: rational number, -0.6: rational number, -1: integer, rational number, $\frac{1}{3}$: rational number; -1, $-\frac{2}{3}$, -0.6, $\frac{1}{3}$
18. -0.01: rational number, 0.1: rational number, 0: whole number, integer, rational number, $-\frac{1}{10}$: rational number; $-\frac{1}{10}$, -0.01, 0, 0.1
19. 16: whole number, integer, rational number, -1.66: rational number, $\frac{5}{3}$: rational number, -1.6: rational number; -1.66, $-1.6, \frac{5}{3}, 16$
20. -2.7: rational number, $\frac{1}{2}$: rational number, 0.3: rational number, -7: integer, rational number; -7, -2.7, 0.3, $\frac{1}{2}$
21. -4.99: rational number, 5: whole number, integer, rational number, $\frac{16}{3}$: rational number, -5.1: rational number; -5.1, -4.99, 5, $\frac{16}{3}$
22. $-\frac{3}{5}$: rational number, -0.4: rational number, -1: integer, rational number, -0.5: rational number; -1, $-\frac{3}{5}$, -0.5, -0.4
23. -6, 6 24. 3, 3 25. 18, 18
26. 0, 0 27. -13.4, 13.4
28. -2.7, 2.7 29. 6.1, 6.1

Answers for 2.1 *continued*

For use with pages 67–72

30. 7.9, 7.9 31. $1\frac{1}{9}$, $1\frac{1}{9}$
32. $\frac{5}{6}$, $\frac{5}{6}$ 33. $-\frac{3}{4}$, $\frac{3}{4}$ 34. $-1\frac{1}{3}$, $1\frac{1}{3}$
35. Hypothesis: a number is a positive integer, conclusion: the number is a whole number; true.
36. Hypothesis: a number is negative, conclusion: its absolute value is negative; false. *Sample answer:* $|-3|$ is 3, a positive integer.
37. Hypothesis: a number is positive, conclusion: its opposite is positive; false. *Sample answer:* The opposite of 2 is -2 , a negative number.
38. Hypothesis: a number is an integer, conclusion: the number is a rational number; true.
39. A
40. $-(-2)$ is not negative. *Sample answer:* In the number $-(-2)$, replace the parentheses with absolute value bars.
41. $-|-0.2|$ is a negative number. *Sample answer:* In the number $-|-0.2|$, remove both negative signs.
42. 0.75 43. 1 44. 0
45. 1.75 46. 1.5 47. 2.25
48. 1.5 49. 1.5 50. B
51. It is the original number. *Sample answer:* The opposite of a is $-a$ and the opposite of $-a$ is a , which is the original number.
52. $a < 0$; $a > 0$; $a = 0$.
Sample answer: When a number a is negative, its opposite will be positive, which is greater than a . When a number a is positive, its opposite will be negative, which is less than a . When a is 0, its opposite is 0, which is equal to a .

2.1 Problem Solving

53. Fondo, Frink, Alamorio, Calexico, Date City
54. -12
55. -3.4 ; the absolute value of -3.4 is less than the absolute value of -3.8 , so it is closer to 0, the exact pitch.
56. B
57. a. 500 Hz
b. The intensity decreases until 1000 Hz and then increases.
58. a. -10°F with a wind speed of 10 miles per hour
b. decreases; decreases

Answers for 2.1 *continued*
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- 59. a.** Sun, Sirius, Canopus, Arcturus, Capella, Achernar; Canopus, Achernar, Arcturus, Capella, Sirius, Sun
- b.** Rigel's apparent magnitude is greater than the Sun's apparent magnitude, so it is dimmer than the Sun; Rigel's absolute magnitude is less than the Sun's absolute magnitude, so it is brighter than the Sun.
- c.** No. *Sample answer:* The apparent magnitude of Arcturus is less than the apparent magnitude of Achernar, but the absolute magnitude of Arcturus is greater than the absolute magnitude of Achernar.
- 60.** -200, -150, -100, -50, 50, 100, 150, 200

2.1 Mixed Review

- 61.** $\frac{5}{6}$ **62.** 1 **63.** $4\frac{1}{4}$
- 64.** 16.3 cm **65.** $6\frac{7}{12}$ ft
- 66.** 17.6 m **67.** not a solution
- 68.** solution **69.** solution
- 70.** not a solution
- 71.** not a solution

72. not a solution

73. range:
2, 5, 11, 27

x	y
5	2
8	5
14	11
30	27

74. range:
0, 3, 9, 15

x	y
0	0
2	3
6	9
10	15

75. range:
1, 5, 11, 19

x	y
2	1
4	5
7	11
11	19

Answers for 2.2

For use with pages 77–79

2.2 Skill Practice

1. 0
2. If they are opposites, their sum will be zero.
3. -8 4. 5 5. 6
6. -5 7. -13 8. -10
9. -6 10. -6 11. -20
12. 1.5 13. -4.5 14. -5.9
15. 6.6 16. -13.6 17. -15.2
18. $-5\frac{3}{10}$ 19. $7\frac{1}{15}$ 20. $-5\frac{17}{20}$
21. $1\frac{16}{45}$ 22. $-18\frac{5}{28}$ 23. $-20\frac{23}{24}$
24. The answer should be negative, $-13 + (-15) = -28$.
25. The numbers have different signs, so their absolute values should have been subtracted, $17 + (-31) = -14$.
26. Inverse property of addition
27. Associative property of addition
28. Commutative property of addition
29. Identity property of addition
30. Associative property of addition
31. Commutative property of addition
32. -15 33. -49 34. -5.13
35. 1.6 36. $-20\frac{1}{5}$ 37. $5\frac{19}{60}$
38. 2 39. -3 40. 20.4
41. -9.5 42. $6\frac{3}{20}$ 43. $7\frac{23}{60}$
44. 8 45. 0
46. -6.4 47. 7.4
48. $|-4| + 0$; 4
49. $-(-18) + (-18)$; 0
50. D
51. 0; $|2x|$
Sample answer: If $x = 2$, then $|2| + (-2) = 2 + (-2) = 0$. If $x = -2$, then $|-2| + (-(-2)) = |-2| + |-2| = 4$.
52. 0; use the commutative property of addition to add each negative number and its opposite. By the additive inverse property, it will equal 0.

2.2 Problem Solving

53. 7°F 54. 55 ft
55. a. 1.5 diopters
b. -3.75 diopters
c. part (b)
56. C
57. a. your friend
b. No, if you score 2 double eagles, you will have the same score.

Answers for 2.2 *continued*
For use with pages 77–79

- 58. a.** 3 **b.** yes
- c.** 5 electrons should be added.
Sample answer: $5 + x = 0$.
For the expression to equal 0,
add the additive inverse of 5,
which is -5 .
- 59.** \$12.40; if you add each profit,
the total is \$12.39, to get a
positive profit, you need to earn
at least \$12.40.

2.2 Mixed Review

- 60.** 14 **61.** 0.9 **62.** 13.5
- 63.** 9.6 **64.** $I = Prt$; \$36
- 65.** $P = 2l + 2w$; 136 ft
- 66.** $C = \frac{5}{9}(F - 32)$; 10°C

Answers for 2.3 *continued*

For use with pages 82–86

2.3 Skill Practice

1. $-3 + (-6)$
2. If the second number is larger than the first number.
3. 18 4. -16 5. -8
6. -44 7. 14.1 8. 17
9. -25.8 10. -2.8 11. $-\frac{1}{3}$
12. $-4\frac{1}{3}$ 13. $\frac{3}{4}$ 14. $-\frac{3}{10}$
15. 8 was substituted for y instead of -8 ;
 $3 - (-8) + 2 = 3 + 8 + 2 = 13$.
16. The opposite of -12 was not added in step 3;
 $3 - [-4 + (-8)] = 3 - (-12)$
 $= 3 + 12$
 $= 15$.
17. 4.6 18. -21.6 19. 10.6
20. 22.6 21. 7.7 22. -4.6
23. 7.6 24. 14.9 25. 1.8
26. -8°C 27. 107°F 28. 200 ft
29. -1280 m 30. -17.4°F
31. 127.1 mi 32. -14
33. 8 34. -14 35. -4.2
36. 34.1 37. 16.4 38. C

39. *Sample answer:* You are overdrawn on your checking account by \$23. You write two more checks for \$14 and \$8. What is your balance?; $-\$45$

40. No. *Sample answer:*

$$(2 - 3) - 4 \neq 2 - (3 - 4),$$
$$2 - 5 \neq 5 - 2$$

41. a. Positive; the absolute value of a negative number is positive.

b. Positive; if $-a - b$ is written as a sum, $-a + (-b)$, then the opposite of a negative number is positive. The sum of two positive numbers is positive.

c. Negative; if $-|a| - |b|$ is written as a sum, $-|a| + (-|b|)$, the opposite of the absolute value of a number is negative. The sum of two negative numbers is negative.

d. Negative; the sum of two negative numbers is negative.

2.3 Problem Solving

42. -4400 ft
43. 14.6°C
44. 9 yd

Answers for 2.3 *continued*
For use with pages 82–86

45. a. $d = t - 342$

b.

t	d
341.7	20.3
343.8	1.8
340.9	21.1
342.7	0.7

341.7 and 340.9; you can tell if $t - 342$ is negative.

46. a. $-\$378$ trillion; $-\$362$ trillion; $-\$422$ trillion; $-\$496$ trillion

b. *Sample answer:* There is a deficit each year and it has increased each year.

47. a. 6° ; 19° b. -4°

48. 8:15 P.M.

2.3 Mixed Review

49. 300 50. 44

51. -14.7 52. 11.2

53. Commutative property of addition

54. Inverse property of addition

55. Identity property of addition

56. Associative property of addition

2.1–2.3 Mixed Review of Problem Solving

1. a. -80°F , -45°F , -37°F , -29°F , 12°F

b. Alaska and California

2. a. $-\$50$ b. $\$50$

3. $\$9.89$;

9	.	8	9
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

4. *Sample answer:* You start a babysitting service. It costs you $\$35.50$ for a training course and then you spend $\$12.43$ on games to bring with you. After your first week, you've earned $\$50.43$. The expression $-35.50 + (-12.43) + 50.43$ represents the profit or loss from the first week of business; $\$2.50$.

Answers for 2.3 *continued*
For use with pages 82–86

5. -14 ; -444 ; -579 ; -515 ; -222 .

Sample answer: Each year more people migrate out of the city than migrate into it.

6. a. 12 P.M.

b. *Sample answer:* A storm is less likely in city B except at 12 P.M.

c. No, because the lifted index is greater in city B.

Answers for 2.4

For use with pages 91–95

2.4 Skill Practice

1. 1
2. *Sample answer:* The identity property of multiplication states that the product of a number and 1 is the number. The multiplicative property of -1 states that the product of a number and -1 is the *opposite* of the number.
3. -28 4. -22 5. 90
6. 88 7. -36 8. 3.25
9. 7 10. 16 11. -43.89
12. 30 13. -40 14. 9
15. -80 16. -32
17. $2\frac{2}{5}$ 18. $-\frac{2}{9}$
19. Multiplicative property of zero
20. Commutative property of multiplication
21. Identity property of multiplication
22. Multiplicative property of -1
23. Associative property of multiplication
24. Multiplicative property of zero
25. Identity property of multiplication
26. Associative property of multiplication
27. Multiplicative property of -1
28. $16y$; $y(16)$, product of -2 and -8 ; $16y$, commutative property of multiplication
29. $18x$; $18x$, same signs, product is positive.
30. $-3q$; $\left[\frac{3}{5}(-5)\right]q$, associative property of multiplication; $-3(q)$, product of $\frac{3}{5}$ and -5 is -3 ; $-3q$, multiply.
31. $-84z$; $12(-7z)$, product of -2 and -6 is 12 ; $[12 \cdot (-7)]z$, associative property of multiplication; $-84(z)$, product of 12 and -7 is -84 ; $-84z$, multiply.
32. $42z$; $20(-2.1)(-z)$, product of -5 and -4 is 20 ; $-42(-z)$, product of 20 and -2.1 is -42 ; $42z$, multiply.
33. $-40c$; $2(4)(-5c)$, product of $-\frac{1}{5}$ and -10 is 2 ; $8(-5c)$, product of 2 and 4 is 8 ; $[8 \cdot (-5)]c$, associative property of multiplication; $-40(c)$, product of 8 and -5 is -40 ; $-40c$, multiply.

Answers for 2.4 *continued*
For use with pages 91–95

34. $5t^2$; $(t)(-t)(-5)$, commutative property of multiplication; $-t^2(-5)$, product of t and $-t$ is $-t^2$; $(-5)(-t^2)$, commutative property of multiplication; $5t^2$, multiply.

35. $16.8r^2$; $[-6r \cdot (-2.8)]r$, associative property of multiplication; $[-6 \cdot (-2.8) \cdot r]r$, commutative property of multiplication; $(16.8r)r$, product of -6 and -2.8 is 16.8 ; $16.8(r \cdot r)$, associative property of multiplication; $16.8r^2$, multiply.

36. $-\frac{3}{10}m^2$; $-\frac{3}{10}(-m)(-m)$, product of $\frac{1}{3}$ and $-\frac{9}{10}$ is $-\frac{3}{10}$; $-\frac{3}{10}m^2$, multiply.

37. -0.4 **38.** -8.8 **39.** -12.6

40. 11.6 **41.** -6.6 **42.** -8.96

43. $-1(7) = -7$, not 7 ;
 $-1(7)(-3)(-2x) = -7(-3)(-2x)$
 $= 21(2x)$
 $= [21 \cdot (-2)]x$
 $= -42x$

44. $(-8)(-5) = 40$, not -40 ;
 $(-8)(-5)(z)(z) = 40(z \cdot z)$
 $= 40z^2$

45. true

46. False. *Sample answer:*
 $(-1)(-2)(3) = 6$

47. true **48.** B

49. $n - 1$; n . *Sample answer:* If you have 4 factors, $(-1)(-2)(-3)(4)$, the most that can be negative is 3, or $4 - 1$, for the product to be negative. If you have 5 factors, $(-1)(-2)(-3)(-4)(-5)$, all of them can be negative for the product to be negative.

2.4 Problem Solving

50. about 632.3 km^2

51. $\$162.50$

52. a. 4.32022 km^3 ; 4.19027 km^3

b. about 0.47658 km^3 ; find the total change in the volume of the glaciers between 1913 and 1994, then multiply the change by $\frac{1}{3}$.

53. C

Answers for 2.4 *continued*
For use with pages 91–95

54. a. $a = 3200 + (-160t)$

b.

t	$3200 + (-160t)$
1	3040
2	2880
3	2720
4	2560
5	2400

4 sec

55. a. $f = 11,250 + (-30t)$,
 $f = 135,000 + (-240t)$

b. 11,160 gal, 134,280 gal

c. Rhododendron; 45,000 gal; the Rhododendron takes 375 hours to burn all of its fuel; the Spokane takes 562.5 hours to burn all of its fuel; to find the number of hours the Rhododendron will take to burn all its fuel, use the equations in part (a) and find the additive inverse of 11,250, then divide it by -30 ; to find the number of hours the Spokane will take to burn all its fuel, use the equations in part (a) and find the additive inverse of 135,000, then divide it by -240 .

56. 6000 km^2

2.4 Mixed Review

57. 82

58. 72

59. 10

60. 225

61. -9

62. -8

63. -13

64. $-\frac{11}{14}$