Applications

1. $^+16$

2. $^+8$

3. $^-8$

4. $^-15$

5. $^+0.7$

6. $^-0.7$

7. $^-1,000$

8. $^-5,000$

9. $^+0.5$

10. $^+\frac{1}{2}$

11. $^+\frac{1}{4}$

12. $^-\frac{11}{5}$

13. **a.** $^+6.5$

    b. $^-6.5$

    c. $^-1.1$

    d. $^+1.1$

14. **a.** $^+15 + {}^-35 = {}^-20$

    b. $^-2 + {}^+7 = {}^+5$

    c. $^-10 + {}^+14 = {}^+4$

    d. $^+60 + {}^-100 = {}^-40$

15. $^+10 + {}^-13 = {}^-3$ or $^+10 - {}^+13 = {}^-3$ or $^-13 + {}^+10 = {}^-3$

16. **a.** $^+10 + {}^-13 - {}^-5 = {}^+2$

    b. $^+10 + {}^-13 - {}^-5 + {}^+5 = {}^+7$ or $^+2 + {}^+5 = {}^+7$

    c. $^+10 + {}^-13 - {}^-5 + {}^+5 + {}^+4 + {}^-4 = {}^+7$ or $^+7 + {}^+4 + {}^-4 = {}^+7$

17. **a.** $^+43 + {}^-47 + {}^-43 = {}^+43 + {}^-43 + {}^-47$ (Commutative Property)
$= 0 + {}^-47$ (sum of opposites or additive inverse)
$= {}^-47$ (sum with zero or additive identity)

    b. $^+5.2 + {}^-5.2 + {}^-\frac{4}{7} = 0 + {}^-\frac{4}{7}$ (sum of opposites or additive inverse)
$= {}^-\frac{4}{7}$ (sum with zero or additive identity)

    c. $^+5\frac{2}{5} + {}^+\frac{3}{7} + {}^-5\frac{2}{5} = {}^+5\frac{2}{5} + {}^-5\frac{2}{5} + {}^+\frac{3}{7}$ (Commutative Property)
$= 0 + {}^+\frac{3}{7}$ (sum of opposites or additive inverse)
$= {}^+\frac{3}{7}$ (sum with zero or additive identity)

18. $^+8$

19. 0

20. $^-24$

21. $^-15$

22. $^+85$

23. $^+95$

24. $^+50$

25. $^-50$

26. $^+1.3$

27. $^-\frac{1}{4}$

28. $^-\frac{3}{5}$

29. $^-\frac{3}{2}$

30. **a.** 0

    b. $^-8$

    c. $^-16$

    d. 0

    e. $^-24$

    f. 0

31. $^{+}15$

32. $^{+}70$

33. $^{-}30$

34. $^{-}80$

35. $^{-}50$

36. $^{-}6$

37. Answers will vary. Possible answers:

   a. The thermometer reads $^{-}4°F$ when Allison checks it in the morning and $^{+}7°F$ when she checks it at noon. What is the change in temperature over the course of the morning?

   b. Stephanie spends $20 to buy ingredients for baked goods to sell at the bake sale. Her profit is $30. How much does she sell her baked goods for?
Or: Matt writes a check for $20. Then he makes a deposit. He ends up with $30 more than he had before writing the check. How much does he deposit?

   c. In Math Fever, Jacob answered his first two questions incorrectly. The second question was worth 150 points. His current score is $^{-}450$. What was the point value of his first question?

38. **a.** $5,280 - {}^{-}768$ is greater because subtraction of a negative can be rewritten as addition of a positive ($5,280 + 768$). This sum is greater than the difference between 5,280 and 768 or the addition of a negative number as in $5,820 + {}^{-}768$.

   b. $7,760 - {}^{-}880$ is greater because it can be rewritten as addition ($7,760 + 880$). The sum of this addition expression is greater than the difference found in the subtraction expression $7,760 - 880$.

   c. The two will produce the same result. $1,500 - {}^{-}3,141$ can be rewritten as $1,500 + 3,141$.

39. **a.** Negative. Use the algorithm for adding numbers with different signs: Find the difference between the two absolute values. Then take the sign of the number with the greater absolute value. The absolute value of $^{-}23$ is greater than 19.

   b. Positive. Subtracting a negative number can be rewritten as addition of a positive. The problem becomes $3.5 + 2.7$. The sum is positive.

   c. Negative. While the subtraction of the negative can be rewritten as addition of a positive, the problem is still $^{-}3.5 + 2.04$. Then, use the algorithm for adding numbers with two different signs: Find the difference between the absolute values of the two numbers. Then take the sign of the number with the greater absolute value. The absolute value of $^{-}3.5$ is greater than 2.04.

   d. Negative. Use the algorithm for adding numbers with different signs: Find the difference between the absolute values of the two numbers. Then take the sign of the number with the greater absolute value. The absolute value of $^{-}6.2$ is greater than 3.1.

40. **a.** Add 9 black chips or subtract 9 red chips.

   b. Subtract 6 black chips or add 6 red chips.

   c. Answers will vary. Sample: 2 black chips

   d. Answers will vary. Sample: 3 black chips

41. $15 - 10 = {}^{+}5$

42. $^{-}20 + {}^{-}14 = {}^{-}34$

43. $200 + 125 = {}^{+}325$

44. $^{-}20 + 14 = {}^{-}6$

45. $^{-}200 + 125 = {}^{-}75$

46. $7 + {}^{-}12 = {}^{-}5$

47. a. Answers will vary. Possible answer: 2013 is 10 years after 2003. 2013 is 10 years before 2023.

b. Answers will vary. Possible answer: $2013 - 2003 = 10$; $2013 - 2023 = {}^-10$

c. Answers will vary. Possible answer: Both are 10 years apart, both involve subtraction, and both have 2013 as the first number. However, they have different answers: one is $^+10$, and the other is $^-10$.

48. a. $^-7$

b. $^-7$

c. $^-45$

d. $^-45$

e. $^-6$

f. $^-6$

g. $^-142$

h. $^-142$

i. Both operations result in the same answer. Adding a negative number is the same as subtracting a positive number with the same absolute value.

49. a. 13

b. 13

c. 25

d. 25

e. 20

f. 20

g. $^-72$

h. $^-72$

i. Both operations result in the same answer. Subtracting a negative number is the same as adding a positive number with the same absolute value.

50. C

51. J

52. A

53. G

54. a. $\frac{23}{4}$ or $5\frac{3}{4}$

b. $-\frac{44}{8}$ or $-5\frac{1}{2}$ or -5.5

c. -3

d. $2\frac{1}{3}$

e. $-\frac{1}{2}$

f. -0.5

55. C

56. Related facts will vary. One possible answer is provided.

a. 17; $10 + 7 = n$

b. $-\frac{1}{8}$; $-\frac{5}{8} - (-\frac{1}{2}) = n$

c. $\frac{13}{9}$; $-\frac{7}{9} - \frac{2}{3} = -n$

57. Yes. Numbers without symbols represent positive numbers.

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59. a. Yes. Many students will choose addition as the "easiest" form. Others will prefer subtraction.

b. Yes. Many students will choose addition as the "easiest" form. Others will prefer subtraction.

Connections

60. a. $0 - 1{,}800 = {}^-\$1{,}800$

b. $^-1{,}800 - 2{,}150 = {}^-\$3{,}950$

c. $^-3{,}950 - 675 = {}^-\$4{,}625$

d. $^-4{,}625 - 2{,}300 = {}^-\$6{,}925$

e. $^-6{,}925 + 665 = {}^-\$6{,}260$

f. $^-6{,}260 + 95 = {}^-\$6{,}165$

g. $^-6{,}165 - 250 = {}^-\$6{,}415$

h. $^-6{,}415 + 1{,}150 = {}^-\$5{,}265$

i. $^-5{,}265 - 225 = {}^-\$5{,}490$

j. $^-5{,}490 + 750 = {}^-\$4{,}740$

k. $^-4{,}740 + 530 = {}^-\$4{,}210$; The balance at the end is $^-\$4{,}210$.

61. $^{-}22°F$; $72 - 94 = {}^{-}22$

62. $^{-}150$ points; $50 + {}^{-}200 = {}^{-}150$

63. a. Any increasing sequence of numbers that are greater than $^{-}4.5$ and less than $^{-}3.5$, such as $^{-}4.4, {}^{-}4.3, {}^{-}4.2, {}^{-}4.1$ or $^{-}3.9, {}^{-}3.8, {}^{-}3.7, {}^{-}3.6$

b. Any increasing sequence of numbers that are greater than $^{-}0.5$ and less than 0.5, such as $^{-}0.4, {}^{-}0.2, 0, 0.2$ or $^{-}0.45, {}^{-}0.15, 0.25, 0.45$
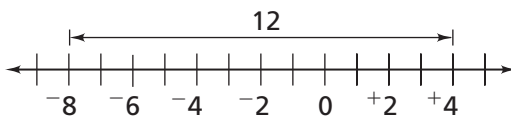
Extensions

64. a. Any numbers greater than 15, such as 15.1, 16, and 200.

b. Any numbers less than 15, such as 14.9, 14, and $^{-}2$.

c. 15

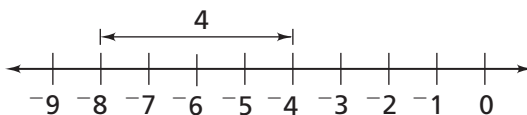**65. a.** On a number line, 8 and 4 have a distance of 4 units.

b. On a number line, $^{-}8$ and 4 have a distance of 12 units.
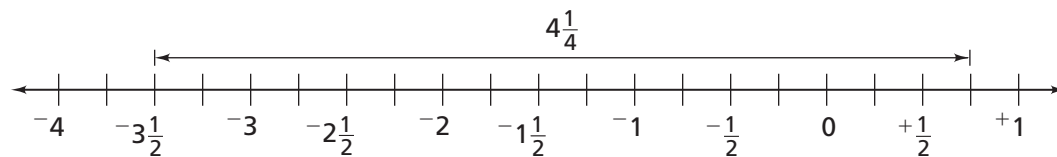

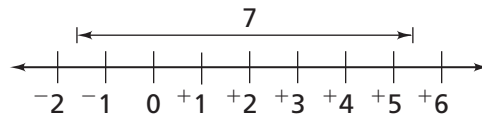**c.** On a number line, 8 and $^{-}4$ have a distance of 12 units.
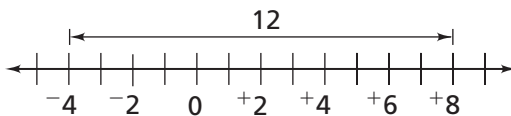
d. On a number line, $^{-}8$ and $^{-}4$ have a distance of 4 units.

e. On a number line, $^{-}3\frac{1}{2}$ and $\frac{3}{4}$ have a distance of $\frac{17}{4}$ units.

f. On a number line, 5.4 and $^{-}1.6$ have a distance of 7 units.

66. a. 4

b. 12

c. 12

d. 4

e. $\frac{11}{4}$

f. 7

g. For parts (a)–(d) and (f), the distance on the number line is the same as the absolute value computation; however, for part (e), this is not true. The absolute value computation is $2\frac{3}{4}$ or $\frac{11}{4}$. Parts (a)–(d) and (f) all deal with subtraction within the absolute value, while part (e) deals with addition. It is reasonable that the absolute value of subtraction would result in the same number as the distance on a number line because distance refers to the difference between two locations; thus, distance is determined by subtraction.

67. **a.** 24

  b. $^-36$

  c. $^-55$

  d. 30

68. **a.** Sands Motor − range: 17.4; profit: 0.8

  b. Daily Trans − range: 52.4; profit: 33.3

  c. Sell to You − range: 170; profit: 419

69. **a.** $0 + (^-7) + 12 = 5$

  b. $0 + 3 + (^-13) = ^-10$