Applications

1–4. Answers will vary. Possible answers given.

1. The Super Brains answered a 250-point question correctly, a 50-point question incorrectly, a 100-point question correctly, a 200-point question incorrectly, and a 200-point question correctly.
$250 + {}^{-}50 + 100 + {}^{-}200 + 200 = 300$

2. The Rocket Scientists answered a 50-point question correctly, a 150-point question correctly, a 100-point question incorrectly, a 150-point question incorrectly, and a 150-point question incorrectly.
$50 + 150 + {}^{-}100 + {}^{-}150 + {}^{-}150 = {}^{-}200$

3. The Know-It-Alls answered a 50-point question correctly, a 100-point question incorrectly, a 150-point question incorrectly, a 100-point question incorrectly, and a 50-point question correctly.
$50 + {}^{-}100 + {}^{-}150 + {}^{-}100 + 50 = {}^{-}250$

4. The Teacher's Pets answered a 100-point question correctly, a 200-point question correctly, a 150-point question incorrectly, a 200-point question incorrectly, and a 50-point question correctly.
$100 + 200 + {}^{-}150 + {}^{-}200 + 50 = 0$

5. B

6. Protons:
$250 + 100 + 200 + {}^{-}150 + {}^{-}200 = 200$ or
$250 + 100 + 200 - 150 - 200 = 200$

7. Neutrons:
${}^{-}200 + 50 + 250 + {}^{-}150 + {}^{-}50 = {}^{-}100$ or
${}^{-}200 + 50 + 250 - 150 - 50 = {}^{-}100$

8. Electrons:
${}^{-}50 + {}^{-}200 + 100 + 200 + {}^{-}150 = {}^{-}100$ or
${}^{-}50 - 200 + 100 + 200 - 150 = {}^{-}100$

9. (See Figure 1.)

10. (See Figure 2.)

11. ${}^{-}45.2$, $\frac{{}^{-}4}{5}$, ${}^{-}0.5$, 0.3, $\frac{3}{5}$, 23.6, 50

12. $3 > 0$

13. ${}^{-}23.4 < {}^{+}23.4$

14. $46 > {}^{-}79$

15. ${}^{-}75 > {}^{-}90$

16. ${}^{-}300 < 100$

17. ${}^{-}1{,}000 < {}^{-}999$

18. ${}^{-}1.73 = {}^{-}1.730$

19. ${}^{-}4.3 < {}^{-}4.03$

Figure 1

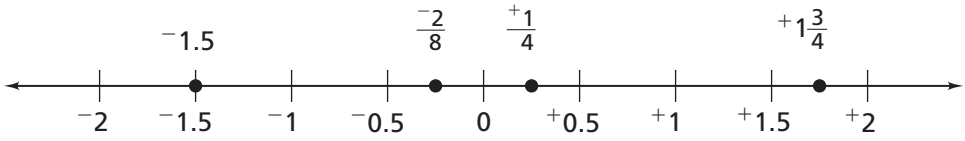
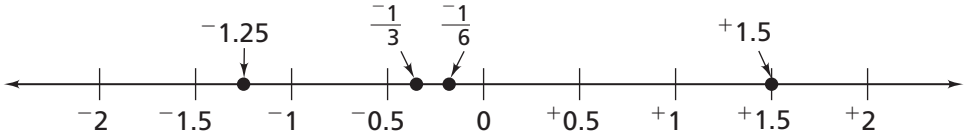


Figure 2



20. **a.** *A*: $^{-}7.5$
B: $^{-}4$
C: $^{-}1.5$
D: 2.5
E: 5.75

b. (See Figure 3.)

c. They are both the same distance from 0, but in opposite directions.

21. **a.** $^{-}7$; $^{-}7$ is 8 from $^{+}1$, $^{+}3$ is only 2 from $^{+}1$

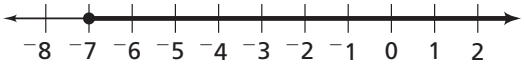
b. $^{-}10$; $^{-}10$ is a distance 11 from $^{+}1$, $^{+}7$ is a distance 6 from $^{+}1$

22. **a.** 0°F

b. $^{-}5$°F

c. $^{+}5$°F

23.


24.


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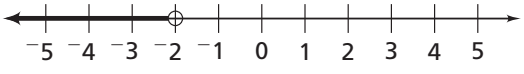

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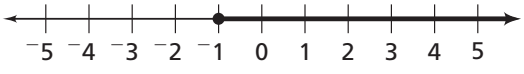

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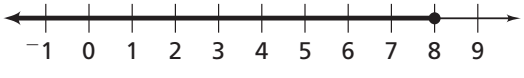

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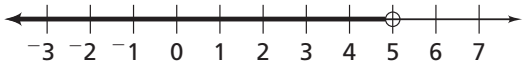
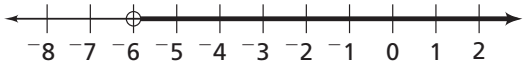


29.


30.


31. $x > 2$

32. $x \leq {}^{-}2$

33. $x < 5$

34. $x \geq 0$

35. **a.** $0 \leq x \leq 150$

b. (See Figure 4.)

36. 1

37. 2

38. $^{-}8$

39. 0

40. 10

41. $^{-}2$

42. $^{-}4$

43. $^{-}3$

44. $^{-}5$

45. $^{-}11$

46. **a.** $^{-}3$; $^{-}7.5$; and $2\frac{2}{3}$

b. 0; (additive inverses)

Figure 3

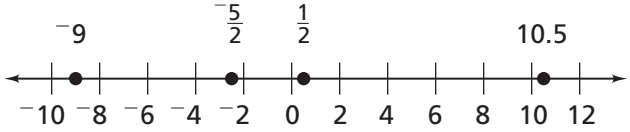
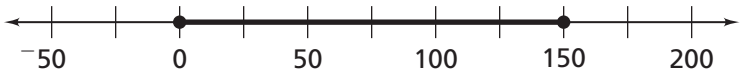


Figure 4



47. **a.** It fell by 100° ($^-100°$).
$^-56° - 44° = {}^-100°$

b. $^-56° - 44° = {}^-100°$ or
$44° + {}^-100° = {}^-56°$

c. (See Figure 5.)

48. $A = {}^-25$; $B = {}^-10$; $C = 20$

a. The change from A to B is 15 units.
$^-25 + n = {}^-10$ or $^-10 - {}^-25 = n$; $n = 15$

b. The change from A to C is 45 units.
$^-25 + n = 20$ or $20 - {}^-25 = n$; $n = 45$

c. The change from B to C is 30 units.
$^-10 + n = 20$ or $20 - {}^-10 = n$; $n = 30$

d. The change from C to A is $^-45$ units.
$20 + n = {}^-25$ or $^-25 - 20 = n$; $n = {}^-45$

e. The change from B to A is $^-15$ units.
$^-10 + n = {}^-25$ or $^-25 - {}^-10 = n$;
$n = {}^-15$

f. The change from C to B is $^-30$ units.
$20 + n = {}^-10$ or $^-10 - 20 = n$; $n = {}^-30$

49. end with: 2 red chips; $^+3 + {}^-5 = {}^-2$

50. end with: 4 black chips; $^-1 + {}^+2 - {}^-3 = {}^+4$

51. add: 3 black chips, or subtract: 3 red chips;
$^-5 - {}^-3 = {}^-2$

52. Answers will vary. Possible answer: start with: 1 red chip; $^-1 - {}^+3 = {}^-4$

53. Answers will vary. Possible answer: Julia earned \$5 mowing her neighbor's yard, but she spent \$8 on gas; $^-8 + 5 = {}^-3$

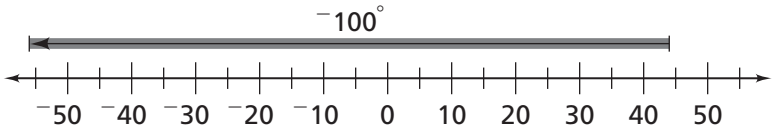
54. **a.** 0

b. 3

c. 8

55. Answers will vary; however, it is important for students to recognize that it is the opposite pairs ($^+1 + {}^-1$) that are used to change the number of chips but keep the total value the same. For example, one can add 2 pairs of black and red chips and still leave the value of the board unchanged ($^+7 + {}^-10 = {}^-3$). One can also remove 4 pairs of black and red chips and still leave the value of the board unchanged ($^+1 + {}^-4 = {}^-3$).

Figure 5



Connections

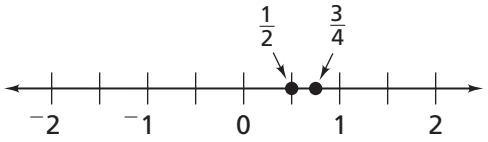
56. **a.** gain of 8 yds;
$7 + 2 + {}^{-}5 + {}^{-}12 + 16 + 8 + {}^{-}8 = 8$

b. 1.14 yd per play; $8 \div 7 \approx 1.14$

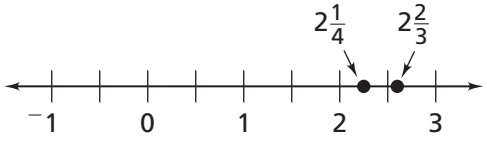
57. Elijah Sparks: 4 under par;
$4 + {}^{-}6 + {}^{-}3 + 1 = {}^{-}4$

58. Keiko Aida: 3 under par;
${}^{-}2 + {}^{-}1 + 5 + {}^{-}5 = {}^{-}3$

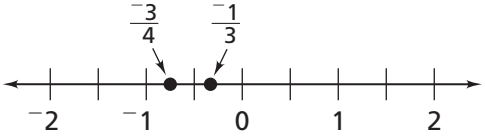
59. Answers will vary. Possible answers:



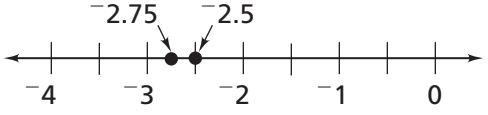
60. Answers will vary. Possible answers:



61. Answers will vary. Possible answers:

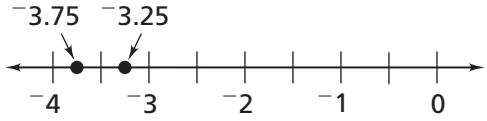


62. Answers will vary. Possible answers:



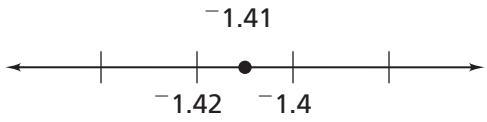
63. Answers will vary. Possible answers:

64. Answers will vary. Possible answers:

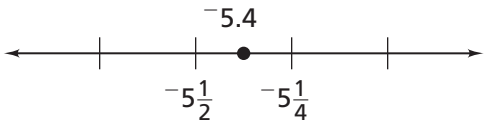


65.

66.



67.



68. (See Figure 6.)

69. (See Figure 7.)

70. (See Figure 8.)

71. (See Figure 9.)

72. $\frac{3}{10}, \frac{9}{25}, \frac{2}{5}, \frac{5}{9}$

73. 2.505, 20.33, 23, 23.30

74. $\frac{9}{6}$, 1.52, $1\frac{4}{7}$, 2

75. $2\frac{8}{9}$, 2.95, 3, $\frac{19}{6}$

76. F

77. D

Figure 6

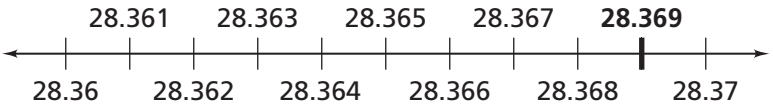


Figure 7

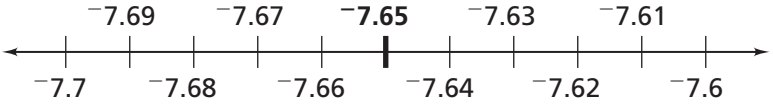


Figure 8

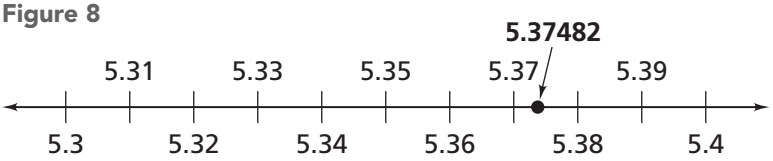
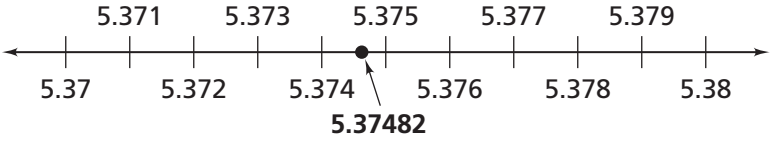


Figure 9



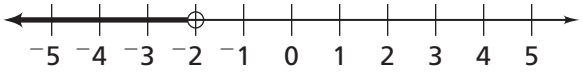
Extensions

78. **a.** (See Figure 10.)

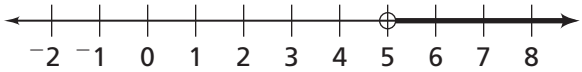
b. $369.53

c. His balance was the greatest on December 1 ($595.50). However, if the starting balance is excluded, then Kenji had the greatest balance during the month on December 5, with $575.55. His balance was the least on December 12, 13, and 14 with $294.67.

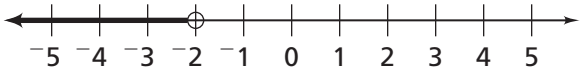
79. $x < ^-2$



80. $x > 5$

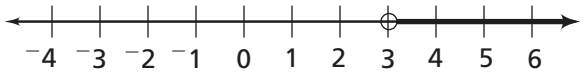


81. $x < ^-2$

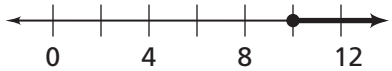


82. $x \geq ^-1$

83. $x > 3$



84. $10 \leq x$ or $x \geq 10$



85. 2.5°C; $(20 + ^-15) \div 2 = 5 \div 2 = 2.5$

86. High was 18°C; $5 = (x + ^-8) \div 2$; $10 = x + ^-8$; $18 = x$

87. $^-12.5$°C; $(^-10 + ^-15) \div 2 = ^-12.5$

88. $5 + ^-6 = ^-1$

89. $^-2 + 2 = 0$

90. $^-7 - ^-5 = ^-2$

Figure 10

Date	Transaction	Balance
December 1		$595.50
December 5	Writes a check for $19.95	$575.55
December 12	Writes a check for $280.88	$294.67
December 15	Deposits $257.00	$551.67
December 17	Writes a check for $58.12	$493.55
December 21	Withdraws $50.00	$443.55
December 24	Writes checks for $17.50, $41.37, and $65.15	$319.53
December 26	Deposits $100	$419.53
December 31	Withdraws $50.00	$369.53