## Applications

**1. a.** In 10 s, it will be at 100 m (10 m/s • 10 s = 100 m). It will reach the east terminal in 150 s (1,500 m ÷ 10 m/s = 150 s).

**b.** 15 *s* ago, it was at −150 m or 150 m to the west of the main terminal (10 m/s • (−15 s) = −150 m). It was at the west terminal about 100 s ago (−1,000 m ÷ 10 m/s = −100 s).

**c.** In 20 s, it will be at −200 m or 200 m to the west (−10 m/s • 20 s = −200 m). It will reach the west terminal in 100 s (−1,000 m ÷ (−10 m/s) = 100 s).

**d.** It was at the east terminal 150 s ago or −150 s (1,500 m ÷ (−10 m/s) = −150 s). 20 s ago, it was at 200 m or 200 m to the east of the main terminal (−10 m/s • (−20 s) = 200 m).

**2.** There are eight red chips each with a value of −5. Thus the total value of the board, by adding, is −40. This means $8 \times (-5) = -40$ or $-40 \div 8 = -5$.

**3.** $10 \times (-5) = -50$ (add 10 terms, each of which is −5).

**4.** $4 \times (-15) = -60 = (-15) + (-15) + (-15) + (-15)$

**5.** $3 \times (-5) = -15 = -5 + (-5) + (-5)$

**6.** $-14 \div 2 = -7$ since $2 \times (-7) = -14 = -7 + (-7)$

**7.** $-14 \div 7 = -2$ since $(-2) \times 7 = -14$

**8.** $-35 \div 7 = -5$ since $(-5) \times 7 = -35$

**9. a.** $7 \cdot 2 = 14$

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

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

**d.** $-7 \cdot 2 = -14$

**e.** $8 \cdot 2.5 = 20$

**f.** $-9 \cdot (-4) = 36$

**g.** $12 \cdot (-3) = -36$

**h.** $-1.5 \cdot 4 = -6$

**i.** $3.5 \cdot 7 = 24.5$

**j.** $-8.1 \cdot (-1) = 8.1$

**k.** $1 \cdot (-6) = -6$

**l.** $-2\frac{1}{2} \cdot 1 = -2\frac{1}{2}$

**10. a.** $<$

**b.** $<$

**c.** $<$

**d.** $<$

**e.** $<$

**f.** $<$

**g.** $>$

**h.** $>$

**i.** $>$

**j.** $<$

**11.** $9 + 5 = 5 + 9$

**12.** $4 \cdot 5 = 5 \cdot 4$

**13. a.** −12 and −12

**b.** −8 and −8

**c.** 6 and 6

**d.** $-\frac{4}{45}$ and $-\frac{4}{45}$

**e.** All the answers are equal, so multiplication with negative numbers is commutative.

**14. a.** True. You can either distribute the negative sign (that is out front) to the numerator or the denominator. In either of the forms, it will still be a negative answer. $\frac{-1}{2} = \frac{1}{-2}$

**b.** False. $-(\frac{1}{2}) = -0.5$, but $\frac{-1}{-2} = 0.5$. In $\frac{-1}{-2}$, both numbers are negative, and a negative divided by a negative equals a positive. $-1 \div (-2) = 0.5$.

**15. a.** 12

**b.** 12

**c.** −2

**d.** $-24$

**e.** 2

**f.** $-4$

**g.** 12

**h.** $-64$

**16.** $7 \cdot (-3) = -21$; $-3 \cdot 7 = -21$; $-21 \div 7 = -3$; $-21 \div (-3) = 7$

**17.** $-4 \cdot (-5) = 20$; $-5 \cdot (-4) = 20$; $20 \div (-4) = -5$; $20 \div (-5) = -4$

**18.** $1.5 \cdot (-3) = -4.5$; $-3 \cdot 1.5 = -4.5$; $-4.5 \div 1.5 = -3$; $-4.5 \div (-3) = 1.5$

**19.** Less than 0 (A negative number divided by a positive number will always be a negative number.)

**20.** 0 (Any number multiplied by 0 is 0.)

**21.** Greater than 0 (A negative multiplied by a negative results in a positive.)

**22.** 0 (0 divided by any nonzero number, regardless of sign, is 0.)

**23.** Greater than 0 (A negative divided by a negative results in a positive.)

**24.** Less than 0 (The product of a negative and a positive is a negative.)

**25.** **a.** 108

**b.** $-125$

**c.** 4.4

**d.** $-8$

**e.** $-7$

**f.** $\frac{8}{15}$

**g.** $-3$

**h.** 9

**i.** $-180$

**j.** $-7.5$

**k.** $\frac{5}{3}$ or $1\frac{2}{3}$

**l.** 1.8

**m.** 450

**n.** $-4$

**o.** 9

**p.** $-1$

**q.** $-5$

**r.** $-5.5$ or $-5\frac{1}{2}$

**26.** B

**27.** J

**28.** 9; Inverse Property of Multiplication; Identity Property of Multiplication

**29.** $-14$; Commutative Property of Multiplication; multiplicative inverse

**30.** 7.8; Commutative Property of Multiplication, multiplicative inverse

**31.** 5.8; Identity Property of Multiplication

**32.** repeat; $-0.\overline{5}$

**33.** terminate; $-0.875$

**34.** repeat; $-0.\overline{36}$

**35.** terminate; 0.3125

**36.** $-5, -3, -2, 2, 3, 5$

## Connections

**37.** **a.** Answers will vary based on students' estimates of the thermometer reading. Sample: There are 4 h between noon and 4:00 P.M. In 4 h, the temperature changes $4 \cdot (-2) = -8$°F, so the temperature at 4:00 P.M. was $69 + (-8) = 61$°F.

**b.** Answers will vary based on students' estimates of the thermometer reading. Sample: There are 21 h between noon and 9:00 A.M. In 21 h, the temperature changes $21 \cdot (-2) = -42$°F, so the temperature at 9:00 A.M. was $69 + (-42) = 27$°F.

**38.** −500 points; $-300 + [4 \cdot (-50)] = -500$ or $-300 - (4 \cdot 50) = -500$

**39.** 500 points; $X - (3 \cdot 100) = 200$; $X = 200 + 300$; $X = 500$

**40.** 13-yd line; $25 - (3 \cdot 4) = 13$ or $25 + [3 \cdot (-4)] = 13$

**41.** lost \$1,437.50; $5{,}750 \cdot (-0.25) = -1{,}437.50$

**42.** **a.** $52 \cdot 75 = 3{,}900$

**b.** $52 \cdot (-75) = -3{,}900$

**c.** $-2{,}262 \div (-58) = 39$

**d.** $\frac{2}{3} \cdot \frac{4}{5} = \frac{8}{15}$

**e.** $-9{,}908 \div 89 \approx -111.326$

**f.** $-7.77 \div (-0.37) = 21$

**g.** $-34 \cdot 15 = -510$

**h.** $53.2 \div (-7) = -7.6$

**i.** $-\frac{2}{3} \cdot \frac{6}{8} = -\frac{1}{2}$

**j.** $90 \div 50 = 1.8$

**k.** $-90 \cdot (-50) = 4{,}500$

**l.** $-108 \div 24 = -4.5$

**m.** $19.5 \div (-3) = -6.5$

**n.** $-8.4 \cdot 6 = -50.4$

**o.** $6 \cdot 2\frac{1}{2} = 15$

**p.** $-3\frac{2}{3} \cdot (-9) = 33$

**q.** $4 \cdot (-1\frac{1}{4}) = -5$

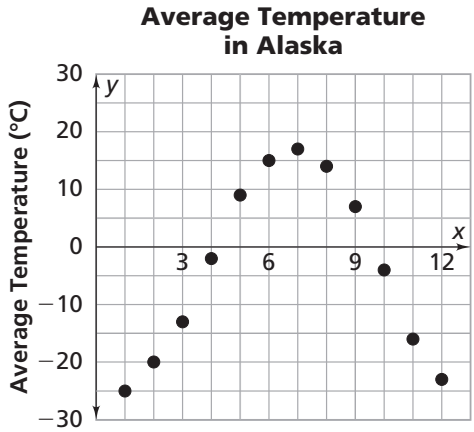
**r.** $-2.5 \cdot 2\frac{1}{5} = -5.5$

**43.** **a.** The temperatures measured in °C from the lowest to highest are: −25, −23, −20, −16, −13, −4, −2, 7, 9, 14, 15, 17. The median falls between the sixth and seventh temperatures, or between −2 and −4, which is a median of −3°C.

**b.** The temperature goes from −25°C to 17°C, giving a range of 42°C.

**c.** The sum of all the temperatures is −41°C, giving a mean temperature of $-41°C \div 12 \approx -3.4°C$.

**d.**




**44.** **a.** $-5 - 18 = -23$

**b.** $-23 + 48 = 25$

**c.** $\frac{3}{4} \cdot (-\frac{5}{9}) = -\frac{5}{12}$

**d.** $119 + (-19.3) = 99.7$

**e.** $-1.5 - (-32.8) = 31.3$

**f.** $12 \div 15 = 0.8$ or $\frac{4}{5}$

**g.** $-169 \div (-1.3) = 130$

**h.** $0.47 - 1.56 = -1.09$

**i.** $6 \cdot (-3.5) = -21$

**j.** $\frac{2}{-3} \div \frac{5}{6} = -\frac{4}{5}$

**k.** $\frac{7}{12} - (-\frac{2}{3}) = \frac{5}{4}$ or $1\frac{1}{4}$

**l.** $-\frac{4}{5} \div (-\frac{1}{4}) = \frac{16}{5}$ or $3\frac{1}{5}$

**45.** **a.** about −57

**b.** about −150 $[-42 + (-108)]$

**c.** about −1.5 $[3 \cdot (-\frac{1}{2})]$

**d.** about 55 $[80 + (-25)]$

**e.** about 25 $(-12.5 + 37.5)$

**f.** about 6 $(90 \div 15)$

**g.** about 13

**h.** about 4.1 $(6 - 1.9)$

**i.** about −240 $[60 \cdot (-4)]$

**j.** about $-\frac{1}{3}(-\frac{2}{3} \div 2)$

**k.** about $6\frac{1}{2}(5\frac{1}{2} + 1)$

**l.** about $4\left[-1 \div (-\frac{1}{4})\right]$

**46.** Answers will vary. Possible answers: $-6$, $-5$ or $-10$, $-3$

**47.** Answers will vary. Possible answers: 6, $-5$ or $-10$, 3

**48.** Answers will vary. Possible answers: 8, $-3$ or $-6$, 4

## Extensions

**49.** always; The sum of two positive rational numbers is positive.

**50.** always; The sum of two negative rational numbers is negative.

**51.** sometimes; The sign of the sum of a positive and negative rational number is the same as the sign of the number with the greatest absolute value.

**52.** always; The product of two positive rational numbers is positive.

**53.** never; The product of two negative rational numbers is positive.

**54.** **a.** $-9 \cdot 4 = -36$ and $3 \cdot (-12) = -36$

**b.** $-20 \cdot (-3) = 60$ and $-5 \cdot (-12) = 60$

**c.** $6 \cdot (-5) = -30$ and $-2 \cdot 15 = -30$

**d.** $12 \cdot (-5) = -60$ and $3 \cdot (-20) = -60$

**e.** $0 + 4 = 4$ and $3 + 1 = 4$

**f.** $-1 + (-3) = -4$ and $-5 + 1 = -4$

**g.** $-5 + (-5) = -10$ and $-2 + (-8) = -10$

**h.** $7 + (-5) = 2$ and $3 + (-1) = 2$

**i.** The Associative Property does work for addition and multiplication of integers.

**55.** True. Zero added to any number, positive or negative, will not change the value of the number.

**56.** False. $-3\frac{3}{8} = -\frac{27}{8}$

**57.** True. $-\frac{3}{4}$ is equivalent to $-0.75$. Adding $-6$ and $-0.75$ gives $-6.75$.

**58.** The temperature dropped 4°F every hour, until it had dropped 24°F. For how many hours did the temperature drop 4°F?
$-4n = -24$; $n = 6$ hours

**59.** When Jayne and Stewart split their earnings from yard work on Saturday, they each received \$16. How much did they earn together from the yard work?
$\frac{n}{2} = 16$; $n = \$32$

**60.** $-12$, $-10$, $-8$, $-4$, $-2$, 0, 1, 3, 7, 9, 11