**18. a)** +8.2; Example: An increase suggests a positive value. **b)** +2.9; Example: A growth suggests a positive value. **c)** −3.5; Example: Below sea level suggests a negative value. **d)** +32.5; Example: Earnings suggest a positive value. **e)** −14.2; Example: Below freezing suggests a negative value.
**19. a)** helium and neon **b)** radon and xenon
**c)** helium (−272.2), neon (−248.67), argon (−189.2), krypton (−156.6), xenon (−111.9), radon (−71.0)
**d)** radon (−61.8), xenon (−107.1), krypton (−152.3), argon (−185.7), neon (−245.92), helium (−268.6)
**20. a)** Example: −2 is to the left of −1 on the number line, so $-2\frac{1}{5}$ is to the left of $-1\frac{9}{10}$ and therefore, it is smaller. **b)** Example: Since both mixed numbers are between −1 and −2 on the number line, Naomi needed to examine the positions of $-\frac{1}{4}$ and $-\frac{2}{7}$. Since $-\frac{2}{7}$ is to the left of $-\frac{1}{4}$, $-1\frac{1}{4}$ is greater.
**21. a)** 6.1 (Penticton), 5.4 (Edmonton), 3.9 (Regina), 0.6 (Whitehorse), −0.1 (Yellowknife), −5.1 (Churchill), −14.1 (Resolute) **b)** Yellowknife
**22. a)** = **b)** > **c)** = **d)** < **e)** > **f)** >
**23.** Yes. Example: Zero can be expressed as the quotient of two integers as long as the dividend is zero, and the divisor is any number except zero.
**24.** Example: **a)** $\frac{2}{5}$ **b)** $\frac{3}{-4}$ **c)** $\frac{-10}{3}$ **d)** $\frac{5}{-4}$
**25.** −3, −2, −1, 0, 1, and 2
**26. a)** 0.44 **b)** $0.\overline{3}$ **c)** −0.7 **d)** −0.66; Example: To determine which pair is greater, write each pair of fractions in an equivalent form with the same positive denominator and compare the numerators.
**27.** $\frac{-1}{3}$, $\frac{-2}{3}$, $\frac{-3}{3}$, $\frac{-4}{3}$, and $\frac{-5}{3}$
**28.** None. Example: $\frac{2}{3}$ and $0.\overline{6}$ are equivalent numbers.
**29. a)** −2; Yes, any integer less than −2 also makes the statement true. **b)** +9; No **c)** −1; No **d)** 0; No
**e)** 4; Yes, 0, 1, 2, and 3 will also make the statement true.
**f)** −1; No **g)** −26; No **h)** −1; Yes, −2, −3, −4, −5, −6, −7, −8, −9, −10, and −11 also make the statement true.
**30. a)** 8 **b)** −2 **c)** −3 **d)** 25

## 2.2 Problem Solving With Rational Numbers in Decimal Form, pages 60–62

**4. a)** −2, −1.93 **b)** 2, 2.3 **c)** −10, −9.98 **d)** 6, 5.34
**5. a)** −2.25 **b)** 1.873 **c)** 0.736 **d)** −12.94
**6. a)** −9, −8.64 **b)** −1, −1.3 **c)** 36, 30.25 **d)** 4, 4.6
**7. a)** 3.6 **b)** 9.556 **c)** −22.26 **d)** −1.204 **e)** 0.762 **f)** −0.833
**8. a)** −13.17 **b)** 2.8 **c)** −3.08
**9. a)** 1.134 **b)** −1.4 **c)** −5.2
**10.** 38.7 °C
**11. a)** +7.7 °C **b)** +1.54 °C/h
**12. a)** 3.8 − (−2.3) **b)** 6.1 m
**13. a)** 85.5 m **b)** 19 min
**14.** a loss of $16.25
**15. a)** −8.2 °C **b)** 1.9 °C
**16. a)** 2.2 **b)** Example: Use hundredths instead of tenths.
**17.** 2.06 m
**18. a)** −2.37 **b)** 1.75
**19. a)** loss of $1.2 million per year
**b)** profit of $3.6 million
**20.** Example: If the cost of gasoline is $1.30/L, then the difference would be $13.65.
**21.** 11 min
**22.** 2080 m
**23.** −0.6 °C
**24. a)** −5.3 **b)** −4.4 **c)** 2.1 **d)** −2.5
**25.** Example: At 16:00 the temperature in Calling Lake, Alberta, started decreasing at the constant rate of −1.1 °C/h. At 23:00 the temperature was −19.7 °C. What was the temperature at 16:00? The answer is −12 °C.
**26.** 2.88
**27. a)** −25.8 **b)** −3.3
**28. a)** 2.6 **b)** −0.35 **c)** −0.45
**29. a)** $3.5 \times (4.1 - 3.5) - 2.8 = -0.7$
**b)** $[2.5 + (-4.1) + (-2.3)] \times (-1.1) = 4.29$
**c)** $-5.5 - (-6.5) \div [2.4 + (-1.1)] = -0.5$

## 2.3 Problem Solving With Rational Numbers in Fraction Form, pages 68–71

**5. a)** 0, $\frac{1}{2}$ **b)** 1, $1\frac{1}{12}$ **c)** −1, $\frac{-5}{6}$ **d)** 0, $\frac{5}{6}$
**e)** $-\frac{1}{2}$, $-\frac{1}{2}$ **f)** $\frac{1}{2}$, $\frac{5}{8}$
**6. a)** 0, $\frac{-1}{12}$ **b)** $\frac{-2}{3}$, $\frac{-5}{9}$ **c)** −1, $\frac{-17}{20}$ **d)** $-\frac{1}{2}$, $\frac{-1}{8}$
**e)** −1, $\frac{-3}{4}$ **f)** $\frac{-1}{2}$, $\frac{-7}{20}$
**7. a)** 1, $\frac{24}{25}$ **b)** 6, $5\frac{5}{6}$ **c)** 0, $\frac{-1}{20}$ **d)** 1, $1\frac{1}{8}$
**e)** $-2\frac{1}{2}$, −2 **f)** 0, $\frac{-4}{15}$
**8. a)** 0, $\frac{1}{12}$ **b)** 1, $1\frac{1}{15}$ **c)** $-\frac{1}{2}$, $-\frac{15}{28}$ **d)** −2, $-1\frac{7}{10}$
**e)** $\frac{-1}{2}$, $\frac{-14}{33}$ **f)** $\frac{2}{3}$, $\frac{3}{5}$
**9.** $19.50
**10.** He is short 6.4 m.
**11.** 120 jiffies
**12. a)** $2\frac{1}{2}$ h **b)** $13\frac{1}{2}$ h
**c)** Tokyo is $3\frac{1}{4}$ h ahead of Kathmandu.
**d)** Chatham Islands are $16\frac{1}{4}$ h ahead of St. John's.
**e)** Kathmandu, Nepal
**13. a)** $\frac{1}{50}$ **b)** 2400 km
**14. a)** Ray **b)** $\frac{1}{24}$ of a pizza **c)** $1\frac{1}{8}$ of a pizza



**15. a)** $1\frac{5}{8}$, $2\frac{1}{4}$, $2\frac{7}{8}$ **b)** $-\frac{1}{24}$, $\frac{1}{48}$, $-\frac{1}{96}$
**16. a)** $108.80 **b)** $44.80
**17. a)** Example: $-\frac{2}{3}$ is a repeating decimal, so she would need to round before adding. **b)** Example: Find a common denominator, change each fraction to an equivalent form with a common denominator, and then add the numerators.
**18.** 9.5 m
**19. a)** $\frac{-5}{4}$ **b)** $1\frac{1}{10}$ **c)** $\frac{8}{13}$ **d)** $-1\frac{1}{2}$
**20.**

| | | |
|---|---|---|
| $-\frac{1}{2}$ | $-2\frac{1}{6}$ | $\frac{1}{6}$ |
| $-\frac{1}{6}$ | $-\frac{5}{6}$ | $-1\frac{1}{2}$ |
| $-1\frac{5}{6}$ | $\frac{1}{2}$ | $-1\frac{1}{6}$ |

**21. a)** $\frac{4}{15}$ **b)** $\frac{9}{20}$ **c)** $-2\frac{1}{4}$
**22. a)** 1 large scoop + 1 medium scoop − 1 small scoop or 2 large scoops − 1 medium scoop **b)** 1 large scoop − 2 small scoops or 2 medium scoops − 3 small scoops
**23.** Example: $-2\frac{1}{6} - \square = -\frac{4}{3}$. Find the rational number to replace ■. The answer is $\frac{-5}{6}$.
**24.** Yes. Example: If the two rational numbers are both negative, the sum would be less.
Example: $\frac{-1}{4} + \frac{-5}{6} = \frac{-13}{12}$
**25.** Example: **a)** $\left[-\frac{1}{2} + \left(-\frac{1}{2}\right)\right] + \left[-\frac{1}{2} - \left(-\frac{1}{2}\right)\right] = -1$
**b)** $\left[-\frac{1}{2} - \left(-\frac{1}{2}\right)\right] + \left[-\frac{1}{2} - \left(-\frac{1}{2}\right)\right] = 0$
**c)** $\left[\left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right)\right] + \left[-\frac{1}{2} - \left(-\frac{1}{2}\right)\right] = \frac{1}{4}$
**d)** $\left(-\frac{1}{2}\right) \div \left(-\frac{1}{2}\right) \div \left(-\frac{1}{2}\right) \div \left(-\frac{1}{2}\right) = 4$
**e)** $\left[-\frac{1}{2} + \left(-\frac{1}{2}\right)\right] + \left[\left(-\frac{1}{2}\right) \times \left(-\frac{1}{2}\right)\right] = -\frac{3}{4}$
**f)** $\left(-\frac{1}{2}\right) \div \left(-\frac{1}{2}\right) \div \left(-\frac{1}{2}\right) - \left(-\frac{1}{2}\right) = -1\frac{1}{2}$
**26.** $\frac{-3}{8}$
**27.** $-\frac{1}{2}$ and 2

## History Link, page 71

**1.** Example: **a)** $\frac{1}{5} + \frac{1}{10}$ **b)** $\frac{1}{2} + \frac{1}{7}$ **c)** $\frac{1}{4} + \frac{1}{5}$ **d)** $\frac{1}{2} + \frac{1}{9}$
**2.** Example: A strategy is to work with factors of the denominator.
**3.** Example: **a)** $\frac{1}{28} + \frac{1}{4}$ **b)** $\frac{1}{18} + \frac{1}{6}$ **c)** $\frac{1}{66} + \frac{1}{6}$
**4.** Example: **a)** $\frac{1}{8} + \frac{1}{4} + \frac{1}{2}$ **b)** $\frac{1}{24} + \frac{1}{12} + \frac{1}{3}$
**c)** $\frac{1}{12} + \frac{1}{6} + \frac{1}{2}$

## 2.4 Determining Square Roots of Rational Numbers, pages 78–81

**5.** Example: 12
**6.** Example: 0.55
**7. a)** 9, 9.61 **b)** 144, 156.25 **c)** 0.36, 0.3844
**d)** 0.09, 0.0841
**8. a)** 16 cm², 18.49 cm² **b)** 0.0016 km², 0.001 225 km²
**9. a)** Yes, 1 and 16 are perfect squares. **b)** No, 5 is not a perfect square. **c)** Yes, 36 and 100 are perfect squares.
**d)** No, 10 is not a perfect square.
**10. a)** No **b)** Yes **c)** No **d)** Yes
**11. a)** 18 **b)** 1.7 **c)** 0.15 **d)** 45
**12. a)** 13 m **b)** 0.4 mm
**13. a)** 6, 6.2 **b)** 2, 2.12 **c)** 0.9, 0.933 **d)** 0.15, 0.148
**14. a)** 0.92 m **b)** 7.75 cm
**15.** 1.3 m
**16. a)** 3.16 m **b)** 6.16 m **c)** 4.2 L
**17. a)** $3504 **b)** The cost will not be the same.
**c)** The cost of fencing two squares each having an area of 60 m² is $4960.
**18.** No. Example: Each side of the picture is 22.36 cm. This is too large for the frame that is 30 cm by 20 cm.
**19.** 2.9 cm
**20.** 3.8 m
**21.** 27.4 m
**22.** 14.1 cm
**23.** 12.5 cm; Assume the 384 square tiles are all the same size.
**24. a)** 7.2 km **b)** 4.6 km **c)** 252.4 km
**25.** 35.3 cm
**26.** 12.2 m
**27.** 4.1 cm
**28. a)** 2.53 s **b)** 3.16 s **c)** 1.41 s
**29.** 30 m/s greater
**30.** 12.3 s
**31. a)** 59.8 cm² **b)** 34.7 cm²
**32.** 36 cm
**33.** 25.1 cm²
**34.** 3.6 m
**35.** 1.8 cm by 5.4 cm
**36.** 4

## Chapter 2 Review, pages 82–83

**1.** OPPOSITES
**2.** RATIONAL NUMBER
**3.** PERFECT SQUARE
**4.** NON-PERFECT SQUARE
**5.** $\frac{3}{24}$, $\frac{-10}{-6}$, $\frac{-6}{4}$, $\frac{82}{-12}$
**6. a)** = **b)** < **c)** > **d)** = **e)** > **f)** >