Exercises

A

3. List the first 6 multiples of each number.
   a) 6 b) 13 c) 22
   d) 31 e) 45 f) 27

4. List the prime factors of each number.
   a) 40 b) 75 c) 81
   d) 120 e) 140 f) 192

5. Write each number as a product of its prime factors.
   a) 45 b) 80 c) 96
   d) 122 e) 160 f) 195

B

6. Use powers to write each number as a product of its prime factors.
   a) 600 b) 1150
   c) 1022 d) 2250
   e) 4500 f) 6125

7. Explain why the numbers 0 and 1 have no prime factors.

8. Determine the greatest common factor of each pair of numbers.
   a) 46, 84 b) 64, 120
   c) 81, 216 d) 180, 224
   e) 160, 672 f) 220, 860

9. Determine the greatest common factor of each set of numbers
   a) 150, 275, 420 b) 120, 960, 1400
   c) 126, 210, 546, 714 d) 220, 308, 484, 988

10. Determine the least common multiple of each pair of numbers.
    a) 12, 14 b) 21, 45
    c) 45, 60 d) 38, 42
    e) 32, 45 f) 28, 52

11. Determine the least common multiple of each set of numbers.
    a) 20, 36, 38 b) 15, 32, 44
    c) 12, 18, 25, 30 d) 15, 20, 24, 27

12. Explain the difference between determining the greatest common factor and the least common multiple of 12 and 14.

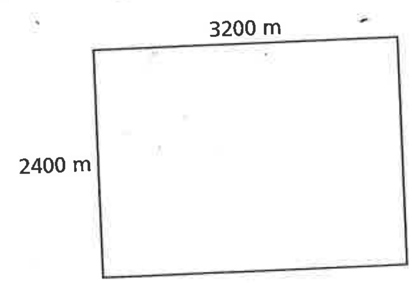
13. Two marching bands are to be arranged in rectangular arrays with the same number of columns. One band has 42 members, the other has 36 members. What is the greatest number of columns in the array?

14. When is the product of two numbers equal to their least common multiple?

15. How could you use the greatest common factor to simplify a fraction? Use this strategy to simplify these fractions.
    a) $\frac{185}{325}$ b) $\frac{340}{380}$ c) $\frac{650}{900}$
    d) $\frac{840}{1220}$ e) $\frac{1225}{2750}$ f) $\frac{2145}{1105}$

16. How could you use the least common multiple to add, subtract, or divide fractions? Use this strategy to evaluate these fractions.
    a) $\frac{9}{14} + \frac{11}{16}$ b) $\frac{8}{15} + \frac{11}{20}$
    c) $\frac{5}{24} - \frac{1}{22}$ d) $\frac{9}{10} + \frac{5}{14} + \frac{4}{21}$
    e) $\frac{9}{25} + \frac{7}{15} - \frac{5}{8}$ f) $\frac{3}{5} - \frac{5}{18} + \frac{7}{3}$
    g) $\frac{3}{5} \div \frac{4}{9}$ h) $\frac{11}{6} \div \frac{2}{7}$

17. A developer wants to subdivide this rectangular plot of land into congruent square pieces. What is the side length of the largest possible square?



18. Do all whole numbers have at least one prime factor? Explain.

19. a) What are the dimensions of the smallest square that could be tiled using an 18-cm by 24-cm tile? Assume the tiles cannot be cut.
    b) Could the tiles in part a be used to cover a floor with dimensions 6.48 m by 15.12 m? Explain.

Assess Your Understanding

3.1

1. Use powers to write each number as a product of its prime factors.
   a) 1260 b) 4224 c) 6120
   d) 1045 e) 3024 f) 3675

2. Determine the greatest common factor of each set of numbers.
   a) 40, 48, 56 b) 84, 120, 144
   c) 145, 205, 320 d) 208, 368, 528
   e) 856, 1200, 1368 f) 950, 1225, 1550

3. Determine the least common multiple of each set of numbers.
   a) 12, 15, 21 b) 12, 20, 32 c) 18, 24, 30
   d) 30, 32, 40 e) 49, 56, 64 f) 50, 55, 66

4. Use the least common multiple to help determine each answer.
   a) $\frac{8}{3} + \frac{5}{11}$ b) $\frac{13}{5} - \frac{4}{7}$ c) $\frac{9}{10} \div \frac{7}{3}$

5. The Mayan used several different calendar systems; one system used 365 days, another system used 260 days. Suppose the first day of both calendars occurred on the same day. After how many days would they again occur on the same day? About how long is this in years? Assume 1 year has 365 days.

3.2

6. Determine the square root of each number. Which different strategies could you use?
   a) 400 b) 784 c) 576
   d) 1089 e) 1521 f) 3025

7. Determine the cube root of each number. Which different strategies could you use?
   a) 1728 b) 3375 c) 8000
   d) 5832 e) 10 648 f) 9261

8. Determine whether each number is a perfect square, a perfect cube, or neither.
   a) 2808 b) 3136 c) 4096
   d) 4624 e) 5832 f) 9270

9. Between each pair of numbers, identify all the perfect squares and perfect cubes that are whole numbers.
   a) 400 – 500 b) 900 – 1000 c) 1100 – 1175

10. A cube has a volume of 2197 m^3. Its surface is to be painted. Each can of paint covers about 40 m^2. How many cans of paint are needed? Justify your answer.

Chapter 3 Factors and Products, page 132

3.1 Factors and Multiples of Whole Numbers, page 140

3. a) 6, 12, 18, 24, 30, 36
b) 13, 26, 39, 52, 65, 78
c) 22, 44, 66, 88, 110, 132
d) 31, 62, 93, 124, 155, 186
e) 45, 90, 135, 180, 225, 270
f) 27, 54, 81, 108, 135, 162

4. a) 2, 5 **b)** 3, 5
c) 3 **d)** 2, 3, 5
e) 2, 5, 7 **f)** 2, 3

5. a) $3 \cdot 3 \cdot 5$, or $3^2 \cdot 5$
b) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 5$, or $2^4 \cdot 5$
c) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3$, or $2^5 \cdot 3$
d) $2 \cdot 61$
e) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5$, or $2^5 \cdot 5$
f) $3 \cdot 5 \cdot 13$

6. a) $2^3 \cdot 3 \cdot 5^2$ **b)** $2 \cdot 5^2 \cdot 23$
c) $2 \cdot 7 \cdot 73$ **d)** $2 \cdot 3^2 \cdot 5^3$
e) $2^2 \cdot 3^2 \cdot 5^3$ **f)** $5^3 \cdot 7^2$

8. a) 2 **b)** 2^3, or 8
c) 3^3, or 27 **d)** 2^2, or 4
e) 2^5, or 32 **f)** $2^2 \cdot 5$, or 20

9. a) 5 **b)** $2^3 \cdot 5$, or 40
c) $2 \cdot 3 \cdot 7$, or 42 **d)** 2^2, or 4

10. a) $2^2 \cdot 3 \cdot 7$, or 84 **b)** $3^2 \cdot 5 \cdot 7$, or 315
c) $2^2 \cdot 3^2 \cdot 5$, or 180 **d)** $2 \cdot 3 \cdot 7 \cdot 19$, or 798
e) $2^5 \cdot 3^2 \cdot 5$, or 1440 **f)** $2^2 \cdot 7 \cdot 13$, or 364

11. a) $2^2 \cdot 3^2 \cdot 5 \cdot 19$, or 3420
b) $2^5 \cdot 3 \cdot 5 \cdot 11$, or 5280
c) $2^2 \cdot 3^2 \cdot 5^2$, or 900
d) $2^3 \cdot 3^3 \cdot 5$, or 1080

12. Greatest common factor: 2; least common multiple: $2^2 \cdot 3 \cdot 7$, or 84

13. $2 \cdot 3$, or 6

14. The greatest common factor of the two numbers is 1.

15. a) $\frac{37}{65}$ **b)** $\frac{17}{19}$
c) $\frac{13}{18}$ **d)** $\frac{42}{61}$
e) $\frac{49}{110}$ **f)** $\frac{33}{17}$

16. a) $\frac{149}{112}$ **b)** $\frac{65}{60}$, or $\frac{13}{12}$
c) $\frac{43}{264}$ **d)** $\frac{304}{210}$, or $\frac{152}{105}$
e) $\frac{121}{600}$ **f)** $\frac{239}{90}$
g) $\frac{27}{20}$ **h)** $\frac{77}{12}$

17. 800 m

18. No; 1 does not have any prime factors.

19. a) 72 cm by 72 cm **b)** Yes

20. a) Yes **b)** Yes
c) 660 feet

21. Yes

22. 30 cm

3.2 Perfect Squares, Perfect Cubes, and Their Roots, page 146

4. a) 14 **b)** 16
c) 19 **d)** 17
e) 21

5. a) 7 **b)** 8
c) 10 **d)** 11
e) 15

6. a) Perfect square
b) Perfect square and perfect cube
c) Neither
d) Perfect square
e) Perfect square and perfect cube
f) Perfect cube

7. a) 22 mm **b)** 42 yd.

8. a) 18 in. **b)** 25 ft.

9. 96 $ft.^2$

10. 35 937 $ft.^3$

11. No; 2000 is not a perfect cube.

12. These answers assume that the endpoints of each range are included in the range.
a) Perfect squares: 324, 361; perfect cube: 343
b) Perfect squares: 676, 729; perfect cube: 729
c) Perfect squares: 841, 900
d) Perfect squares: 1225, 1296; perfect cube: 1331

13. The first 5 are: 0, 1, 64, 729, 4096

14. 12 ft.

15. a) $\frac{45x^2}{8}$ **b)** $x = 4$

16. Edge length: 6 units

17. a) $11x^2y$ b) $4x^2y$

18. $1^3 + 12^3$, $9^3 + 10^3$

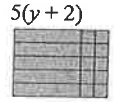
Chapter 3: Checkpoint 1, page 149

1. a) $2^2 \cdot 3^2 \cdot 5 \cdot 7$ b) $2^7 \cdot 3 \cdot 11$
   c) $2^3 \cdot 3^2 \cdot 5 \cdot 17$ d) $5 \cdot 11 \cdot 19$
   e) $2^4 \cdot 3^3 \cdot 7$ f) $3 \cdot 5^2 \cdot 7^2$
2. a) 2^3, or 8 b) $2^2 \cdot 3$, or 12
   c) 5 d) 2^4, or 16
   e) 2^3, or 8 f) 5^2, or 25
3. a) $2^2 \cdot 3 \cdot 5 \cdot 7$, or 420
   b) $2^5 \cdot 3 \cdot 5$, or 480
   c) $2^3 \cdot 3^2 \cdot 5$, or 360
   d) $2^5 \cdot 3 \cdot 5$, or 480
   e) $2^6 \cdot 7^2$, or 3136
   f) $2 \cdot 3 \cdot 5^2 \cdot 11$, or 1650
4. a) $\frac{103}{33}$ b) $\frac{71}{35}$
   c) $\frac{27}{70}$
5. 18 980 days; 52 years
6. a) 20 b) 28
   c) 24 d) 33
   e) 39 f) 55
7. a) 12 b) 15
   c) 20 d) 18
   e) 22 f) 21
8. a) Neither
   b) Perfect square
   c) Perfect square and perfect cube
   d) Perfect square
   e) Perfect cube
   f) Neither
9. a) Perfect squares: 400, 441, 484
   b) Perfect squares: 900, 961; perfect cube: 1000
   c) Perfect square: 1156
10. 26 cans

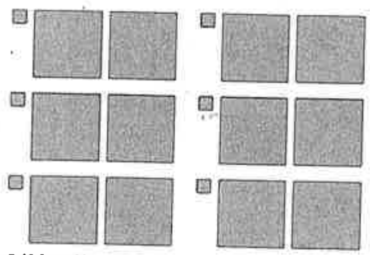
3.3 Common Factors of a Polynomial, page 155

Gray algebra tiles represent positive tiles and black tiles represent negative algebra tiles.

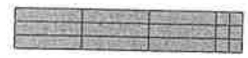
4. a) $3x + 12$; 3, $x + 4$
   b) $4x^2 + 10x$; $2x$, $2x + 5$
   c) $12x^2 - 8x + 16$; 4, $3x^2 - 2x + 4$
5. a) 3 b) m
6. a) i) $3(2 + 5n)$ ii) $3(2 - 5n)$
   iii) $3(5n - 2)$ iv) $3(-5n + 2)$
   b) i) $m(4 + m)$ ii) $m(m + 4)$
   iii) $m(4 - m)$ iv) $m(m - 4)$
7. a) $5(y + 2)$



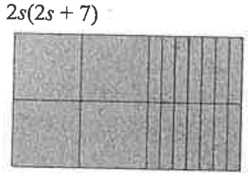
   b) $6(1 + 2x^2)$



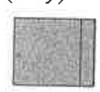
   c) $3(3k + 2)$



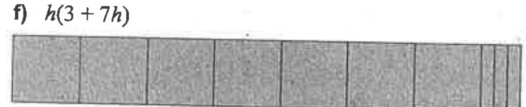
   d) $2s(2s + 7)$



   e) $y(1 + y)$



   f) $h(3 + 7h)$



8. a) $3b^2(3 - 4b)$ b) $12(4s^3 - 1)$
   c) $-a^2(1 + a)$ d) $3x^2(1 + 2x^2)$
   e) $4y(2y^2 - 3)$ f) $-7d(1 + 2d^3)$
9. a) $3(x^2 + 4x - 2)$