

Practice 4-1**Divisibility and Factors**
.....**List all the factors of each number.**

1. 12 _____

2. 45 _____

3. 41 _____

4. 54 _____

5. 48 _____

6. 100 _____

7. 117 _____

Test whether each number is divisible by 2, 3, 5, 9, and 10.

8. 215 _____

9. 432 _____

10. 770 _____

11. 1,011 _____

12. 975 _____

13. 2,070 _____

14. 3,707 _____

15. 5,715 _____

Write the missing digit to make each number divisible by 9.16. $7\boxed{}1$ 17. $2,2\boxed{}2$ 18. $88,\boxed{}12$ 19. There are four different digits which, when inserted in the blank space in the number $4\boxed{}5$, make the number divisible by 3. Write them.
_____20. There are two different digits which, when inserted in the blank space in the number $7,16\boxed{}$, make the number divisible by 5. Write them.
_____21. There are five different digits which, when inserted in the blank space in the number $99,99\boxed{}$, make the number divisible by 2. Write them.

Practice 4-2

Exponents

Evaluate each expression.

1. m^4 , for $m = 5$ _____

2. $(5a)^3$, for $a = -1$ _____

3. $-(2p)^2$, for $p = 7$ _____

4. $-n^6$, for $n = 2$ _____

5. b^6 , for $b = -1$ _____

6. $(e - 2)^3$, for $e = 11$ _____

7. $(6 + h^2)^2$, for $h = 3$ _____

8. $x^2 + 3x - 7$, for $x = -4$ _____

9. $y^3 - 2y^2 + 3y - 4$, for $y = 5$ _____

Write using exponents.

10. $3 \cdot 3 \cdot 3 \cdot 3$ _____

11. $k \cdot k \cdot k \cdot k \cdot k$ _____

12. $(-9)(-9)(-9)m \cdot m \cdot m$ _____

13. $g \cdot g \cdot g \cdot g \cdot h$ _____

14. $7 \cdot a \cdot a \cdot b \cdot b \cdot b$ _____

15. $-8 \cdot m \cdot n \cdot n \cdot 2 \cdot m \cdot m$ _____

16. $d \cdot (-3) \cdot e \cdot e \cdot d \cdot (-3) \cdot e$ _____

Simplify each expression.

17. $(-2)^3$ and -2^3 _____

18. 0^{12} _____

19. 2^8 and 4^4 _____

20. $-5^2 + 4 \cdot 2^3$ _____

21. $3(8 - 6)^2$ _____

22. $-6^2 + 2 \cdot 3^2$ _____

23. $(-2)(-5)^2(3)$ _____

24. $24 + (11 - 3)^2 \div 4$ _____

25. $(17 - 3)^2 \div (4^2 - 3^2)$ _____

26. $(5 + 10)^2 \div 5^2$ _____

27. $4^3 \div (2^5 - 4^2)$ _____

28. $(-1)^5 \cdot (2^4 - 13)^2$ _____

Practice 4-3Prime Factorization and Greatest Common Factor
.....**Find each GCF.**

- | | |
|------------------------------------|----------------------------|
| 1. 8, 12 _____ | 2. 36, 54 _____ |
| 3. 63, 81 _____ | 4. 69, 92 _____ |
| 5. 15, 28 _____ | 6. 21, 35 _____ |
| 7. $30m, 36n$ _____ | 8. $75x^3y^2, 100xy$ _____ |
| 9. 15, 24, 30 _____ | 10. 48, 80, 128 _____ |
| 11. $36hk^3, 60k^2m, 84k^4n$ _____ | 12. $2mn, 4m^2n^2$ _____ |

Is each number prime, composite, or neither? For each composite, write the prime factorization.

- | | |
|---------------|---------------|
| 13. 75 _____ | 14. 152 _____ |
| 15. 432 _____ | 16. 588 _____ |
| 17. 160 _____ | 18. 108 _____ |
| 19. 19 _____ | 20. 143 _____ |
| 21. 531 _____ | 22. 369 _____ |
| 23. 83 _____ | 24. 137 _____ |

25. The numbers 3, 5, and 7 are factors of n . Find four other factors of n besides 1.

26. For which expressions is the GCF $8x$?

- A. $2xy$ and $4x^2$ B. $16x^2$ and $24xy$ C. $8x^3$ and $4x$ D. $24x^2$ and $48x^3$

Practice 4-4**Simplifying Fractions****Write in simplest form.**

- | | |
|-------------------------------------|-------------------------------------|
| 1. $\frac{10}{15}$ _____ | 2. $\frac{18}{36}$ _____ |
| 3. $\frac{27}{36}$ _____ | 4. $\frac{12}{15}$ _____ |
| 5. $\frac{26}{39}$ _____ | 6. $\frac{7b}{9b}$ _____ |
| 7. $\frac{16y^3}{20y^4}$ _____ | 8. $\frac{8x}{10y}$ _____ |
| 9. $\frac{6xy}{16y}$ _____ | 10. $\frac{24n^2}{28n}$ _____ |
| 11. $\frac{abc}{10abc}$ _____ | 12. $\frac{30hxy}{54kxy}$ _____ |
| 13. $\frac{mn^2}{pm^5n}$ _____ | 14. $\frac{5jh}{15jh^3}$ _____ |
| 15. $\frac{12h^3k}{16h^2k^2}$ _____ | 16. $\frac{20s^2t^3}{16st^5}$ _____ |

Find two fractions equivalent to each fraction.

- | | |
|----------------------------------|--------------------------------|
| 17. $\frac{1}{4}$ _____ | 18. $\frac{2}{3}$ _____ |
| 19. $\frac{3}{5}$ _____ | 20. $\frac{3}{18}$ _____ |
| 21. $\frac{8k}{16k}$ _____ | 22. $\frac{3m}{8n}$ _____ |
| 23. $\frac{5pq}{10p^2q^3}$ _____ | 24. $\frac{3s^2t^2}{7r}$ _____ |

25. Monty completed 18 passes in 30 attempts. What fraction of his passes did Monty complete? Write in simplest form.

26. Five new state quarters will be issued by the United States mint this year. What fraction of the states will have quarters issued this year?

Practice 4-5

Solve a Simpler Problem

Solve each problem by solving a simpler problem.

1. A baseball team has 4 pitchers and 3 catchers. How many different pitcher-catcher combinations are possible? One way to solve this problem is to make a list like the one started below. Finish the list.

P1-C1
P1-C2

P2-C1
P2-C2

2. The baseball team has 2 first basemen, 3 second basemen, and 2 third basemen. How many combinations of the three positions are possible?
- _____
3. A quarter is tossed 3 times. In how many different orders can heads and tails be tossed?
- _____
4. A quarter is tossed 4 times. In how many different orders can heads and tails be tossed?
- _____
5. Curtains are manufactured in 3 different styles and 5 different colors.
- a. How many different style-color combinations are possible?
- _____
- b. The curtains are produced in 2 different fabrics. How many different style-color-fabric combinations are possible?
- _____

Practice 4-6

Rational Numbers

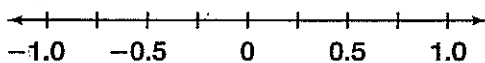
Graph the rational numbers below on the same number line.

1. $\frac{3}{4}$

2. $-\frac{1}{4}$

3. -0.5

4. 0.3



Evaluate. Write in simplest form.

5. $\frac{x}{y}$, for $x = 12, y = 21$ _____

6. $\frac{n}{n+p}$, for $n = 9, p = 6$ _____

7. $\frac{k}{k^2+4}$, for $k = 6$ _____

8. $\frac{x-y}{-21}$, for $x = -2, y = 5$ _____

9. $\frac{m}{n}$, for $m = 6, n = 7$ _____

10. $\frac{x(xy-8)}{60}$, for $x = 3, y = 9$ _____

Write three fractions equivalent to each fraction.

11. $\frac{5}{7}$ _____

12. $\frac{22}{33}$ _____

13. $\frac{24}{30}$ _____

14. $\frac{6}{16}$ _____

15. Which of the following rational numbers are equal to $-\frac{17}{10}$?

$-17, -1.7, -\frac{34}{20}, 0.17$

16. Which of the following rational numbers are equal to $\frac{3}{5}$?

$\frac{12}{20}, -\frac{3}{5}, 0.3, \frac{6}{10}$

17. Which of the following rational numbers are equal to $\frac{12}{15}$?

$\frac{4}{5}, \frac{40}{50}, -\frac{8}{10}, \frac{8}{10}$

18. The weight w of an object in pounds is related to its distance d from the center of Earth by the equation $w = \frac{320}{d^2}$, where d is in thousands of miles. How much does the object weigh at sea level which is about 4,000 miles from the center of Earth?

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Practice 4-7

Exponents and Multiplication

Complete each equation.

1. $9^3 \cdot 9 \text{ --- } = 9^7$

2. $6^8 \cdot 6 \text{ --- } = 6^{17}$

3. $n \text{ --- } \cdot n^5 = n^{15}$

4. $(a \text{ --- })^8 = a^{24}$

5. $(c^4) \text{ --- } = c^{12}$

6. $r \text{ --- } \cdot r^{12} = r^{20}$

Simplify each expression.

7. $(z^3)^5$ _____

8. $-(m^4)^3$ _____

9. $(-3^2)^3$ _____

10. $(x^3)(x^4)$ _____

11. $y^4 \cdot y^5$ _____

12. $(-y^5)(y^2)$ _____

13. $(3y^2)(2y^3)$ _____

14. $3x^{12} \cdot 2x^3$ _____

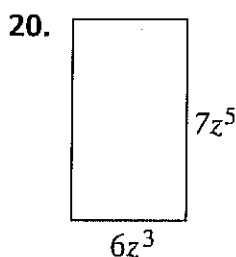
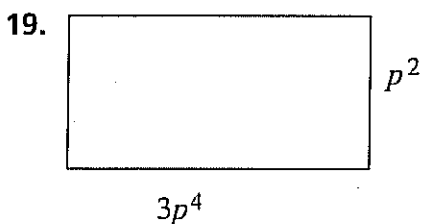
15. $m^{30} \cdot m^{12}$ _____

16. $(x^4)(y^2)(x^2)$ _____

17. $(-6x^7)(-9x^{12})$ _____

18. $(h^4)^4$ _____

Find the area of each rectangle.



Compare. Use $>$, $<$, or $=$ to complete each statement.

21. $(4^3)^2$ $(4^2)^3$

22. $5^3 \cdot 5^4$ 5^{10}

23. $(3^5)^4$ 3^{10}

24. 3^4 9^2

25. $(9^7)^9$ $(9^8)^8$

26. $4^2 \cdot 4^3$ 4^5

27. $(6^2)^2$ $3^4 \cdot 2^4$

28. $5^2 \cdot 5^6$ 5^7

29. $(8^2)^2$ $(8^2)^3$

Practice 4-8**Exponents and Division****Complete each equation.**

1. $\frac{8^n}{8^7} = 8^2$, $n =$ _____

2. $\frac{12x^5}{4x} = 3x^n$, $n =$ _____

3. $\frac{1}{h^5} = h^n$, $n =$ _____

4. $\frac{p^n}{p^8} = p^{-6}$, $n =$ _____

5. $\frac{1}{81} = 3^n$, $n =$ _____

6. $\frac{12^4}{12^n} = 1$, $n =$ _____

Simplify each expression.

7. $\frac{a^3}{a^7}$ _____

8. $\frac{j^5}{j^6}$ _____

9. $\frac{x^7}{x^7}$ _____

10. $\frac{k^5}{k^9}$ _____

11. $\frac{9x^8}{12x^5}$ _____

12. $\frac{2f^{10}}{f^5}$ _____

13. $\frac{3y^4}{6y^{-4}}$ _____

14. n^{-5} _____

15. $\frac{3xy^4}{9xy}$ _____

16. $(-15)^0$ _____

17. $\frac{15h^6k^3}{5hk^2}$ _____

18. $4b^{-6}$ _____

Write each expression without a fraction bar.

19. $\frac{a^7}{a^{10}}$ _____

20. $\frac{4x^2y}{2x^3}$ _____

21. $\frac{x^3y^4}{x^9y^2}$ _____

22. $\frac{12mn}{12m^3n^5}$ _____

23. $\frac{16s^2t^4}{8s^5t^3}$ _____

24. $\frac{21e^4f^2}{7e^2}$ _____

25. Write three different quotients that equal 4^{-5} .

Practice 4-9**Scientific Notation**
.....**Write each number in standard notation.**

1. 3.77×10^4 _____

2. 8.5×10^3 _____

3. 9.002×10^{-5} _____

4. 1.91×10^{-3} _____

Write each number in scientific notation.

5. Pluto is about 3,653,000,000 mi from the sun. _____

6. There are 63,360 in. in a mile. _____

7. At its closest, Mercury is about 46,000,000 km from the sun. _____

8. 77,250,000 _____

9. 526,000 _____

10. 8 billion _____

11. 8,100,000 _____

12. 0.00000073 _____

13. 0.000903 _____

Multiply. Express each result in scientific notation.

14. $(2 \times 10^5)(3 \times 10^2)$

15. $(1.5 \times 10^5)(4 \times 10^9)$

16. $(6 \times 10^{-4})(1.2 \times 10^{-3})$

17. $(5 \times 10^3)(1.7 \times 10^{-5})$

Order from least to greatest.

18. 72×10^5 , 6.9×10^6 , 23×10^5

19. 19×10^{-3} , 2.5×10^{-4} , 1.89×10^{-4}

20. An ounce is 0.00003125 tons. Write this number in scientific notation.

21. A century is 3,153,600,000 seconds. Write this number in scientific notation.

Reteaching 4-1

Divisibility and Factors

Find all the factors of 30.

Start with 1 and 30.

Is 30 divisible by 2? Yes, it ends in 0.

List 2 and 15.

Is 30 divisible by 3? Yes, the sum of the digits, 3, is divisible by 3.

List 3 and 10.

Is 30 divisible by 4? No, $4 \cdot 7 = 28$ and $4 \cdot 8 = 32$.

Is 30 divisible by 5? Yes, it ends in 0.

List 5 and 6.

When you list all the factors in order, the pairs with products of 30 form a symmetric pattern.

1, 2, 3, 5, 6, 10, 15, 30



Fill in the boxes to find all the factors for each number.

1. 34
1, 2, , 34

2. 50
1, 2, 5, , , 50

3. 52
1, , , 13, 26, 52

4. 36
1, , 3, , 6, 9, , 18, 36

Find all the factors of each number.

5. 55 _____

6. 40 _____

7. 42 _____

8. 48 _____

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Chapter 4 Answers

Practice 4-1

1. 1, 2, 3, 4, 6, 12 2. 1, 3, 5, 9, 15, 45 3. 1, 41
 4. 1, 2, 3, 6, 9, 18, 27, 54 5. 1, 2, 3, 4, 6, 8, 12, 16,
 24, 48 6. 1, 2, 4, 5, 10, 20, 25, 50, 100 7. 1, 3, 9,
 13, 39, 117 8. 5 9. 2, 3, 9 10. 2, 5, 10 11. 3
 12. 3, 5 13. 2, 3, 5, 9, 10 14. none 15. 3, 5, 9
 16. 1 17. 3 18. 8 19. 0, 3, 6, 9 20. 0, 5
 21. 0, 2, 4, 6, 8

Practice 4-2

1. 625 2. -125 3. -196 4. -64 5. 1
 6. 729 7. 225 8. -3 9. 86 10. 3^4
 11. k^5 12. $(-9)^3 m^3$ 13. $g^4 h$ 14. $7a^2 b^3$
 15. $-16m^3 n^2$ 16. $(-3)^2 d^2 e^3$ 17. -8; -8
 18. 0 19. 256; 256 20. 7 21. 12
 22. -18 23. -150 24. 40 25. 28 26. 9
 27. 4 28. -9

Practice 4-3

1. 4 2. 18 3. 9 4. 23 5. 1 6. 7 7. 6
 8. $25xy$ 9. 3 10. 16 11. $12k^2$ 12. $2mn$
 13. composite; $3 \cdot 5^2$ 14. composite; $2^3 \cdot 19$
 15. composite; $2^4 \cdot 3^3$ 16. composite; $2^2 \cdot 3 \cdot 7^2$
 17. composite; $2^5 \cdot 5$ 18. composite; $2^2 \cdot 3^3$
 19. prime 20. composite; $11 \cdot 13$
 21. composite; $3^2 \cdot 59$ 22. composite; $3^2 \cdot 41$
 23. prime 24. prime 25. 15, 35, 21, 105
 26. B

Practice 4-4

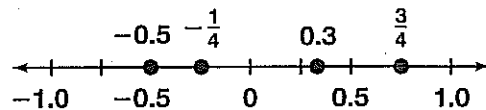
1. $\frac{2}{3}$ 2. $\frac{1}{2}$ 3. $\frac{3}{4}$ 4. $\frac{4}{5}$ 5. $\frac{2}{3}$ 6. $\frac{7}{9}$ 7. $\frac{4}{5y}$ 8. $\frac{4x}{5y}$
 9. $\frac{3x}{8}$ 10. $\frac{6n}{7}$ 11. $\frac{1}{10}$ 12. $\frac{5h}{9k}$ 13. $\frac{n}{pm^4}$ 14. $\frac{1}{3h^2}$
 15. $\frac{3h}{4k}$ 16. $\frac{5s}{4t^2}$ 17. $\frac{2}{8}, \frac{3}{12}$ 18. $\frac{4}{6}, \frac{6}{9}$ 19. $\frac{6}{10}, \frac{9}{15}$
 20. $\frac{1}{6}, \frac{2}{12}$ 21. $\frac{1}{2}, \frac{2}{4}$ 22. $\frac{6m}{16n}, \frac{9m}{24n}$ 23. $\frac{1}{2pq^2}, \frac{pq}{2p^2q^3}$
 24. $\frac{6s^2t^2}{14r}, \frac{3s^3t^3}{7rst}$ 25. $\frac{3}{5}$ 26. $\frac{1}{10}$

Practice 4-5

1. 12; P1-C3, P2-C3; P3-C1, P4-C1; P3-C2, P4-C2;
 P3-C3, P4-C3 2. 12 3. 8 4. 16 5a. 15
 b. 30

Practice 4-6

1-4.



5. $\frac{4}{7}$ 6. $\frac{3}{5}$ 7. $\frac{3}{20}$ 8. $\frac{1}{3}$ 9. $-\frac{6}{7}$ 10. $\frac{19}{20}$ 11. -14.
 Sample answers. 11. $-\frac{5}{7}, \frac{10}{14}, -\frac{10}{14}$ 12. $\frac{2}{3}, -\frac{2}{3}, \frac{4}{6}$
 13. $\frac{4}{5}, -\frac{4}{5}, -\frac{24}{30}$ 14. $\frac{3}{8}, -\frac{3}{8}, -\frac{6}{16}$ 15. -1.7, $-\frac{34}{20}$
 16. $\frac{12}{20}, -\frac{3}{5}, \frac{6}{10}$ 17. $\frac{4}{5}, \frac{40}{50}, \frac{8}{10}$ 18. 20 lb

Practice 4-7

1. 4 2. 9 3. 10 4. 3 5. 3 6. 8 7. z^{15}
 8. $-m^{12}$ 9. -3^6 10. x^7 11. y^9 12. $-y^7$
 13. $6y^5$ 14. $6x^{15}$ 15. m^{42} 16. $x^6 y^2$
 17. $54x^{19}$ 18. h^{16} 19. $3p^6$ 20. $42z^8$ 21. =
 22. < 23. > 24. = 25. < 26. = 27. =
 28. > 29. <

Practice 4-8

1. 9 2. 4 3. -5 4. 2 5. -4 6. 4 7. $\frac{1}{4}$
 8. $\frac{1}{j}$ 9. 1 10. $\frac{1}{k^4}$ 11. $\frac{3x^3}{4}$ 12. $2f^5$ 13. $\frac{y^8}{2}$
 14. $\frac{1}{n^5}$ 15. $\frac{y^3}{3}$ 16. 1 17. $3h^5 k$ 18. $\frac{4}{b^6}$
 19. a^{-3} 20. $2x^{-1}y$ 21. $x^{-6}y^2$ 22. $m^{-2}n^{-4}$
 23. $2s^{-3}t$ 24. $3e^2 f^2$ 25. Answers may vary.
 $\frac{1}{4^5}, \frac{4^2}{4^7}, \frac{4^{-4}}{4}$

Practice 4-9

1. 37,700 2. 8,500 3. 0.00009002 4. 0.00191
 5. 3.653×10^9 6. 6.336×10^4 7. 4.6×10^7
 8. 7.725×10^7 9. 5.26×10^5 10. 8×10^9
 11. 8.1×10^6 12. 7.3×10^{-7} 13. 9.03×10^{-4}
 14. 6×10^7 15. 6×10^{14} 16. 7.2×10^{-7}
 17. 8.5×10^{-2} 18. $23 \times 10^5, 6.9 \times 10^6,$
 72×10^5 19. $1.89 \times 10^{-4}, 2.5 \times 10^{-4},$
 19×10^{-3} 20. 3.125×10^{-5}
 21. 3.1536×10^9

Reteaching 4-1

1. 17 2. 10, 25 3. 2, 4 4. 2, 4, 12 5. 1, 5, 11, 55
 6. 1, 2, 4, 5, 8, 10, 20, 40 7. 1, 2, 3, 6, 7, 14, 21, 42
 8. 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

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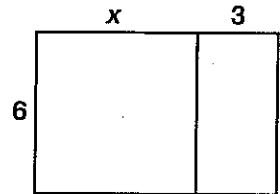
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Cumulative Review (continued)

Chapter 4

15. Which expression is equal to x^{14} ?
- A. $x^7 + x^7$ B. $(x^7)^2$ C. $(x^7)^7$ D. $x^2 \cdot x^7$
16. Which symbol makes $(5^3)^4$ $5^3 \cdot 5^4$ true?
- F. $<$ G. $>$ H. $=$ J. none

17. Write a variable expression using parentheses for the total area of the rectangle. Then find the area for $x = 5$.



18. The quotient of a number n and 3.2 is negative twenty-five hundredths. Write and solve an equation to find n .

19. List all the factors of 56.

20. A restaurant offers a breakfast special of one egg, toast, and orange or tomato juice for \$1.79. The egg may be poached, scrambled, or fried. List all the breakfast special combinations that are available. How many are there? Explain how you know you have them all.

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