



Reteach Chapter 8.1 page 52

■ **Lesson 8.1**

1. 7^{10}
2. $81y^{20}$
3. $-500x^4$
4. $x^{10}y^{10}$
5. $-2a^{11}b^3$
6. $(3x + 1)^{12}$
7. $64c^6d^6$
8. t^{12}
9. Cannot be further simplified.



Extra Practice 8.1

■ Lesson 8.1

1. 3^6 or 729 2. 2^{15} or 32,768
3. x^8 4. y^{16} 5. $8x^3$ 6. $9x^8$
7. x^{14} 8. $8x^5$ 9. $x^3y^3z^{12}$
10. $a^8b^{10}c^{15}$ 11. $-x^5y^{10}z^{10}$ 12. $4x^8y^{13}$
13. $x^6, 64$ 14. $x^3y^6, 8$
15. $3x^3y, 24$ 16. $x^4y^7, 16$
17. $-8x^3y^3, -64$ 18. $72x^2y^3, 288$
19. $5x^2y^7, 20$ 20. $144y^8, 144$
21. $-432x^3y^6, -3456$ 22. $x^6y^{20}, 64$
23. $x^4y^5, 16$ 24. $-2x^{11}y^7, -4096$
25. 256 ft^3 26. $8\pi \text{ ft}^3$ 27. \$108.16
28. 1,048,576, no 29. $(5x)^2, 1600 \text{ mi}^2$



EXERCISES

8.1 page 403

Guided Practice

CRITICAL THINKING about the Lesson

- Can x^3y^4 be simplified? Explain.
No, the bases are not the same.
- Is $a^5 \cdot a^3 = a^{15}$? Why or why not?
- Simplify $a^3 \cdot a^4$. Confirm your result by letting $a = 2$ and evaluating the expression in both its original form and its simplified form. a^7
- In the general exponential equation $y = C(a)^x$, suppose that $a = 2$, and $x = 3$. Describe how y changes when x is increased by 1. y is doubled.
- No, $a^5 \cdot a^3 = a^{5+3} = a^8$
- No, $(-3b)^4 = (-3)^4b^4 = 81b^4$
- Simplify $(a^{10})^3$. What property did you use? a^{30} , Power of a Power
- Is $(-3b)^4 = -12b^4$? Why or why not?
- Use a calculator to evaluate $(1.06)^{11}$. Round your result to two decimal places.
1.90
- Identify each of these equations as a model of exponential growth or of exponential decay.
 - $y = 3^x$
 - $y = 0.5(3)^x$
 - $y = (0.5)^x$
 - $y = 2(0.5)^x$
 growth, growth, decay, decay

Independent Practice



Raymond's last day as the band's sound technician

Independent Practice

In Exercises 9–41, simplify, if possible.

9. $4^2 \cdot 4^3$ **4^5 or 1024**

12. $10^2 \cdot 10^9$ **10^{11}**

15. $[(2x + 3)^3]^2$ **$(2x + 3)^6$**

18. $[(5 + x)^3]^6$ **$(5 + x)^{18}$**

21. $(4a)^2 \cdot a$ **$16a^3$**

24. $(x \cdot x^2)^3 \cdot 3x$ **$3x^{10}$**

27. $2x^3 \cdot (3x)^2$ **$18x^5$**

30. $(-rs)(rs^3)^2$ **$-r^3s^7$**

33. $(4a^2)^3(\frac{1}{2}a^3)^2$ **$16a^{12}$**

36. $(-y)^4(-y)^3(-y)^2$ **$-y^9$**

39. $(abc^2)^3(a^2b)^2$ **$a^7b^5c^6$**

10. $6^5 \cdot 6^4$ **6^9 or 10,077,696**

13. $x \cdot x^5$ **x^6**

16. $(2x)^3$ **$8x^3$**

19. $(-5a)^2$ **$25a^2$**

22. $6^2 \cdot (6x^3)^2$ **6^4x^6 or 1296x⁶**

25. $(3a)^2 \cdot (-4a)^4$

28. $3y^2 \cdot (2y)^3$ **$24y^5$**

31. $(-2xy)^3(-x^2)$ **$8x^5y^3$**

34. $(8b^3)^2(\frac{1}{4}b^2)^2$ **$4b^{10}$**

37. $(2t)^3(-t^2)$ **$-8t^5$**

40. $(r^2st^3)^2(s^4t)^3$ **$r^4s^{14}t^9$**

25. $3^2(-4)^4a^6$ **or 2304a⁶**

$(-9)^8$ or 43,046,721

11. $[(-9)^2]^4$

14. $(5^5)^4$ **5^{20}**

17. $(3 \cdot 7)^4$ **21^4 or 194,481**

20. $(16 \cdot 2)^2$ **32^2 or 1024**

23. $[(-3xy)^2]^3$

26. $(9a^3)^2 \cdot (2a)^3$

29. $(-ab)(a^2b)^2$ **$-a^5b^3$**

32. $(-3cd)^3(-d^2)$ **$27c^3d^5$**

35. $(-x)^5(-x)^2(-x)^3$ **x^{10}**

38. $(-w^3)(3w^2)^2$ **$-9w^7$**

41. $(-3xy^2)^3(-2x^2y)^2$
 $-108x^7y^8$

In Exercises 42–47, evaluate the expression when $a = 1$ and $b = 2$.

42. $(a^4)^3$ **1**

45. $(a^2b)^5$ **32**

43. $b^3 \cdot b^4$ **128**

46. $(b^2 \cdot b^3) \cdot (b^2)^4$ **8192**

26. $2^39^2a^9$ **or 648a⁹**

44. $(a^2 \cdot b)^3$ **8**

47. $[(a + 4)^2]^3 \cdot (a + 4)$
78,125

In Exercises 48–50, say which number is larger.

48. $(5 \cdot 7)^3$ or $5 \cdot 7^3$ **$(5 \cdot 7)^3$**

49. $5^4 \cdot 2^5$ or $(5 \cdot 2)^5$ **$(5 \cdot 2)^5$**

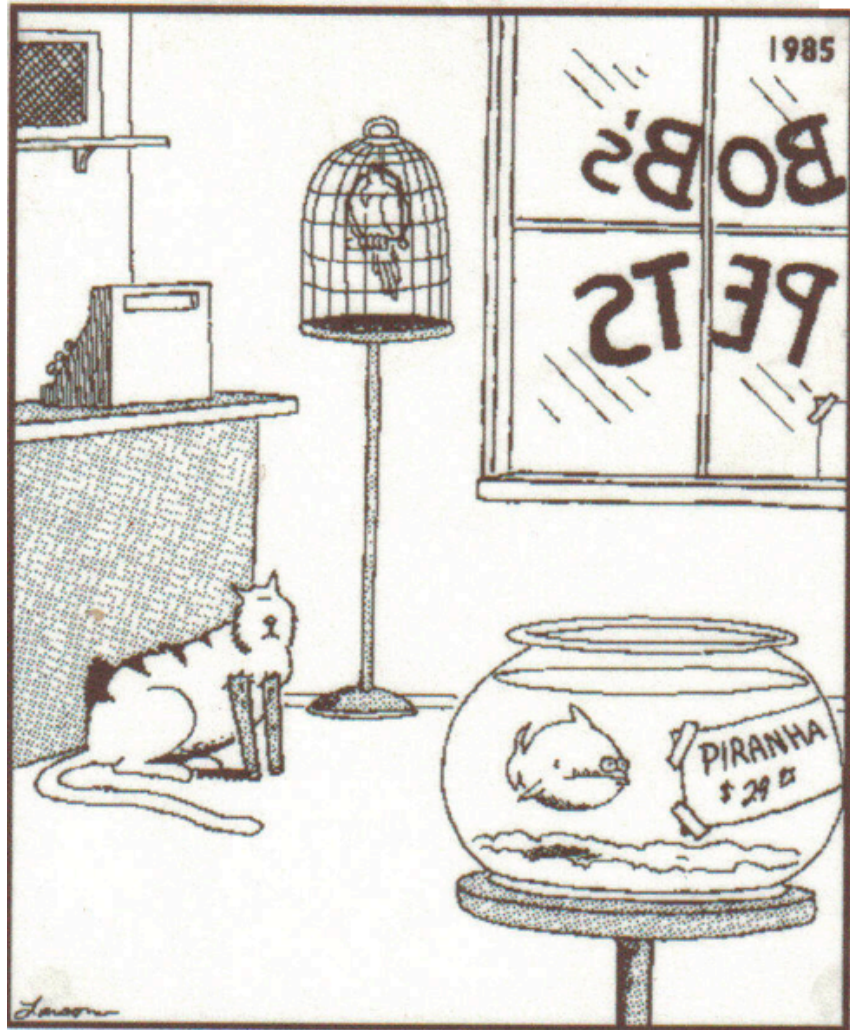
50. $(4^5 \cdot 4^{10})$ or 4^{50} **4^{50}**



Reteach 8.2 page 53

■ **Lesson 8.2**

- | | | | | |
|----------------------|----------------------|---------------------|-----------|---------------------|
| 1. $\frac{1}{14a}$ | 2. $\frac{8}{y^3}$ | 3. $\frac{1}{x}$ | 4. $7b^4$ | 5. $\frac{1}{3a^7}$ |
| 6. $\frac{d^6}{c^2}$ | 7. $\frac{y^5}{x^5}$ | 8. 1, if $x \neq 0$ | 9. 1 | |



Extra Practice 8.2

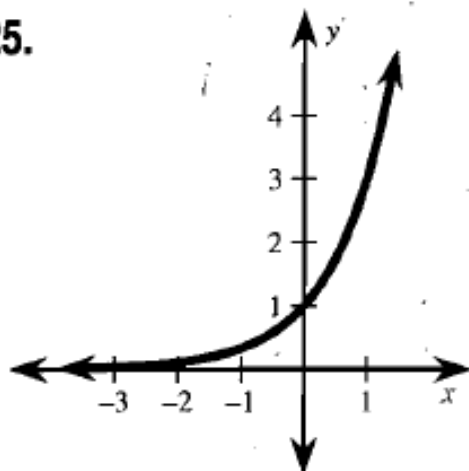
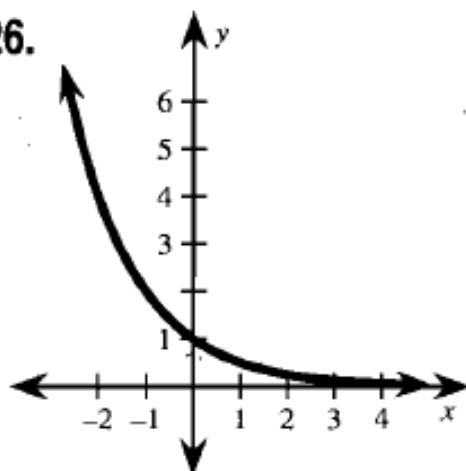
■ Lesson 8.2

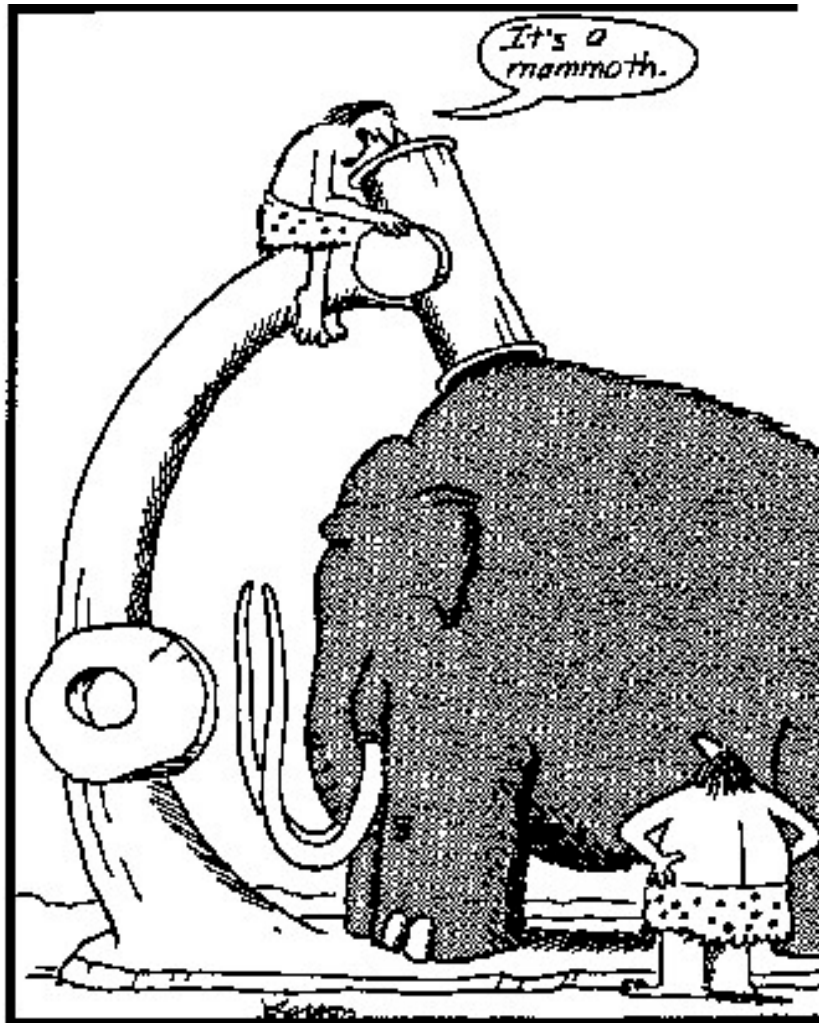
1. $\frac{1}{27}$
2. $\frac{1}{32}$
3. 16
4. $\frac{1}{8}$
5. 3
6. 25
7. 1
8. $\frac{1}{16}$
9. 8
10. $\frac{1}{64}$
11. $\frac{1}{36}$
12. $-\frac{1}{8}$
13. $\frac{1}{x^8}$
14. $\frac{3}{x^5}$
15. $\frac{x^2}{7}$
16. $9x^4$
17. $\frac{8}{x^7y^8}$
18. $\frac{x^4y^3}{6z^5}$
19. $3y^3$
20. $\frac{1}{16x^2}$
21. $\frac{1}{16x^4}$
22. $27x^3$
23. $\frac{1}{y^2}$
24. $\frac{3y^5}{4x^2}$



"Say ... what's a mountain goat doing way up here in a cloud bank?"

Lesson 8.2 (continued)

25.**26.****27.** 100, 50, 25, 12.5, 6.25, 3.125, 1.5625**28.** 1980: ≈ 1206 , 1985: 1200
1990: ≈ 1194 , 2000: ≈ 1182 **29.** 10,240 grams**30.** 1960: ≈ 1869 , 1970: ≈ 1933
1980: 2000, 1990: ≈ 2069



Early microscope

EXERCISES

Guided Practice

CRITICAL THINKING about the Lesson

1. True or False? If a is positive, a^{-n} is positive. Explain your reasoning.
2. Simplify $a^5 \cdot a^{-5}$. The result implies that a^5 and a^{-5} are ? of each other.
3. Rewrite $5a^{-3}b^{-2}$ with positive exponents. Why does the 5 stay in the numerator?
4. Simplify $3c^{-5} \cdot 4c^4$. Can a simplified form have a negative exponent? $\frac{12}{c}$, no
5. If $a^0 = 1$ ($a \neq 0$), what point do all graphs of the form $y = (a)^x$ have in common? Is this true for $y = 2(a)^x$? $(0, 1)$; no

Independent Practice

In Exercises 6–17, rewrite the expression using positive exponents.

6. $x^{-7} \frac{1}{x^2}$

7. $x^{-9} \frac{1}{x^0}$

8. $5x^{-4} \frac{5}{x^4}$

9. $3x^{-2} \frac{3}{x^2}$

10. $\frac{1}{2x^{-3}} \frac{x^0}{2}$

11. $\frac{1}{4x^{-5}} \frac{x^0}{4}$

12. $x^{-2}y^3 \frac{y^3}{x^2}$

13. x^6y^{-7}

14. $3x^{-3}y^{-8} \frac{3}{x^3y^8}$

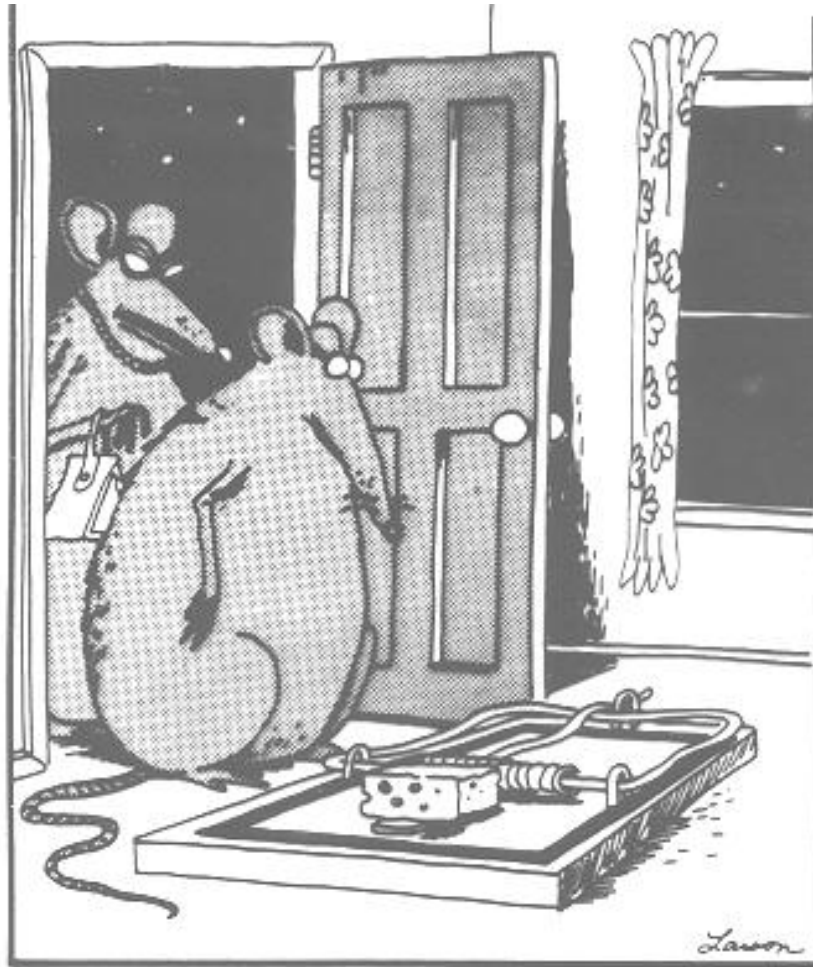
15. $6x^{-2}y^{-4} \frac{6}{x^2y^4}$

16. $\frac{1}{7x^{-4}y^{-1}} \frac{x^4y}{7}$

17. $\frac{1}{2x^{-10}y^{12}}$

In Exercises 18–29, evaluate the expression.

$\frac{x^{10}}{2y^{12}} \cdot \frac{1}{4}$



"Well, heaven knows what it is or where it came from
— just get rid of it. But save that cheese first."

14. $3x^{-3}y^{-8} \frac{3}{x^3y^8}$

15. $6x^{-2}y^{-4} \frac{6}{x^2y^4}$

16. $\frac{1}{7x^{-4}y^{-1}} \frac{x^4y}{7}$

17. $\frac{1}{2x^{-10}y^{12}}$

$\frac{x^{10}}{2y^{12}} \cdot \frac{1}{4}$

In Exercises 18–29, evaluate the expression.

18. $3^{-2} \frac{1}{9}$

19. $2^{-4} \frac{1}{16}$

20. $-4^0 \cdot \frac{1}{2^{-2}} -4$

21. $4^{-3} \cdot 4^2$

22. $6^3 \cdot 6^{-1} 36$

23. $8^4 \cdot 8^{-4} 1$

24. $7^{-9} \cdot 7^9 1$

25. $(5^{-3})^2$

26. $(-4^{-2})^{-1} -16$

27. $-6 \cdot (-6)^{-1} 1$

28. $5 \cdot 5^{-1} 1$

29. $2^0 \cdot 3^{-3}$

$\frac{1}{27}$

In Exercises 30–41, rewrite the expression using positive exponents.

30. $(-3)^0x x$

31. $(5y)^{-2} \frac{1}{25y^2}$

32. $(-2x)^{-3} -\frac{1}{8x^3}$

33. $(-4a)^0 1$

34. $(-3x)^{-1} \cdot 2y -\frac{2y}{3x}$

35. $(4xy)^{-2} \frac{1}{16x^2y^2}$

36. $(3x)^{-1} \frac{1}{3x}$

37. $(2a^{-3})^3$

38. $\frac{4}{b^{-2}} 4b^2$

39. $\frac{5}{a^{-4}} 5a^4$

40. $\frac{1}{(4x)^{-3}} 64x^3$

41. $\frac{1}{(2y)^{-5}} 32y^5$

In Exercises 42–45, say if the graph of the function contains the point (0, 1).

42. $y = -3^x$ No

43. $y = 4^x$ Yes

44. $y = 3 \cdot 1^x$ No

45. $y = 50^x$ Yes

46. **Population of Missouri** Between 1970 and 1990, Missouri's population increased at the rate of 0.47% per year. The population, P , in year t is given by

$$P = 4,903,000 \cdot 1.0047^t$$

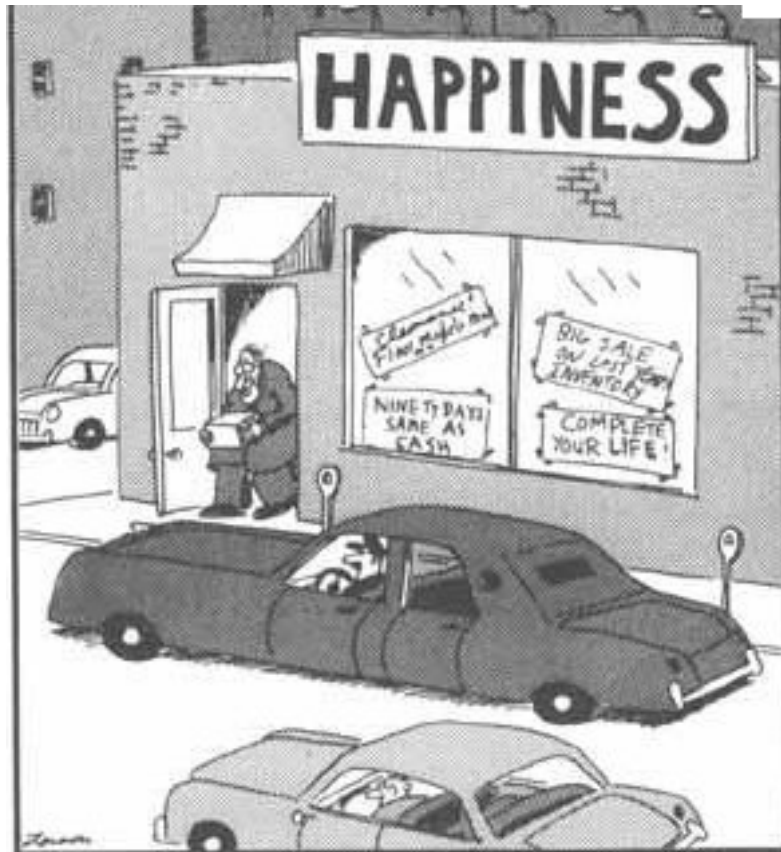
where $t = 0$ corresponds to 1980. Find the population in 1970, 1980, and 1990.

$$4,678,406; 4,903,000; 5,138,376$$

47. **Population of Buffalo** Between 1970 and 1990, the population of Buffalo, New York, decreased at the rate of 0.82% per year. The population, P , in year t is given by

$$P = 1,025,000 \cdot 0.9918^t$$

where $t = 0$ corresponds to 1980. Find the population in 1970, 1980, and 1990.



His few friends had told him he could never buy it, but Mr. Crawley surmised that they just didn't know where the store was.

Reteach 8.3

■ Lesson 8.3

1. c^6
2. $\frac{64x^3}{27y^3}$
3. $\frac{b^2}{a^2}$
4. $\frac{-15}{xy}$
5. $\frac{8}{a^3b^4}$
6. $\frac{4}{y^8}$

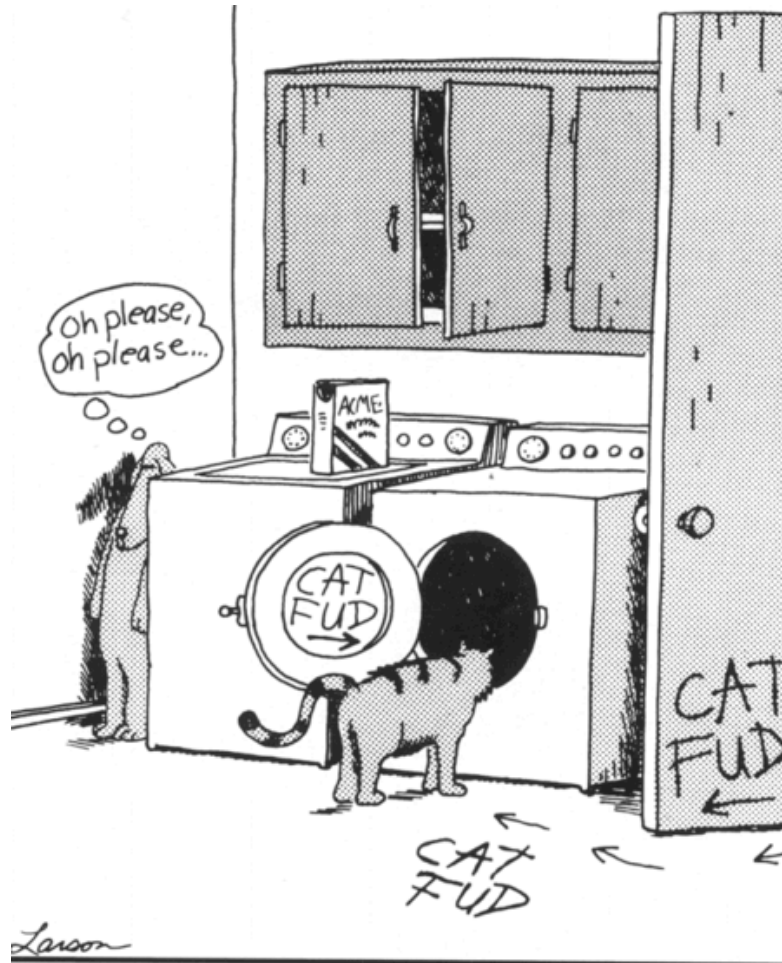


Hopeful parents

Extra Practice 8.3

■ Lesson 8.3

1. 49 2. $\frac{1}{36}$ 3. 1 4. -1
5. 128 6. 16 7. $\frac{1}{27}$ 8. $\frac{8}{27}$
9. $\frac{16}{25}$ 10. $-\frac{1}{32}$ 11. $\frac{3}{11}$ 12. $\frac{4}{9}$
13. $\frac{x^4}{81}$ 14. x^5 15. $\frac{64}{x^6}$
16. $\frac{1}{x^3}$ 17. x^9 18. $4x^3y$
19. $\frac{9y^4}{4x^7}$ 20. $-\frac{4y^3}{x^3}$ 21. $\frac{y^4}{x^2}$
22. $\frac{x^3}{3}$ 23. $\frac{54y^6}{x^{14}}$ 24. $-\frac{5y^6}{8x^8}$
25. $\frac{3125}{7776}$ 26. 1.030301
27. 2, 2.4, 2.88, 3.456
28. 100, ≈ 51 , ≈ 26 , ≈ 13 , ≈ 7 , ≈ 4 , ≈ 2



Guided Practice

CRITICAL THINKING about the Lesson 1. No, the bases are not the same.

1. Can $\frac{x^{10}}{y^4}$ be simplified? Why or why not?

3. When you divide powers with the same base, do you add or subtract exponents?

Subtract

2. Does $\frac{x^{-4}}{x^{-5}}$ simplify as x or $\frac{1}{x}$? x

4. What is the relationship between $\frac{x^4}{x^2}$ and $\frac{x^{-4}}{x^{-2}}$? Are they equivalent or are they reciprocals of each other? Explain.

Reciprocals, their product is 1.

Independent Practice

In Exercises 5–16, evaluate the expression.

5. $\frac{6^6}{6^4}$ 36

6. $\frac{8^3}{8^1}$ 64

7. $\frac{(-4)^5}{(4)^5}$ -1

8. $\frac{(-3)^9}{(-3)^9}$ 1

9. $\frac{2^2}{2^{-3}}$ 32

10. $\frac{8^3 \cdot 8^2}{8^5}$ 1

11. $\frac{7^4 \cdot 7}{7^7}$ $\frac{1}{49}$

12. $(\frac{3}{4})^2$ $\frac{9}{16}$

13. $(\frac{5}{3})^3$ $\frac{125}{27}$

14. $(-\frac{2}{3})^3$ $-\frac{8}{27}$

15. $(-\frac{4}{5})^2$ $\frac{16}{25}$

16. $(\frac{9}{6})^{-1}$ $\frac{2}{3}$



"A cat killer? Is that the face of a cat killer?
Cat chaser maybe. But hey—who isn't?"

In Exercises 17–28, simplify the expression.

17. $\left(\frac{2}{x}\right)^4 \frac{16}{x^4}$

18. $\frac{x^4}{x^5} \frac{1}{x}$

19. $\left(\frac{1}{x}\right)^6 \frac{1}{x^6}$

20. $x^3 \cdot \frac{1}{x^2} x$

21. $x^7 \cdot \frac{1}{x^9} \frac{1}{x^2}$

22. $\frac{3x^2y^2}{3xy} \cdot \frac{6xy^3}{3y} 2x^2y^3$

23. $\frac{4xy^3}{2y} \cdot \frac{5xy^{-3}}{x^2} \frac{10}{y}$

24. $\frac{16x^3y}{-4xy^3} \cdot \frac{-2xy}{-x} - \frac{8x^2}{y}$

25. $\frac{-9x^5y^7}{x^2y^3} \cdot \frac{(2xy)^2}{-6x^2y^2} 6x^3y^4$

★ 26. $\frac{6x^{-2}y^2}{xy^{-3}} \cdot \frac{(4x^2y)^{-2}}{xy^2} \frac{3y}{8x^8}$

★ 27. $\frac{7x^{-1}y^3}{x^2y^{-2}} \cdot \frac{(3xy^2)^{-1}}{xy} \frac{7y^2}{3x^5}$

★ 28. $\left(\frac{2xy^{-2}y^4}{3yx^{-1}}\right)^{-2} \cdot \left(\frac{4xy}{2x^{-1}y^3}\right)^2 \frac{9}{y^6}$

Mercury Levels In Exercises 29 and 30, use the information from Example 4.

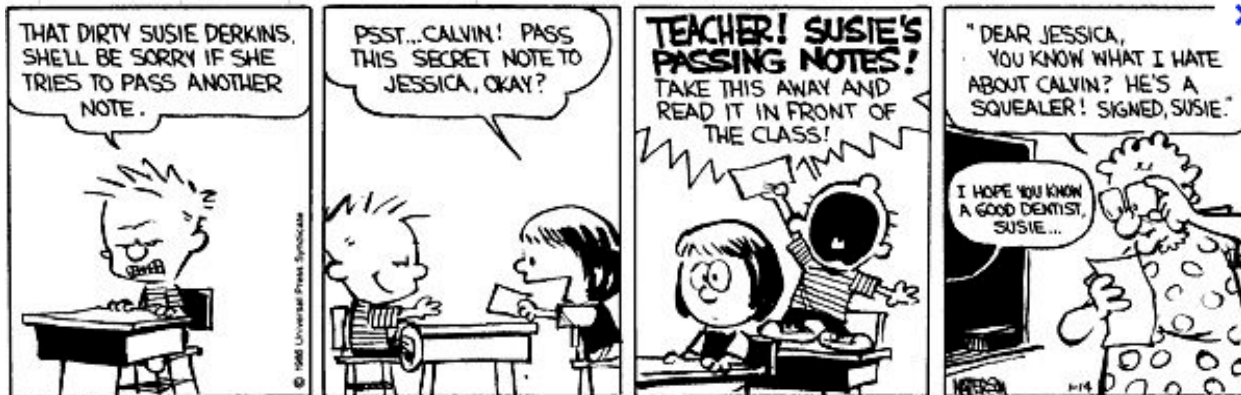
- ★ 29. As the FDA inspector, you test a $4\frac{1}{2}$ -kilogram fish and find that it has 4 milligrams of methylmercury. Does this fish meet FDA requirements? **Yes**
- ★ 30. A fish weighing 9 kilograms is found to contain 11 milligrams of methylmercury. As an FDA inspector, do you allow this fish to be sold? If not, how much would the fish have to weigh for 11 milligrams of methylmercury to be acceptable? **No, 11 kg**





■ Lesson 8.4

- | | | |
|--------------------------|-----------------------------------|-----------------------|
| 1. 0.00000933 | 2. 2.78 | 3. 45,700,000 |
| 4. 1.34×10^{10} | 5. 3.5×10^{-5} | 6. 7.52×10^1 |
| 7. 7.035×10^1 | 8. $\approx 2.27 \times 10^{-18}$ | |
| 9. 4.24×10^4 | | |

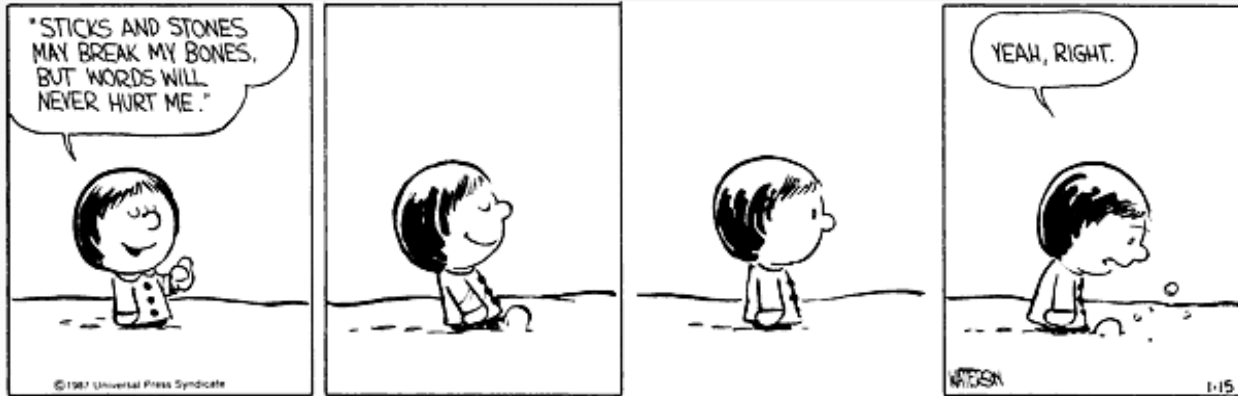


■ Lesson 8.4

1. 2030 2. 34,578 3. 64.3 4. 720,000
5. 5.2 6. 0.0468 7. 0.0000013
8. 0.008497 9. 0.00098 10. 2.5×10^4
11. 3.641×10^1 12. 4×10^6
13. 5.642×10^5 14. 9.32×10^0
15. 1.5×10^{-1} 16. 8.3×10^{-3}
17. 7.18×10^{-7} 18. 6.73×10^{-2}
19. 6×10^{11} 20. 9×10^{-9}
21. 6×10^2 22. 8×10^{-1}
23. 1.2×10^{10} 24. 3.5×10^{-3}
25. 2.4×10^4 26. 3.6×10^{-2}
27. 4.2×10^{-1} 28. 2.7×10^9
29. 3.125×10^{-4} 30. 1×10^{12}
31. 1.86×10^5 32. 1.2719×10^9
33. 6.681822×10^{-24} 34. $\approx 2.91 \times 10^{-1}$

Calvin and Hobbes by Bill Watterson

January 15, 1987



Guided Practice

CRITICAL THINKING about the Lesson

- The following numbers are equal. Which one is in scientific notation?
a. 912 b. 9.12×10^2
- To write 0.000032 in scientific notation, how many places must you move the decimal point? 5
- Which is equal to 62,000, 6.2×10^4 or 6.2×10^{-4} ?
- What is one thousand times one millionth? Write your answer in scientific notation. 1×10^{-3} ; one thousandth

Independent Practice

- In Exercises 5–12, rewrite the scientific notation in decimal form.
- | | | | |
|----------------------------------|---------------------------------------|----------------------------------|--------------------------------|
| 5. 1.09×10^6 | 6. 2.345×10^8 | 7. 6.21×10^0 6.21 | 8. 9.4675×10^4 94,675 |
| 9. 8.52×10^{-3} 0.00852 | 10. 7.021×10^{-5} 0.00007021 | 11. 8.67×10^{-2} 0.0867 | 12. 4.73×10^0 4.73 |
- In Exercises 13–20, rewrite the decimal in scientific notation.
- | | | | |
|------------------------------------|-------------------------------------|---------------------------------------|----------------------------------|
| 13. 93,000,000 9.3×10^7 | 14. 900,000,000 9×10^8 | 15. 1,637,000,000 1.637×10^9 | 16. 67.8 6.78×10^1 |
| 17. 0.000435 4.35×10^{-4} | 18. 0.008367 8.367×10^{-3} | 19. 0.004392 4.392×10^{-3} | 20. 0.0875 8.75×10^{-2} |

In Exercises 21–26, evaluate the expression without a calculator. Write the result in decimal form.

21. $6 \times 10^{-2} \cdot 3 \times 10^4$ **1800**

22. $5 \times 10^5 \cdot 5 \times 10^{-5}$ **25**

23. $4 \times 10^4 \cdot 2 \times 10^{-1}$ **8000**

24. $6 \times 10^{-3} \cdot 7 \times 10^{-4}$
0.000042

25. $9 \times 10^{-3} \cdot 4 \times 10^8$
3,600,000

26. $8 \times 10^4 \cdot 10 \times 10^{-1}$
80,000

Technology In Exercises 27–32, use a calculator to evaluate the expression. Write the result in both decimal form and in scientific notation. See margin.

27. $8,000,000 \cdot 623,000$

28. $3,000,000 \cdot 43,000$

29. $0.000345 \cdot 8,980,000,000$

30. $345,000 \cdot 0.000086$

31. $(3.28 \times 10^{-6})^4$

32. 0.000045^3

In Exercises 33–36, write the number in scientific notation.

33. **Carbon Atom** An atom of carbon has a mass of 0.000000000000000000000004 gram. **4×10^{-23}**

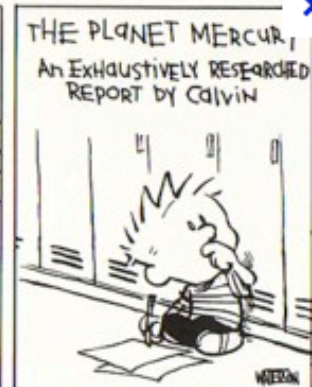
34. **Population of the United States** In 1990, the United States population was about 250,000,000. **2.5×10^8**

35. **Quarterback Salary** Jim Kelly, the quarterback for the Buffalo Bills football team, was paid \$4,800,000 in 1990. **$4.8 \times 10^6$**

36. **Metric Conversion** One meter is equal to one thousandth of a kilometer. **1×10^{-3}**



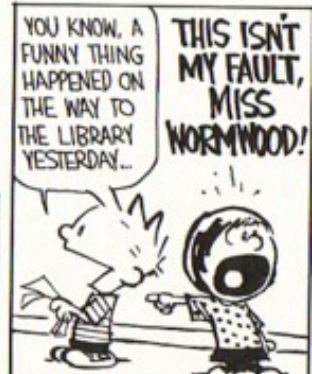
OF COURSE I DID. AND I'LL BET MY HALF MAKES YOUR HALF LOOK PATHETIC.



AND TO TELL US ABOUT THE MYTHOLOGY OF MERCURY, HERE'S MY PARTNER, CALVIN.



THANK YOU, THANK YOU! HEY, WHAT A CROWD! YOU LOOK GREAT THIS MORNING... REALLY, I MEAN THAT! GO ON, GIVE YOURSELVES A HAND!



■ Lesson 8.5

1. 1.0×10^{-15}

2. $\approx 7.69 \times 10^{-21}$

3. $\approx 4.0 \times 10^2$



■ Lesson 8.5

1. ≈ 8424 people/km² 2. \$4000

3. 1.0375×10^3 minutes 4. $\frac{1}{15}$

5. $\approx 4.684 \times 10^3$ sec 6. 65

7. 3×10^4 ft², ≈ 0.37 dollars/ft²

8. $\approx 3.26 \times 10^{-15}$ cm³



8-1

Skills Practice

Multiplying Monomials

Determine whether each expression is a monomial. Write *yes* or *no*. Explain.

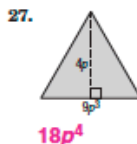
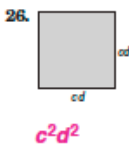
1. 11 **Yes; 11 is a real number and an example of a constant.**
2. $a - b$ **No; This is the difference, not the product, of two variables.**
3. $\frac{p^2}{q^2}$ **No; This is the quotient, not the product, of two variables.**
4. y **Yes; Single variables are monomials.**
5. j^3k **Yes; This is the product of two variables.**
6. $2a + 3b$ **No; This is the sum of two monomials.**

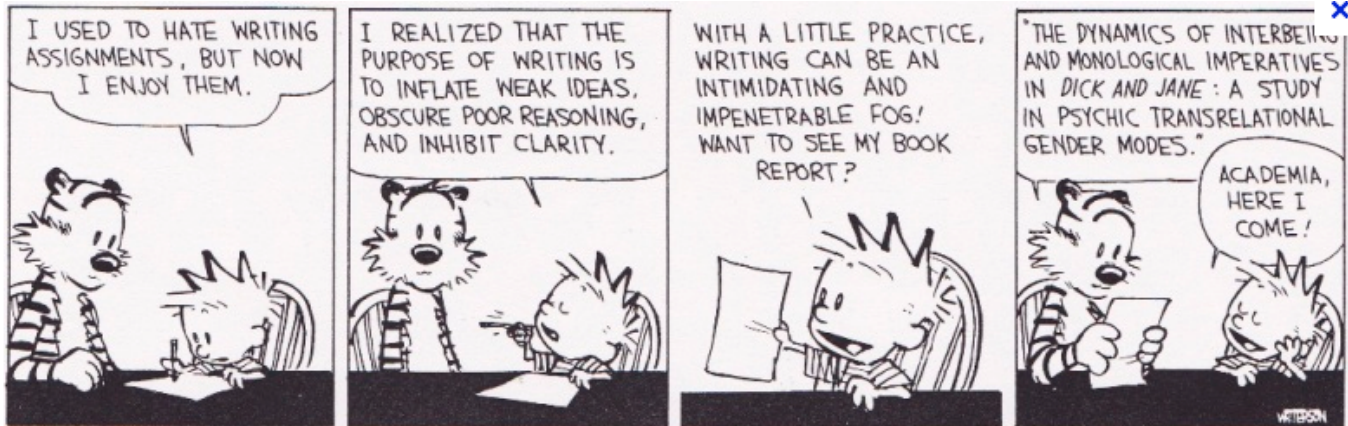
Simplify.

- | | |
|--|--|
| 7. $a^2(a^3)(a^6)$ a^{11} | 8. $x(x^2)(x^7)$ x^{10} |
| 9. $(y^2z)(yz^2)$ y^3z^3 | 10. $(\ell^2k^2)(\ell^3k)$ ℓ^5k^3 |
| 11. $(e^2f^4)(e^2f^2)$ e^4f^6 | 12. $(cd^2)(c^3d^2)$ c^4d^4 |
| 13. $(2x^2)(3x^5)$ $6x^7$ | 14. $(5a^7)(4a^2)$ $20a^9$ |
| 15. $(4xy^2)(3x^2y^5)$ $12x^4y^8$ | 16. $(7a^5b^2)(a^2b^3)$ $7a^7b^5$ |
| 17. $(-5m^3)(3m^8)$ $-15m^{11}$ | 18. $(-2c^4d)(-4cd)$ $8c^5d^2$ |
| 19. $(10^2)^3$ 10^6 or 1,000,000 | 20. $(p^3)^{12}$ p^{36} |
| 21. $(-6p)^2$ $36p^2$ | 22. $(-3y)^2$ $-27y^3$ |
| 23. $(3pq^2)^2$ $9p^2q^4$ | 24. $(2b^3c^4)^2$ $4b^6c^8$ |

Reader

GEOMETRY Express the area of each figure as a monomial.







NAME _____ DATE _____ PERIOD _____

8-2 Skills Practice***Dividing Monomials***

Simplify. Assume that no denominator is equal to zero.

1. $\frac{6^5}{6^4}$ **6^1 or 6**

2. $\frac{9^{12}}{9^8}$ **9^4 or 6561**

3. $\frac{x^4}{x^2}$ **x^2**

4. $\frac{r^3s^2}{r^3s^4}$ **$\frac{1}{s^2}$**

5. $\frac{m}{m^3}$ **$\frac{1}{m^2}$**

6. $\frac{9d^7}{3d^6}$ **$3d$**

7. $\frac{12n^5}{36n}$ **$\frac{n^4}{3}$**

8. $\frac{w^4u^3}{w^4u}$ **u^2**

9. $\frac{a^3b^5}{ab^2}$ **a^2b^3**

10. $\frac{m^7n^2}{m^3n^2}$ **m^4**

11. $-\frac{21w^5u^2}{7w^4u^5}$ **$-\frac{3w}{u^3}$**

12. $\frac{32x^3y^2z^5}{-8xyz^2}$ **$-4x^2yz^3$**

13. $\left(\frac{4p^7}{7s^2}\right)^2$ **$\frac{16p^{14}}{49s^4}$**

14. 4^{-4} **$\frac{1}{256}$**

15. 8^{-2} **$\frac{1}{64}$**

16. $\left(\frac{5}{3}\right)^{-2}$ **$\frac{9}{25}$**

17. $\left(\frac{9}{11}\right)^{-1}$ **$\frac{11}{9}$**

18. $\frac{h^3}{h^{-6}}$ **h^9**

19. $k^0(k^4)(k^{-6})$ **$\frac{1}{k^2}$**

20. $k^{-1}(\ell^{-6})(m^3)$ **$\frac{m^3}{k\ell^6}$**

21. $\frac{f^{-7}}{f^4}$ **$\frac{1}{f^{11}}$**

22. $\left(\frac{16p^5q^2}{2p^3q^3}\right)^0$ **1**

23. $\frac{f^{-5}g^4}{h^{-2}}$ **$\frac{g^4h^2}{f^5}$**

24. $\frac{15x^6y^{-9}}{5xy^{-11}}$ **$3x^5y^2$**

25. $-\frac{15w^9u^{-1}}{5u^3}$ **$-\frac{3}{u^4}$**

26. $\frac{48x^6y^7z^5}{-6xy^2z^6}$ **$-\frac{8x^5y^2}{z}$**

Word

NAME _____ DATE _____ PERIOD _____

8-2 Skills Practice***Dividing Monomials***

Simplify. Assume that no denominator is equal to zero.

1. $\frac{6^5}{6^4}$ **6¹ or 6**

2. $\frac{9^{12}}{9^8}$ **9⁴ or 6561**

3. $\frac{x^4}{x^2}$ **x²**

4. $\frac{r^3s^2}{r^3s^4}$ **$\frac{1}{s^2}$**

5. $\frac{m}{m^3}$ **$\frac{1}{m^2}$**

6. $\frac{9d^7}{3d^6}$ **3d**

7. $\frac{12n^5}{36n}$ **$\frac{n^4}{3}$**

8. $\frac{w^4u^3}{w^4u}$ **u²**

9. $\frac{a^3b^5}{ab^2}$ **a²b³**

10. $\frac{m^7n^2}{m^3n^2}$ **m⁴**

11. $\frac{-21w^5u^2}{7w^4u^5}$ **$-\frac{3w}{u^3}$**

12. $\frac{32x^3y^2z^5}{-8xyz^2}$ **$-4x^2yz^3$**

13. $\left(\frac{4p^7}{7s^2}\right)^2$ **$\frac{16p^{14}}{49s^4}$**

14. 4^{-4} **$\frac{1}{256}$**

15. 8^{-2} **$\frac{1}{64}$**

16. $\left(\frac{5}{3}\right)^{-2}$ **$\frac{9}{25}$**

17. $\left(\frac{9}{11}\right)^{-1}$ **$\frac{11}{9}$**

18. $\frac{h^3}{h^{-6}}$ **h⁹**

19. $k^0(k^4)(k^{-6})$ **$\frac{1}{k^2}$**

20. $k^{-1}(\ell^{-6})(m^3)$ **$\frac{m^3}{k\ell^6}$**

21. $\frac{f^{-7}}{f^4}$ **$\frac{1}{f^{11}}$**

22. $\left(\frac{16p^5q^2}{2p^3q^3}\right)^0$ **1**

23. $\frac{f^{-5}g^4}{h^{-2}}$ **$\frac{g^4h^2}{f^5}$**

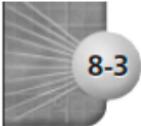
24. $\frac{15x^5y^{-9}}{5xy^{-11}}$ **3x⁵y²**

25. $\frac{-15w^0u^{-1}}{5u^3}$ **$-\frac{3}{u^4}$**

26. $\frac{48x^6y^7z^5}{-6xy^5z^5}$ **$-\frac{8x^5y^2}{z}$**

Word




8-3 Skills Practice
Scientific Notation

NAME _____ DATE _____ PERIOD _____

Express each number in standard notation.

1. 4×10^3

4000

2. 2×10^8

200,000,000

3. 3.2×10^5

320,000

4. 3×10^{-6}

0.000003

5. 9×10^{-2}

0.09

6. 4.7×10^{-7}

0.00000047**ASTRONOMY** Express the number in each statement in standard notation.

7. The diameter of Jupiter is 1.42984×10^5 kilometers. **142,984**

8. The surface density of the main ring around Jupiter is 5×10^{-6} grams per centimeter squared. **0.000005**

9. The minimum distance from Mars to Earth is 5.45×10^7 kilometers. **54,500,000**

Express each number in scientific notation.

10. 41,000,000

 4.1×10^7

11. 65,100

 6.51×10^4

12. 283,000,000

 2.83×10^8

13. 264,701

 2.64701×10^5

14. 0.019

 1.9×10^{-2}

15. 0.000007

 7×10^{-6}

16. 0.000010035

 1.0035×10^{-5}

17. 264.9

 2.649×10^2

18. 150×10^2

 1.5×10^4 **Evaluate. Express each result in scientific and standard notation.**

19. $(3.1 \times 10^7)(2 \times 10^{-5})$

 6.2×10^2 ; 620

20. $(5 \times 10^{-2})(1.4 \times 10^{-4})$

 7.0×10^{-6} ; 0.000007

21. $(3 \times 10^3)(4.2 \times 10^{-1})$

 1.26×10^3 ; 1260

22. $(3 \times 10^{-2})(5.2 \times 10^9)$

 1.56×10^8 ; 156,000,000

23. $(2.4 \times 10^2)(4 \times 10^{-10})$

 9.6×10^{-8} ; 0.000000096

24. $(1.5 \times 10^{-4})(7 \times 10^{-5})$

 1.05×10^{-8} ; 0.0000000105

25. $\frac{5.1 \times 10^6}{1.5 \times 10^2}$

 3.4×10^4 ; 34,000

26. $\frac{7.2 \times 10^{-5}}{4 \times 10^{-3}}$

 1.8×10^{-2} ; 0.018



Kuta Software - Infinite Algebra 1

Name _____

More Properties of Exponents

Simplify. Your answer should contain only positive exponents.

1) $(x^{-2}x^{-3})^4$

$$\frac{1}{x^{20}}$$

2) $(x^4)^{-3} \cdot 2x^4$

$$\frac{2}{x^8}$$

3) $(n^3)^3 \cdot 2n^{-1}$

$$2n^8$$

4) $(2v)^2 \cdot 2v^{-2}$

$$8v^4$$

5) $\frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

$$8x^8y^6$$

6) $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$

$$\frac{2y^2}{x}$$

7) $\frac{x^3y^3 \cdot x^3}{4x^2}$

$$\frac{x^4y^3}{4}$$

8) $\frac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$

$$\frac{3xy}{8}$$

9) $\frac{x}{(2x^0)^2}$

$$\frac{x}{4}$$

10) $\frac{2m^{-4}}{(2m^{-4})^3}$

$$\frac{m^8}{4}$$

$$11) \frac{(2m^2)^{-3}}{m^2}$$

$$\frac{1}{2m^4}$$

$$12) \frac{2x^3}{(x^{-1})^3}$$

$$2x^6$$

$$13) (a^{-3}b^{-3})^0$$

$$1$$

$$14) x^4y^3 \cdot (2y^2)^0$$

$$x^4y^3$$

$$15) ba^4 \cdot (2ba^4)^{-3}$$

$$\frac{1}{8b^2a^8}$$

$$16) (2x^0y^2)^{-3} \cdot 2yx^3$$

$$\frac{x^3}{4y^3}$$

$$17) \frac{2k^3 \cdot k^2}{k^{-3}}$$

$$2k^8$$

$$18) \frac{(x^{-2})^4 x^4}{2x^{-3}}$$

$$\frac{1}{2x^5}$$

$$19) \frac{(2x)^{-4}}{x^{-1} \cdot x}$$

$$\frac{1}{16x^4}$$

$$20) \frac{(2x^3z^2)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$$

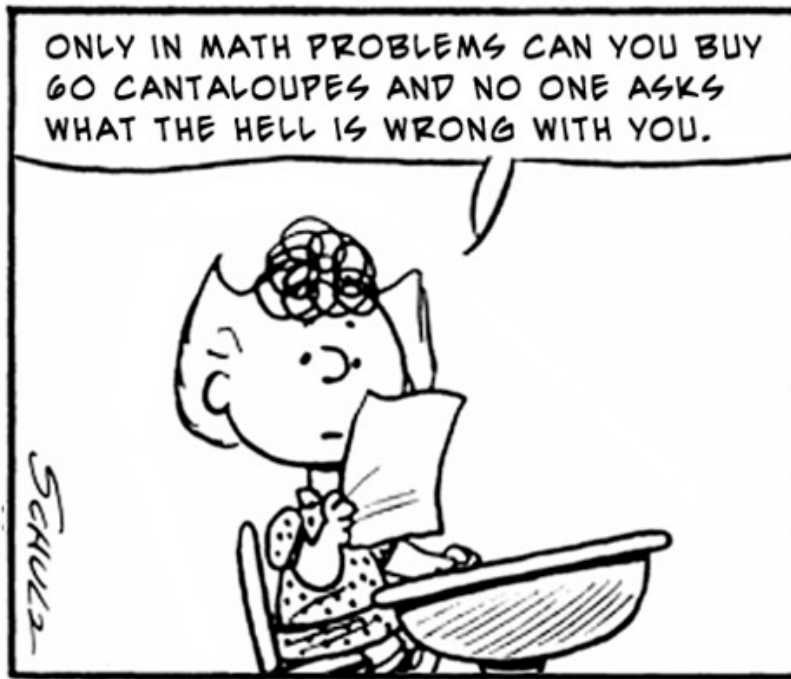
$$\frac{8x^{10}z}{y^4}$$

$$21) \frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$$

$$\frac{m^3}{16p^3q^2}$$

$$22) \frac{(2hj^2k^{-2} \cdot h^4j^{-1}k^4)^0}{2h^{-3}j^{-4}k^{-2}}$$

$$\frac{h^3j^4k^2}{2}$$



Kuta Software - Infinite Algebra 1

Name_____

Properties of Exponents

Da

Simplify. Your answer should contain only positive exponents.

1) $2m^2 \cdot 2m^3$

$4m^5$

2) $m^4 \cdot 2m^{-3}$

$2m$

3) $4r^{-3} \cdot 2r^2$

$\frac{8}{r}$

4) $4n^4 \cdot 2n^{-3}$

$8n$

5) $2k^4 \cdot 4k$

$8k^5$

6) $2x^3y^{-3} \cdot 2x^{-1}y^3$

$4x^2$

7) $2y^2 \cdot 3x$

$6y^2x$

8) $4v^3 \cdot vu^2$

$4v^4u^2$

9) $4a^3b^2 \cdot 3a^{-4}b^{-3}$

$$\frac{12}{ab}$$

11) $(x^2)^0$

$$1$$

13) $(4r^0)^4$

$$256$$

15) $(3k^4)^4$

$$81k^{16}$$

10) $x^2y^{-4} \cdot x^3y^2$

$$\frac{x^5}{y^2}$$

12) $(2x^2)^{-4}$

$$\frac{1}{16x^8}$$

14) $(4a^3)^2$

$$16a^6$$

16) $(4xy)^{-1}$

$$\frac{1}{4xy}$$

17) $(2b^4)^{-1}$

$$\frac{1}{2b^4}$$

18) $(x^2y^{-1})^2$

$$\frac{x^4}{y^2}$$

19) $(2x^4y^{-3})^{-1}$

$$\frac{y^3}{2x^4}$$

20) $(3m)^{-2}$

$$\frac{1}{9m^2}$$

21) $\frac{r^2}{2r^3}$

$$\frac{1}{2r}$$

22) $\frac{x^{-1}}{4x^4}$

$$\frac{1}{4x^5}$$

23) $\frac{3n^4}{3n^3}$

$$n$$

24) $\frac{m^4}{2m^4}$

$$\frac{1}{2}$$

$$25) \frac{3m^{-4}}{m^3}$$

$$\frac{3}{m^7}$$

$$26) \frac{2x^4y^{-4}z^{-3}}{3x^2y^{-3}z^4}$$

$$\frac{2x^2}{3yz^7}$$

$$27) \frac{4x^0y^{-2}z^3}{4x}$$

$$\frac{z^3}{y^2x}$$

$$28) \frac{2h^3j^{-3}k^4}{3jk}$$

$$\frac{2h^3k^3}{3j^4}$$

$$29) \frac{4m^4n^3p^3}{3m^2n^2p^4}$$

$$\frac{4m^2n}{3p}$$

$$30) \frac{3x^3y^{-1}z^{-1}}{x^{-4}y^0z^0}$$

$$\frac{3x^7}{yz}$$



DETERMINATION

No matter what barriers stand in your way, never lose sight of your goal.