Name _____ Class _____ Date _____

Practice 8-3

Multiplication Properties of Exponents

Simplify each expression.

1. $(3d^{-4})(5d^{8})$
2. $(-8m^{4})(4m^{8})$
3. $n^{-6} \cdot n^{-9}$
4. $a^{3} \cdot a$
5. $3^{8} \cdot 3^{5}$
6. $(3p^{-15})(6p^{11})$
7. $p^{7} \cdot q^{5} \cdot p^{6}$
8. $(-1.5a^{5}b^{2})(6a)$
9. $(-2d^{3}e^{3})(6d^{4}e^{6})$
10. $\frac{1}{b^{-7} \cdot b^{5}}$
11. $p^{5} \cdot q^{2} \cdot p^{4}$
12. $\frac{1}{n^{7} \cdot n^{-5}}$
13. $(8d^{4})(4d^{7})$
14. $x^{-9} \cdot x^{3} \cdot x^{2}$
15. $2^{3} \cdot 2^{2}$
16. $r^{7} \cdot s^{4} \cdot s \cdot r^{3}$
17. $b^{7} \cdot b^{13}$
18. $(7p^{4})(5p^{9})$
19. $2^{8} \cdot 2^{-9} \cdot 2^{3}$
20. $(6r^{4}s^{3})(9rs^{2})$
21. $4^{3} \cdot 4^{2}$
22. $m^{12} \cdot m^{-14}$
23. $s^{7} \cdot t^{4} \cdot t^{8}$
24. $(-3xy^{6})(3.2x^{5}y)$
25. $5^{-7} \cdot 5^{9}$
26. $\frac{1}{h^{7} \cdot h^{3}}$
27. $\frac{1}{t^{-5} \cdot t^{-3}}$
28. $f^{5} \cdot f^{2} \cdot f^{0}$
29. $r^{6} \cdot r^{-13}$
30. $5^{-6} \cdot 5^{4}$

Simplify each expression. Write each answer in scientific notation.

31. $(7 \times 10^{7})(5 \times 10^{-5})$
32. $(3 \times 10^{8})(3 \times 10^{4})$
33. $(9.5 \times 10^{-4})(2 \times 10^{-5})$
34. $(4 \times 10^{9})(4.1 \times 10^{8})$
35. $(7.2 \times 10^{-7})(2 \times 10^{-5})$
36. $(5 \times 10^{7})(4 \times 10^{3})$
37. $(6 \times 10^{-6})(5.2 \times 10^{4})$
38. $(4 \times 10^{6})(9 \times 10^{8})$
39. $(6.1 \times 10^{9})(8 \times 10^{14})$
40. $(2.1 \times 10^{-4})(4 \times 10^{-7})$
41. $(1.6 \times 10^{5})(3 \times 10^{11})$
42. $(9 \times 10^{12})(0.3 \times 10^{-18})$
43. $(4 \times 10^{9})(11 \times 10^{3})$
44. $(5 \times 10^{13})(9 \times 10^{-9})$
45. $(7 \times 10^{6})(4 \times 10^{9})$
46. $(6 \times 10^{-8})(12 \times 10^{-7})$
47. $(6 \times 10^{15})(3.2 \times 10^{2})$
48. $(5 \times 10^{8})(2.6 \times 10^{-16})$

49. In 1990, the St. Louis metropolitan area had an average of 82×10^{-6} g/m^3 of pollutants in the air. How many grams of pollutants were there in 2×10^{3} m^3 of air?

50. Light travels approximately 5.87×10^{12} mi in one year. This distance is called a light-year. Suppose a star is 2×10^{4} light-years away. How many miles away is that star?

51. The weight of 1 m^3 of air is approximately 1.3×10^{3} g. Suppose that the volume of air inside of a building is 3×10^{6} m^3. How much does the air inside the building weigh?

52. Light travels 1.18×10^{10} in. in 1 second. How far will light travel in 1 nanosecond or 1×10^{-9} s?

Name _____ Class _____ Date _____

Practice 8-4

More Multiplication Properties of Exponents

Simplify each expression.

1. $(4a^5)^3$

2. $(2^{-3})^4$

3. $(m^{-3}n^4)^{-4}$

4. $(x^5)^2$

5. $2^5 \cdot (2^4)^2$

6. $(4x^4)^3(2xy^3)^2$

7. $x^4 \cdot (x^4)^3$

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

9. $(5^2)^2$

10. $(a^4)^{-5} \cdot a^{13}$

11. $(3f^4g^{-3})^3(f^2g^{-2})^{-1}$

12. $x^3 \cdot (x^3)^5$

13. $(d^2)^{-4}$

14. $(a^3b^4)^{-2}(a^{-3}b^{-5})^{-4}$

15. $(x^2y)^4$

16. $(12b^{-2})^2$

17. $(m^{-5})^{-3}$

18. $(x^{-4})^5(x^3y^2)^5$

19. $(y^6)^{-3} \cdot y^{21}$

20. $n^6 \cdot (n^{-2})^5$

21. $(m^5)^{-3}(m^4n^5)^4$

22. $(a^3)^6$

23. $b^{-9} \cdot (b^2)^4$

24. $(4^{-1}s^3)^{-2}$

25. $(5a^3b^5)^4$

26. $(b^{-3})^6$

27. $(y^6)^3$

28. $a^{-4} \cdot (a^4b^3)^2$

29. $(x^4y)^3$

30. $d^3 \cdot (d^2)^5$

Simplify. Write each answer in scientific notation.

31. $10^{-9} \cdot (2 \times 10^2)^2$

32. $(3 \times 10^{-6})^3$

33. $10^4 \cdot (4 \times 10^6)^3$

34. $(9 \times 10^7)^2$

35. $10^{-3} \cdot (2 \times 10^3)^5$

36. $(7 \times 10^5)^3$

37. $(5 \times 10^5)^4$

38. $(2 \times 10^{-3})^3$

39. $(5 \times 10^2)^{-3}$

40. $(3 \times 10^5)^4$

41. $(4 \times 10^8)^{-3}$

42. $(1 \times 10^{-5})^{-5}$

43. $10^5 \cdot (8 \times 10^7)^3$

44. $(10^2)^3(6 \times 10^{-3})^3$

45. $10^7 \cdot (2 \times 10^2)^4$

46. The kinetic energy, in joules, of a moving object is found by using the formula $E = \frac{1}{2}mv^2$, where m is the mass and v is the speed of the object. The mass of a car is 1.59×10^3 kg. The car is traveling at 2.7×10^1 m/s. What is the kinetic energy of the car?

47. The moon is shaped somewhat like a sphere. The surface area of the moon is found by using the formula $S = 12.56r^2$. What is the surface area of the moon if the radius is 1.08×10^3 mi?

48. Because of a record corn harvest, excess corn is stored on the ground in a pile. The pile is shaped like a cone. The height of the pile is 25 ft, and the radius of the pile is 1.2×10^2 ft. Use the formula $V = \frac{1}{3}\pi r^2h$ to find the volume.

49. Suppose the distance in feet that an object travels in t seconds is given by the formula $d = 64t^2$. How far would the object travel after 1.5×10^3 seconds?