

GUIDED PRACTICE

Vocabulary Check ✓

1. State the name of the property illustrated.

a. $a^m \cdot a^n = a^{m+n}$

b. $(a^m)^n = a^{mn}$

c. $(ab)^m = a^m b^m$

Concept Check ✓

2. **ERROR ANALYSIS** Describe the mistake made in simplifying the expression.

a. ~~$(-2)^2(-2)^3 = 4^5$~~

b. ~~$\frac{x^8}{x^2} = x^4$~~

c. ~~$x^4 \cdot x^3 = x^{12}$~~

Skill Check ✓

Evaluate the expression. Tell which properties of exponents you used.

3. $6 \cdot 6^2$

4. $(9^6)(9^2)^{-3}$

5. $(2^3)^2$

6. $\left(\frac{3}{2^{-2}}\right)\left(\frac{1}{2}\right)^2$

7. $\left(\frac{3}{5}\right)^{-2}$

8. $\frac{7^{-5}}{7^{-3}}$

Simplify the expression. Tell which properties of exponents you used.

9. $z^{-2} \cdot z^{-4} \cdot z^6$

10. $yz^{-2}(x^2y)^3z$

11. $(4x^3)^{-2}$

12. $\left(\frac{2}{x^{-3}}\right)^6$

13. $\frac{3y^6}{y^3}$

14. $\frac{(xy)^4}{xy^{-1}}$

15. **ASTRONOMY** Earth has a radius of about 6.38×10^3 kilometers. The sun has a radius of about 6.96×10^5 kilometers. Use the formula for the volume of a sphere given on page 325 to calculate the volume of the sun and the volume of Earth. Divide the volumes. Do you get the same result as in Example 3?

PRACTICE AND APPLICATIONS

STUDENT HELP

▶ **Extra Practice**
to help you master
skills is on p. 947.

EVALUATING NUMERICAL EXPRESSIONS Evaluate the expression. Tell which properties of exponents you used.

16. $4^2 \cdot 4^4$

17. $(5^{-2})^3$

18. $(-9)(-9)^3$

19. $(8^2)^3$

20. $\frac{5^2}{5^5}$

21. $\left(\frac{3}{7}\right)^3$

22. $\left(\frac{5}{9}\right)^{-3}$

23. $11^{-2} \cdot 11^0$

24. $\frac{4^{-2}}{4^{-3}}$

25. $\left(\frac{1}{8}\right)^{-4}$

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

27. $\frac{2^2}{2^{-9}}$

28. $\frac{6^2}{(6^{-2} \cdot 5^1)^{-2}}$

29. $6^0 \cdot 6^3 \cdot 6^{-4}$

30. $\left(\frac{1}{10}\right)^3 \left(\frac{1}{10}\right)^{-3}$

31. $\left(\left(\frac{2}{5}\right)^{-3}\right)^2$

SIMPLIFYING ALGEBRAIC EXPRESSIONS Simplify the expression. Tell which properties of exponents you used.

32. $x^8 \cdot \frac{1}{x^3}$

33. $(2^3x^2)^5$

34. $(x^2y^2)^{-1}$

35. $\frac{x^5}{x^{-2}}$

36. $\frac{x^5y^2}{x^4y^0}$

37. $(x^4y^7)^{-3}$

38. $\frac{x^{11}y^{10}}{x^{-3}y^{-1}}$

39. $-3x^{-4}y^0$

40. $(10x^3y^5)^{-3}$

41. $\frac{x^{-1}y}{xy^{-2}}$

42. $(4x^2y^5)^{-2}$

43. $\frac{2x^2y}{6xy^{-1}}$

44. $\frac{5x^3y^9}{20x^2y^{-2}}$

45. $\frac{xy^9}{3y^{-2}} \cdot \frac{-7y}{21x^5}$

46. $\frac{y^{10}}{2x^3} \cdot \frac{20x^{14}}{xy^6}$

47. $\frac{12xy}{7x^4} \cdot \frac{7x^5y^2}{4y}$

STUDENT HELP

▶ HOMEWORK HELP

Example 1: Exs. 16–31

Example 2: Exs. 32–51

Examples 3, 4: Exs. 52–56