6.3 *n*th Roots and Rational Exponents · Form A

All work must be completed on a separate sheet of paper, in a clear and organized manner. Final answers only on WS.

Examples 1 and 2

Simplify.

1. $\pm\sqrt{225a^{16}b^{36}}$

2. $-\sqrt{16c^4d^2}$

3. $-\sqrt{400x^{32}y^{40}}$

4. $\sqrt[8]{x^{16}y^8}$

5. $\sqrt[6]{x^{18}}$

6. $\sqrt[3]{a^{12}}$

Examples 3

Write each expression in radical form, or write each radical in exponential form.

7. $4^{\frac{2}{7}}$

8. $\sqrt{17}$

9. $\sqrt[4]{625x^2}$

Examples 4

10. **DEPRECIATION** The depreciation rate is calculated by the expression $1 - \left(\frac{T}{P}\right)^{\frac{1}{n}}$, where *n* is the age of the item in years, *T* is the resale price in dollars, and *P* is the original price in dollars. Write the expression in radical form for an 8 year-old car originally purchased for $52,425.

Example 5

Evaluate each expression.

11. $256^{\frac{1}{4}}$

12. $81^{-\frac{1}{4}}$

13. $16^{-\frac{5}{4}}$

Example 6

Simplify each expression.

14. $a^{\frac{4}{9}} \cdot a^{\frac{1}{4}}$

15. $y^{-\frac{4}{5}}$

Mixed Exercises

Simplify.

16. $-\sqrt{(2x+1)^6}$

17. $\sqrt[3]{(4x-7)^{24}}$

18. $\sqrt[4]{256(5x-2)^{12}}$

19. $\sqrt{-64y^8z^6}$

20. $\sqrt[4]{-16x^{16}y^8}$

21. $x^{\frac{2}{3}} \cdot x^{\frac{8}{3}}$

22. $\left(y^{-\frac{3}{5}}\right)^{-\frac{1}{4}}$

23. $w^{-\frac{7}{8}}$

24. $\dfrac{f^{-\frac{1}{4}}}{4f^{\frac{1}{2}} \cdot f^{-\frac{1}{3}}}$

25. $\dfrac{z^{\frac{4}{5}}}{z^{\frac{1}{2}}}$

26. $\dfrac{ab}{\sqrt{c}}$

27. SPORTS A volleyball has a volume of 864π cm^3. A tennis ball has a volume of 32π cm^3. By how much does the radius of the volleyball exceed that of the tennis ball? Write your answer using rational exponents.

28. CELLS The number of cells in a cell culture grows exponentially. The number of cells in the culture as a function of time is given by the expression $N\left(\frac{6}{5}\right)^t$, where t is measured in hours and N is the initial size of the culture. Write the following expressions in radical form.
 a. the number of cells after 20 minutes with N initial cells
 b. the number of cells after 44 minutes with N initial cells
 c. the number of cells after 1 hour and 15 minutes with 4000 initial cells

29. REGULARITY There are no real nth roots of a number w. What can you conclude about the index and the number w?

30. STRUCTURE Which of the following functions are equivalent? Justify your answer.
 a. $f(x) = \sqrt[3]{x^9}$ **b.** $g(x) = \sqrt{x^6}$ **c.** $r(x) = \left(\sqrt[3]{x}\right)^9$ **d.** $s(x) = \left(\sqrt{x}\right)^6$

31. WRITE Explain how it might be easier to simplify an expression using rational exponents rather than using radicals.

32. PERSEVERE Under what conditions is $\sqrt{x^2 + y^2} = x + y$ true?

33. PERSEVERE For what real values of x is $\sqrt[3]{x} > x$?

34. PERSEVERE Write an equivalent expression for $\sqrt[3]{2x} \cdot \sqrt[3]{8y}$. Simplify the radical.