Name _____ Date _____

LESSON 7.3

Practice C

For use with the lesson "Define and Use Zero and Negative Exponents"

Evaluate the expression.

1. $3^{-4} \cdot 3^{-1}$

2. $9^{-4} \cdot 9^{8}$

3. $(5^{-1})^{4}$

4. $\dfrac{1}{10^{-5}}$

5. $\dfrac{5^{-6}}{5^{-9}}$

6. $\dfrac{8^{-10}}{8^{-8}}$

7. $15\left(\dfrac{3}{5}\right)^{-1}$

8. $32\left(\dfrac{2^{-4}}{2^{3}}\right)$

9. $4 - 2 \cdot \left(\dfrac{7}{12^{0}}\right)$

Simplify the expression. Write your answer using only positive exponents.

10. $(4x^{-3}y^{4})^{-2}$

11. $\dfrac{1}{9x^{-4}y^{-8}}$

12. $\dfrac{1}{6x^{4}y^{-10}}$

13. $\dfrac{1}{(4x^{-5})^{-2}}$

14. $\dfrac{8}{(-2d^{2})^{-4}}$

15. $\dfrac{(2x)^{-4}y^{8}}{-x^{5}y^{-3}}$

16. $\dfrac{x^{-6}y^{4}}{(-3x^{2})^{-4}y^{-1}}$

17. $\dfrac{20x^{3}y^{-4}}{(2x^{-4}y^{-1})^{2}}$

18. $\dfrac{(4x^{-4}y^{7})^{2}}{24x^{-6}y^{2}}$

Tell whether the statement is *true* or *false* for all nonzero values of *a* and *b*. If it is *false*, give a counterexample.

19. $\dfrac{a^{-5}}{a^{-6}} = \dfrac{1}{a}$

20. $\dfrac{b^{-1}}{a^{-1}} = \dfrac{a}{b}$

21. $\dfrac{1}{a^{-1} + b^{-1}} = a + b$

22. **Guitar** The world's smallest guitar is only 10^{-6} meter tall. An average guitar is about 10^{0} meter tall. How many times taller is an average guitar than the world's smallest guitar?

23. **Knitting Needles** A size 1 knitting needle has a diameter of about 4^{-1} centimeter and a size 8 knitting needle has a diameter of about 2^{-1} centimeter.

a. How many times larger is the diameter of a size 8 needle than the diameter of a size 1 needle?

b. Suppose that each needle is 14 inches long. Write expressions for the approximate volume of each size of knitting needle. Use the formula for the volume of a cylinder $V = \pi r^{2}h$.

c. How many times larger is the approximate volume of a size 8 needle than the approximate volume of a size 1 needle?

d. Are your approximations in part (b) overestimates or underestimates? *Explain* your reasoning.