NAME

Module 1 Getting Ready for Algebra
Lesson 4 Simplifying Expressions with Exponents and Roots

Simplify.

1. 8^3 **512**

2. 3^4 **81**

3. 3^0 **1**

4. $\left(\frac{3}{7}\right)^2$ $\frac{9}{49}$

5. $\left(\frac{2}{3}\right)^4$ $\frac{16}{81}$

6. 21^1 **21**

7. 11^2 **121**

8. 0^6 **0**

9. $(-2)^3$ **–8**

10. $\left(-\frac{3}{4}\right)^3$ $-\frac{27}{64}$

11. $(-2)^7$ **–128**

12. $(-1)^0$ **1**

13. $(-6)^2$ **36**

14. $\left(-\frac{1}{6}\right)^3$ $-\frac{1}{216}$

15. $\sqrt{81}$ **9**

16. $\sqrt{\frac{4}{9}}$ $\frac{2}{3}$

17. $\sqrt[3]{729}$ **9**

18. $\sqrt[3]{\frac{1}{8}}$ $\frac{1}{2}$

19. $\sqrt[3]{-125}$ **–5**

20. $\sqrt{900}$ **30**

Journal

1. A student wrote the rule: $1^n = 1$, where n is any natural number. Is the student correct? Can you think of any changes that might be made to her rule? Explain.
2. Students often forget the "code" for simplifying exponential expressions and say that $b^n = b \cdot n$. Is there ever a case in which $b^n = b \cdot n$? Explain.
3. In this lesson, you learned the rule $b^0 = 1$. Write a rule for b^1. Write a rule for 0^n. Explain each rule.
4. How can you determine whether a cube root is negative or positive? Explain.
5. In the expression $(-2)^4$, why are parentheses included? What is the value of -2^4?

Cumulative Review

Complete the table by placing a check mark in each column that applies to the given number.

	Real Number	Rational Number	Integer	Whole Number	Natural Number
1. –3	✓	✓	✓		
2. 0	✓	✓	✓	✓	
3. 5.6	✓	✓			
4. 5	✓	✓	✓	✓	✓
5. $\frac{2}{5}$	✓	✓			

Simplify.

6. $(-3)(-5) =$ **15**

7. $-4 - (-4) =$ **0**

8. $13 + (-8) =$ **5**

9. $\left(\frac{2}{5}\right) - \left(-\frac{1}{2}\right) =$ **$\frac{9}{10}$**

10. $\frac{1}{8} \cdot \frac{2}{3} =$ **$\frac{1}{12}$**

Possible Journal Responses

1. **The student's rule is correct. The student could change the condition to "*n* is any *whole* number." Since whole numbers include the natural numbers and zero, the rule would still be correct. $b^0 = 1$ for any nonzero number b.**
2. **There are several cases in which $b^n = b \cdot n$. For example, $1^1 = 1 \cdot 1$, $2^2 = 2 \cdot 2$, $0^2 = 0 \cdot 2$, and others.**
3. **$b^1 = b$. The first power of a number is that number. $0^n = 0$, provided $n \neq 0$. 0^0 is undefined. If there is one or more zero factors in a product, the product is zero.**
4. **To determine whether the cube root of a number is negative or positive, look at the number under the radical. If the number is negative, its cube root is negative. If the number is positive, its cube root is positive.**
5. **The parentheses help to clarify what the base is. In the exponential expression $(-2)^4$, the base is –2. Negative two is raised to the fourth power, giving $-2 \cdot -2 \cdot -2 \cdot -2 = 16$. Without the parentheses, the base is 2, and the negative sign is applied after the exponent is applied. The value of -2^4 is $-(2 \cdot 2 \cdot 2 \cdot 2) = -16$.**