

LESSON
7-1 **Reading Strategies**
Using Patterns

Studying the patterns that are found in expressions with exponents can help you remember the rules for evaluating expressions with integer exponents.

$$\left. \begin{aligned} 3^4 &= 3 \cdot 3 \cdot 3 \cdot 3 = 81 \\ 3^3 &= 3 \cdot 3 \cdot 3 = 27 \\ 3^2 &= 3 \cdot 3 = 9 \\ 3^1 &= 3 \end{aligned} \right\}$$

Positive exponents: The answer is the base multiplied by itself the number of times identified by the exponent.

$$\left. \begin{aligned} 3^0 &= 1 \\ 3^{-1} &= \frac{1}{3} \\ 3^{-2} &= \frac{1}{3 \cdot 3} = \frac{1}{9} \\ 3^{-3} &= \frac{1}{3 \cdot 3 \cdot 3} = \frac{1}{27} \\ 3^{-4} &= \frac{1}{3 \cdot 3 \cdot 3 \cdot 3} = \frac{1}{81} \end{aligned} \right\}$$

Zero exponent: The answer is always 1 (if the base is not 0; $0^0 = 0$).

Negative exponents: The answer is the *reciprocal* of the same expression with a positive exponent.

Note that the rules are the same when the base is a variable:

$$b^3 = b \cdot b \cdot b \qquad g^0 = 1 \qquad k^{-5} = \frac{1}{k^5} \qquad \frac{1}{m^{-3}} = m^3$$

Answer each question.

1. What is the base of the expression 6^{-4} ? _____
2. What number can go in the box to make a true statement: $5^{\square} = 1$? _____
3. Write the expression $\frac{1}{8^3}$ with a negative exponent. _____
4. What is the *reciprocal* of b^7 ? _____

Simplify each expression.

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|---------------------|-----------------------|
| 5. 2^5 _____ | 6. 2^{-5} _____ |
| 7. 7^0 _____ | 8. 10^{-6} _____ |
| 9. $(-4)^3$ _____ | 10. $(-4)^{-3}$ _____ |
| 11. t^{-4} _____ | 12. c^2d^{-3} _____ |
| 13. $8x^{-5}$ _____ | 14. $12r^0$ _____ |