Guided Practice

Check ✓

Simplify using the Laws of Exponents. (Examples 1–6)

1. $4^5 \cdot 4^3 =$ **4^8 or 65,536**

2. $-2a(3a^4) =$ **$-6a^5$**

3. $\dfrac{y^8}{y^5} =$ **y^3**

4. $\dfrac{24k^9}{6k^6} =$ **$4k^3$**

5. $\dfrac{2^2 \cdot 3^3 \cdot 4^5}{2 \cdot 3 \cdot 4^4} =$ **$2 \cdot 3^2 \cdot 4$ or 72**

6. $\dfrac{(-3)^4 \cdot (-4)^3 \cdot 5^2}{(-3)^2 \cdot (-4) \cdot 5} =$

$(-3)^2 \cdot (-4)^2 \cdot 5$ or 720

7. The table shows the number of people worldwide that speak certain languages. How many times as many people speak French than Sicilian?

2^4 or 16 times

Language	Total (millions)
French	2^6

26

anything.

7. The table shows the number of people worldwide that speak certain languages. How many times as many people speak French than Sicilian?

(Example 7) 2^4 **or 16 times**

Language	Total (millions)
French	2^6
Sicilian	2^2

8. (e) **Building on the Essential Question** How can I use the properties of integer exponents to simplify algebraic and numeric expressions? **Sample answer:**
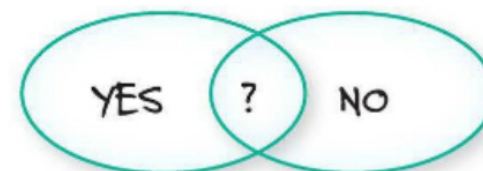
If multiplication or division expressions contain powers

with the same base, you can use the properties to

simplify before you multiply or divide.

Rate Yourself!

Are you ready to move on? Shade the section that applies.

YES   ?   NO

For more help, go online to access a Personal Tutor.

Tutor

FOLDABLES Time to update your Foldable!

Independent Practice

Simplify using the Laws of Exponents. (Examples 1–6)

1. $(-6)^2 \cdot (-6)^5 =$ **$(-6)^7$ or $-279{,}936$**

2. $-4a^5(6a^5) =$ **$-24a^{10}$**

3. $(-7a^4bc^3)(5ab^4c^2) =$ **$-35a^5b^5c^5$**

4. $\dfrac{8^{15}}{8^{13}} =$ **8^2 or 64**

5. $\dfrac{16t^4}{8t} =$ **$2t^3$**

6. $\dfrac{x^6y^{14}}{x^4y^9} =$ **x^2y^5**

7. $\dfrac{3^4x^4}{3x^2} =$ **3^3x^2 or 2**

27

5. $\dfrac{16t^4}{8t} = $ **2t³**

6. $\dfrac{x^6y^{14}}{x^4y^9} = $ **x²y⁵**

7. $\dfrac{3^4x^4}{3x^2} = $ **3³x² or 27x²**

8. $\dfrac{4^5 \cdot 5^3 \cdot 6^2}{4^4 \cdot 5^2 \cdot 6} = $ **4 · 5 · 6 or 120**

9. $\dfrac{6^3 \cdot 6^6 \cdot 6^4}{6^2 \cdot 6^3 \cdot 6^3} = $ **6⁵ or 7,776**

10. $\dfrac{(-2)^5 \cdot (-3)^4 \cdot (-5)^3}{(-2)^3 \cdot (-3) \cdot (-5)^2} = $ **(−2)² · (−3)³ · (−5) or 540**

11. The processing speed of a certain computer is 10^{11} instructions per second. Another computer has a processing speed that is 10^3 times as fast. How many instructions per second can the faster computer process? (Example 7)

10¹⁴ instructions

12. The table shows the seating capacity of tw different facilities. About how many times great is the capacity of Madison Square Garden in New York than a typical movie theater? (Example 7)

3⁴ or 81 times

	Seating

or 540

11 The processing speed of a certain computer is 10^{11} instructions per second. Another computer has a processing speed that is 10^3 times as fast. How many instructions per second can the faster computer process? (Example 7)

10^{14} **instructions**

12. The table shows the seating capacity of tw different facilities. About how many times great is the capacity of Madison Square Garden in New York than a typical movie theater? (Example 7)

3^4 **or 81 times**

Place	Seating Capacity
Movie theater	3^5
Madison Square Garden	3^9

Lesson 3 Multiply and Divide Monomials

13. Refer to the information in the table.

a. How many times as great is one quadrillion than one million?

10^9 **times greater**

b. One quintillion is one trillion times as great as what number?

10^6 **or one million**

Power of Ten	U.S. Name
10^3	one thousand
10^6	one million
10^9	one billion
10^{12}	one trillion
10^{15}	one quadrillio
10^{18}	one quintillion

(MP) Persevere with Problems Find each missing exponent.

14. $(6^{\circ})(6^3) = 6^5$ **2**

15. $3x^{\circ} \cdot 4x^3 = 12x^{12}$ **9**

16. $p^3 \cdot p^{\circ} \cdot p^2 = p^9$ **4**

17. $\dfrac{3^{\circ}}{3^2} = 3^4$ **6**

18. $\dfrac{5^9}{5^{\circ}} = 5^4$ **5**

19. $2x^{\circ} \cdot \dfrac{3x^2}{x^6} = 6x^3$ **7**

$2x^{?} \cdot 3x^2$

x^6

20. **MP Identify Structure** Write a multiplication expression with a product of 5^{13}.

Sample answer: $5^{10} \cdot 5^3$

21. **MP Justify Conclusions** Is $\dfrac{3^{100}}{3^{99}}$ greater than, less than, or equal to 3?

Explain your reasoning to a classmate. **equal; Sample answer: Using the quotient of powers, $\dfrac{3^{100}}{3^{99}} = 3^{100-99}$ or 3^1, which is 3.**

22. **MP Persevere with Problems** What is twice 2^{30}? Write using exponents. Explain your reasoning.

2^{31}; $2 \cdot 2^{30} = 2^{31}$

23. **MP Use a Counterexample** Determine whether the statement below is true or false. If *true*, explain your reasoning. If *false*, give a counterexample.

For any integer a, $(-a)^2 = -a^2$.

false; Sample answer: If $a = 3$, then $(-3)^2 = 9$, but $-3^2 = -9$.