NAME _____ DATE _____

4-8 Multiplying and Dividing Monomials (Pages 205–209)

You can multiply and divide numbers with exponents (or powers) if they have the same base.

Multiplying and Dividing Powers	• To find the product of powers *that have the same base*, add their exponents. $a^m \cdot a^n = a^{m+n}$ • To find the quotient of powers *that have the same base*, subtract their exponents. $a^m \div a^n = a^{m-n}$

EXAMPLES

A Find $2^5 \cdot 2^3$.

Follow the pattern of $a^m \cdot a^n = a^{m+n}$. Notice that both factors have the same base, 2. Therefore 2 is also the base of the answer.

$2^5 \cdot 2^3 = 2^{5+3}$ *or* 2^8

B Find $\frac{b^8}{b^2}$.

Follow the pattern of $a^m \div a^n = a^{m-n}$. Notice that both factors have the same base, b. Therefore the base of the answer is also b.

$\frac{b^8}{b^2} = b^{8-2}$ *or* b^6

Try These Together

1. Find $x \cdot x^3$. Express your answer in exponential form.

HINT: $x = x^1$

2. Find $\frac{9^{10}}{9^6}$. Express your answer in exponential form.

HINT: The answer will have a base of 9.

PRACTICE

Find each product or quotient. Express your answer in exponential form.

3. $m^4 \cdot m^3$

4. $(p^{12}q^5)(p^3q^3)$

5. $(2y^7)(5y^2)$

6. $(12x^7)(x^{11})$

7. $8^6 \div 8^2$

8. $\frac{15^7}{15^2}$

9. $n^{18} \div n^9$

10. $\frac{x^3y^{10}}{x^3y^4}$

11. $\frac{r^{50}}{r}$

12. $\frac{9m^{11}}{3m^5}$

13. $\frac{12t^4}{4t^3}$

14. $(x^8 \cdot x^7) \div x^3$

Find each missing exponent.

15. $(y^?)(y^4) = y^{10}$

16. $\frac{20^{15}}{20^?} = 20^5$

17. History The Italian mathematician Pietro Cataldi, born in 1548, wrote exponents differently from the way they are written today. For example, he wrote $5\overset{2}{|}$ for $5x^2$ and $5\overset{3}{|}$ for $5x^3$. How do you think he would have written the answer to $6x^3 \cdot x^4$?

18. **Standardized Test Practice** Simplify the expression $p^6q^4r^{10} \cdot p^2qr^5$.

A $p^8q^5r^{15}$ **B** $p^3q^4r^2$ **C** $p^8q^4r^{15}$ **D** $p^4q^3r^5$

Answers: **1.** x^4 **2.** 9^4 **3.** m^7 **4.** $p^{15}q^8$ **5.** $10y^9$ **6.** $12x^{18}$ **7.** 8^4 **8.** 15^5 **9.** n^9 **10.** y^6 **11.** r^{49} **12.** $3m^6$ **13.** $3t$ **14.** x^{12} **15.** 6 **16.** 10 **17.** $6\overset{4}{|}$ **18.** A