

Multiplying and Dividing Powers

(Pages 341–345)

Product of Powers	You can multiply powers with the same base by adding exponents. For any number a , and all integers m and n , $a^m \cdot a^n = a^{m+n}$.
Quotient of Powers	You can divide powers with the same base by subtracting exponents. For all integers m and n and any nonzero number a , $\frac{a^m}{a^n} = a^{m-n}$.
Zero Exponent	For any nonzero number a , $a^0 = 1$.

EXAMPLES

Simplify each expression.

A $4x^2(5x^3)$

$$\begin{aligned} 4x^2(5x^3) &= (4 \cdot 5)(x^2x^3) \\ &= 20x^{2+3} \\ &= 20x^5 \end{aligned}$$

B $\frac{a^6b^9}{a^2b^5}$

$$\begin{aligned} \frac{a^6b^9}{a^2b^5} &= \left(\frac{a^6}{a^2}\right)\left(\frac{b^9}{b^5}\right) \\ &= (a^{6-2})(b^{9-5}) \\ &= a^4b^4 \end{aligned}$$

Try These Together

1. Simplify $3g^3(-6g^2h)$.

HINT: Add exponents.

2. Simplify $\frac{x^5y^2z}{x^3y^2}$.

HINT: Subtract exponents. Any nonzero number raised to the zero power is equal to 1.

PRACTICE

Simplify each expression.

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|--|-------------------------------------|-----------------------------------|------------------------------|
| 3. $a^7(a)(a^2)$ | 4. $(g^2h)(gh^4)$ | 5. $(c^5d)(c^3d^5)$ | 6. $\frac{a^2b^9}{a^2b^8}$ |
| 7. $(2m^2n^8)(2mn^9)$ | 8. $8^3 \cdot 8^6$ | 9. $g^5(g^3s^3)$ | 10. $(3abc)(6ab^2c^2)$ |
| 11. $\frac{16x^6y^7z^8}{-2x^4y^4z^0}$ | 12. $(xy)(xz)(yz)$ | 13. $\frac{4r^2}{2r^2}$ | 14. $\frac{-42k^6}{-7k^5}$ |
| 15. $\frac{63a^2b}{-9a}$ | 16. $(-2xy)(6y^8)$ | 17. $m^0(m^2n)$ | 18. $\frac{c^4d^3}{c^4d^3}$ |
| 19. $\left(\frac{1}{3}p^3\right)(9pr^2)$ | 20. $\frac{28a^3b^7c^2}{-4a^2b^5c}$ | 21. $\frac{-30x^2y^3z}{-15x^2yz}$ | 22. $\frac{-18rs^2t^4}{3st}$ |



23. Standardized Test Practice Simplify $(a^2b)(ab^2)$.

A ab

B a^3b^3

C a^4b

D a^2b^2

Answers: 1. $-18g^5h$ 2. x^2z 3. a^{10} 4. g_3h_5 5. c_8d_6 6. b 7. $4m^3n^7$ 8. 8^9 9. g_8s_3 10. $18a_2b_3c_3$ 11. $-8x^2y^3z^8$ 12. $x^2y^2z^2$ 13. 2 14. $6k$ 15. $-7ab$ 16. $-12xy^9$ 17. m^2n 18. 1 19. $3p^4r^2$ 20. $-7ab^2c$ 21. $2y^2$ 22. $-6rs^2t^4$ 23. B