

Algebra I  
Section 7.2 Notes  
Multiplying Powers with the Same Base

Name: Key

**Key Definitions:**

What is another way of writing  $3^4 \cdot 3^2$ ?

$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$$

1. When multiplying powers with the same base, you can simplify the exponents by adding them together.

Ex. Simplify  $5^2 \cdot 5^5$

$$5^7$$

Simplify  $x^5 \cdot x^{-3}$

$$x^2$$

2. When simplifying algebraic expressions, combine like terms, then simplify.

Ex. Simplify  $4z^5 \cdot 9z^2$

$$(4 \cdot 9)(z^5 \cdot z^2) = 36z^7$$

Simplify  $2a \cdot 9b^4 \cdot 3a^2$

$$(2 \cdot 9 \cdot 3)(a^1 \cdot a^2)(b^4) = 54a^3b^4$$

3. When simplifying expressions with rational exponents (fractions), just plug into your calculator but make sure you use parenthesis!

Ex. Simplify  $16^{\frac{1}{4}}$

$$= 2$$

Simplify  $27^{\frac{1}{3}}$

$$= 3$$

**Practice Problems**

Rewrite each expression using each base only once.

1.  $6^3 \cdot 6^8$

$$= 6^{11}$$

2.  $(-2)^2 \cdot (-2)^5$

$$= (-2)^7$$

3.  $3^{-5} \cdot 3^3 \cdot 3^{-2}$

$$= 3^{-4} = \frac{1}{3^4}$$

Simplify each expression.

4.  $m^5 \cdot m^7$

$$= m^{12}$$

5.  $3z^3 \cdot z^7$

$$= 3z^{10}$$

6.  $2c^{-2} \cdot 3c^6$

$$= (2 \cdot 3)(c^{-2} \cdot c^6) = 6c^4$$

7.  $(s^6t^2)(s^{-5}t^6)$

$$= (s^6 \cdot s^{-5})(t^2 \cdot t^6) = s^1t^8$$

8.  $(3x^8)(5y^2)(2x^5)$

$$= (3 \cdot 5 \cdot 2)(x^8 \cdot x^5)(y^2) = 30x^{13}y^2$$

9.  $-4g^{-4} \cdot h^5 \cdot 5h^{-7} \cdot 2g^2$

$$= (-4 \cdot 5 \cdot 2)(g^{-4} \cdot g^2)(h^5 \cdot h^{-7}) = -40g^{-2}h^{-2} = \frac{-40}{g^2h^2}$$

$$10. 16^{\frac{1}{4}}$$

$$= (2)$$

$$11. 125^{\frac{1}{3}}$$

$$= (5)$$

$$12. 169^{\frac{1}{2}}$$

$$= (13)$$

$$13. 343^{\frac{2}{3}}$$

$$= (49)$$

$$14. 64^{\frac{4}{3}}$$

$$= (256)$$

$$15. 25^{\frac{3}{2}}$$

$$= (125)$$

$$16. x^{\frac{1}{2}} \cdot x^{\frac{5}{2}}$$

$$\frac{1}{2} + \frac{5}{2} = \frac{6}{2} = 3$$

$$= (x^3)$$

$$17. s^{\frac{2}{3}} \cdot t^4 \cdot s^{\frac{2}{3}}$$

$$\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$$

$$= (t^4 s^{\frac{4}{3}})$$

$$18. 5q^{\frac{5}{6}} \cdot 2r^{-2} \cdot q^{\frac{1}{12}}$$

$$\frac{5}{6} + \frac{1}{12} = \frac{10}{12} + \frac{1}{12} = \frac{11}{12}$$

$$= (5 \cdot 2)(q^{\frac{11}{12}})(r^{-2})$$

$$= \frac{10q^{\frac{11}{12}}}{r^2}$$

$$19. (-2x^{\frac{3}{4}} \cdot 3y^{\frac{1}{2}})(x^{\frac{5}{8}} \cdot 3y^{\frac{5}{8}})$$

$$\frac{3}{4} + \frac{5}{8} = \frac{6}{8} + \frac{5}{8} = \frac{11}{8}$$

$$\frac{1}{2} + \frac{5}{8} = \frac{4}{8} + \frac{5}{8} = \frac{9}{8}$$

$$= (-2 \cdot 3 \cdot 3)(x^{\frac{11}{8}})(y^{\frac{9}{8}})$$

$$= (-18x^{\frac{11}{8}}y^{\frac{9}{8}})$$

$$20. (5s^2)(-3r^{\frac{3}{5}})(s^{-5})$$

$$= (5 \cdot -3)(5^2 \cdot s^{-5})(r^{\frac{3}{5}})$$

$$= -15s^{-3}r^{\frac{3}{5}}$$

$$= \frac{-15r^{\frac{3}{5}}}{s^3}$$

$$21. (g^3 \cdot 3h^{\frac{3}{2}})(5h^{\frac{5}{4}} \cdot 2g^{-5})$$

$$\frac{3}{2} + \frac{5}{4} = \frac{6}{4} + \frac{5}{4} = \frac{11}{4}$$

$$= (3 \cdot 5 \cdot 2)(g^3 g^{-5})(h^{\frac{11}{4}})$$

$$= 30g^{-2}h^{\frac{11}{4}}$$

$$= \frac{30h^{\frac{11}{4}}}{g^2}$$

Complete each equation by finding the value of x.

$$22. 3^x \cdot 3^5 = 3^9$$

$$x = 4$$

$$23. m^{-5} \cdot m^x = m^{-13}$$

$$-5 + x = -13$$

$$x = -8$$

$$24. 5^8 \cdot 5^x \cdot 5^{-4} = 5^{-3}$$

$$8 + x - 4 = -3$$

$$x = -7$$

$$25. s^{\frac{1}{2}} \cdot s^x = s^{\frac{5}{2}}$$

$$\frac{1}{2} + x = \frac{5}{2}$$

$$x = \frac{4}{2} = 2$$

$$26. 8^{\frac{2}{3}} \cdot 8^{\frac{4}{3}} \cdot 8^x = 8^3$$

$$\frac{2}{3} + \frac{4}{3} + x = 3$$

$$\frac{6}{3} + x = 3$$

$$2 + x = 3$$

$$x = 1$$

$$27. t^{\frac{1}{2}} \cdot t^x = t^{\frac{3}{4}}$$

$$\frac{1}{2} + x = \frac{3}{4}$$

$$x = \frac{1}{4}$$

$$28. b^x \cdot c^{-5} \cdot b^3 = \frac{1}{c^5} = c^{-5}$$

$$x = -3$$

$$29. 4^{-2} \cdot 7^3 \cdot 4^x = 7^3$$

$$-2 + x = 0$$

$$x = 2$$

$$30. q^4 \cdot r^x \cdot r^{\frac{1}{2}} \cdot q^2 = q^6 r^1$$

$$4 + x + \frac{1}{2} = 6 + 1$$

$$x = \frac{1}{2}$$