

Sec. 7.3 More Multiplication Properties of Exponents

Power of a Power

$$(a^m)^n = a^{mn}$$

$$(5^4)^2 = (5^4)(5^4) = 5^{4+4} = 5^8$$

$$\left(a^{\frac{3}{2}}\right)^3 = a^{\frac{3}{2} \cdot \frac{3}{1}} = a^{\frac{9}{2}}$$

Product to a Power

$$(ab)^n = a^n b^n$$

$$\begin{aligned}(4x)^3 &= (4x)(4x)(4x) = 4 \cdot 4 \cdot 4 \cdot x \cdot x \cdot x \\ &= 4^3 x^3 = 64x^3\end{aligned}$$

$$(4b)^{\frac{3}{2}} = 4^{\frac{3}{2}} b^{\frac{3}{2}} = 8b^{\frac{3}{2}}$$

$$\textcircled{2} \textcircled{2} (2 \cdot 2)^{\frac{3}{2}} = 2^3 = 8$$

Combined:

$$\begin{aligned}(2^1 x^1 y^3 z^4)^2 &= 2^2 x^2 (y^3)^2 (z^4)^2 \\ &= 4x^2 y^6 z^8\end{aligned}$$

Problem 1: Simplify

a. $(b^3)^5 = b^{15}$

b. $(p^4)^6 = p^{24}$

c. $(p^{\frac{1}{2}})^{\frac{1}{4}} = p^{\frac{1}{8}}$

Problem 2: Simplify

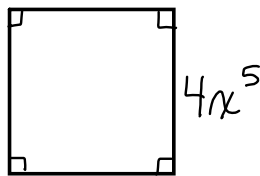
a. $h^{-2}(h^4)^{-3} = h^{-2}h^{-12} = h^{-14} = \frac{1}{h^{14}}$

b. $x^2(x^6)^{-4} = x^2x^{-24} = x^{-22} = \frac{1}{x^{22}}$

c. $w^{-2}(w^{\frac{5}{3}})^3 = w^{-2}w^5 = w^3$

Problem 3: Find the area of the square.

a.



$$A = s^2$$

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

$$= 4^2(x^5)^2$$

$$= 16x^{10}$$

b. Simplify $(3g^4)^{-2} = 3^{-2}(g^4)^{-2}$

$$\frac{1}{(3g^4)^2}$$

$$\frac{1}{3^2(g^4)^2}$$

$$\frac{1}{9g^8}$$

$$3^{-2}g^{-8}$$

$$= \frac{1}{3^2g^8} = \frac{1}{9g^8}$$

Problem 4: Simplify

$$a. (b^{\frac{1}{3}})^6 (2ab^{-\frac{1}{2}})^4$$

$$b^2 (2^4 a^4 (b^{-\frac{1}{2}})^4)$$

$$b^2 (16a^4 b^{-2})$$

$$16a^4 \boxed{b^2 b^{-2}} \quad b^0 = 1$$

$$16a^4$$

Problem 5: Volume of a sphere: $V = \frac{4}{3}\pi r^3$

What is the volume of a sphere with a radius of 10^2 millimeters?

$$V = \frac{4}{3}\pi r^3 \quad r = 10^2$$

$$V = \frac{4}{3}\pi (10^2)^3 = \left(\frac{4}{3} \times 10^6\right)\pi$$