

7.2 Exponents as fractions

* Review :

* \sqrt{n} can also be written as $\sqrt[2]{n}$

* $\sqrt[3]{n}$ means cube root of "n"

* $\sqrt[4]{n}$ means 4th root of "n"

* $\sqrt[2]{4} = 2$

* $\sqrt[3]{8} = 2$

* $\sqrt[4]{1296} = 6$

* Rational Exponents :

* all exponents as fractions can be converted to radical form

where

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

* $\sqrt[2]{4} = 4^{\frac{1}{2}} = 2$

* $\sqrt[3]{8} = 8^{\frac{1}{3}} = 2$

* $\sqrt[4]{1296} = 1296^{\frac{1}{4}} = 6$

* Both forms are interchangeable depending on the problem

* write your final answer without the radical

* Review Problem 4 on pg. 428

* Got it? #4

A) $16^{\frac{1}{4}} = \sqrt[4]{16} = 2$ what raised to the 4th power is 16?

B) $27^{\frac{1}{3}} = \sqrt[3]{27} = 3$ what raised to the 3rd power is 27?

C) $64^{\frac{1}{2}} = \sqrt{64} = 8$ what raised to the 2nd power is 64?

* Simplifying Expressions with Radical Exponents (when the numerator of your exponent is NOT 1)

* $\sqrt[n]{a}$ can also be written $(\sqrt[n]{a})^1$

* $\sqrt[3]{4^3}$ " " $(\sqrt[3]{4})^3$

* to simplify $(\sqrt[3]{4})^3 = (\sqrt[3]{4}) \cdot (\sqrt[3]{4}) \cdot (\sqrt[3]{4})$

$$\begin{aligned} & \text{or} \\ 4^{\frac{3}{3}} &= 4^{\frac{1}{3}} \cdot 4^{\frac{1}{3}} \cdot 4^{\frac{1}{3}} \\ &= 4^{\frac{3}{3}} \\ &= 4^1 \end{aligned}$$

* Review Problem 5 on pg. 428

* Got it? #5

a) $25^{\frac{3}{2}} = 25^{\frac{1}{2}} \cdot 25^{\frac{1}{2}} \cdot 25^{\frac{1}{2}} = 5 \cdot 5 \cdot 5 = 125$

OR
 $\sqrt{25^3} = (\sqrt{25})^3 = \sqrt{25} \cdot \sqrt{25} \cdot \sqrt{25} = 5 \cdot 5 \cdot 5 = 125$

b) $27^{\frac{2}{3}} = 27^{\frac{1}{3}} \cdot 27^{\frac{1}{3}} = 3 \cdot 3 = 9$

OR
 $\sqrt[3]{27^2} = (\sqrt[3]{27})^2 = \sqrt[3]{27} \cdot \sqrt[3]{27} = 3 \cdot 3 = 9$

c) $16^{\frac{3}{4}} = 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} \cdot 16^{\frac{1}{4}} = 2 \cdot 2 \cdot 2 = 8$

OR
 $\sqrt[4]{16^3} = (\sqrt[4]{16})^3 = \sqrt[4]{16} \cdot \sqrt[4]{16} \cdot \sqrt[4]{16} = 2 \cdot 2 \cdot 2 = 8$

* Review Problem 6 on pg. 429

* Got it? # 6

A) $2c^{\frac{3}{5}} \cdot 2c^{\frac{1}{5}}$

$4c^{\frac{4}{5}}$

B) $n^{\frac{1}{3}} \cdot n^{\frac{4}{3}}$

$n^{\frac{5}{3}}$

C) $(b^{\frac{2}{3}} \cdot c^{\frac{2}{5}})(b^{\frac{1}{3}} \cdot c^{\frac{9}{10}})$

$(b^{\frac{2}{3}} \cdot b^{\frac{1}{3}})(c^{\frac{2}{5}} \cdot c^{\frac{9}{10}})$

$(b^{\frac{6}{6}} \cdot b^{\frac{2}{6}})(c^{\frac{4}{10}} \cdot c^{\frac{9}{10}})$

$b^{\frac{8}{6}} c^{\frac{13}{10}}$

D) $(3j^{\frac{2}{3}} \cdot 7m^{\frac{1}{4}})(3j^{\frac{1}{6}} \cdot 7m^{\frac{3}{4}})$

$(3j^{\frac{2}{3}} \cdot 3j^{\frac{1}{6}})(7m^{\frac{1}{4}} \cdot 7m^{\frac{3}{4}})$
 $(9j^{\frac{4}{6}} \cdot j^{\frac{1}{6}})(49m^{\frac{1}{4}} \cdot m^{\frac{3}{4}})$
 $9j^{\frac{5}{6}}(49m^{\frac{7}{4}})$

$441j^{\frac{5}{6}}m^{\frac{7}{4}}$

7.2 wksht # 18-32 all &
44-48 all

$$18) 16^{\frac{1}{4}} = \sqrt[4]{16} = 2$$

$$19) 125^{\frac{1}{3}} = \sqrt[3]{125} = 5$$

$$20) 243^{\frac{1}{5}} = \sqrt[5]{243} = 3$$

$$21) 8^{\frac{2}{3}} = \sqrt[3]{8} \cdot \sqrt[3]{8}$$

2 · 2

$$4$$

$$22) 64^{\frac{4}{3}} = \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64}$$

4 · 4 · 4 · 4

16 · 16

$$256$$

$$23) 25^{\frac{3}{2}} = \sqrt{25} \cdot \sqrt{25} \cdot \sqrt{25}$$

5 · 5 · 5

$$125$$

$$24) (7q^{\frac{4}{3}} \cdot 6r^{\frac{3}{5}})(7q^{\frac{1}{3}} \cdot 6r^{\frac{1}{5}})$$

$$(7 \cdot 6 \cdot 7 \cdot 6)(q^{\frac{4}{3}} \cdot q^{\frac{1}{3}})(r^{\frac{3}{5}} \cdot r^{\frac{1}{5}})$$

$$1,764 (q^{\frac{5}{3}})(r^{\frac{4}{5}})$$

$$= 1,764 q^{\frac{5}{3}} r^{\frac{4}{5}}$$

$$25) (3h^{\frac{5}{2}} \cdot 2K^{\frac{3}{4}})(2K^{\frac{5}{2}} \cdot 3h^{\frac{5}{4}})$$

$$(3 \cdot 2 \cdot 2 \cdot 3)(h^{\frac{5}{2}} \cdot h^{\frac{5}{4}})(K^{\frac{3}{4}} \cdot K^{\frac{5}{2}})$$

$$36(h^{\frac{10}{4}} h^{\frac{5}{4}})(K^{\frac{3}{4}} \cdot K^{\frac{6}{4}})$$

$$36h^{\frac{15}{4}} K^{\frac{9}{4}}$$

$$26) (8p^{\frac{1}{2}} \cdot 5m^{\frac{1}{2}})(8p^{\frac{1}{4}} \cdot 5m^{\frac{5}{2}})$$

$$(8 \cdot 5 \cdot 8 \cdot 5)(p^{\frac{1}{2}} \cdot p^{\frac{1}{4}})(m^{\frac{1}{2}} \cdot m^{\frac{5}{2}})$$

$$1600(p^{\frac{2}{12}} \cdot p^{\frac{3}{12}})(m^{\frac{6}{4}} \cdot m^{\frac{5}{6}})$$

$$1600p^{\frac{5}{12}} m^{\frac{8}{6}}$$

$$= 1600m^{\frac{4}{3}} p^{\frac{5}{12}}$$

27)

$$9^{-2} \cdot 9^4 = 9^{\square}$$

$$-2 + 4 = \square$$

$$2 = \square$$

$$9^{-2} \cdot 9^4 = 9^2$$

$$28) 5^{\square} \cdot 5^3 = 5^2$$

$$\square + 3 = 2$$

$$-3 \quad -3$$

$$5^{-1} \cdot 5^3 = 5^2$$

$$\square = -1$$

$$29) 2^8 \cdot 2^{\square} = 2^{-2}$$

$$8 + \square = -2$$

$$\begin{array}{r} -8 \\ -8 \end{array}$$

$$2^8 \cdot 2^{-10} = 2^{-2}$$

$$\square = -10$$

$$30) z^{\square} \cdot z^{-5} = z^3$$

$$\square - 5 = 3$$

$$\begin{array}{r} +5 \\ +5 \end{array}$$

$$z^8 \cdot z^{-5} = z^3$$

$$\square = 8$$

$$31) m^{\frac{1}{3}} \cdot m^{\frac{1}{6}} \cdot m^{\square} = m^2$$

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

$$m^{\frac{1}{3}} \cdot m^{\frac{1}{6}} \cdot m^{\frac{3}{2}} = m^2$$

$$\frac{2}{6} + \frac{1}{6} + \square = 2$$

$$\frac{3}{6} + \square = 2$$

$$\begin{array}{r} -\frac{3}{6} \\ -\frac{3}{6} \end{array}$$

$$\square = \frac{12}{6} - \frac{3}{6}$$

$$\square = \frac{9}{6} \text{ or } \frac{3}{2}$$

$$32) d^7 \cdot d^{-13} \cdot d^{-9} = d^{\square}$$

$$d^7 \cdot d^{-13} \cdot d^{-9} = d^{-15}$$

$$7 + -13 + -9 = \square$$

$$\begin{array}{r} -6 + -9 = \square \end{array}$$

$$\underline{-15 = \square}$$

$$44) \frac{1}{n^{-8} \cdot n^3}$$

$$\frac{n^8}{n^3} \text{ or } n^5$$

$$48) 4^x \cdot 4^{x+1} \cdot 4$$

$$4^{(x+x+1+1)}$$

*combine like terms

$$4^{2x+2}$$

$$45) \frac{1}{x^4 \cdot x^{-9}}$$

$$\frac{x^9}{x^4} \text{ or } x^5$$

$$49) (n+2)^5 (n+2)^{-3}$$

$$(n+2)^2$$

or

$$(n+2)(n+2)$$

or

$$n^2 + 4n + 4$$

$$46) 7k^4(-2k^6 - k)$$

$$(-14k^{10}) - (7k^5)$$

$$-14k^{10} - 7k^5$$

$$47) -2x^2(-3x^{\frac{1}{2}} + 5)$$

$$(6x^{\frac{3}{2}}) - (10x^2)$$

$$6x^{\frac{3}{2}} - 10x^2$$

7.2 textbook pg. 430 # 22-30

$$22) 8^{\frac{1}{3}} = \sqrt[3]{8} = 2$$

$$23) 625 = \sqrt[4]{625} = 5$$

$$24) 1,000^{\frac{1}{3}} = \sqrt[3]{1,000} = 10$$

$$25) 16^{\frac{3}{4}} = \sqrt[4]{16} \cdot \sqrt[4]{16} \cdot \sqrt[4]{16}$$
$$2 \cdot 2 \cdot 2$$
$$8$$

$$26) 9^{\frac{5}{2}} = \sqrt[2]{9} \cdot \sqrt[2]{9} \cdot \sqrt[2]{9} \cdot \sqrt[2]{9} \cdot \sqrt[2]{9}$$
$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$$
$$243$$

$$27) 64^{\frac{7}{3}} = \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64} \cdot \sqrt[3]{64}$$
$$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$$
$$4^7$$
$$16,384$$

$$28) (8b^{\frac{2}{3}} \cdot 9t^{\frac{1}{5}})(8b^{\frac{5}{3}} \cdot 9t^{\frac{3}{5}})$$

$$(8 \cdot 9 \cdot 8 \cdot 9)(b^{\frac{2}{3}} \cdot b^{\frac{5}{3}})(t^{\frac{1}{5}} \cdot t^{\frac{3}{5}})$$

$$5,184 b^{\frac{7}{3}} t^{\frac{4}{5}}$$

$$29) (7d^{\frac{2}{3}} \cdot 2g^{\frac{5}{6}})(2g^{\frac{3}{2}} \cdot 7d^{\frac{5}{6}})$$

$$(7 \cdot 2 \cdot 2 \cdot 7)(d^{\frac{3}{2}} \cdot d^{\frac{5}{6}})(g^{\frac{5}{6}} \cdot g^{\frac{3}{2}})$$

$$196(d^{\frac{9}{6}} \cdot d^{\frac{5}{6}})(g^{\frac{5}{6}} \cdot g^{\frac{9}{6}})$$

$$196d^{\frac{14}{6}}g^{\frac{14}{6}}$$

$$196d^{\frac{7}{3}}g^{\frac{7}{3}}$$

$$30) (4r^{\frac{2}{5}} \cdot 5s^{\frac{2}{7}})(5s^{\frac{5}{7}} \cdot 4r^{\frac{3}{5}})$$

$$(4 \cdot 5 \cdot 5 \cdot 4)(r^{\frac{2}{5}} \cdot r^{\frac{3}{5}})(s^{\frac{2}{7}} \cdot s^{\frac{5}{7}})$$

$$400(r^{\frac{5}{5}})(s^{\frac{7}{7}})$$

$$400rs$$