4.3

#18. $6\sqrt[4]{3} \times 6^4$

$\sqrt[4]{?} = 6$

$\sqrt[4]{6^4} = 6$

$= \sqrt[4]{3 \times 1296}$

$= \boxed{\sqrt[4]{3888}}$

#17. a) $\sqrt[4]{48}$

$= \sqrt[4]{16 \times 3}$

$= \sqrt[4]{16} \times \sqrt[4]{3}$

$= 2\sqrt[4]{3}$

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$\sqrt{\frac{2}{3}}$ = yes

$= \frac{\sqrt{2}}{\sqrt{3}}$

$\sqrt{\sqrt{2}}$ = irrational

NO

#12. a) $3\sqrt{2} \times 3^2$

$= \sqrt{18}$

i) $5\sqrt[3]{2} \times 5^3$

$= \sqrt[3]{2 \times 5^3}$

$= \sqrt[3]{250}$

perfect 4th roots
$\left\{ \begin{array}{l} \cancel{1^4 = 1} \\ 2^4 = 16 \\ \cancel{3^4 = 81} \end{array} \right.$

10 c) $\sqrt{108} = \sqrt{36 \times 3}$

$= 6\sqrt{3}$

$= \sqrt{4 \times 27}$

$= \sqrt{4} \times \sqrt{27}$

$= 2\sqrt{27} = 2\sqrt{9 \times 3}$

$= 2 \times \sqrt{9} \times \sqrt{3}$

$= 2 \times 3 \times \sqrt{3}$

$= \boxed{6\sqrt{3}}$

4.4 Rational Exponents and Radicals

Recall:

$(x^a)(x^b) = x^{a+b}$ $\qquad$ $\dfrac{(x^a)}{(x^b)} = x^{a-b}$ $\qquad$ $(x^a)^b = x^{a \cdot b}$

Consider the following:

$(5^{1/2})(5^{1/2})$ $\qquad$ and $\qquad$ $(\sqrt{5})(\sqrt{5})$

$= 5^{\frac{1}{2}+\frac{1}{2}}$ $\qquad$ $= \sqrt{5 \cdot 5}$

$= 5^{2/2} = 5^1$ $\qquad$ $= \sqrt{25}$

$\qquad$ $= 5$

$$\boxed{\therefore 5^{1/2} = \sqrt{5}}$$

Similarly:

$(5^{1/3})(5^{1/3})(5^{1/3})$ $\qquad$ and $\qquad$ $(\sqrt[3]{5})(\sqrt[3]{5})(\sqrt[3]{5})$

$5^{\frac{1}{3}+\frac{1}{3}+\frac{1}{3}}$ $\qquad$ $= \sqrt[3]{5 \cdot 5 \cdot 5}$

$= 5^{3/3}$ $\qquad$ $= \sqrt[3]{125}$

$= 5$ $\qquad$ $= 5$

$$\boxed{\therefore 5^{1/3} = \sqrt[3]{5}}$$

* If n is a natural number and x is a rational number then $\boxed{x^{1/n} = \sqrt[n]{x}}$

ex. a) $16^{1/2}$ $\qquad$ b) $(-64)^{1/3}$ $\qquad$ c) $32^{1/5}$

$= \sqrt{16}$ $\qquad$ $= \sqrt[3]{-64}$ $\qquad$ $= \sqrt[5]{32}$

$= 4$ $\qquad$ $= -4$ $\qquad$ $= 2$

* And if the numerator of the exponent is not 1 ....

usually easier

$$\boxed{x^{\frac{m}{n}} = \sqrt[n]{x^m} \text{ or } (\sqrt[n]{x})^m}$$

ex. $16^{3/4} = (16^{1/4})^3$ $\qquad$ $(16^3)^{1/4}$

$= (\sqrt[4]{16})^3$ $\qquad$ $(\text{huge})^{1/4}$

$= (2)^3$

$= 8$

$\sqrt{16^{3/4}}$

ex. Express as a power

a) $\sqrt[3]{5^2}$

$= 5^{2/3}$

b) $(\sqrt[4]{7})^3$

$= 7^{3/4}$

ex. Express as a radical, then evaluate find the value of

a) $15^{2/3}$

$= \sqrt[3]{15^2}$

or

$(\sqrt[3]{15})^2 \doteq 6.08$

$\boxed{\text{Math}}$ $\boxed{x\sqrt{\ }}$

b) $(-27)^{4/3}$

$= \sqrt[3]{(-27)^4}$ or $(\sqrt[3]{-27})^4$

$= (-3)^4$

$= 81$

c) $(0.01)^{3/2}$

$= \left(\frac{1}{100}\right)^{3/2}$

$= \frac{(1)^{3/2}}{(100)^{3/2}}$

$= \frac{1}{(\sqrt{100})^3}$

$= \frac{1}{10^3}$

$= \frac{1}{1000}$

d) $(0.75)^{1.2} \doteq 0.71$

$1.2 = \frac{12}{10} = \frac{6}{5}$

$= \left(\frac{3}{4}\right)^{6/5}$

$= \left(\sqrt[5]{\frac{3}{4}}\right)^6$

$\doteq 0.71$

homefun: pg. 227 #3, 4, 6-12, 16-19