7.2 PROPERTIES OF RATIONAL EXPONENTS

REVIEW

Product of Powers	$a^m \cdot a^n = a^{m+n}$
Power of a Power	$(a^m)^n = a^{mn}$
Power of a Product	$(ab)^m = a^m \cdot b^m$

Negative Exponent Property	$a^{-m} = \frac{1}{a^m}$
Zero Exponent Property	$a^0 = 1$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$
Power of a Quotient	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

REMEMBER

THE SAME RULES APPLY TO EXPONENTS WHEN THEY ARE FRACTIONS!!

Example 1: Simplify each expression.

a) $5^{\frac{1}{2}} \cdot 5^{\frac{1}{4}} = 5^{\frac{1}{2}+\frac{1}{4}} = 5^{\frac{2}{4}+\frac{1}{4}} = \boxed{5^{\frac{3}{4}}}$

b) $(8^{\frac{1}{2}} \cdot 5^{\frac{1}{3}})^2 = 8^{\frac{1}{2}\cdot 2} \cdot 5^{\frac{1}{3}\cdot 2} = \boxed{8 \cdot 5^{\frac{2}{3}}}$

c) $(2^4 \cdot 3^4)^{-\frac{1}{4}}$

$$\frac{1}{(2^4 \cdot 3^4)^{1/4}} = \frac{1}{2^{4\cdot\frac{1}{4}} \cdot 3^{4\cdot\frac{1}{4}}} = \frac{1}{2 \cdot 3} = \boxed{\frac{1}{6}}$$

d) $\dfrac{7^1}{7^{\frac{1}{3}}} = 7^{\frac{3}{3}-\frac{1}{3}} = \boxed{7^{\frac{2}{3}}}$

e) $\left(\dfrac{12^{\frac{1}{3}}}{4^{\frac{1}{3}}}\right)^2 = \dfrac{12^{\frac{1}{3}\cdot 2}}{4^{\frac{1}{3}\cdot 2}} = \dfrac{12^{2/3}}{4^{2/3}} = \left(\dfrac{12}{4}\right)^{2/3} = \boxed{3^{2/3}}$

Example 2: Simplify each expression.

a) $6^{\frac{1}{2}} \cdot 6^{\frac{1}{3}} = 6^{\frac{1}{2}\cdot\frac{3}{3}+\frac{1}{3}\cdot\frac{2}{2}} = 6^{\frac{3}{6}+\frac{2}{6}} = \boxed{6^{5/6}}$

b) $(27^{\frac{1}{3}} \cdot 6^{\frac{1}{4}})^{2}$

$27^{\frac{1}{3}\cdot 2} \cdot 6^{\frac{1}{4}\cdot 2} = \boxed{27^{\frac{2}{3}} \cdot 6^{\frac{1}{2}}}$

c) $(4^3 \cdot 2^3)^{-\frac{1}{3}}$

$\frac{1}{(4^3 \cdot 2^3)^{1/3}} = \frac{1}{4^{3\cdot\frac{1}{3}} \cdot 2^{3\cdot\frac{1}{3}}}$

$= \frac{1}{4 \cdot 2} = \boxed{\frac{1}{8}}$

d) $\frac{6^1}{6^{\frac{3}{4}}} = 6^{\frac{4}{4}-\frac{3}{4}} = \boxed{6^{\frac{1}{4}}}$

e) $\left(\frac{18^{\frac{1}{4}}}{9^{\frac{1}{4}}}\right)^3 = \left(\frac{18}{9}\right)^{\frac{1}{4}\cdot 3}$

$= \boxed{2^{\frac{3}{4}}}$