Rules for Exponents & Radicals

If n is a positive integer greater than 1 and both a and b are positive real numbers, then:

Rule	Example	Example
$a^m \bullet a^n = a^{m+n}$	$x^2 \bullet x^3$ $\Rightarrow (x\cdot x)\cdot(x\cdot x\cdot x)$ x^{2+3} $\quad x\cdot x\cdot x\cdot x\cdot x$ x^5 $\quad x^5$	$3^{24} \bullet 3^5 = 3^{24+5}$ $= 3^{29}$
$(a^m)^n = a^{m\cdot n}$	$(x^2)^3$ $\Rightarrow x^2\cdot x^2\cdot x^2$ $x^{2\cdot 3}$ $\quad (x\cdot x)\cdot(x\cdot x)\cdot(x\cdot x)$ x^6 $\quad x^6$	$(4^3)^8 = 4^{3\cdot 8}$ $= 4^{24}$
$(ab)^n = a^n \cdot b^n$	$(xy)^3 \Rightarrow xy\cdot xy\cdot xy$ x^3y^3 $\quad (x\cdot x\cdot x)(y\cdot y\cdot y)$ x^3y^3	$(2b^3)^5 = 2^5(b^3)^5$ $= 32\, b^{3\cdot 5}$ $= 32\, b^{15}$
$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$\left(\frac{x}{y}\right)^4 \Rightarrow \frac{x}{y}\cdot\frac{x}{y}\cdot\frac{x}{y}\cdot\frac{x}{y}$ $\frac{x^4}{y^4}$	$\left(\frac{2t}{5}\right)^3 = \frac{(2t)^3}{5^3}$ $= \frac{2^3t^3}{5^3} = \frac{8t^3}{125}$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{x^5}{x^3} \Rightarrow \frac{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}\cdot x\cdot x}{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}}$ 111 x^{5-3} $\quad x^2$ x^2	$\frac{2^{52}}{2^{21}} = 2^{52-21}$ $= 2^{31}$
$a^{-n} = \frac{1}{a^n}$	x^{-3} "undo" multiplying by $x\cdot x\cdot x$ $\frac{1}{x^3}$ (inverse of $\cdot x$ is $\cdot\frac{1}{x}$)	$\left(\frac{5}{7}\right)^{-2} = \left(\frac{7}{5}\right)^2 = \frac{7^2}{5^2}$ $= \frac{49}{25}$
$\sqrt[n]{a^n} = a$	$\sqrt[4]{x^4} \Rightarrow \sqrt[4]{x\cdot x\cdot x\cdot x}$ $= x$	$\sqrt[6]{64} = \sqrt[6]{2^6}$ $= 2$
$\sqrt[n]{ab} = \sqrt[n]{a}\cdot\sqrt[n]{b}$	$\sqrt[3]{8x^3} = \sqrt[3]{2^3\cdot x^3}$ $= \sqrt[3]{2^3}\cdot\sqrt[3]{x^3} = 2x$	$\sqrt[5]{243\cdot 1024} = \sqrt[5]{3^5}\cdot\sqrt[5]{4^5}$ $= 3\cdot 4 = 12$
$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$	$\sqrt[4]{\frac{x^4}{16}} = \frac{\sqrt[4]{x^4}}{\sqrt[4]{2^4}} = \frac{x}{2}$	$\sqrt[3]{\frac{27}{125}} = \frac{\sqrt[3]{3^3}}{\sqrt[3]{5^3}} = \frac{3}{5}$
$a^{1/n} = \sqrt[n]{a}$	$x^{1/3} = \sqrt[3]{x}$ splitting a multiplier into smaller intervals	$625^{1/4} = \sqrt[4]{625} = \sqrt[4]{5^4}$ $= 5$