Guide to:
Harder indices

maths Links

Explanation:

For a **fractional index** $\frac{m}{n}$, the bottom number **n** is the **root** and the top number **m** is the **power**: $a^{m/n} = (\sqrt[n]{a})^m$. Always take the root first to keep the numbers small before raising to the power.

A **negative index** means take the **reciprocal** (flip the fraction upside down): $a^{-n} = \frac{1}{a^n}$ and $(\frac{a}{b})^{-n} = (\frac{b}{a})^n$.

Example 1: Find the exact value of (a) $27^{2/3}$ and (b) $16^{-3/4}$.

Solution:

(a) Cube root first, then square: $(\sqrt[3]{27})^2 = 3^2 = \mathbf{9}$

(b) Negative power gives reciprocal, 4th root is 2:

$16^{-3/4} = \frac{1}{(\sqrt[4]{16})^3} = \frac{1}{2^3} = \frac{1}{8}$

Answer: (a) 9, (b) $\frac{1}{8}$

Example 2: Work out the value of $(\frac{8}{125})^{-2/3}$ as an improper fraction.

Solution:

Negative sign flips the fraction: $(\frac{125}{8})^{2/3}$

Cube root top and bottom: $(\frac{\sqrt[3]{125}}{\sqrt[3]{8}})^2 = (\frac{5}{2})^2$

Square top and bottom: $5^2 \div 2^2 = \frac{25}{4}$

Answer: $\frac{25}{4}$ (or $6\frac{1}{4}$)

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