

E Michaelmas Fractional Indices

Patrons are reminded that $\sqrt{x} \equiv x^{\frac{1}{2}}$ and $\sqrt[n]{x} \equiv x^{\frac{1}{n}}$.

Also note that $\sqrt{4} = 2$. ($\sqrt{4} \neq \pm 2$.)

Most questions shamelessly stolen from Vickers and Tipler.

1. Without a calculator evaluate the following:

- | | | | |
|-------------------------|-----------------------------------|--|-------------------------------------|
| (a) $4^{\frac{1}{2}}$ | <input type="text" value="2"/> | (p) $8^{-\frac{2}{3}}$ | <input type="text" value="1/4"/> |
| (b) $16^{\frac{1}{2}}$ | <input type="text" value="4"/> | (q) $32^{\frac{4}{5}}$ | <input type="text" value="16"/> |
| (c) $9^{\frac{1}{2}}$ | <input type="text" value="3"/> | (r) $27^{-\frac{5}{3}}$ | <input type="text" value="1/243"/> |
| (d) $8^{\frac{1}{3}}$ | <input type="text" value="2"/> | (s) $(\frac{1}{4})^{\frac{1}{2}}$ | <input type="text" value="1/2"/> |
| (e) $64^{\frac{1}{6}}$ | <input type="text" value="2"/> | (t) $(\frac{1}{27})^{-\frac{1}{3}}$ | <input type="text" value="3"/> |
| (f) $125^{\frac{1}{3}}$ | <input type="text" value="5"/> | (u) $(\frac{1}{64})^{\frac{1}{3}}$ | <input type="text" value="1/4"/> |
| (g) $16^{\frac{1}{4}}$ | <input type="text" value="2"/> | (v) $(\frac{8}{27})^{-\frac{1}{3}}$ | <input type="text" value="3/2"/> |
| (h) $81^{\frac{1}{4}}$ | <input type="text" value="3"/> | (w) $(\frac{64}{9})^{\frac{3}{2}}$ | <input type="text" value="512/27"/> |
| (i) $32^{\frac{1}{5}}$ | <input type="text" value="2"/> | (x) $(\frac{27}{8})^{-\frac{5}{3}}$ | <input type="text" value="32/243"/> |
| (j) $27^{\frac{1}{3}}$ | <input type="text" value="3"/> | (y) $(\frac{4}{9})^{-\frac{1}{2}}$ | <input type="text" value="3/2"/> |
| (k) $4^{\frac{3}{2}}$ | <input type="text" value="8"/> | (z) $(64 \times 5^{-3})^{\frac{1}{3}}$ | <input type="text" value="4/5"/> |
| (l) $8^{\frac{2}{3}}$ | <input type="text" value="4"/> | | |
| (m) $4^{-\frac{1}{2}}$ | <input type="text" value="1/2"/> | | |
| (n) $4^{\frac{5}{2}}$ | <input type="text" value="32"/> | | |
| (o) $9^{-\frac{3}{2}}$ | <input type="text" value="1/27"/> | | |

2. Evaluate:

- | | | | |
|--|-----------------------------------|--|-------------------------------------|
| (a) $\frac{1}{(\frac{2}{3})^2 + (\frac{4}{9})^{\frac{1}{2}}}$ | <input type="text" value="9/10"/> | (e) $\frac{\frac{2}{3} + (\frac{4}{9})^{\frac{1}{2}}}{1 + (\frac{8}{27})^{-\frac{1}{3}}}$ | <input type="text" value="8/15"/> |
| (b) $\frac{2}{(\frac{4}{9})^{\frac{3}{2}} + (\frac{2}{3})^3}$ | <input type="text" value="27/8"/> | (f) $\frac{4 + (\frac{9}{4})^{\frac{3}{2}}}{2 + (\frac{1}{9})^{\frac{1}{2}}}$ | <input type="text" value="177/50"/> |
| (c) $\frac{1}{(\frac{8}{27})^{\frac{2}{3}} - (\frac{81}{4})^{-\frac{1}{2}}}$ | <input type="text" value="9/2"/> | (g) $\frac{(\frac{27}{8})^{-\frac{1}{3}} + \frac{1}{6}}{(\frac{1}{4})^{\frac{1}{2}} - 9^{-\frac{1}{2}}}$ | <input type="text" value="5"/> |
| (d) $\frac{4}{(\frac{81}{16})^{-\frac{3}{4}} + (\frac{4}{3})^3}$ | <input type="text" value="3/2"/> | (h) $\frac{(\frac{9}{4})^{\frac{1}{2}} - (\frac{9}{16})^{-\frac{1}{2}}}{3 - (\frac{27}{8})^{\frac{1}{3}}}$ | <input type="text" value="1/9"/> |

3. Simplify the following:

- | | | | |
|--|--------------------------------------|--|---------------------------------------|
| (a) $\frac{x}{\sqrt{x}}$ | <input type="text" value="sqrt(x)"/> | (c) $x^{-2} \times x^{\frac{1}{2}}$ | <input type="text" value="x^{-3/2}"/> |
| (b) $\frac{x^2 \times \sqrt{x}}{x^{-1}}$ | <input type="text" value="x^{7/2}"/> | (d) $\frac{x^2 \times x^{0.5}}{\sqrt[3]{x}}$ | <input type="text" value="x^{13/6}"/> |