COSMOS COACHING CENTRE

Worksheet 28 - INDICES
– Fractional indices and surds

1. Evaluate these numbers.

a 2^2 and $\sqrt{4}$ **b** 2^3 and $\sqrt[3]{8}$ **c** 3^2 and $\sqrt{9}$

d 3^3 and $\sqrt[3]{27}$ **e** 4^2 and $\sqrt{16}$ **f** 4^3 and $\sqrt[3]{64}$

2. Write these numbers using a root sign.

a $3^{\frac{1}{2}}$ **b** $7^{\frac{1}{2}}$ **c** $5^{\frac{1}{3}}$ **d** $12^{\frac{1}{3}}$

e $31^{\frac{1}{5}}$ **f** $18^{\frac{1}{7}}$ **g** $9^{\frac{1}{9}}$ **h** $3^{\frac{1}{8}}$

3. Use index laws to simplify these expressions. Leave your answer in index form.

a $a^{\frac{1}{2}} \times a^{\frac{1}{2}}$ **b** $a^{\frac{1}{3}} \times a^{\frac{1}{3}}$ **c** $a^{\frac{2}{3}} \times a^{\frac{4}{3}}$ **d** $a^2 \times a^{\frac{1}{2}}$

e $\dfrac{x^{\frac{2}{3}}}{x^{\frac{1}{3}}}$ **f** $\dfrac{x^{\frac{3}{2}}}{x^{\frac{1}{2}}}$ **g** $\dfrac{x^{\frac{7}{6}}}{x^{\frac{2}{6}}}$ **h** $\dfrac{x^{\frac{4}{3}}}{x^{\frac{1}{3}}}$

i $(y^2)^{\frac{1}{2}}$ **j** $(y^3)^{\frac{2}{3}}$ **k** $(y^{\frac{1}{2}})^3$ **l** $(x^{\frac{1}{2}})^{\frac{1}{2}}$

m $(x^{\frac{2}{3}})^4$ **n** $(a^{\frac{2}{5}})^{\frac{1}{3}}$ **o** $(a^{\frac{3}{4}})^{\frac{1}{2}}$ **p** $(n^{\frac{2}{5}})^{\frac{10}{3}}$

4. Evaluate the following without using a calculator. Hint: first rewrite each question using positive indices.

a $4^{-\frac{1}{2}}$ **b** $8^{-\frac{1}{3}}$ **c** $32^{-\frac{1}{5}}$ **d** $81^{-\frac{1}{4}}$

e $25^{-\frac{1}{2}}$ **f** $27^{-\frac{1}{3}}$ **g** $1000^{-\frac{1}{3}}$ **h** $256^{-\frac{1}{4}}$

5. Note that $8^{\frac{2}{3}} = (8^{\frac{1}{3}})^2$ using power of a power.

$= (\sqrt[3]{8})^2$ since $8^{\frac{1}{3}} = \sqrt[3]{8}$

$= 2^2$ $\sqrt[3]{8} = 2$ since $2^3 = 8$

$= 4$

Use the approach shown in the example above to evaluate these numbers.

a $27^{\frac{2}{3}}$ **b** $64^{\frac{2}{3}}$ **c** $9^{\frac{3}{2}}$ **d** $25^{\frac{3}{2}}$ **e** $16^{\frac{5}{4}}$ **f** $4^{\frac{5}{2}}$ **g** $81^{\frac{3}{2}}$