Pearson Edexcel

Indices – problem solving

A LEVEL LINKS
Scheme of work: 1a. Algebraic expressions – basic algebraic manipulation, indices and surds

Key points

- $a^m \times a^n = a^{m+n}$

- $\dfrac{a^m}{a^n} = a^{m-n}$

- $(a^m)^n = a^{mn}$

- $a^0 = 1$

- $a^{\frac{1}{n}} = \sqrt[n]{a}$ i.e. the nth root of a

- $a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

- $a^{-m} = \dfrac{1}{a^m}$

- The square root of a number produces two solutions, e.g. $\sqrt{16} = \pm 4$.

Example 1   Write $\dfrac{1}{3x}$ as a single power of x

$\dfrac{1}{3x} = \dfrac{1}{3}x^{-1}$	Use the rule $\dfrac{1}{a^m} = a^{-m}$, note that the fraction $\dfrac{1}{3}$ remains unchanged

Example 2   Write $\dfrac{4}{\sqrt{x}}$ as a single power of x

$\dfrac{4}{\sqrt{x}} = \dfrac{4}{x^{\frac{1}{2}}}$ $= 4x^{-\frac{1}{2}}$	**1** Use the rule $a^{\frac{1}{n}} = \sqrt[n]{a}$ **2** Use the rule $\dfrac{1}{a^m} = a^{-m}$

Practice questions

1 Write the following in the form ax^n.

   a $5\sqrt{x}$ **b** $\dfrac{2}{x^3}$ **c** $\dfrac{1}{3x^4}$

   d $\dfrac{2}{\sqrt{x}}$ **e** $\dfrac{4}{\sqrt[3]{x}}$ **f** 3

2 $p = 4^a$ and $q = 4^b$

   Write in terms of p and q

   a 4^{a+b} **b** 4^{b-a}

   c 4^{2a} **d** 4^{b-2}

3   **a** $2^3 \times 2^n = 2^9$

      Work out the value of n.

      ....

   b $2x^3 = 128$

      Work out the value of x.

      ....

Answers

1 **a** $5x^{\frac{1}{2}}$ **b** $2x^{-3}$ **c** $\dfrac{1}{3}x^{-4}$

   d $2x^{-\frac{1}{2}}$ **e** $4x^{-\frac{1}{3}}$ **f** $3x^0$

2 **a** pq **b** $\dfrac{a}{p}$ **c** p^2 **d** $\dfrac{q}{16}$

3 **a**   6   **b**   4