CHAPTER 4
Logarithmic and exponential functions

The index laws (1)

QUESTION 1   Use the index laws to simplify:

a $x^2 \times x^5$

b $a^7 \times a$

c $4p^{12} \div 2p^3$

d $x^2y^3 \times xy^4$

e $(a^5)^2$

f $(3m^2n)^4$

g a^0

h $6y^0$

i $\dfrac{x^9}{x^3}$

j $\dfrac{6t^8}{2t^4}$

k $\dfrac{x^2y^5}{x^4y^4}$

l $\dfrac{2ab^6}{8a^2b^6}$

m $(2a^3b^2)^3 \div 4ab$

n $15n^9 \div 3n^5 \times 4n$

o $(g^4h^3)^2 \times 2(gh^2)^3$

QUESTION 2   Evaluate:

a 2^3

b 10^4

c 3^1

d 6^0

e $4^{\frac{1}{2}}$

f $8^{\frac{2}{3}}$

g $25^{\frac{3}{2}}$

h $32^{0.8}$

QUESTION 3   Write as fractions (in simplest form):

a 5^{-1}

b 2^{-3}

c 4^{-4}

d 10^{-5}

e 6^{-2}

f $9^{-\frac{1}{2}}$

g $16^{-\frac{1}{4}}$

h $1000^{-\frac{2}{3}}$

Logarithmic and exponential functions

The index laws (2)

QUESTION **1**   Use a calculator to find the value of:

a 8^7

b 2.5^4

c $529^{1.5}$

d 2^{-7}

e $\sqrt{2\,455\,489}$

f $\sqrt[5]{371\,293}$

g $\left(\sqrt[3]{0.027}\right)^4$

h $\sqrt[3]{(0.027)^4}$

QUESTION **2**   Simplify:

a $5^{2x} \times 5^{3x} \div 5^x$

b $7^{3x+4} \times 7^{9-3x}$

c $(3^x)^2 \times (3^{3x})^3$

d $8^{2x} \div 2^{6x} \times 4^x$

e $9^{3m+1} \times 3^{4m-1}$

f $32^n \div 8^{2n} \div 4^{3n}$

QUESTION **3**   Solve:

a $k^7 = 16\,384$

b $(2^{5m})^2 = 1\,048\,576$

c $(1-p)^5 = 7776$

d $9^{3a} = 3^7$

e $5^x \times 25^{3-x} = 5$

f $4^{3q+5} \times 8^{2q-7} = 2$

QUESTION **4**   Find the value of x, correct to two decimal places, if:

a $x^8 = 12\,756$

b $2x^6 = 12.8$

c $x^2 \times (2x^3)^3 = 15$

Page 95 1 **a** x^7 **b** a^8 **c** $2p^9$ **d** x^3y^7 **e** a^{10} **f** $81m^8n^4$ **g** 1 **h** 6 **i** x^6 **j** $3t^4$ **k** $\dfrac{y}{x^2}$ **l** $\dfrac{1}{4a}$ **m** $2a^8b^5$ **n** $20n^5$ **o** $2g^{11}h^{12}$ **2 a** 8

b 10 000 **c** 3 **d** 1 **e** 2 **f** 4 **g** 125 **h** 16 **3 a** $\dfrac{1}{5}$ **b** $\dfrac{1}{8}$ **c** $\dfrac{1}{256}$ **d** $\dfrac{1}{100\ 000}$ **e** $\dfrac{1}{36}$ **f** $\dfrac{1}{3}$ **g** $\dfrac{1}{2}$ **h** $\dfrac{1}{100}$

Page 96 1 **a** 2 097 152 **b** 39.0625 **c** 12 167 **d** 0.007 8125 **e** 1567 **f** 13 **g** 0.0081 **h** 0.0081 **2 a** 5^{4x} **b** 7^{13} **c** 3^{11x} **d** 2^{2x}

e 3^{10m+1} **f** 2^{-7n} **3 a** $k = 4$ **b** $m = 2$ **c** $p = -5$ **d** $a = 1\dfrac{1}{6}$ **e** $x = 5$ **f** $q = 1$ **4 a** 3.26 **b** 1.36 **c** 1.06