Chapter 3 Indices and surds
Worksheet A

10A **1** Simplify the following.

a $\sqrt{54}$

b $2\sqrt{32}$

c $\dfrac{\sqrt{28}}{6}$

d $\sqrt{\dfrac{12}{25}}$

10A **2** Simplify the following.

a $7\sqrt{2}-3\sqrt{2}$

b $9\sqrt{3}+3\sqrt{6}-6\sqrt{3}+2\sqrt{6}$

c $8\sqrt{5}-\sqrt{20}$

d $5\sqrt{12}+4\sqrt{27}-3\sqrt{75}$

10A **3** Simplify the following.

a $\sqrt{6}\times\sqrt{7}$

b $\sqrt{15}\div\sqrt{3}$

c $3\sqrt{5} \times \sqrt{10}$

d $\dfrac{18\sqrt{12}}{6\sqrt{2}}$

4 Expand and simplify the following.

a $\sqrt{2}\left(3\sqrt{5}+\sqrt{10}\right)$

b $2\sqrt{6}\left(4\sqrt{3}-3\sqrt{6}\right)$

c $\left(\sqrt{7}-3\right)\left(4+\sqrt{7}\right)$

d $\left(4\sqrt{5}-1\right)\left(2\sqrt{5}+3\right)$

10A **5** Expand and simplify the following.

a $\left(4+\sqrt{11}\right)^2$

b $\left(3\sqrt{5}-2\sqrt{3}\right)^2$

c $\left(6-\sqrt{3}\right)\left(6+\sqrt{3}\right)$

d $\left(3\sqrt{2}+\sqrt{5}\right)\left(3\sqrt{2}-\sqrt{5}\right)$

6 Rationalise the denominator in the following.

10A

a $\frac{3}{\sqrt{2}}$

_____

_____

b $\frac{2\sqrt{3}}{\sqrt{5}}$

_____

_____

c $\frac{3\sqrt{5}}{4\sqrt{6}}$

_____

_____

d $\frac{1-\sqrt{2}}{\sqrt{10}}$

_____

_____

Chapter 3 Indices and surds
Worksheet B

1 Simplify the following using the index laws.

a $m^6 \div m^2$

b $2s^3t^2 \times 4s^2t$

c $(a^2)^5$

d $(5b^3)^2$

e $\dfrac{12x^5y^3}{3x^2y}$

f $\left(\dfrac{2x^3}{3y}\right)^3$

2 Evaluate using the zero power.

a $7m^0$

b $6x^0 - (4x)^0$

3 Express each using positive indices.

a x^{-3}

b $\dfrac{8}{y^{-4}}$

c $5a^2b^{-3}$

_____

_____

4 Simplify the following and express your answers using positive indices.

a $\dfrac{6(mn^{-4})^3}{m^{-2}n} \times \left(\dfrac{m^2}{3n^{-3}}\right)^2$

_____

_____

_____

b $\left(\dfrac{4a^{-3}}{b^{-2}c^4}\right)^2 \div \left(\dfrac{2a^{-3}b}{c^2}\right)^3$

_____

_____

_____

5 Write each of these numbers as a basic numeral.

a 7.905×10^4

_____

b 3.8×10^{-5}

_____

6 Write each of these numbers using scientific notation.

a 5 160 000

_____

b 0.00402

_____

10A **7** Express the following in index form.

a $\sqrt{5}$

_____

b $3\sqrt{3}$

_____

c $\sqrt[3]{9x^2}$

_____

d $2\sqrt[5]{x^4}$

_____

8 Express the following in surd form. 10A

a $7^{\frac{1}{4}}$

b $3^{\frac{2}{5}}$

9 Evaluate the following without a calculator. 10A

a $32^{\frac{1}{5}}$

b $27^{-\frac{1}{3}}$

10 Solve for x in each of the following. 10A

a $2^x = 16$

b $5^{2x+1} = 125^x$

11 Define variables and form exponential rules for the following situations.

a $400 000 is invested at 16% per annum.

b The contents of a leaking water tank, initially 800 litres, is decreasing at a rate of 4% per hour.

12 The value of a house purchased for $600 000 is expected to grow by 12% per year. Let $\$V$ be the value of the house after t years.

a Write a rule connecting V and t.

_____

_____

b Use your rule to find the expected value of the house after the following number of years. Round to the nearest dollar.

i 2 years _____

_____

ii 10 years _____

_____

c Use trial and error to estimate when the house will be worth $1 million. Round to one decimal place.

_____

_____

Chapter 3 Indices and surds

Worksheet A answers

1	**a**	$3\sqrt{6}$	**b**	$8\sqrt{2}$	**c**	$\frac{\sqrt{7}}{3}$	**d**	$\frac{2\sqrt{3}}{5}$
2	**a**	$4\sqrt{2}$	**b**	$3\sqrt{3}+5\sqrt{6}$	**c**	$6\sqrt{5}$	**d**	$7\sqrt{3}$
3	**a**	$\sqrt{42}$	**b**	$\sqrt{5}$	**c**	$15\sqrt{2}$	**d**	$3\sqrt{6}$
4	**a**	$3\sqrt{10}+2\sqrt{5}$	**b**	$24\sqrt{2}-36$	**c**	$\sqrt{7}-5$	**d**	$37+10\sqrt{5}$
5	**a**	$27+8\sqrt{11}$	**b**	$57-12\sqrt{15}$	**c**	33	**d**	13
6	**a**	$\frac{3\sqrt{2}}{2}$	**b**	$\frac{2\sqrt{15}}{5}$	**c**	$\frac{\sqrt{30}}{8}$	**d**	$\frac{\sqrt{10}-2\sqrt{5}}{10}$

Worksheet B answers

1	**a**	m^4	**b**	$8s^5t^3$	**c**	a^{10}		
	d	$25b^6$	**e**	$4x^3y^2$	**f**	$\frac{8x^9}{27y^3}$		
2	**a**	7	**b**	5				
3	**a**	$\frac{1}{x^3}$	**b**	$8y^4$	**c**	$\frac{5a^2}{b^3}$		
4	**a**	$\frac{2m^9}{3n^7}$	**b**	$\frac{2a^3b}{c^2}$				
5	**a**	79 050	**b**	0.000 038				
6	**a**	5.16×10^6	**b**	4.02×10^{-3}				
7	**a**	$5^{\frac{1}{2}}$	**b**	$3^{\frac{3}{2}}$	**c**	$9^{\frac{1}{3}}x^{\frac{2}{3}}$	**d**	$2x^{\frac{4}{5}}$
8	**a**	$\sqrt[4]{7}$	**b**	$\sqrt[5]{9}$ or $\left(\sqrt[5]{3}\right)^2$				
9	**a**	2	**b**	$\frac{1}{3}$				
10	**a**	$x=4$	**b**	$x=1$				
11	**a**	A = amount of money at any time, n = number of years of investment, $A=400\,000\times1.16^n$						
	b	A = litres in tank at any time, n = number of hours elapsed, $A=800\times0.96^n$						
12	**a**	$V=600\,000\times1.12^t$						
	b	**i** \$752 640 **ii** \$1 863 509						
	c	4.5 years						