Unit 10 · Indices

HARDER PRACTICE QUESTIONS

Full marks 35

Write your answers on separate paper. Show your working, one step a line. Use the laws of indices only for powers of the same base; when you are unsure, write the factors out and count.

1 Spot the errors [4]

Sakshi worked out these four. Each answer is wrong. Find the right answer, and say what went wrong.

i. $x^6 \div x^2 = x^3$

ii. $2^3 \times 3^2 = 6^5$

iii. $5a^0 = 1$

iv. $4^{-2} = -16$

2 Which is bigger? [4]

In each pair, say which is bigger. Show how you know.

a. 2^5 or 5^2

b. 2^{10} or 10^3

c. 3^{-2} or 2^{-3}

d. $(-2)^5$ or $(-3)^3$

3 The missing index [4]

Find the number n in each.

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

b. $3^7 \div 3^n = 9$

c. $5^n = 1$

d. $2^n = \dfrac{1}{32}$

4 One number, many powers [4]

i. Write 64 as a power of 2, as a power of 4 and as a power of 8.

ii. Use your answers to write $4^3 \times 2^4$ as a single power of 2.

iii. Write $27^2 \div 9^2$ as a power of 3.

iv. Find every number from 2 to 99 that can be written as a power, with a whole-number base and an index of 2 or more, in more than one way.

5 Folding paper [4]

A sheet of paper is 0.1 mm thick. Fold it in half, and it is 2 sheets thick; fold it again, and it is 4.

i. How many sheets thick is it after 5 folds? Write your answer as a power of 2.

ii. How thick is it after 10 folds, in cm?

iii. Use $2^{10} \approx 1000$ to estimate how thick it would be after 20 folds, in meters.

iv. Estimate the thickness after 30 folds, in km.

6 Break it into primes [4]

Simplify. Write every number as a product of prime factors first.

a. $\dfrac{6^4 \times 2^{-1}}{3^3 \times 2^2}$

b. $\dfrac{12a^5b^3 \times 18a^2b}{27a^6b^4}$

7 Put in the values [4]

If $x = 2$, $y = -1$ and $z = 3$, find the value of each.

a. x^y

b. $y^z + z^y$

c. $(x + y)^z$

d. $(xz)^y \times z^x$

8 Think: adding up the doubles [4]

i. Copy and complete the table.

Sum	1	1 + 2	1 + 2 + 4	1 + 2 + 4 + 8	1 + 2 + 4 + 8 + 16
Value	1	3	.....	.....	.....

ii. Compare each value with the next power of 2. What do you notice?

iii. Use your pattern to find $1 + 2 + 2^2 + 2^3 + \cdots + 2^9$ without adding the ten numbers.

iv. Show that $2^5 - 2^4 = 2^4$. Use it to explain why adding the next power of 2 keeps the pattern going.

9 Make your own [3]

i. Write three different products of powers of 2 that equal 2^{10}, at least one of them with a negative index.

ii. Write a division of two powers of 5 whose answer is 1.

iii. Write the number 1 as a power in three different ways.