

Try each question first. Show each step. Use only if assigned the Support route.

Department / teacher instructions:

Editable toolkit / reminders:

Name: _____ Class: _____ Date: _____

A. Conversions

1.	Write $2 \times 2 \times 2$ as an index.
	Prompt: Count the factors.
2.	Simplify $3^2 \times 3^3$.
	Prompt: Add the powers.
3.	Simplify $5^6 \div 5^2$.
	Prompt: Subtract the powers.
4.	Simplify $(2^3)^2$.
	Prompt: Multiply the powers.
5.	Calculate $4^2 + 4^2$.
	Prompt: Calculate each power first.
6.	Write 7^0 .
	Prompt: Any non-zero number to power zero is 1.
7.	Write 10^3 as an ordinary number.
	Prompt: Three factors of 10.

B. Index laws

1.	Simplify $2^4 \times 2^3$.
	Prompt: Same base: add powers.
2.	Simplify $7^8 \div 7^3$.
	Prompt: Same base: subtract powers.
3.	Simplify $(3^2)^4$.
	Prompt: Multiply powers.
4.	Write 5^0 and 10^0 .
	Prompt: Both equal 1.
5.	Simplify $4^3 \times 4^2 \div 4^4$.
	Prompt: Combine the powers carefully.
6.	Explain why $2^3 \times 2^2$ is not 4^5 .
	Prompt: The bases are multiplied, not added.
7.	Calculate $2^5 + 3^2$.
	Prompt: Powers before addition.
8.	Write $6 \times 6 \times 6 \times 6$ using an index.
	Prompt: Four factors of 6.

Support route continued

Complete the remaining work if time allows. Show enough working for another person to follow your method.

C. Explain and check

1.	Is $2^3 \times 2^2 = 4^5$? Explain.
	Prompt: Expand both sides.
2.	Which is larger: 2^6 or 6^2 ?
	Prompt: Calculate both.
3.	Explain why $a^0 = 1$.
	Prompt: Use division: $a^2 \div a^2$.
4.	A pupil says $(2^3)^2 = 2^5$. Correct the error.
	Prompt: Power of a power uses multiplication.
5.	Find two different expressions equal to 64.
	Prompt: Use powers of 2.
6.	How can you check an index-law answer?
	Prompt: Expand small powers.

D. Mixed practice

1.	Simplify $2^5 \times 2^{-2}$.
	Prompt: Add the powers.
2.	Simplify $(2^3 \times 2^4) \div 2^5$.
	Prompt: Combine all powers of 2.
3.	Write 27×9 as a single power of 3.
	Prompt: Rewrite 27 and 9 as powers of 3.
4.	Solve $2^x = 32$.
	Prompt: Write 32 as a power of 2.
5.	Compare 3^4 and 4^3 .
	Prompt: Calculate both.
6.	Write one sentence explaining an index law.
	Prompt: State what happens to powers.

Support route answers

Answers are grouped by section. Accept equivalent correct methods and explanations.

A: 2^3 ; 3^5 ; 5^4 ; 2^6 ; 32; 1; 1,000.

B: 2^7 ; 7^5 ; 3^8 ; 1 and 1; 4; bases are multiplied; 41; 6^4 .

C: no; 2^6 ; divide a^2 by a^2 ; multiply powers; answers vary; expand small powers.

D: 2^3 ; 2^2 ; 3^5 ; $x=5$; $3^4=81$ and $4^3=64$; answers vary.

Indices - Core route

Work independently. Use this worksheet only if your teacher assigned the Core route.

Department / teacher instructions:

Editable toolkit / reminders:

Name: _____ Class: _____ Date: _____

A. Conversions

1.	Simplify $2^4 \times 2^3$.
2.	Simplify $7^8 \div 7^3$.
3.	Simplify $(3^2)^4$.
4.	Write 5^0 and 10^0 .
5.	Simplify $4^3 \times 4^2 \div 4^4$.
6.	Simplify $6^2 \times 6^3$.

B. Calculations

1.	Simplify $3^5 \times 3^2$.
2.	Simplify $10^7 \div 10^4$.
3.	Simplify $(5^2)^3$.
4.	Simplify $2^6 \div 2^2 \times 2^3$.
5.	Calculate $2^4 + 3^3$.
6.	Solve $3^x = 81$.
7.	Write 64 as a power of 2.
8.	Write 125 as a power of 5.

Complete the remaining work if time allows. Show enough working for another person to follow your method.

C. Compare and reason

1.	Explain why $2^3 \times 2^2$ is not 4^5 .
2.	Which is larger: 2^6 or 6^2 ? Explain.
3.	Explain why $a^0 = 1$ for $a \neq 0$.
4.	A pupil says $(2^3)^2 = 2^5$. Explain.
5.	Find two different index expressions with value 64.
6.	Explain why powers are calculated before addition.

D. Mixed and check

1.	Simplify $5^7 \div 5^2$.
2.	Simplify $4^2 \times 4^3 \div 4^4$.
3.	Solve $2^x = 128$.
4.	Compare 3^4 and 4^3 .
5.	Write 81 as a power of 3.
6.	Create an index-law question whose answer is 2^6 .

Core route answers

Answers are grouped by section. Accept equivalent correct methods and explanations.

A: 2^7 ; 7^5 ; 3^8 ; 1 and 1; 4; 6^5 .

B: 3^7 ; 10^3 ; 5^6 ; 2^7 ; 97; $x=4$; 2^6 ; 5^3 .

C: bases are multiplied; 6^2 ; divide a^2 by a^2 ; powers multiply; answers vary; order of operations.

D: 5^5 ; 4; $x=7$; $3^4=81$ and $4^3=64$; 3^4 ; answers vary.

Indices - Stretch route

Choose efficient methods. Use this worksheet only if your teacher assigned the Stretch route.

Department / teacher instructions:

Editable toolkit / reminders:

Name: _____ Class: _____ Date: _____

A. Flexible conversion

1.	Simplify $3^5 \times 3^{-2}$.
2.	Simplify $(2^3 \times 2^4) \div 2^5$.
3.	Write 27×9 as a single power of 3.
4.	Explain why $a^0 = 1$ for $a \neq 0$.
5.	Solve $2^x = 32$.
6.	Create two different index expressions with value 64.

B. Applied indices

1.	Simplify $5^7 \div 5^9$.
2.	Simplify $2^{-3} \times 2^5$.
3.	Simplify $(3^2)^3 \div 3^4$.
4.	Write 16×8 as a single power of 2.
5.	Solve $5^x = 625$.
6.	Explain why $a^m \div a^n = a^{m-n}$.

Complete the remaining work if time allows. Show enough working for another person to follow your method.

C. Reasoning

1.	Without calculating fully, compare 2^{10} and 10^2 .
2.	Which is larger: 3^6 or 6^3 ? Justify.
3.	Explain the difference between 2^3 and 3^2 .
4.	Find two different ways to write 1 using indices.
5.	A pupil adds powers when simplifying $(2^3)^4$. Explain the mistake.
6.	Explain how index laws reduce repeated multiplication.

D. Challenge

1.	Simplify $2^3 \times 2^4 \times 2^{-5}$.
2.	Solve $3^x = 729$.
3.	Write a general rule for multiplying powers with the same base.
4.	Write a general rule for a power raised to a power.
5.	Find all whole-number x for $2^x < 32$.
6.	Create a challenging index expression with answer 1.

Stretch route answers

Answers are grouped by section. Accept equivalent correct methods and explanations.

A: 3^3 ; 2^2 ; 3^5 ; $a^2 \div a^2 = 1$; $x=5$; answers vary.

B: 5^{-2} ; 2^2 ; 3^2 ; 2^7 ; $x=4$; divide numerator and denominator by a^n .

C: $2^{10} = 1024 > 100$; 3^6 ; bases and powers swap roles; a^0 and $a^n \div a^n$; powers multiply; replace repeated multiplication with laws.

D: 2^2 ; $x=6$; $a^m \times a^n = a^{m+n}$; $(a^m)^n = a^{mn}$; $x=0,1,2,3,4$; answers vary.