



Using index notation

Year 7 About 70 minutes No calculator 47 marks

Date _____

A Do Now

Quick questions to start.

- A1** Last lesson [1 mark] Write $10x + 25$ in the form $5(\dots)$.
- A2** Needed today [1 mark] Work out 4^3 .

Answer

Answer $5(\dots)$

- A3** Needed today [1 mark] Write $7 \times 7 \times 7 \times 7 \times 7$ using a power.
- A4** From chapter 6 [1 mark] A cube has edges of 3 cm. Work out its volume.

Answer

Answer cm^3

B Example, then your turn

Year 7

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Write each one as simply as possible, using powers.

- (a) $t \times t \times t \times t \times t$ (b) $3k \times 5k \times k$
- (c) $a \times 4b \times a \times b$

Hint Multiply the numbers. Then count how many times each letter is multiplied.

- B1** Write each one as simply as possible, using powers. [3 marks]

- (a) $5w \times 2w$
- (b) $y \times 3y \times 2y$
- (c) $2p \times q \times 3p$

Answer (a) ... (b) ... (c) ...

EXAMPLE 2

Write each one as simply as possible.

- (a) $(2n)^3$ (b) $(5x)^2$ (c) $2x \times (3x)^2$

Hint $(2n)^3$ means $2n \times 2n \times 2n$. Every part of the bracket is cubed, not just the n .

- B2** Write each one as simply as possible. [3 marks]

- (a) $(3t)^2$
- (b) $(2y)^4$
- (c) $4a \times (2a)^2$

Answer (a) ... (b) ... (c) ...

EXAMPLE 3

Work out the value of each expression when $n = 4$.

- (a) $2n^2$ (b) $(2n)^2$ (c) $n^3 + n^2$

Hint Work out the power first, unless there is a bracket. In $2n^2$ only the n is squared.

B3 Work out the value of each expression when $n = 5$. [3 marks]

- (a) $3n^2$
 (b) $(3n)^2$
 (c) $n^4 - 10n^2$

Answer (a) ... (b) ... (c) ...

EXAMPLE 4

Expand the brackets.

- (a) $x(x^2 + 3)$ (b) $3a(4a - a^2)$

Hint Multiply every term inside the bracket by the term outside. $a \times a^2 = a^3$.

B4 Expand the brackets. [2 marks]

- (a) $y(y^2 - 5)$
 (b) $4p(p + 2p^2)$

Answer (a) (b)

c Practice

Year 7

- C1** (a) Explain the difference between $2k$ and k^2 . [2 marks]

(b) k is greater than 0. Find the value of k for which $2k$ and k^2 are equal.

Answer (b) $k = \dots\dots$

- C2** Which two of these are equal to $2x^3$? [2 marks]

- A $x^3 + x^3$ B $(2x)^3$
 C $2x \times x^2$ D x^6

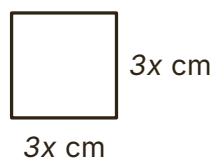
Answer and

- C3** Fill in each gap. [2 marks]

- (a) $3x^2 \times \square = 12x^5$
 (b) $\square \times 2y = 10y^3$

Answer (a) (b)

- C4** This square has sides of $3x$ cm. [2 marks]
 Write expressions for (a) its area, (b) its perimeter.



Not drawn accurately

Answer (a) (b)

- C5** Work out the value of each expression when $a = 2$ and $b = 3$. [2 marks]
- (a) a^3b^2 (b) $(ab)^2$

Answer (a) (b)

D Exam-style questions

GCSE Foundation

- D1** Ravi says, " $(2x)^3 = 6x^3$." [3 marks]

Ravi is wrong. Write $(2x)^3$ correctly, and show with $x = 2$ that $6x^3$ gives a different value.

- D2** This cuboid is 5 cm long, x cm high and x cm deep.

- (a) Write an expression for its volume. [1 mark]

Answer cm^3

- (b) Write an expression for its total surface area. [3 marks]

Answer cm^2

- (c) Write your answer to part (b) in the form $2x(\dots)$. [1 mark]

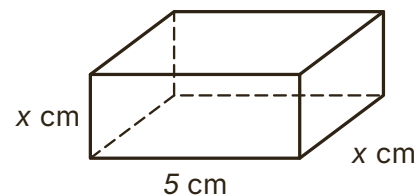
Answer $2x(\dots)$

Total for D2: 5 marks

- D3** Work out the value of each expression when $n = -2$.

- (a) n^3 [1 mark]

Answer



Not drawn accurately

(b) $(3n)^2$

[1 mark]

Answer

(c) $2n^2 - n^3$

[2 marks]

Answer

Total for D3: 4 marks

D4 Expand and simplify $x(x^2 + 4) + 2x(x^2 - 1)$.

[3 marks]

Answer

D5 Show that $(3n)^2 - 3n^2 = 6n^2$.

[3 marks]

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 n is a whole number from 1 to 10.

[4 marks]

For which values of n is n^2 bigger than 2^n ? For which values are they equal?

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Make a table with columns n , n^2 and 2^n .
Hint 2 2^n doubles each time n goes up by 1. n^2 grows more slowly once n is 5 or more.
Hint 3 $n = 2$: 4 and 4. $n = 3$: 9 and 8. $n = 4$: 16 and 16. $n = 5$: 25 and 32.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can write a product such as $3k \times 2k$ using a power. ☐ ☐ ☐
- I can tell $(2n)^2$ from $2n^2$, and work out their values. ☐ ☐ ☐
- I can expand a bracket that gives powers. ☐ ☐ ☐
- I can write expressions for areas and volumes using powers. ☐ ☐ ☐