

Exercise walk-through

Exponential Function Manipulation ■ 2.4

eXercise

You must be able to

- apply the **laws of exponents** 指数律 (product, quotient, power)
- rewrite $a \cdot b^{x+c}$ as a constant times b^x

Method — Laws of exponents

$$b^{m+n} = b^m \cdot b^n; b^{m-n} = \frac{b^m}{b^n}; (b^m)^n = b^{mn}.$$

Method — Rewriting a shift as a scaling

$a \cdot b^{x+c} = (a \cdot b^c) \cdot b^x$ — a horizontal shift of an exponential is the same as a vertical scaling.

Method — Example

$$5 \cdot 2^{x+2} = 5 \cdot 2^2 \cdot 2^x = 20 \cdot 2^x.$$

Practice 2.1 ■ 1 mark

Simplify $b^3 \cdot b^4$.

Solution 2.1

Worked steps

$$b^7 \text{ (B1).}$$

Practice 2.2 ■ 1 mark

Simplify $(b^2)^5$.

Solution 2.2

Worked steps

$$b^{10} \text{ B1.}$$

Practice 2.3 ■ 2 marks

Rewrite 2^{x+3} as a constant times 2^x .

Solution 2.3

Worked steps

$$2^{x+3} = 2^3 \cdot 2^x = 8 \cdot 2^x \quad \text{M1} \quad \text{A1}.$$

Exam-style 3.1 ■ 1 mark

$b^m \cdot b^n$ equals

A b^{mn}

B b^{m+n}

C b^{m-n}

D $b^m + b^n$

Solution 3.1

A b^{mn}

B b^{m+n}



C b^{m-n}

D $b^m + b^n$

Worked steps

B.

Exam-style 3.2 ■ 1 mark

$(b^m)^n$ equals

A b^{m+n}

B b^{mn}

C $b^m \cdot n$

D b^{m-n}

Solution 3.2

A b^{m+n}

B b^{mn}



C $b^m \cdot n$

D b^{m-n}

Worked steps

B.

Exam-style 3.3 ■ 1 mark

Rewrite $5 \cdot 2^{x+2}$ as a constant times 2^x .

- (a) Split the exponent.
- (b) Evaluate 2^2 .
- (c) Write the result as a constant times 2^x .

Solution 3.3

Worked steps

(a) $5 \cdot 2^{x+2} = 5 \cdot 2^2 \cdot 2^x$ **B1**. (b) $2^2 = 4$ **B1**. (c) $20 \cdot 2^x$ **B1**.