

E2.4 Indices II

Name: _____ Class: _____ Date: _____

Total: 11 marks

KEY WORDS indices 指数 • equation 方程 • indices in algebra 代数中的指数
 • laws of indices 指数定律 • base 底数

Objective

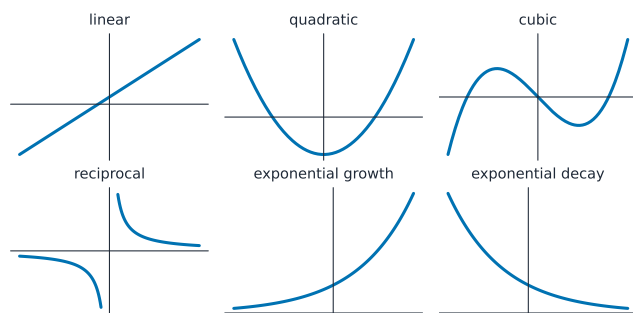
Build the skills to answer Extended exam questions on **indices in algebra** 代数中的指数 — applying the **laws of indices** 指数定律 to algebraic terms, and solving simple index equations.

You must be able to:

- simplify products, quotients and powers of algebraic terms
- handle negative powers in algebra
- solve $a^x = b$ by writing both sides with the same base

1 Worked examples

■ Indices with letters



recognise $y = x^2$, $y = 1/x$, $y = 2^x$ from shape

The index laws work with letters too

$$a^m \times a^n = a^{m+n} \quad a^m \div a^n = a^{m-n} \quad (a^m)^n = a^{mn}$$

- **Worked:** $(5x^3)^2 = 25x^6$; $12a^5 \div 3a^{-2} = 4a^7$; $6x^7y^4 \times 5x^{-5}y = 30x^2y^5$.
- **Index equation:** $2^x = 32 = 2^5 \rightarrow x = 5$.

Answer shapes: **M1** a correct method, **A1** the correct answer.

2 Practice

2.1 Simplify $(3a^2)^3$. [2]

2.2 Simplify $10x^6 \div 2x^2$. [2]

2.3 Simplify $a^4 \times a^{-7}$. [1]

3 Exam-style questions

3.1 Simplify $(2x^2y)^3$. [2]

3.2 Simplify $\frac{15a^7b^2}{5a^3b^2}$. [2]

3.3 Solve $3^x = 81$. [2]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 $(3a^2)^3 = 3^3a^6 = 27a^6$.

2.2 $10 \div 2 = 5$, $x^6 \div x^2 = x^4$, so $5x^4$.

2.3 $a^4 \times a^{-7} = a^{-3}$ (or $\frac{1}{a^3}$).

3.1 $(2x^2y)^3 = 2^3x^6y^3 = 8x^6y^3$.

3.2 $\frac{15}{5} = 3$, $a^7 \div a^3 = a^4$, $b^2 \div b^2 = 1$, so $3a^4$.

3.3 $81 = 3^4$, so $3^x = 3^4 \rightarrow x = 4$.