



**eClassroom**

GCSE Mathematics

# Indices

## Questions

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Pearson Edexcel GCSE & iGCSE Mathematics



## Section A — Foundation

### Worked Examples

#### [Fluency]

Simplify  $3^2 \times 3^5$

When multiplying powers with the same base, add the indices:

$$3^2 \times 3^5 = 3^{2+5} = 3^7$$

#### [Reasoning]

Explain why any number raised to the power 0 equals 1.

Using the division law:  $a^n \div a^n = a^{n-n} = a^0$

But any number divided by itself = 1, so  $a^0 = 1$  for any  $a \neq 0$ .

#### [Problem Solving]

Write  $2^3 \times 2^x = 64$  as a power of 2 and find x.

$$64 = 2^6, \text{ so: } 2^3 \times 2^x = 2^{3+x} = 2^6$$

$$\text{Therefore: } 3 + x = 6 \rightarrow x = 3$$

#### [Fluency]

1. Calculate  $3^4$ .

(1 mark)

#### [Fluency]

2. Simplify  $2^3 \times 2^4$ . Give your answer as a power of 2.

(1 mark)

#### [Fluency]

3. Simplify  $5^6 \div 5^2$ . Give your answer as a power of 5.

(1 mark)

#### [Fluency]

4. Write 64 as a power of 2.

(1 mark)

#### [Fluency]

5. Write down the value of  $4^0$ .

(1 mark)

#### [Fluency]

6. Simplify  $(3^2)^4$ . Give your answer as a power of 3.

(1 mark)

**[Reasoning]**

7. Write  $5^{-2}$  as a fraction.

(2 marks)

**[Reasoning]**

8. Evaluate  $27^{1/3}$ . Show your reasoning.

(2 marks)

**[Problem Solving]**

9. Find the value of  $x$  such that  $2^x = 32$ . Show your working.

(2 marks)

**[Problem Solving]**

10. Amy says: " $2^3 \times 3^3 = 6^6$ "

Amy is wrong. Show why, and write down the correct simplification of  $2^3 \times 3^3$ .

(3 marks)



## Section B — Higher

### Worked Examples

#### [Fluency]

Evaluate  $8^{2/3}$

Split the fractional index: power/root  $\rightarrow$  root first, then power.

$$8^{2/3} = (8^{1/3})^2 = 2^2 = 4$$

#### [Reasoning]

Show that  $27^{4/3} = 81$ .

$$27^{4/3} = (27^{1/3})^4 = 3^4 = 81 \quad \checkmark$$

#### [Problem Solving]

Solve  $4^{2x-1} = 8^{x+1}$

Write both sides as powers of 2:

$$2^{2(2x-1)} = 2^{3(x+1)}$$

$$4x - 2 = 3x + 3 \rightarrow x = 5$$

#### [Fluency]

1. Evaluate  $125^{1/3}$ .

(1 mark)

#### [Fluency]

2. Evaluate  $8^{2/3}$ .

(2 marks)

#### [Fluency]

3. Simplify  $(x^3 \times x^5) \div x^4$

(2 marks)

#### [Fluency]

4. Evaluate  $16^{-3/4}$ . Give your answer as a fraction.

(2 marks)

#### [Reasoning]

5. Show that  $4^{3/2} = 8$ .

(2 marks)

#### [Reasoning]

6. Without using a calculator, show clearly that  $9^{5/2} = 243$ .

(2 marks)

**[Reasoning]**

7. Solve  $3^{2x+1} = 81$  giving your answer as a fraction.

(3 marks)

**[Problem Solving]**

8. Solve  $2^{3x} = 4^{x+2}$

Show all your working clearly.

(3 marks)

**[Problem Solving]**

9. Given that  $5^a = 3$ , express  $5^{3a-1}$  in the form  $\frac{p}{q}$  where p and q are integers.

(3 marks)

**[Problem Solving]**

10. Prove that  $(4^n \times 2^{n+2}) \div 8^{n-1} = 32$  for all integer values of n.

(4 marks)