

WA8MNAA1

Algebraic techniques

Core + Challenge

Power of a Power and the Zero Index

I can raise powers and products to a power, use the zero index, and combine the index laws to simplify.

Name: _____ Date: _____ Score: _____ / 58

Key idea

Power of a power: keep the base and **multiply** the indices. $(a^3)^4 = a^3 \times a^3 \times a^3 \times a^3 = a^{12}$

Power of a product: raise **every** factor to the power. $(ab)^5 = a^5b^5$; $(2x^3)^2 = 2^2 \times x^6 = 4x^6$

Zero index: any non-zero base to the power 0 equals 1. $7^0 = 1$, $(3xy)^0 = 1$, but $5x^0 = 5 \times 1 = 5$

Why it works: by the division law $a^3 \div a^3 = a^0$, but any number divided by itself is 1. So $a^0 = 1$.

A

Fluency *practise the skill*

/ 16 marks

Simplify, leaving your answer in index form unless asked to evaluate. 1 mark each.

1. $(2^3)^4$ _____

9. $5x^0$ _____

2. $(a^5)^2$ _____

10. $(5x)^0$ _____

3. $(x^4)^3$ _____

11. $(-2y^4)^2$ _____

4. $(m^2)^7$ _____

12. $(a^2b^3)^4$ _____

5. 9^0 _____

13. $3^0 + 4^0$ _____

6. $(ab)^4$ _____

14. Evaluate $(10^2)^3$ _____

7. $(3x)^2$ _____

15. $(x^3)^2 \times x^4$ _____

8. $(2a^3)^3$ _____

16. $(y^4)^3 \div y^5$ _____

B

Core *apply the skill to problems*

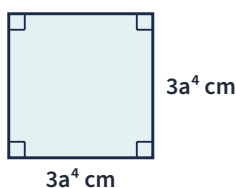
/ 22 marks

- 1 Write $(5^2)^3$ as a single power of 5, then evaluate it. [2 marks]

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Answer: _____

- 2 A square tile has side length $3a^4$ cm. Find an expression for its area. [2 marks]



.....

Answer: _____

- 3 A cube-shaped storage box has edges of $2k^2$ cm. Find an expression for its volume. [2 marks]

.....

Answer: _____

- 4 Simplify $(2x^3)^4 \div 4x^5$ [2 marks]

.....

.....

Answer: _____

- 5 Simplify $(3a^2b)^3$ [2 marks]

.....

Answer: _____

- 6 Evaluate $4^0 + 2^3 \times 7^0 - (3^2)^0$ [2 marks]

.....

Answer: _____

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- 7 Find the value of each pronumeral: (a) $(x^n)^5 = x^{30}$ (b) $(2^3)^k = 2^{21}$ [2 marks]

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Answer:

- 8 A bacteria sample in a UWA lab doubles every hour. Starting from one cell, there are 2^{12} cells after 12 hours. Write 2^{12} as a power of 4 and as a power of 8. [3 marks]

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Answer:

- 9 Simplify $(m^4)^3 \times (m^2)^5 \div m^{20}$ [2 marks]

.....

Answer:

- 10 A square photo has an area of $36p^{10} \text{ cm}^2$. Find its side length, and check your answer by squaring it. [3 marks]

.....

Answer:

C Reasoning *explain, justify and check*

/ 9 marks

- 1 Tom wrote $(a^4)^3 = a^7$. Explain his mistake and give the correct answer. [2 marks]

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- 2 Use $5^3 \div 5^3$ to explain why $5^0 = 1$. [2 marks]

.....

- 3 True or false: $(2a)^3 = 2a^3$. Give a reason. [2 marks]

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- 4 Mia says $(a + b)^2 = a^2 + b^2$ because $(ab)^2 = a^2b^2$. Test her claim with $a = 3$ and $b = 4$, and explain why the rule for products does not work for sums. [3 marks]

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D Challenge *multi-step and problem-solving*

/ 11 marks

- 1 Find x if $(2^x)^3 \times 4^x = 2^{40}$. [3 marks]

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Answer: _____

- 2 Write 2^{60} , 3^{40} and 5^{20} in order from smallest to largest, without a calculator. (Hint: write each with index 20.) [3 marks]

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Answer: _____

- 3 Simplify $(2a^3b^2)^3 \times (3ab^4)^2 \div 6a^8b^{10}$ [2 marks]

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Answer: _____

- 4 How many digits does the number $4^5 \times 5^{12}$ have? (Hint: pair each 2 with a 5.) [3 marks]

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Answer: _____

How did I go?

Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 11 **Total** ____ / 58

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