

WA8MNAA1

Algebraic techniques

Core + Challenge

Index Laws: Multiplying and Dividing Powers

I can multiply and divide powers with the same base, including terms with coefficients and pronumerals.

Name: _____ Date: _____ Score: _____ / 58

Key idea

Index form: in 2^5 the **base** is 2 and the **index** is 5: $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$. Also $a = a^1$.

Multiplying powers with the same base: keep the base and **add** the indices. $a^3 \times a^4 = a^7$ ($3 + 4 = 7$)

Dividing powers with the same base: keep the base and **subtract** the indices. $x^9 \div x^4 = x^5$ ($9 - 4 = 5$)

Coefficients: multiply or divide the numbers, then use the laws. $3a^4 \times 2a^3 = 6a^7$; $12m^8 \div 4m^2 = 3m^6$

A

Fluency *practise the skill*

/ 16 marks

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

1. $2^3 \times 2^4$ _____

9. $4p^2 \times 5p^5$ _____

2. $5^6 \div 5^2$ _____

10. $-2k^3 \times 6k^4$ _____

3. $a^5 \times a^3$ _____

11. $a^2 \times a^3 \times a^4$ _____

4. $x^{10} \div x^3$ _____

12. $20t^7 \div 5t^6$ _____

5. $m \times m^6$ _____

13. Evaluate $2^3 \times 2^2$ _____

6. $7^8 \div 7$ _____

14. Evaluate $10^8 \div 10^5$ _____

7. $3a^4 \times 2a^3$ _____

15. $a^3b^2 \times a^4b$ _____

8. $15y^9 \div 5y^4$ _____

16. $18x^5y^4 \div 6x^2y$ _____

B**Core** *apply the skill to problems*

/ 22 marks

- 1 Write $3^4 \times 3^2$ as a single power of 3, then evaluate it.

[2 marks]

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Answer: _____

- 2 A phone photo is 2^{10} pixels wide and 2^9 pixels high. Write the total number of pixels as a single power of 2, then evaluate it.

[2 marks]

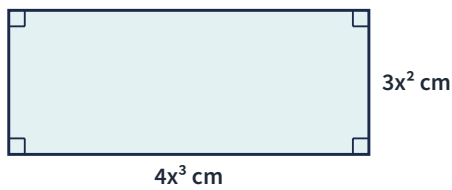
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Answer: _____

- 3 Find an expression for the area of this rectangle.

[2 marks]



.....

Answer: _____

- 4 A warehouse in Canning Vale holds 5^6 muesli bars, packed in cartons of 5^3 bars. How many cartons is that? Give your answer as a power of 5 and as a number.

[2 marks]

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Answer: _____

- 5 Find the value of each pronumeral: (a) $a^n \times a^5 = a^{12}$ (b) $y^{11} \div y^k = y^3$

[2 marks]

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Answer: _____

- 6 Simplify $6a^5b^3 \times 4a^2b^6$

[2 marks]

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Answer: _____

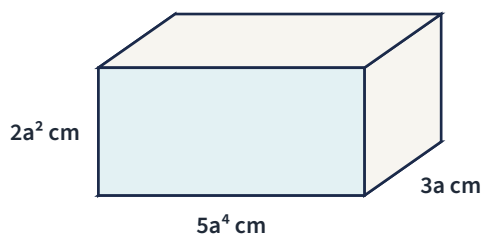
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- 7 Simplify $40x^8y^5 \div 8x^3y^2$ [2 marks]

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Answer: _____

- 8 Find a simplified expression for the volume of this rectangular prism. [3 marks]



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Answer: _____

- 9 Use the index laws to evaluate $2^5 \times 2^3 \div 2^6$ without a calculator. [2 marks]

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Answer: _____

- 10 Write $8^3 \times 4^2$ as a single power of 2. [3 marks]

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Answer: _____

C

Reasoning *explain, justify and check*

/ 9 marks

- 1 Jess wrote $3^4 \times 3^5 = 9^9$. Explain her mistake and give the correct answer. [2 marks]

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- 2 Write $a^3 \times a^4$ in expanded form to explain why it equals a^7 . [2 marks]

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- 3 True or false: $2^3 \times 3^2 = 6^5$. Give a reason. [2 marks]

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- 4 Use expanded form and cancelling to explain why $x^8 \div x^2 = x^6$ and not x^4 . [3 marks]

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D

Challenge *multi-step and problem-solving*

/ 11 marks

- 1 Find n if $9^4 \times 27^n = 3^{20}$. [3 marks]

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Answer: _____

- 2 Which is larger, 2^{30} or 3^{20} ? Explain without a calculator. (Hint: write both with index 10.) [3 marks]

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Answer: _____

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3 Simplify $12a^7b^4 \times 5ab^3 \div 15a^5b^6$ [2 marks]

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Answer: _____

4 Find the last digit of 7^{2026} . Show the pattern you used. [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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