

WA7MNAA1

Algebraic techniques

Core + Challenge

Index Notation and Powers of 10

I can write, expand, evaluate and compare numbers in index notation, including powers of 10.

Name: _____ Date: _____ Score: _____ / 56

Key idea

Index notation: 7^3 has **base** 7 and **index** (power) 3. It means $7 \times 7 \times 7 = 343$.

Powers of 10: $10^3 = 10 \times 10 \times 10 = 1000$. The index tells you how many zeros. $4000 = 4 \times 10^3$

Compare by evaluating: $5^4 = 625$ and $4^5 = 1024$, so $4^5 > 5^4$. Swapping the base and index changes the value.

Watch out: $3^4 \neq 3 \times 4$. $3^4 = 81$ but $3 \times 4 = 12$.

A

Fluency *practise the skill*

/ 16 marks

Evaluate, or write in the form asked.

1. $2^5 =$ _____

9. $5 \times 5 \times 5 \times 5$ in index form _____

2. $3^4 =$ _____

10. $2 \times 2 \times 2 \times 3 \times 3$ in index form _____

3. $5^3 =$ _____

11. 1 000 000 as a power of 10 _____

4. $10^4 =$ _____

12. 6^4 in expanded form _____

5. $7^2 =$ _____

13. $4000 = 4 \times 10^n$. $n =$ _____

6. $1^9 =$ _____

14. $30\,000 = 3 \times 10^n$. $n =$ _____

7. $4^3 =$ _____

15. $7 \times 10^2 =$ _____

8. $2^3 \times 3^2 =$ _____

16. $2^{10} =$ _____

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

/ 22 marks

- 1 A single bacterium doubles every hour. How many bacteria are there after 6 hours? Write your answer in index form and as a number. [2 marks]

.....

Answer: _____

- 2 One grain of rice is put on the first square of a chessboard, 2 on the second, 4 on the third, and so on. How many grains are on the 10th square? Give index form and value. [2 marks]

.....

Answer: _____

- 3 Which is larger: 2^5 or 5^2 ? By how much? [2 marks]

.....

Answer: _____

- 4 Write as an ordinary number: $3 \times 10^4 + 5 \times 10^2 + 7$ [2 marks]

.....

Answer: _____

- 5 A cube-shaped box has edges of 4 cm. Write its volume in index form and evaluate it. [2 marks]

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Answer: _____

- 6 Evaluate each of 3^4 , 4^3 , 2^6 and 9^2 . Which pairs are equal? [3 marks]

.....

Answer: _____

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- 7 The distance from Earth to the Sun is about 150 000 000 km. Write 150 000 000 in the form 15×10^n . What is n ? [2 marks]

.....

Answer:

- 8 How many times larger is 10^6 than 10^3 ? [2 marks]

.....

Answer:

- 9 A message is forwarded so that each person sends it to 3 new people. In round 1, 3 people receive it; in round 2, 9 people. How many receive it in round 5? [2 marks]

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Answer:

- 10 Without a calculator, evaluate $2^4 \times 5^4$. (Hint: pair each 2 with a 5.) [3 marks]

.....

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Answer:

C Reasoning *explain, justify and check*

/ 9 marks

- 1 Explain the difference between 3^4 and 3×4 . [2 marks]

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- 2 Ella says $2^3 = 6$. Explain her mistake. [2 marks]

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- 3 Without calculating both fully, explain which is larger: 10^5 or 5^{10} . [3 marks]

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- 4 Explain why 10^n is always written as 1 followed by n zeros.

[2 marks]

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D Challenge *multi-step and problem-solving*

/ 9 marks

- 1 Find n if $2^n = 256$.

[2 marks]

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Answer: _____

- 2 What is the last digit of 3^{20} ? Explain using a pattern.

[3 marks]

.....

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Answer: _____

- 3 Write 64 in index form in three different ways, each with a whole-number base and index greater than 1.

[2 marks]

.....

.....

Answer: _____

- 4 Which is larger: 2^{10} or 10^3 ? By how much?

[2 marks]

.....

.....

Answer: _____

How did I go?

Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 9 **Total ____ / 56**

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