

WA7MNAAS

Algebraic techniques

Core + Challenge

Number Laws with Variables

I can use the commutative and associative laws with variables to simplify expressions and test statements.

Name: _____ Date: _____ Score: _____ / 57

Key idea

Commutative: order doesn't matter for + and $\times$. $a + b = b + a$, $3 \times p = p \times 3$. **Not** for $-$ or $\div$.

Associative: grouping doesn't matter for + and $\times$. $(x + 2) + 5 = x + 7$, $2 \times 3p = 6p$.

Rearrange to simplify: $4 \times a \times 3 = 4 \times 3 \times a = 12a$ $25 \times n \times 4 = 100n$ $3a + 2a = 5a$ (3 lots of a plus 2 lots of a)

Test a claim by substituting a value. If one value fails, the statement is not always true.

A

Fluency *practise the skill*

/ 16 marks

Q1–8: is the statement always true? Q9–16: simplify.

- | | |
|--|---|
| 1. True or false? $a + 7 = 7 + a$ _____ | 9. Simplify $4 \times a \times 3$ _____ |
| 2. True or false? $5 \times m = m \times 5$ _____ | 10. Simplify $2m \times 5$ _____ |
| 3. True or false? $a - 3 = 3 - a$ _____ | 11. Simplify $p + 4 + 6$ _____ |
| 4. True or false? $a \times b \times 4 = 4ab$ _____ | 12. Simplify $3a + 2a$ _____ |
| 5. True or false? $(x + 2) + 5 = x + 7$ _____ | 13. Simplify $7x - 2x$ _____ |
| 6. True or false? $12 \div n = n \div 12$ _____ | 14. Simplify $b \times b$ _____ |
| 7. True or false? $2 \times 3p = 6p$ _____ | 15. Simplify $6y \div 2$ _____ |
| 8. True or false? $a \div 2 \div 3 = a \div 6$ _____ | 16. Simplify $2 \times a \times 3 \times b$ _____ |

B

Core *apply the skill to problems*

/ 22 marks

- 1 Four friends each have a bag of c chocolates and each is given 3 more. [3 marks]

(a) Write two different expressions for the total.

(b) Show they are equal when $c = 10$.

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Answer: _____

- 2 Is $20 \div (a + b)$ the same as $20 \div a + 20 \div b$? Test with $a = 2$ and $b = 3$. [2 marks]

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Answer: _____

- 3 Rewrite $25 \times n \times 4$ to make it easy to simplify. What is the simplified expression? [2 marks]

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Answer: _____

- 4 A rectangle is $3m$ cm long and $4n$ cm wide. Write and simplify an expression for its area, naming the law you used. [2 marks]

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Answer: _____

- 5 A rectangle has sides $2x$ cm and 5 cm. Write and simplify an expression for its perimeter. [2 marks]

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Answer: _____

- 6 Use the associative law to show that $(a + 3) + 7 = a + 10$. Check with $a = 5$. [2 marks]

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Answer: _____

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7 Simplify $5 \times k \times 2 \times k$. [2 marks]

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 Answer: _____

8 Which of these are equivalent to $12x$? $3 \times 4x$ $6x + 6x$ $12 + x$ $2 \times 6 \times x$ [3 marks]

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 Answer: _____

9 Sam buys 3 packs of p pens, then 2 more packs of the same pens. Write a simplified expression for the total number of pens. [2 marks]

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 Answer: _____

10 Is $m \div 3$ equal to $5m \div 15$? Explain. [2 marks]

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 Answer: _____

C Reasoning *explain, justify and check*

/ 9 marks

1 Explain, with an example, why subtraction is not commutative. [2 marks]

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2 Is $a \div 6b = a \div 2 \div 3b$ always true? Test with $a = 12$ and $b = 1$, and explain. [3 marks]

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3 Jo says $3a + 2b = 5ab$. Explain why she is wrong. [2 marks]

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- 4 Explain why $4 \times 25 \times x$ is easy to simplify, and what law makes this possible. [2 marks]

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D Challenge *multi-step and problem-solving*

/ 10 marks

- 1 Show that $2(n + 3) - n - 6$ always equals n . Check with $n = 10$. [3 marks]

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Answer:

- 2 Find the missing term: $6pq = 2p \times \square$ [2 marks]

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- 3 For whole numbers a and b that are both 2 or more, compare $a + b$, ab and a^b . Try at least three pairs. What do you notice? [3 marks]

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Answer:

- 4 A rectangle has area $24xy$. Give three different pairs of possible side lengths. [2 marks]

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Answer:

How did I go?

Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 10 **Total ____ / 57**

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