

WA7MNAAS

Algebraic techniques

Core + Challenge

Number Laws with Variables — Marking Key

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

For tutors and parents. Award method marks for correct working even if the final answer is wrong.

Marks summary

Section A Fluency: 16 Section B Core: 22 Section C Reasoning: 9 Section D Challenge: 10 **Total: 57**

Fluency: 1 mark each; accept an equivalent unsimplified answer for half credit at tutor's discretion.

A

Fluency *answers and working*

/ 16 marks

Q	Answer	Working
1	True	Commutative/associative laws
2	True	Commutative/associative laws
3	False	Not always – test a value, e.g. 10
4	True	Commutative/associative laws
5	True	Commutative/associative laws
6	False	Not always – test a value, e.g. 10
7	True	Commutative/associative laws
8	True	Commutative/associative laws
9	12a	$4 \times a \times 3 = 12a$
10	10m	$2m \times 5 = 10m$
11	$p + 10$	$p + 4 + 6 = p + 10$
12	5a	$3a + 2a = 5a$
13	5x	$7x - 2x = 5x$
14	b^2	$b \times b = b^2$
15	3y	$6y \div 2 = 3y$
16	6ab	$2 \times a \times 3 \times b = 6ab$

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B

Core *answers, working and marks*

/ 22 marks

Q	Answer	Working / sample response	Marks
1	(a) $4(c + 3)$ and $4c + 12$ (b) both 52	$4 \times 13 = 52$; $40 + 12 = 52$ <i>1 mark each expression</i> <i>1 mark: check</i>	3
2	No: $4 \neq 16.67$	$20 \div 5 = 4$; $10 + 6.67 = 16.67$ <i>1 mark: both values</i> <i>1 mark: no</i>	2
3	$25 \times 4 \times n = 100n$	Commutative law <i>1 mark: reorder</i> <i>1 mark: $100n$</i>	2
4	$12mn$ (commutative)	$3m \times 4n = 3 \times 4 \times m \times n$ <i>1 mark: $12mn$</i> <i>1 mark: law</i>	2
5	$4x + 10$	$2x + 5 + 2x + 5$ <i>1 mark: sum of sides</i> <i>1 mark: $4x + 10$</i>	2
6	$a + (3 + 7)$; $15 = 15$	$(5 + 3) + 7 = 15$; $5 + 10 = 15$ <i>1 mark each</i>	2
7	$10k^2$	$5 \times 2 \times k \times k$ <i>1 mark: 10</i> <i>1 mark: k^2</i>	2
8	$3 \times 4x$, $6x + 6x$, $2 \times 6 \times x$	$12 + x$ is not equivalent (test $x = 1$: $13 \neq 12$) <i>1 mark each correct (-1 for $12 + x$)</i>	3
9	$5p$	$3p + 2p$ <i>1 mark: $3p + 2p$</i> <i>1 mark: $5p$</i>	2
10	Yes	$\frac{5m}{15} = \frac{m}{3}$, like equivalent fractions (divide top and bottom by 5). <i>1 mark: yes</i> <i>1 mark: reason</i>	2

C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	e.g. $9 - 4 \neq 4 - 9$	$5 \neq -5$, so changing the order changes the answer. <i>2 marks</i>	2
2	True	$12 \div 6 = 2$; $12 \div 2 \div 3 = 2$. Dividing by $6b$ is dividing by 2, then by $3b$. <i>1 mark: test</i> <i>1 mark: true</i> <i>1 mark: explanation</i>	3

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Q	Answer	Working / sample response	Marks
3	Unlike terms can't be combined	Test $a = 2$, $b = 1$: $3a + 2b = 8$ but $5ab = 10$. $3a$ and $2b$ are unlike terms, so they cannot be combined. <i>1 mark: counterexample</i> <i>1 mark: explanation</i>	2
4	$100x$ – associative/commutative	Group $4 \times 25 = 100$ first. <i>2 marks</i>	2

D

Challenge solutions and marking criteria

/ 10 marks

Q	Answer	Working / sample response	Marks
1	n	$2n + 6 - n - 6 = n$; $26 - 10 - 6 = 10$ <i>1 mark: expand</i> <i>1 mark: simplify</i> <i>1 mark: check</i>	3
2	$3q$	$6pq \div 2p = 3q$ <i>2 marks</i>	2
3	$a^b \geq ab \geq a + b$	$(2, 2)$: 4, 4, 4; $(3, 2)$: 5, 6, 9; $(4, 3)$: 7, 12, 64 <i>1 mark: examples</i> <i>1 mark: pattern</i> <i>1 mark: equality only at (2, 2)</i>	3
4	e.g. $6x$ and $4y$; $8xy$ and 3 ; $12x$ and $2y$	Any pair multiplying to $24xy$ <i>2 marks: three pairs</i>	2