

WA8MNAA2

Algebraic techniques

Core + Challenge

Simplifying Algebraic Expressions — Marking Key

I can collect like terms, including negative terms and several pronumerals, and check equivalence by substituting.

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: 11 **Total: 58**

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	$8x$	$5 + 3 = 8$
2	$5a$	$9 - 4 = 5$
3	$-4m$	$3 - 7 = -4$
4	$9y + 2$	$6y + 3y = 9y$
5	$6a + 4b$	$4a + 2a; 3b + b$
6	$3p - 2q$	$8p - 5p; -3q + q$
7	$-7x - 2$	$-2x - 5x; 7 - 9$
8	$8ab$	$ba = ab$, so like terms
9	$3x^2 + 5x$	x^2 and x are unlike
10	$10mn - 2m$	$7mn + 3mn$
11	$-3k$	$1 - 6 + 2 = -3$
12	$4c$	$2.5 + 1.5 = 4$
13	$-2t - 4$	$-4t + 2t; 6 - 10$
14	$7xy$	$-3x + 3x = 0$
15	10	$12 + (-2) = 10$
16	21	$2 \times 9 - (-3) = 18 + 3$

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B

Core answers, working and marks

/ 22 marks

Q	Answer	Working / sample response	Marks
1	$8x + 2$	$2(3x + 2) + 2(x - 1)$ $= 6x + 4 + 2x - 2 = 8x + 2$ <i>1 mark: adds all four sides</i> <i>1 mark: $8x + 2$</i>	2
2	$6a + 8$	$(2a + 5) + (3a - 1) + (a + 4)$ $= 6a + 8$ <i>1 mark: sum of sides</i> <i>1 mark: $6a + 8$</i>	2
3	$11x - 2$	$4x + (2x - 3) + (5x + 1)$ $= 11x - 2$ <i>1 mark: full sum</i> <i>1 mark: $11x - 2$</i>	2
4	$4a + 4b - 2c$	$a: 5 - 1 = 4; b: -3 + 7 = 4; c: 2 - 4 = -2$ <i>1 mark: two terms right</i> <i>1 mark: all three</i>	2
5	$2x^2 + 2x - 3$	$x^2: 3 - 1 = 2; x: -4 + 6 = 2; \text{numbers: } 5 - 8 = -3$ <i>1 mark: two terms right</i> <i>1 mark: all three</i>	2
6	(a) $9a + 9b$ (b) $3a - b$	$(a) (6a + 4b) + (3a + 5b) = 9a + 9b$ $(b) (6a + 4b) - (3a + 5b) = 3a - b$ <i>1 mark: (a)</i> <i>1 mark: (b) set-up</i> <i>1 mark: $3a - b$</i>	3
7	$6x + 4y$	$3x + y + 2x + y + x + 2y$ $= 6x + 4y$ <i>1 mark: all six sides</i> <i>1 mark: $6x + 4y$</i>	2
8	(a) $-3x$ (b) $6n$	$(a) 4x + ? = x, \text{ so } ? = -3x$ $(b) ? - 2n = 4n, \text{ so } ? = 6n$ <i>1 mark each</i>	2
9	A and C	$A = a + 4b$ and $C = a + 4b$ With $a = 3, b = 2: A = 11, B = 27, C = 11, D = 14$ <i>1 mark: A and C</i> <i>1 mark: substitution check</i>	2
10	Difference is 14 cm	Hexagon: $6(2k - 1) = 12k - 6$ Square: $4(3k + 2) = 12k + 8$ $(12k + 8) - (12k - 6) = 14$ <i>1 mark: hexagon</i> <i>1 mark: square</i> <i>1 mark: difference 14</i>	3

C Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	$2x + 2y$	She combined $-2y$ and $4y$ as $-6y$. The signs belong to the terms: $-2y + 4y = 2y$. 1 mark: explains error 1 mark: $2x + 2y$	2
2	They are unlike terms	$3a$ and $2b$ have different pronumerals, so they are unlike terms. $a = 2, b = 3: 3a + 2b = 12$ but $5ab = 30$. 1 mark: unlike terms 1 mark: numerical check	2
3	False	$4x^2$ and $3x$ are unlike terms, so they cannot be added. $x = 2: 4(4) + 3(2) = 22$ but $7(8) = 56$. 1 mark: false 1 mark: reason	2
4	Equal at $x = 2$, different at $x = 3$	$x = 2: x^2 = 4$ and $2x = 4$, so one value makes them look equivalent $x = 3: x^2 = 9$ but $2x = 6$, so they are not equivalent One counterexample disproves; equivalent expressions must agree for every value 1 mark: $x = 2$ example 1 mark: $x = 3$ example 1 mark: explanation	3

D Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	$(2a + 2b)$ cm	length + width = half the perimeter = $5a + 3b$ width = $(5a + 3b) - (3a + b) = 2a + 2b$ 1 mark: $5a + 3b$ 1 mark: $2a + 2b$	2
2	Top right $x + 1$; middle row $x - 2, x + 2$; bottom $x + 4, x - 3$; total $3x$	Let the total be T. Diagonal from top left: bottom right = $T - (x + 3) - x$ Bottom row then gives bottom middle = $x + 4$, so middle column: $(x - 4) + x + (x + 4) = 3x = T$ Then: top right $x + 1$, bottom right $x - 3$, middle left $x - 2$, middle right $x + 2$ 1 mark: $T = 3x$ 1 mark: three cells 1 mark: all five	3
3	Base $(4n - 3)$ cm; $n = 3.5$	Base = $(10n + 1) - 2(3n + 2) = 4n - 3$ $4n - 3 = 11$, so $4n = 14$ $n = 3.5$ 1 mark: $4n - 3$ 1 mark: equation 1 mark: $n = 3.5$	3

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Q	Answer	Working / sample response	Marks
4	$4n + 6$	$n + (n + 1) + (n + 2) + (n + 3) = 4n + 6$ $4n + 6 = 4n + 4 + 2 = 4(n + 1) + 2$ It is always 2 more than a multiple of 4 <i>1 mark: $4n + 6$</i> <i>1 mark: rewriting</i> <i>1 mark: explanation</i>	3