

WA8MNAA3

Algebraic techniques

Core + Challenge

Factorising with a Common Factor — Marking Key

I can factorise expressions by taking out the highest common factor, including negative factors, and check by expanding.

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	6	$12 = 6 \times 2$, $18 = 6 \times 3$
2	4	x is not in 20
3	3a	$\text{HCF}(6, 9) = 3$; a^2 and a share a
4	5n	$\text{HCF}(10, 15) = 5$; common n
5	$3(x + 4)$	HCF 3
6	$5(a - 4)$	HCF 5
7	$4(2m + 3)$	HCF 4
8	$7(2 - 3y)$	HCF 7
9	$x(x + 7)$	HCF x
10	$3p(2p - 3)$	HCF 3p
11	$2a(2b + 5)$	HCF 2a
12	$6y(2x - 3y)$	HCF 6y
13	$-5(k + 3)$	take out -5
14	$-4(2x - 3)$	take out -4
15	$3a(3a + 2b - 1)$	HCF 3a; $3a \div 3a = 1$
16	2x	$3 \times 2x = 6x$

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B

Core *answers, working and marks*

/ 22 marks

Q	Answer	Working / sample response	Marks
1	$(x + 3) \text{ cm}$	$6x + 18 = 6(x + 3)$ length = $x + 3$ <i>1 mark: $6(x + 3)$</i> <i>1 mark: $x + 3$</i>	2
2	$10(2a - 3b + 1)$	HCF of 20, 30 and 10 is 10 $10 \div 10 = 1$, so the last term is 1 <i>1 mark: HCF 10</i> <i>1 mark: brackets</i>	2
3	$7m(m - 2n)$	HCF = $7m$ Check: $7m \times m - 7m \times 2n = 7m^2 - 14mn$ <i>1 mark: $7m(m - 2n)$</i> <i>1 mark: check</i>	2
4	1700	$17(23 + 77) = 17 \times 100$ $= 1700$ <i>1 mark: $17(23 + 77)$</i> <i>1 mark: 1700</i>	2
5	$12a + 12c = 12(a + c)$	$12(a + c)$: the bracket is the cost of one adult and one child ticket, bought 12 times. <i>1 mark: $12(a + c)$</i> <i>1 mark: meaning</i>	2
6	$-4x(3x + 2)$	HCF = $4x$; first term negative, so take out $-4x$ $-4x \times 3x = -12x^2$; $-4x \times 2 = -8x$ <i>1 mark: $-4x$</i> <i>1 mark: $(3x + 2)$</i>	2
7	$(3a + 2b) \text{ cm}$; $P = (16a + 4b) \text{ cm}$	$15a^2 + 10ab = 5a(3a + 2b)$ Other side $3a + 2b$ $P = 2(5a + 3a + 2b) = 16a + 4b$ <i>1 mark: factorisation</i> <i>1 mark: $3a + 2b$</i> <i>1 mark: $16a + 4b$</i>	3
8	$6p(3q - 4)$	$18pq \div 6p = 3q$ $24p \div 6p = 4$ <i>1 mark each</i>	2
9	$2\pi r(r + h)$	HCF = $2\pi r$ Check: $2\pi r \times r + 2\pi r \times h$ <i>1 mark: HCF $2\pi r$</i> <i>1 mark: $(r + h)$</i>	2

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Q	Answer	Working / sample response	Marks
10	$2(4x + 7); (4x + 7) \text{ m}$	$8x + 14 = 2(4x + 7)$ $P = 2(\text{length} + \text{width})$ $\text{length} + \text{width} = 4x + 7$ <i>1 mark: factorisation</i> <i>1 mark: link to $2(L + W)$</i> <i>1 mark: $4x + 7$</i>	3

C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	$4(3x + 4)$	$6x + 8$ still has a common factor of 2, so she did not take out the HCF, which is 4. <i>1 mark: explanation</i> <i>1 mark: $4(3x + 4)$</i>	2
2	Wrong; $3(2x^2 - 5)$	$3x(2x - 5) = 6x^2 - 15x$, not $6x^2 - 15$ The HCF of $6x^2$ and 15 is 3, so $6x^2 - 15 = 3(2x^2 - 5)$ <i>1 mark: expansion shows error</i> <i>1 mark: $3(2x^2 - 5)$</i>	2
3	True	Expand: $-2 \times a = -2a$ and $-2 \times (-4) = +8$ So $-2(a - 4) = -2a + 8$ <i>1 mark: true</i> <i>1 mark: expansion</i>	2
4	Only $x^2 + 5x$ has a common factor	$x^2 = x \times x$ and $5x = 5 \times x$ share the factor x : $x(x + 5)$ x^2 and 5 have no common factor other than 1 So $x^2 + 5$ cannot be factorised this way <i>1 mark: $x(x + 5)$</i> <i>1 mark: no common factor</i> <i>1 mark: conclusion</i>	3

D

Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	(a) $(b + 3)(a + 5)$ (b) $(y - 1)(2x - 3)$	(a) $(b + 3)$ is a common factor of both terms (b) $(y - 1)$ is common: $(y - 1)(2x - 3)$ Check by expanding each <i>1 mark: idea</i> <i>1 mark: (a)</i> <i>1 mark: (b)</i>	3
2	47 000	$47(999 + 1)$ $= 47 \times 1000 = 47\,000$ <i>1 mark: $47(999 + 1)$</i> <i>1 mark: 47 000</i>	2

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Q	Answer	Working / sample response	Marks
3	$3(n + 1)$ and $5(2n + 5)$	$(a) n + (n + 1) + (n + 2) = 3n + 3 = 3(n + 1)$ $(b) (2n + 1) + (2n + 3) + \dots + (2n + 9) = 10n + 25$ $= 5(2n + 5)$ <i>1 mark: (a)</i> <i>1 mark: $10n + 25$</i> <i>1 mark: $5(2n + 5)$</i>	3
4	$12a^2b^2(2a - 3b + 1)$	HCF of 24, 36, 12 is 12 Lowest powers: a^2 and b^2 , so $HCF = 12a^2b^2$ Divide each term: $2a, -3b, 1$ <i>1 mark: 12</i> <i>1 mark: a^2b^2</i> <i>1 mark: brackets</i>	3