

WA8MNAUN4

Understanding number

Core + Challenge

Order of Operations and Mental Strategies with Integers — Marking Key

I can use order of operations, the number laws and inverse operations to calculate and check with integers.

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	-11	$-3 + (-8)$
2	-2	1×-2
3	38	$20 - (-18) = 20 + 18$
4	-10	$-6 - 4$
5	3	$-18 \div -6$
6	6	$16 - 10$
7	-6	$-16 + 10$
8	-40	5×-8
9	-594	$-600 + 6$
10	800	$(25 \times -4) \times -8 = -100 \times -8$
11	-510	$-500 + (-10)$
12	-180	$12 \times -10 + 12 \times -5 = -120 - 60$
13	8	$-48 \div -6$
14	true	commutative law: both are 12
15	false	$-8 - (-2) = -6$, but $-8 - 4 - 6 = -18$
16	>	$-10 > -12$

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B

Core answers, working and marks

/ 22 marks

Q	Answer	Working / sample response	Marks
1	(a) $(-2 + 6) \times -3 = -12$ (b) $(8 - 12) \div (4 - 2) = -2$	(a) $4 \times -3 = -12$ (without brackets: $-2 + (-18) = -20$) (b) $-4 \div 2 = -2$ 1 mark: (a) 2 marks: (b) — both brackets needed	3
2	(a) -459 (b) -796	(a) $-9 \times 50 + (-9 \times 1) = -450 - 9 = -459$ (b) $200 \times -4 - 1 \times -4 = -800 + 4 = -796$ 1 mark each	2
3	$-2 + 4 \times 3 + 3 \times -2 = 4^\circ\text{C}$	$-2 + 4 \times 3 + 3 \times (-2)$ $= -2 + 12 + (-6)$ $= 4^\circ\text{C}$ 1 mark: expression 1 mark: correct order of operations 1 mark: 4°C	3
4	-4	$-10 - (2 \times -3) = -10 - (-6) = -10 + 6 = -4$ Lily subtracted first: $(-10 - 2) \times -3 = 36$ 1 mark: -4 1 mark: error explained	2
5	20	$9 \times 2 - (-2)$ $= 18 + 2 = 20$ 1 mark: 9 and -2 1 mark: 20	2
6	(a) true (b) false	(a) LHS $-5 \times -2 = 10$; RHS $-20 + 30 = 10$ (b) LHS $-20 \div -4 = 5$; RHS $3 - 8 = -5$ 1 mark each with working	2
7	-\$588	$6 \times -98 = 6 \times -100 + 6 \times 2$ $= -600 + 12 = -588$ 1 mark: strategy 1 mark: -588	2
8	Correct	Check 49×-24 : $50 \times -24 = -1200$, then $-1200 + 24 = -1176$ ✓ so $-1176 \div -24 = 49$ 1 mark: multiplication check 1 mark: conclusion	2
9	(a) < (b) =	(a) $-3 \times 4 = -12$ and $6^2 = 36$ (b) $6 - 2 = 4$ and $-24 \div -6 = 4$ 1 mark each	2
10	-2600	$(-4 \times -25) \times 13 \times -2$ $= 100 \times 13 \times -2 = 1300 \times -2 = -2600$ 1 mark: regrouping 1 mark: -2600	2

C Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	Should be $150 + 30 = 180$	$-12 = -10 + (-2)$, so the two parts are added $-15 \times -12 = 150 + 30 = 180$ <i>1 mark: error</i> <i>1 mark: 180</i>	2
2	No	$(-48 \div 4) \div -2 = -12 \div -2 = 6$ $-48 \div (4 \div -2) = -48 \div -2 = 24$; $6 \neq 24$, so the grouping matters <i>1 mark: both values</i> <i>1 mark: conclusion</i>	2
3	False	If a is negative, e.g. $a = -3$, then $-a = -(-3) = 3$, which is positive (and if $a = 0$, $-a = 0$) <i>1 mark: false</i> <i>1 mark: counterexample</i>	2
4	-900	Associative/commutative: $-25 \times 4 \times 9 = -100 \times 9 = -900$ Distributive: $-25 \times 30 + (-25 \times 6) = -750 - 150 = -900$ <i>1 mark: first strategy</i> <i>1 mark: second strategy</i> <i>1 mark: laws named</i>	3

D Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	$120 = 5 \times 3 \times (-2) \times (-4)$	Multiplying the two negatives makes a positive: $(-2) \times (-4) = 8$ $5 \times 3 \times 8 = 120$ $2 \times 3 \times 4 \times 5 = 120$ is the biggest possible size, and it is positive because there are two negatives; using $+$, $-$ or $\div$ on any pair gives a smaller size, so 120 is the maximum <i>1 mark: pairs the negatives</i> <i>1 mark: 120</i> <i>1 mark: reasoning</i>	3
2	-3	Brackets: $(-3 - 5) = -8$; $(-2)^3 = -8$; $3^2 = 9$ Top: $-8 - 4 \times (-8) = -8 + 32 = 24$ Bottom: $1 - 9 = -8$; $24 \div -8 = -3$ <i>1 mark: powers</i> <i>1 mark: numerator 24</i> <i>1 mark: -3</i>	3
3	$n = -2, -1, 0, 1, 2$	$-3n + 4 \geq -2$ gives $-3n \geq -6$, so $n \leq 2$ $-3n + 4 < 13$ gives $-3n < 9$, so $n > -3$ check: $n = 2$ gives $-2 \checkmark$, $n = -2$ gives $10 \checkmark$, $n = -3$ gives $13 \times$, $n = 3$ gives $-5 \times$ <i>1 mark: $n \leq 2$</i> <i>1 mark: $n > -3$</i> <i>1 mark: full list</i>	3

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Q	Answer	Working / sample response	Marks
4	3	$-98 \times 102 = -98 \times 100 - 98 \times 2 = -9800 - 196 = -9996$ $99 \times 101 = 9900 + 99 = 9999$; $-9996 + 9999 = 3$ <i>1 mark: both products</i> <i>1 mark: 3</i>	2