

WA8MNAC3

Calculating with number

Core + Challenge

Operations with Positive and Negative Fractions and Decimals — Marking Key

I can add, subtract, multiply and divide positive and negative fractions and decimals, including powers, and check by estimating.

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	$\frac{1}{4}$	$-\frac{2}{4} + \frac{3}{4}$
2	$-\frac{5}{6}$	$-\frac{4}{6} - \frac{1}{6}$
3	$-\frac{3}{10}$	$\frac{6}{10} - \frac{9}{10}$
4	$-\frac{3}{5}$	$-\frac{18}{30}$
5	$\frac{2}{3}$	same signs: $\frac{24}{36}$
6	$-\frac{5}{2}$	$-\frac{5}{6} \times 3 = -\frac{15}{6}$ (or $-2\frac{1}{2}$)
7	2	same signs; 4 sevenths $\div$ 2 sevenths
8	$\frac{1}{4}$	$-\frac{1}{2} \times -\frac{1}{2}$
9	$-\frac{8}{27}$	odd power $\rightarrow$ negative
10	2.7	$5.1 - 2.4$
11	-5.35	$-(3.6 + 1.75)$
12	-0.24	$4 \times 6 = 24$, two d.p.
13	0.6	same signs: 0.60
14	-8	$48 \div 6 = 8$
15	-0.008	$-0.2 \times -0.2 \times -0.2$
16	≈ -24	-6×4

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B

Core *answers, working and marks*

/ 22 marks

Q	Answer	Working / sample response	Marks
1	5.35 °C	$-1.4 + 6.75 = 5.35$ <i>1 mark: $-1.4 + 6.75$</i> <i>1 mark: 5.35 °C</i>	2
2	(a) -\$2.10 (b) -\$0.90	$(a) 6 \times -0.35 = -2.10$ $(b) -2.10 + 1.20 = -0.90$ <i>1 mark each</i>	2
3	-1 m	$-\frac{3}{8} \times 2\frac{2}{3} = -\frac{3}{8} \times \frac{8}{3}$ $= -\frac{24}{24} = -1$ <i>1 mark: improper fraction</i> <i>1 mark: -1 m</i>	2
4	$\frac{1}{16}$	$(-\frac{3}{4})^2 = \frac{9}{16}$ $\frac{9}{16} - \frac{8}{16} = \frac{1}{16}$ <i>1 mark: $\frac{9}{16}$</i> <i>1 mark: $\frac{1}{16}$</i>	2
5	Estimate ≈ -10 ; exact -9.702	Estimate: $-20 \times 0.5 = -10$ Exact: $198 \times 49 = 9702$, three decimal places, negative sign: -9.702 close to -10, so reasonable <i>1 mark: estimate</i> <i>1 mark: digits 9702</i> <i>1 mark: -9.702</i>	3
6	8	Sign: negative $\div$ negative is positive Size: $6.4 \div 0.8$ is about $6 \div 1 = 6$, not 80. Correct: $64 \div 8 = 8$ <i>1 mark: both errors</i> <i>1 mark: 8</i>	2
7	$-\frac{9}{10}$	$\times$ first: $\frac{3}{4} \times -\frac{2}{3} = -\frac{1}{2}$ $-\frac{2}{5} + -\frac{1}{2} = -\frac{4}{10} - \frac{5}{10} = -\frac{9}{10}$ <i>1 mark: $-\frac{1}{2}$</i> <i>1 mark: $-\frac{9}{10}$</i>	2
8	$-2\frac{3}{4}$	$S = -\frac{1}{2}; 3 \times -\frac{3}{4} = -\frac{9}{4}$ $-\frac{1}{2} + -\frac{9}{4} = -\frac{2}{4} - \frac{9}{4} = -\frac{11}{4} = -2\frac{3}{4}$ <i>1 mark: $-\frac{9}{4}$</i> <i>1 mark: $-2\frac{3}{4}$</i>	2

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Q	Answer	Working / sample response	Marks
9	20 seconds	change needed: $-3.6 - (-12.6) = 9$ m $9 \div 0.45 = 900 \div 45$ $= 20$ s <i>1 mark: 9 m</i> <i>1 mark: division</i> <i>1 mark: 20 s</i>	3
10	-1°C	sum: $-2.3 + 1.5 - 0.8 - 4.1 + 0.7 = -5.0$ $-5.0 \div 5 = -1.0$ <i>1 mark: sum -5</i> <i>1 mark: -1°C</i>	2

C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	0.25 and -0.25	$(-0.5)^2 = -0.5 \times -0.5 = 0.25$ (the brackets mean the negative is squared) $-0.5^2 = -(0.5 \times 0.5) = -0.25$ (only 0.5 is squared) <i>1 mark each value with reason</i>	2
2	True	e.g. $-3 \div 0.5 = -6$, and $-6 < -3$ dividing by a number less than 1 makes the size bigger, so a negative moves further left <i>1 mark: true</i> <i>1 mark: example</i>	2
3	$-\frac{1}{4}$	Leo added the numerators and added the denominators common denominator: $-\frac{3}{4} + \frac{2}{4} = -\frac{1}{4}$ <i>1 mark: error</i> <i>1 mark: $-\frac{1}{4}$</i>	2
4	-0.98×-3.05	Both are positive (same signs) 0.98×3.05 is just under 3.05 (2% less): about 2.99 $2.9 \div 0.99$ is just over 2.9 (about 1% more): about 2.93, so the first is larger <i>1 mark: both positive</i> <i>1 mark: estimate each</i> <i>1 mark: conclusion</i>	3

D

Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	-1	$(-\frac{1}{2})^3 = -\frac{1}{8}$; $-\frac{1}{8} + \frac{6}{8} = \frac{5}{8}$ $\frac{5}{8} \div -\frac{5}{8} = -1$ <i>1 mark: $\frac{5}{8}$</i> <i>1 mark: -1</i>	2

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Q	Answer	Working / sample response	Marks
2	$-\frac{1}{10}$	The factors are $-\frac{1}{2}, -\frac{2}{3}, -\frac{3}{4}, \dots, -\frac{9}{10}$: 9 negative factors $\rightarrow$ negative $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \dots \times \frac{9}{10}$: each numerator cancels the denominator before it leaving $\frac{1}{10}$, so the product is $-\frac{1}{10}$ 1 mark: sign 1 mark: cancelling 1 mark: $-\frac{1}{10}$	3
3	1.5 and 3	Before squaring: 0.5 or -0.5 $-\frac{2}{3}x + 1.5 = 0.5$ gives $-\frac{2}{3}x = -1$, $x = 1.5$ $-\frac{2}{3}x + 1.5 = -0.5$ gives $-\frac{2}{3}x = -2$, $x = 3$ 1 mark: ± 0.5 1 mark: 1.5 1 mark: 3	3
4	Estimate ≈ -4 ; exact -4.056	Estimate: $(-4)^2 \times -0.5 \div 2 = 16 \times -0.5 \div 2 = -4$, so -40.56 is 10 times too big $(-3.9)^2 = 15.21$; $15.21 \times -0.52 = -7.9092$ $-7.9092 \div 1.95 = -4.056$ 1 mark: estimate 1 mark: -7.9092 1 mark: -4.056	3