

WA8MNAUN1

Understanding number

Core + Challenge

Recurring Decimals and Fractions — Marking Key

I can convert fractions to terminating or recurring decimals, predict which will terminate, and write recurring decimals as fractions.

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	0.25	$1 \div 4$
2	0.375	$3 \div 8$
3	0.333...	$1 \div 3$, the 3 repeats
4	0.8333...	$5 \div 6$, only the 3 repeats
5	0.181818...	$\frac{18}{99}$: the block 18 repeats
6	0.35	$\frac{35}{100}$
7	0.555...	ninths: the numerator repeats
8	$\frac{7}{9}$	one repeating digit $\rightarrow$ over 9
9	$\frac{4}{11}$	$\frac{36}{99} = \frac{4}{11}$
10	$\frac{1}{11}$	$\frac{9}{99} = \frac{1}{11}$
11	yes	$25 = 5 \times 5 \rightarrow 0.36$
12	no	$12 = 2 \times 2 \times 3 \rightarrow 0.41666...$
13	yes	$\frac{21}{28} = \frac{3}{4} = 0.75$ (simplify first)
14	0.45	third digit 4 $\rightarrow$ round down
15	0.167	$0.16666... \rightarrow 0.167$
16	0.8	$0.777... \rightarrow 0.8$

B

Core answers, working and marks

/ 22 marks

Q	Answer	Working / sample response	Marks
1	0.714285714285...; block 714285	Remainders: $5 \rightarrow 1 \rightarrow 3 \rightarrow 2 \rightarrow 6 \rightarrow 4 \rightarrow 5$ (back to the start) digits 7, 1, 4, 2, 8, 5 then repeat <i>1 mark: correct digits</i> <i>1 mark: notation and block 714285</i>	2
2	T: $\frac{3}{16}, \frac{11}{50}, \frac{9}{12}$; R: $\frac{4}{15}, \frac{5}{24}, \frac{7}{30}$	$16 = 2 \times 2 \times 2 \times 2$ (T); $15 = 3 \times 5$ (R); $50 = 2 \times 5 \times 5$ (T) $24 = 2 \times 2 \times 2 \times 3$ (R); $\frac{9}{12} = \frac{3}{4}$, $4 = 2 \times 2$ (T); $30 = 2 \times 3 \times 5$ (R) <i>1 mark: factors shown</i> <i>1 mark: simplifies $\frac{9}{12}$</i> <i>1 mark: all six correct</i>	3
3	\$6.666... $\approx$ \$6.67; $3 \times$ \$6.67 = \$20.01	$20 \div 3 = 6.666...$ rounds to \$6.67 (third digit 6 $\rightarrow$ round up) $3 \times 6.67 = 20.01$: each share was rounded up slightly <i>1 mark: 6.666...</i> <i>1 mark: \$6.67</i> <i>1 mark: explanation</i>	3
4	$\frac{3}{11}$	Two-digit block $\rightarrow$ over 99: $\frac{27}{99}$ $\div 9$: $\frac{3}{11}$ <i>1 mark: $\frac{27}{99}$</i> <i>1 mark: $\frac{3}{11}$</i>	2
5	$\frac{8}{9}$ and $\frac{5}{33}$	$0.888... = \frac{8}{9}$ $0.151515... = \frac{15}{99} = \frac{5}{33}$ <i>1 mark each</i>	2
6	0.6111...; 61.1%	$11 \div 18 = 0.61111...$ (only the 1 repeats) $61.111... \% \approx 61.1\%$ <i>1 mark: 0.6111...</i> <i>1 mark: 61.1%</i>	2
7	$\frac{4}{11}$	$\frac{4}{11} = 0.363636...$ $0.3636... > 0.3600$ (compare the third decimal place) <i>1 mark: 0.3636...</i> <i>1 mark: $\frac{4}{11}$ larger</i>	2
8	$1\frac{1}{3} = \frac{4}{3}$	$1.333... = 1 + 0.333... = 1 + \frac{1}{3}$ $= \frac{4}{3}$ <i>1 mark each</i>	2
9	$40 = 2 \times 2 \times 2 \times 5$; 0.225	only 2s and 5s, so it terminates $\frac{9}{40} = \frac{225}{1000} = 0.225$ <i>1 mark: prime factors with reason</i> <i>1 mark: 0.225</i>	2

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Q	Answer	Working / sample response	Marks
10	$0.5666... \approx 0.567$	$17 \div 30 = 0.56666...$ the 4th digit is 6, so round up: 0.567 <i>1 mark: 0.5666...</i> <i>1 mark: 0.567</i>	2

C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	$0.333... + 0.666... = 0.999...$	$\frac{1}{3} = 0.333...$ and $\frac{2}{3} = 0.666...$ adding: $0.999... = \frac{1}{3} + \frac{2}{3} = 1$ <i>1 mark: both decimals</i> <i>1 mark: conclusion</i>	2
2	No	$\frac{6}{15}$ simplifies to $\frac{2}{5}$ (denominator 5 only) $\frac{2}{5} = 0.4$, which terminates. Always simplify first. <i>1 mark: simplifies</i> <i>1 mark: 0.4 terminates</i>	2
3	$\frac{2}{3} \approx 0.67$	$0.666...:$ the third digit is 6 (5 or more), so round up 0.67 <i>1 mark: explains round up</i> <i>1 mark: 0.67</i>	2
4	At most 6 different remainders	Each new digit depends only on the current remainder There are only 6 possible non-zero remainders, so within 6 steps a remainder must come back Once a remainder repeats, the digits repeat from there <i>1 mark: digit depends on remainder</i> <i>1 mark: only 6 remainders</i> <i>1 mark: repeat conclusion</i>	3

D

Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	$\frac{23}{55}$	$0.0181818... = \frac{1}{10} \times 0.181818... = \frac{1}{10} \times \frac{18}{99} = \frac{18}{990}$ $0.4 = \frac{396}{990}$, so the total is $\frac{414}{990}$ $\div 18: \frac{23}{55}$ <i>1 mark: $\frac{18}{990}$ (or equivalent)</i> <i>1 mark: $\frac{414}{990}$</i> <i>1 mark: $\frac{23}{55}$</i>	3

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Q	Answer	Working / sample response	Marks
2	5	The block 428571 has 6 digits; $2026 = 6 \times 337 + 4$ the 4th digit of the block is 5 <i>1 mark: remainder 4</i> <i>1 mark: 5</i>	2
3	19	$60 = 2 \times 2 \times 3 \times 5$: the 3 must cancel so the numerator must be a multiple of 3: 3, 6, 9, ..., 57 $57 \div 3 = 19$ fractions <i>1 mark: 3 must cancel</i> <i>1 mark: multiples of 3</i> <i>1 mark: 19</i>	3
4	$\frac{41}{333}$; sum = 1	Three-digit block $\rightarrow$ over 999: $\frac{123}{999} = \frac{41}{333}$ $0.876876... = \frac{876}{999}$ $\frac{123}{999} + \frac{876}{999} = \frac{999}{999} = 1$ <i>1 mark: $\frac{123}{999}$</i> <i>1 mark: $\frac{41}{333}$</i> <i>1 mark: sum 1</i>	3