

WA8MMGTW2

Two-dimensional space and structures

Core + Challenge

Circumference of a Circle — Marking Key

I can use $C = \pi d = 2\pi r$ to find the circumference of a circle, and work backwards to find the radius or diameter.

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	31.4 cm	3.14×10
2	18.84 m	3.14×6
3	25.12 cm	$2 \times 3.14 \times 4$
4	12.56 m	$2 \times 3.14 \times 2$
5	62.8 mm	3.14×20
6	3.14 m	$2 \times 3.14 \times 0.5$
7	314 cm	3.14×100
8	10 cm	$31.4 \div 3.14$
9	22.0 cm	$\pi \times 7 = 21.99\dots$
10	18.8 cm	$2 \times \pi \times 3 = 18.84\dots$
11	39.3 m	$\pi \times 12.5 = 39.26\dots$
12	50.3 mm	$2 \times \pi \times 8 = 50.26\dots$
13	9.4 m	$2 \times \pi \times 1.5 = 9.42\dots$
14	12.7 cm	$40 \div \pi = 12.73\dots$
15	15.9 m	$100 \div (2\pi) = 15.91\dots$
16	141.4 cm	$\pi \times 45 = 141.37\dots$

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B

Core answers, working and marks

/ 22 marks

Q	Answer	Working / sample response	Marks
1	56.52 cm	$C = \pi d = 3.14 \times 18 = 56.52$ <i>1 mark: $C = \pi d$</i> <i>1 mark: 56.52 cm</i>	2
2	47.1 m	$C = 2\pi r = 2 \times \pi \times 7.5 = 47.12\dots$ <i>1 mark: $C = 2\pi r$</i> <i>1 mark: 47.1 m</i>	2
3	(a) 207 cm (b) 482 turns	(a) $C = \pi \times 66 = 207.34\dots \approx 207$ cm (b) 1 km = 100 000 cm; $100\,000 \div 207.34\dots = 482.2\dots$ ≈ 482 turns (accept 483 from using 207) <i>1 mark: 207 cm</i> <i>1 mark: 100 000 cm</i> <i>1 mark: 482 (or 483)</i>	3
4	15.1 m; \$136	$C = 2 \times \pi \times 2.4 = 15.07\dots \approx 15.1$ m Buy 16 m (whole metres) $16 \times 8.50 = \$136$ <i>1 mark: 15.1 m</i> <i>1 mark: 16 m</i> <i>1 mark: \$136</i>	3
5	0.70 m	$d = C \div \pi = 2.2 \div \pi = 0.7002\dots$ <i>1 mark: $C \div \pi$</i> <i>1 mark: 0.70 m</i>	2
6	63.7 m	$r = C \div (2\pi) = 400 \div (2\pi) = 63.66\dots$ <i>1 mark: $C \div 2\pi$</i> <i>1 mark: 63.7 m</i>	2
7	75.36 cm; 18.84 cm	1 hour: $2 \times 3.14 \times 12 = 75.36$ 15 minutes is $\frac{1}{4}$ of a turn: $75.36 \div 4 = 18.84$ <i>1 mark each</i>	2
8	7 people	$C = \pi \times 150 = 471.2\dots$ cm $471.2 \div 60 = 7.85\dots \rightarrow 7$ people (round down) <i>1 mark: 471 cm</i> <i>1 mark: 7</i>	2
9	64 mm	$C = \pi \times 20.5 = 64.40\dots$ <i>1 mark: working</i> <i>1 mark: 64 mm</i>	2
10	The square, by 0.6 cm	Circle: $3.14 \times 10 = 31.4$ cm; square: $4 \times 8 = 32$ cm $32 - 31.4 = 0.6$ <i>1 mark: both</i> <i>1 mark: square by 0.6 cm</i>	2

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C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	$d = 2r$	The diameter is two radii, $d = 2r$. So $\pi d = \pi \times 2r = 2\pi r$. <i>1 mark: $d = 2r$</i> <i>1 mark: substitution</i>	2
2	3.14 each time; π	$22.0 \div 7.0 = 3.14$; $75.4 \div 24.0 = 3.14$; $207.3 \div 66.0 = 3.14$ $C \div d$ is always about 3.14 — this is π. <i>1 mark: column</i> <i>1 mark: π</i>	2
3	37.7 cm	She used the radius in $C = \pi d$. The diameter is 12 cm. $C = \pi \times 12 = 37.69... \approx 37.7$ cm <i>1 mark: error</i> <i>1 mark: 37.7 cm</i>	2
4	True	$C = \pi d$, so $\pi \times 2d = 2 \times \pi d$. e.g. $d = 5$ cm $\rightarrow C = 15.7$ cm; $d = 10$ cm $\rightarrow C = 31.4$ cm $= 2 \times 15.7$ <i>1 mark: true</i> <i>1 mark: reason</i> <i>1 mark: example</i>	3

D

Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	1.59 m; no	New C – old $C = 10$ m, so $2\pi(R + h) - 2\pi R = 10$ $2\pi h = 10 \rightarrow h = 10 \div (2\pi) = 1.591... \approx 1.59$ m R cancels, so the answer is the same for any circle. <i>1 mark: $2\pi h = 10$</i> <i>1 mark: 1.59 m</i> <i>1 mark: radius does not matter</i>	3
2	106.25 km	The computer's count of turns stays the same. Each turn is now 68π instead of 64π: $\frac{68}{64}$ as far $100 \times \frac{68}{64} = 106.25$ km (π cancels) <i>1 mark: same number of turns</i> <i>1 mark: ratio 68 : 64</i> <i>1 mark: 106.25 km</i>	3
3	127 cm	One turn: $1000 \div 250 = 4$ m $d = 4 \div \pi = 1.273... \text{ m} \approx 127$ cm <i>1 mark: 4 m</i> <i>1 mark: 127 cm</i>	2

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Q	Answer	Working / sample response	Marks
4	68.3 mm	Circle: $d = 1000 \div \pi = 318.30... \text{ mm}$ Square: side = $1000 \div 4 = 250 \text{ mm}$ $318.30... - 250 = 68.3 \text{ mm}$ <i>1 mark: 318.3</i> <i>1 mark: 250</i> <i>1 mark: 68.3 mm</i>	3