

WA8MMGTW2

Two-dimensional space and structures

Core + Challenge

Area of a Circle — Marking Key

I can use $A = \pi r^2$ to find the area of a circle from its radius or diameter, find the radius from the area, and find the area of rings.

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	314 cm ²	$3.14 \times 10^2 = 3.14 \times 100$
2	12.56 m ²	3.14×4
3	78.5 cm ²	3.14×25
4	1256 mm ²	$r = 20: 3.14 \times 400$
5	28.26 cm ²	3.14×9
6	50.24 m ²	$r = 4: 3.14 \times 16$
7	0.785 m ²	3.14×0.25
8	31 400 mm ²	$3.14 \times 10\,000$
9	153.9 cm ²	$\pi \times 49 = 153.93\dots$
10	63.6 m ²	$\pi \times 20.25 = 63.61\dots$
11	113.1 cm ²	$r = 6: \pi \times 36 = 113.09\dots$
12	490.9 m ²	$r = 12.5: \pi \times 156.25 = 490.87\dots$
13	4.5 m ²	$\pi \times 1.44 = 4.52\dots$
14	4.0 cm	$r^2 = 50 \div \pi = 15.91\dots; \sqrt{15.91\dots} = 3.98\dots$
15	6.9 m	$r^2 = 150 \div \pi = 47.74\dots; \sqrt{} = 6.90\dots$
16	35.7 mm	$r = \sqrt{(1000 \div \pi)} = 17.84\dots; d = 35.68\dots$

B

Core answers, working and marks

/ 22 marks

Q	Answer	Working / sample response	Marks
1	254.34 cm ²	$A = 3.14 \times 9^2 = 3.14 \times 81 = 254.34$ <i>1 mark: 81</i> <i>1 mark: 254.34 cm²</i>	2
2	201.1 m ²	$r = 16 \div 2 = 8$ $A = \pi \times 64 = 201.06\dots$ <i>1 mark: r = 8</i> <i>1 mark: 201.1 m²</i>	2
3	30 cm pizza (2.55 c vs 2.86 c per cm ²)	30 cm: $A = \pi \times 15^2 = 706.9 \text{ cm}^2$; $1800 \div 706.9 = 2.55 \text{ c}$ 20 cm: $A = \pi \times 10^2 = 314.2 \text{ cm}^2$; $900 \div 314.2 = 2.86 \text{ c}$ The 30 cm pizza is cheaper per cm ² . <i>1 mark: both areas</i> <i>1 mark: both rates</i> <i>1 mark: conclusion</i>	3
4	64 m ²	$A = \pi \times 4.5^2 = \pi \times 20.25 = 63.61\dots$ <i>1 mark: working</i> <i>1 mark: 64 m²</i>	2
5	0.89 m	$r^2 = 2.5 \div \pi = 0.795\dots$ $r = \sqrt{0.795\dots} = 0.892\dots$ <i>1 mark: r²</i> <i>1 mark: 0.89 m</i>	2
6	200.96 cm ²	Big circle: $3.14 \times 100 = 314$ Hole: $3.14 \times 36 = 113.04$ $314 - 113.04 = 200.96$ <i>1 mark: big circle</i> <i>1 mark: hole</i> <i>1 mark: 200.96 cm²</i>	3
7	23.8 m ²	$r = 2.75$ $A = \pi \times 2.75^2 = 23.75\dots$ <i>1 mark: r = 2.75</i> <i>1 mark: 23.8 m²</i>	2
8	(a) 78.5 m ² (b) 32 times	(a) $\pi \times 5^2 = 78.53\dots$ (b) $2500 \div 78.53\dots = 31.8\dots \approx 32$ <i>1 mark each</i>	2
9	Square, by 19.9 cm ²	Round: $\pi \times 11^2 = 380.13\dots$; square: 400 $400 - 380.13\dots = 19.86\dots \approx 19.9$ <i>1 mark: both areas</i> <i>1 mark: square by 19.9 cm²</i>	2
10	452 km ²	$A = \pi \times 144 = 452.38\dots$ <i>1 mark: working</i> <i>1 mark: 452 km²</i>	2

C

Reasoning *sample answers and marking criteria*

/ 9 marks

Q	Answer	Working / sample response	Marks
1	The shape is nearly a parallelogram πr by r	Half the sectors' curved edges are along the bottom, so the base is half the circumference: $\frac{1}{2} \times 2\pi r = \pi r$. The height is the radius r. Area $\approx$ base $\times$ height $= \pi r \times r = \pi r^2$ (and it gets closer as the sectors get thinner). <i>1 mark: base πr</i> <i>1 mark: height r</i> <i>1 mark: conclusion</i>	3
2	78.5 cm ²	He used the diameter instead of the radius. $r = 5$ cm. $A = \pi \times 5^2 = 78.53... \approx 78.5$ cm² <i>1 mark: error</i> <i>1 mark: 78.5</i>	2
3	False: the area is 4 times as big	$\pi(2r)^2 = \pi \times 4r^2 = 4 \times \pi r^2$ e.g. $r = 1$: π; $r = 2$: 4π <i>1 mark: false</i> <i>1 mark: $\times 4$ with reason</i>	2
4	No	The numbers are the same, but one is a length (cm) and the other is an area (cm²). You cannot compare a length with an area; with a different unit (e.g. mm) the numbers would not match. <i>1 mark: no</i> <i>1 mark: different units/quantities</i>	2

D

Challenge *solutions and marking criteria*

/ 11 marks

Q	Answer	Working / sample response	Marks
1	78.5%; no	Circle $r = 5$: $\pi \times 25 = 78.53...;$ square 100 $78.53... \div 100 = 78.5\%$ 20 cm square: $\pi \times 100 \div 400 =$ the same, $\frac{\pi}{4} = 78.5\%$ for any size <i>1 mark: 78.5%</i> <i>1 mark: same for 20 cm</i> <i>1 mark: reason</i>	3
2	$r = 2$ cm	$\pi r^2 = 2\pi r$ Divide both sides by πr: $r = 2$ <i>1 mark: equation</i> <i>1 mark: $r = 2$</i>	2

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Q	Answer	Working / sample response	Marks
3	2.49 m	Garden + path = $2 \times$ garden: $\pi R^2 = 2 \times \pi \times 36 = 72\pi$ $R^2 = 72$, so $R = 8.485\dots$ Width = $8.485\dots - 6 = 2.49$ m <i>1 mark: $\pi R^2 = 72\pi$</i> <i>1 mark: $R = 8.49$</i> <i>1 mark: 2.49 m</i>	3
4	One 40 cm pizza, by 25.1 cm ²	One large: $\pi \times 20^2 = 400\pi$; two small: $2 \times \pi \times 14^2 = 392\pi$ $400\pi > 392\pi$ Difference $8\pi = 25.13\dots \approx 25.1$ cm² <i>1 mark: 400π</i> <i>1 mark: 392π</i> <i>1 mark: 25.1 cm²</i>	3