GCSE MATHEMATICS · HIGHER

Targeting Grade 9

Paper 4 · Mark scheme · Calculator · 40 marks

M method mark **P** process mark **A** accuracy mark (depends on the M or P marks before it)
B independent mark **C** communication mark **ft** follow through **oe** or equivalent

Q	Working	Answer	Mark	Notes
1	Multiplier: $\left(1+\frac{x}{100}\right)\left(1-\frac{x}{100}\right)=0.9516$ $1-\frac{x^2}{10\,000}=0.9516$ $x^2=484$	22	P1 P1 P1 A1	

Q	Working	Answer	Mark	Notes
2	$y=kx^3$ and $x=\frac{c}{\sqrt{z}}$ so $y\propto\frac{1}{z^{1.5}}$ New $z=1.69z$; $\sqrt{1.69}=1.3$ Multiplier for $y=\frac{1}{1.3^3}=0.4551\ldots$	Decrease of 54.5%	P1 P1 P1 A1	Must state decrease

Q	Working	Answer	Mark	Notes
3(a)	Arc length $= 30 - 18 = 12$ cm Area $= \frac{\theta}{360}\pi r^2$ with $\frac{\theta}{360} = \frac{12}{18\pi}$	54	P1 P1 A1	Or area $= \frac{1}{2} \times$ radius $\times$ arc
3(b)	$\frac{\theta}{360} \times 2\pi \times 9 = 12$	76.4	M1 A1	

Q	Working	Answer	Mark	Notes
4(a)	$ab^2 = 36$ and $ab^5 = 121.5$ $b^3 = \frac{121.5}{36} = 3.375 \Rightarrow b = 1.5$	$a = 16,\ b = 1.5$	M1 M1 A1	
4(b)	$16 \times 1.5^{10} = 922.6\ldots$, $16 \times 1.5^{11} = 1383.9\ldots$	11	M1 A1	Trials either side of 1000

Q	Working	Answer	Mark	Notes
5	Water is a cone with height 20 cm, radius $12 \times \frac{20}{30} = 8$ cm Volume of water $= \frac{1}{3}\pi \times 8^2 \times 20 = \frac{1280\pi}{3}$ Volume of bowl $= \frac{2}{3}\pi \times 10^3 = \frac{2000\pi}{3}$ $\frac{1280}{2000} \times 100$	64	P1 P1 P1 P1 A1	Similar triangles $= 1340.4\ldots$ $= 2094.3\ldots$

Q	Working	Answer	Mark	Notes
6(a)	v at $t = 0, 3, 6, 9, 12$: $0,\ 6.75,\ 9,\ 6.75,\ 0$ Strip width 3 $\frac{1}{2} \times 3 \times \big(0+0+2(6.75+9+6.75)\big)$	 67.5	M1 M1 M1 A1	 Trapezium areas
6(b)		Underestimate	C1	The curve bends outwards (is above) the tops of the trapezia, so the trapezia miss some area

Q	Working	Answer	Mark	Notes
7	Angle at centre $= 72°$ (5 isosceles triangles) $5 \times \frac{1}{2} r^2 \sin 72° = 100$ $r^2 = 42.06\ldots \Rightarrow r = 6.485\ldots$ Side $= 2r \sin 36°$ or $\sqrt{2r^2 - 2r^2 \cos 72°}$ Side $= 7.623\ldots$	 38.1	P1 P1 P1 P1 P1 A1	 r = distance from centre to a vertex

Q	Working	Answer	Mark	Notes
8	$AC^2 = 8.2^2 + 5.6^2 - 2 \times 8.2 \times 5.6 \cos 112°$		M1	
	$AC = 11.53\ldots$		A1	
	Area $ABC = \frac{1}{2} \times 8.2 \times 5.6 \sin 112° = 21.28\ldots$		M1	
	Area $ACD = \frac{1}{2} \times 11.53\ldots \times 7.4 \sin 38° = 26.27\ldots$		M1	ft their AC
	$21.28\ldots + 26.27\ldots$		M1	
		47.6	A1	
		Total	**40**	