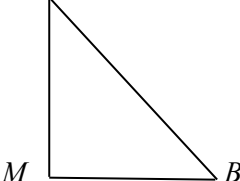


		Note: We do not need to see $-\frac{48}{5}$. Some candidates will automatically reject this solution.
	A1	For the correct value of n Do not award if $-\frac{48}{5}$ is included as a value.

Question	Scheme	Marks
9(a)	$\angle AOB = \frac{1.8x}{x} = 1.8$  $MB = x \sin 0.9 \Rightarrow AB = 2x \sin 0.9$ <p>Hence diameter $AC = 2x \sin 0.9 + 2x$ [or Radius = $x \sin 0.9 + x$]</p> <p>Arc length of semicircle: $\frac{\pi D}{2} = \frac{\pi(2x \sin 0.9 + 2x)}{2} = \pi x(1 + \sin 0.9)$</p> <p>Perimeter of logo: $P = \pi x(1 + \sin 0.9) + 2x + 1.8x \Rightarrow P = x(\pi + \pi \sin 0.9 + 3.8)$ $[a=1, b=3.8]$</p>	<p>B1</p> <p>M1</p> <p>dM1A1</p> <p>M1</p> <p>M1A1</p> <p>[7]</p>
(b)	$D = 2 \times 10 \times \sin 0.9 + 2 \times 10 = 35.6665\dots$ $\text{Area of semicircle} = \frac{\frac{\pi \times 35.6665\dots^2}{4}}{2} = 499.553\dots$ $\text{Area of sector} = 1.8 \times \frac{10^2}{2} = 90$ $\text{Area of segment} = 90 - \frac{1}{2} \times 10 \times 10 \times \sin 1.8 = 41.307\dots$ <p>OR Area of triangle = $\frac{1}{2} \times 10 \times 10 \times \sin 1.8 = 48.692$</p> $\text{Area of logo} = 499.553 - 41.307 = 458.245\dots \approx \text{awrt } 458 \text{ (cm}^2\text{)}$	<p>M1</p> <p>M1</p> <p>B1</p> <p>B1</p> <p>M1A1</p> <p>[6]</p>
Total 13 marks		

Part	Mark	Notes
(a)	B1	For finding angle $AOB = 1.8$ in radians only seen anywhere.
	M1	For find the length AB or $\frac{1}{2} AB$ using their angle.

		$AB = 2x \sin 0.9 \quad \frac{1}{2} AB = x \sin 0.9$ [Allow $AB = 1.57x$] Please check their diagram for their labelling/notation.
	dM1	For attempting to find the diameter (or radius) of the semi-circle ADC Allow $2x + 1.57x$ or $3.57x$ [Dependent on the previous M mark]
	A1	For the correct expression for the diameter $[2x \sin 0.9 + 2x]$ or the radius $[x \sin 0.9 + x]$ of the semi-circle.
	M1	For finding the arc length of the semi-circle. This can be simplified or unsimplified. [Allow also $1.79\pi x$]
	M1	For finding the perimeter of the logo using their values in terms of x and $\sin 0.9$ only That is: $P = 1.8x + 2x +$ their arc length of ADC
	A1	For the correct expression exactly as written.
	ALT – Uses cosine rule	
	B1	For finding angle $AOB = 1.8$
	M1	Finds the length AB or $\frac{1}{2} AB$ using their angle. [They must sqrt to find AB] $AB = \sqrt{x^2 + x^2 - 2 \times x \times x \cos 1.8}$
	dM1	For attempting to find the diameter (or radius) of the semi-circle ADC $AC = 2x + 'x\sqrt{2 - 2 \cos 1.8}'$
	A1	For the correct diameter or radius of the circle.
	M1	For finding the arc length of the semi-circle. $P = \frac{\pi(x\sqrt{2 - 2 \cos 1.8})}{2}$
	M1	For finding the perimeter of the logo using their values. That is: $P = 1.8x + 2x + ' \pi x(1 + \sin 0.9) '$ They must change cosine to sine for this mark. $\frac{1}{2}(\sqrt{2 - 2 \cos 1.8}) = \sin 0.9$ must be explicitly seen NOTE: $\left[\sin \theta = \sqrt{\frac{1 - \cos 2\theta}{2}} \right]$
	A1	For the correct expression exactly as written.
(b)	Allow work in degrees in this part as it makes no difference.	
	M1	For attempting to find the diameter or radius of the semicircle. Accept: $D = 2 \times 10 \times \sin \angle \text{their } AOB + 2 \times 10 = (35.6665...)$ $r = \frac{2 \times 10 \times \sin \angle \text{their } AOB + 2 \times 10}{2} = (17.833...)$
	M1	For using their D , [where $D \neq 10$] to find the area of the semicircle . $\text{Area}_{\text{semicircle}} = \frac{\pi \times ('35.6665...')^2}{4}$ OR $\frac{\pi \times 17.8333...^2}{2} = (499.553...)$ Note: This is an A mark in Epen
	B1	For finding the area of the sector If they work in degrees, accept awrt 90. This is not a ft mark.