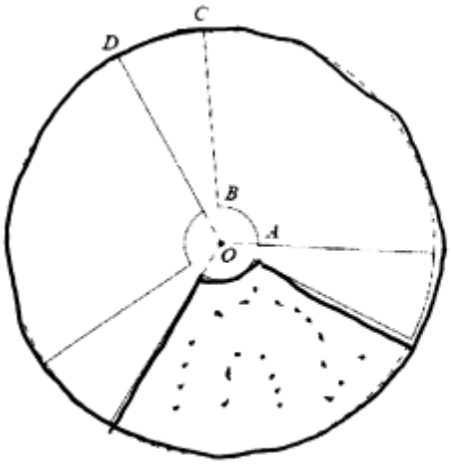


Alt II

M1 : one relevant area Eg $\pi \times 8^2$

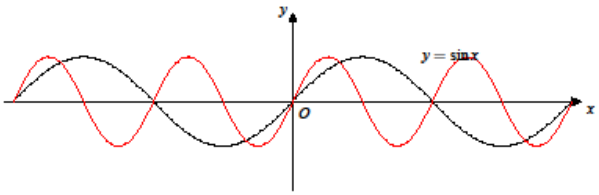
dM1 : Corresponding area $\frac{1}{2} \times 8^2 \times \frac{5}{3} - \frac{1}{2} \times 3^2 \times \frac{5}{3}$

A1 : Both correct

ddM1 : ○ − 3 × ◔

A1 : Awrt 0.473 m² or 4730 cm²

Variations are possible, e.g. 3 × area of blades (inc. circle) + area circle – area of blades within the circle, but these can be marked according to the scheme.

Question	Scheme		Marks
9(a)	(i) $2p$		**B1**
	(ii) $-p$		**B1**
	(iii) $3-p$		**B1**
			(3)
(b)		Correct shape, same height starting at *O*, scaling may be incorrect. Two repeats of the sin*x* graph each side	**M1** **A1**
			(2)
(c)	For $x = \frac{\alpha}{2}$		**B1**
	Attempt at second root E.g. $x = \frac{180° - \alpha}{2}$		**M1**
	$x = 90° - \frac{\alpha}{2}$		**A1**
			(3)
			(8 marks)
Notes:			

(a)

(i) B1: For $2p$. Condone $p + p$. Award when $2p$ is the y coordinate of a coordinate pair. E.g $(180-\alpha, 2p)$

(ii) B1: For $-p$. Award when $-p$ is the y coordinate of a coordinate pair. E.g $(\alpha - 180, -p)$

(iii) B1: For $3-p$. Award when $3-p$ is the y coordinate of a coordinate pair. E.g $\left(180+\alpha, 3-p\right)$

(b)

M1: Same shape, starting at O, and same height as original graph, but the scaling may be incorrect.
Mark the intention. For example their graph may be slightly taller or shorter than the given curve.
One complete sine curve on just one side of the y-axis is sufficient for the method mark.
Also allow this mark when candidates use Diagram 1 and mark the x - intercepts as below.
If they ignore the given Diagram and use their own axes you must be convinced their sketch for $y=\sin 2x$ is the same eight / amplitude as $y=\sin x$ but a different scaling / frequency. So you must be able to see some numbers marked on the axes or graph

A1: Correct sketch. Look for intersections at $\left(\pm 360°, 0\right)$ and $\left(\pm 180°, 0\right)$ in addition to the above

(c)

B1: $x=\frac{\alpha}{2}$ given as one solution.

M1: A second solution which may not be in the given range. Any of $\frac{180°-\alpha}{2}$, $90°-\frac{\alpha}{2}$, $180°+\frac{\alpha}{2}$, $-90°-\frac{\alpha}{2}, -180°+\frac{\alpha}{2}, 360°+\frac{\alpha}{2}$ are examples of using the symmetry to find a second solution.

A1: $x=90°-\frac{\alpha}{2}$ or $\frac{180°-\alpha}{2}$ as second solution with no additional solutions within the given range.

Question	Scheme	Marks
10(a)	$\frac{dy}{dx}=\frac{6}{7}x^2+\frac{2}{7}x-\frac{5}{2}$	**M1 A1**
		(2)
(b)	At $x=-\frac{7}{2}$, $\frac{dy}{dx}=\frac{6}{7}\left(-\frac{7}{2}\right)^2+\frac{2}{7}\left(-\frac{7}{2}\right)-\frac{5}{2}=...(=7)$	**M1**
	So at B we know $\frac{dy}{dx}="-\frac{1}{7}"$	**M1**
	hence $\frac{6}{7}x^2+\frac{2}{7}x-\frac{5}{2}=-\frac{1}{7}$	**dM1**
	$\Rightarrow 12x^2+4x-35=-2\Rightarrow 12x^2+4x-33=0$*	**A1***
		(4)
(c)	E.g. $12x^2+4x-33=0\Rightarrow(2x-3)(6x+11)=0\Rightarrow x=...$	**M1**
	From graph we can see the x coordinate is positive, so $x=\frac{3}{2}$ at B	**A1**
		(2)
(d)	Equation of l is $y="-\frac{1}{7}"x-1$	**M1**
	Finds coordinates of A $x=-\frac{7}{2}\Rightarrow y="-\frac{1}{7}"\times-\frac{7}{2}-1=\left(-\frac{1}{2}\right)$	**dM1**
	Substitutes $x=-\frac{7}{2}, y="-\frac{1}{2}"$ into $y=\frac{2}{7}x^3+\frac{1}{7}x^2-\frac{5}{2}x+k\Rightarrow k=...$	**ddM1**
	$k=\frac{5}{4}$ CSO	**A1**
		(4)
		(12 marks)

(a)

M1: Finds $\frac{dy}{dx}$, look for at least two terms correct. They do not need to be simplified.

A1: Correct derivative, need not be simplified. ISW after a correct answer

(b) Marks cannot be retrospectively awarded from work in (d)

M1: Substitutes $-\frac{7}{2}$ into their $\frac{dy}{dx}$ to find the gradient of C at A

M1: Applies perpendicular condition to their gradient to find gradient at B

dM1: Equates $\frac{dy}{dx}$ to the gradient of the normal at B, depends on first M mark and a changed gradient.

A1*: Reaches the given equation with any correct intermediate line shown following $\frac{6}{7}x^2+\frac{2}{7}x-\frac{5}{2}=-\frac{1}{7}$