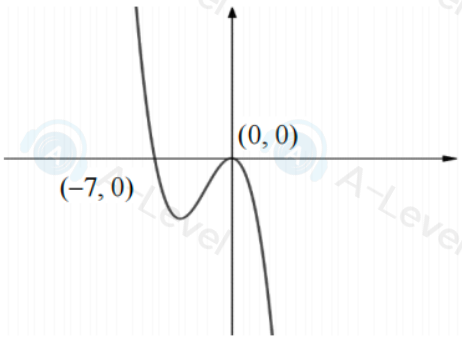
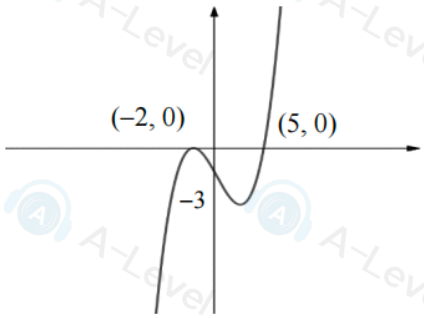
Question Number	Scheme	Marks
9. (a)	24π	B1 **(1)**
(b)	$(18\pi, -1)$	B1ft **(1)**
(c)(i)	$-12\pi - \alpha$	B1 ft
(ii)	$6\pi - \alpha$	B1 ft **(2)** **(4 marks)**

Question	Scheme		Marks
5(i)(a)		B1 Horizontal translation ← B1 Maximum at origin B1 $(-7,0)$	B1B1B1
			(3)
(b)		B1 Reflection in y-axis B1 Touches at $(-2,0)$ and passes through $(5,0)$ B1 Passes through $(0,-3)$	B1B1B1
			(3)
(ii)a	$x = 0 \Rightarrow y = k\cos\left(\frac{\pi}{6}\right) = \sqrt{3}$ $k\frac{\sqrt{3}}{2} = \sqrt{3} \Rightarrow k = 2$		B1
(b)	$(p =)\ \frac{\pi}{3}$ **or** $(q =)\ \frac{4\pi}{3}$ $(p =)\ \frac{\pi}{3}$ **and** $(q =)\ \frac{4\pi}{3}$		B1 B1
			(3)
			(9 marks)

Question Number	Scheme	Marks
5a	e.g. $(\cos\theta =)\ \dfrac{5^2+(1+x)^2-x^2}{2\times5(1+x)}\ \left(=\dfrac{25+1+2x+x^2-x^2}{2\times5(1+x)}\right)$ or e.g. $x^2=5^2+(1+x)^2-2\times5(1+x)\cos\theta$ $\cos\theta=\dfrac{13+x}{5+5x}$ *	M1 A1*
		(2)
b	$\theta=$ awrt $42°$ $(42.470747\ldots.)$ --- Attempts to find AB, AD or AC: e.g. $\dfrac{AB}{\sin"42"}=\dfrac{5}{\sin30}\Rightarrow AB=\ldots$ or e.g. $\angle ABC=180-30-"42.5"="107.6"$ $\dfrac{\sin DBC}{1+2\sqrt{3}}=\dfrac{\sin"42.5"}{2\sqrt{3}}\Rightarrow\angle DBC="60.5"$, $\angle ABD="107.6"-"60.5"="47.1"$ $\dfrac{AD}{\sin("47.1")}=\dfrac{2\sqrt{3}}{\sin30}\Rightarrow AD=\ldots$ or e.g. $\dfrac{AC}{\sin"108"}=\dfrac{5}{\sin30}\Rightarrow AC=\ldots$ --- $AB=6.75\ldots$ or $AD=5.07\ldots$ or $AC=9.53\ldots$ Area $=\dfrac{1}{2}\times5\times"6.75"\times\sin(180-30-"42.5")$ or $=\dfrac{1}{2}\times5\times"9.54"\times\sin("42.5")$ $=$ awrt 16.1 (m^2)	B1 M1 A1 dM1 A1
		(5)
		(7 marks)

Question Number	Scheme	Marks
9(a)	$b=-1$	B1
	$\frac{9}{4}-(x-3)^2$	M1A1
		(3)
(b)	$\left(3, \frac{9}{4}\right)$	B1ftB1ft
		(2)
(c)(i)	$x=\frac{9}{2}$	B1
(ii)	$k=\frac{\pi}{3}$	B1
(iii)	6	B1
		(3)
(d)	$m=\frac{0-"\frac{9}{4}"}{"\frac{9}{2}"-"3"}=-\frac{3}{2}$	M1
	$y-0="-\frac{3}{2}"\left(x-"\frac{9}{2}"\right)$ or $y-"\frac{9}{4}"="-\frac{3}{2}"(x-"3")$	dM1
	$y=-\frac{3}{2}\left(x-\frac{9}{2}\right)$ or $y-\frac{9}{4}=-\frac{3}{2}(x-3)$ o.e.	A1
	$y>\cos\left(\frac{1}{3}\pi x\right),\ y<6x-\frac{27}{4}-x^2,\ y<-\frac{3}{2}x+\frac{27}{4}$	B1ftB1
		(5)
		(13 marks)

Question Number	Scheme	Marks
6. (a)	$(540°, -5)$	B1, B1 **(2)**
(b) (i)	$(360°, 3)$	B1, B1 **(2)**
(ii)	$(180°, 5)$	B1, B1 **(2)**
		(6 marks)

Question	Scheme	Marks
11(a)	$x=\frac{5\pi}{2}$ **or** $y=12$	B1
	$x=\frac{5\pi}{2}$ **and** $y=12$	B1
		(2)
(b)	$x=\frac{3\pi}{2}$ **or** $y=-21$	B1
	$x=\frac{3\pi}{2}$ **and** $y=-21$	B1
		(2)
(c)(i)	$(A=)-12$	B1
(ii)	$(B=)\frac{5\pi}{4}$	B1
		(2)
		Total 6

Question Number	Scheme	Marks
7.(a)	Attempts $\frac{\sin\angle ACB}{6.5}=\frac{\sin 35}{4.7}$	M1
	$\angle ACB=$ awrt(52 or 53)° or awrt(127or128)°	A1
	$\angle ACB=127.5°$	A1
(b)	Eg $\frac{(AC)}{\sin"17.5°"}=\frac{6.5}{\sin"127.5°"}$ or $=\frac{4.7}{\sin 35°}$	M1
	$\left[\frac{(CD)}{\sin"75°"}=\frac{4.7}{\sin"127.5°"}\Rightarrow(CD)=...\Rightarrow(AC)+(CD)\right]$=awrt 8.2	A1
	Total length of wood $=8.1+6.5+4.7+4.7=$ awrt24.1	A1
		(3) **(6 marks)**
Alt1(a)	$\cos 35=\frac{AC^2+6.5^2-4.7^2}{2\times 6.5\times AC}\Rightarrow AC^2-13\cos(35)AC+20.16=0\Rightarrow AC=...$	
	$\cos\angle ACB=\frac{"AC"^2+4.7^2-6.5^2}{2\times"AC"\times 4.7}$ oe	M1

Question Number	Scheme	Marks
4. (a)	Area $ABCD$ is 40 cm^2 $\Rightarrow 40 = 6\times10\times\sin\theta$ oe	M1
	$\sin\theta = \frac{2}{3} \Rightarrow \theta = 180° - 41.8°$	M1
	$\angle DAB =$ awrt 138.19°	A1
		(3)
(b)	Attempts $DB^2 = 10^2 + 6^2 - 2\times10\times6\cos"138.19°"$	M1
	$DB =$ awrt 15.0 (cm)	A1
		(2)
		(5 marks)

Question Number	Scheme	Marks
9(a)	π	B1
		(1)
(b)(i)	3	B1
		(1)
(ii)	5	B1
		(1)
(iii)	201	B1
		(1)
		(4 marks)

Question	Answer	Marks	Guidance
9(a)	$6\sin 0.9 = \frac{AC}{2}$ or $AC^2 = 6^2 + 6^2 - 2\times6\times6\cos1.8$	**M1**	OE Correct working in degrees is acceptable throughout.
	$AC = 9.40$	**A1**	SOI Accept 9.39 – 9.41, may be used but not seen for A1.
	Angle $CAB = ½(\pi - 1.8)$	**M1**	SOI Expect 0.6708 (or 0.671).
	Arc $CD =$ *their* 9.40 × *their* 0.6708	**M1**	Expect 6.306 (or 6.31), do not accept 6 for *their* AC or 1.8 for CAB.
	[Perimeter = 6 + 3.40 + 6.306 =] 15.7	**A1**	Accept 15.69 – 15.72.
		5	

Question Number	Scheme	Marks
4. (a)	$(270°, 0)$	B1
		(1)
(b)	$(-180°, -4)$	B1, B1
		(2)
(c)(i)	100	B1
(ii)	4	B1
(iii)	7	B1
		(3)
		(6 marks)

Question Number	Scheme	Marks
6 (a)	Angle $AFB = \dfrac{\pi - 2.275}{2} = 0.433$ *	B1*
		(1)
(b)	Attempts $r\theta = 6.2 \times 2.275 = (14.105)$	M1
	Attempts $\left(x^2\right) = 6.4^2 + 6.2^2 - 2 \times 6.4 \times 6.2 \cos(0.433) = (7.36)$ or $(x = 2.71)$	M1
	Correct attempt = $2x + r\theta + 12.8 = 2 \times 2.714 + 14.105 + 12.8 = 32.3\,(\text{m})$	dM1, A1
		(4)
(c)	Attempts $\dfrac{1}{2} r^2 \theta = \dfrac{1}{2} \times 6.2^2 \times 2.275 = (43.7255)$	M1
	Attempts $\dfrac{1}{2} ab \sin C = \dfrac{1}{2} \times 6.2 \times 6.4 \times \sin 0.433 = (8.325)$	M1
	Correct attempt = $2 \times 8.325 + 43.7255 = 60.4\,(\text{m}^2)$	dM1, A1
		(4)
		(9 marks)

Question Number	Scheme	Marks
3(a)	$(\text{f}(x) =) -3\cos x$ or $(\text{f}(x) =) 3\sin(x - 90°)$	M1 A1
		(2)
(b)(i)	8	B1
(ii)	5	B1
		(2)
		(4 marks)