Question	Answer	Marks	Partial Marks
9(b)	$2a + a(2\phi) = \frac{1}{2}(2a\tan\phi + a(2\phi))$ oe or $a\tan\phi = 2a + a\phi$	**M2**	**M1** for arc length = $2a\phi$ soi or for $PT = a\tan\phi$ **and** $PT = 2a + a\phi$
	$\tan\phi = 2 + \phi$	**A1**	
10(a)(i)	$ar = 8$ and $ar^2 + ar^3 = 160$ soi	**B2**	**B1** for each
	Correct unsimplified quadratic equation in r e.g. $\left[a = \frac{8}{r} \text{ and so } \right] \frac{8}{r} \times r^2 + \frac{8}{r} \times r^3 = 160$ oe	**M1**	
	Correct simplification to $r^2 + r - 20 = 0$	**A1**	
10(a)(ii)	Factorises or solves: $(r + 5)(r - 4) = 0$	**M1**	
	$r = 4$	**A1**	
	$a = 2$	**A1**	
	Alternative method $5a^2 - 2a - 16 = 0$ oe	**(B1)**	
	Factorises or solves *their* 3-term quadratic in a	**(M1)**	
	$a = 2$	**(A1)**	
10(b)	$p + 2(q - 1) = 14$ oe	**B1**	
	$\frac{q}{2}\{2p + 4(q-1)\} = 168$ oe	**B1**	
	Eliminates p or q e.g. $\frac{q}{2}\{2(14 - 2(q-1)) + 4(q-1)\} = 168$ OR simplifies S_q: $q\{p + 2(q-1)\} = 168$ and writes $q(14) = 168$	**M1**	condone one error in rearrangement of either equation before substituting
	Correctly solves *their* equation for *their p* or *their q*	**M1**	**dep** on previous **M1**
	$q = 12$ and $p = -8$	**A2**	**A1** for $q = 12$ or $p = -8$

Question	Answer	Marks	Partial Marks
11	Full, complete and actioned method to find the first area: A or $\frac{1}{2}A$ or B or $\frac{1}{2}B$	**5**	**B1 for** $\left[\mathrm{F}(x)=\right]\int (1+\cos x)\,\mathrm{d}x = x+\sin x$ oe **B1** for the area of an appropriate rectangle or rectangles soi **M1** for correct use of correct limits to find an appropriate area under the curve **A1** for the accurate area under the curve **B1** for area A or $\frac{1}{2}A$ or B or $\frac{1}{2}B$ OR **M1** for attempting to integrate sin$x$ or $\pm\cos x$ **M1** dep for using correct limits **A1** for a correctly integrated expression with correct limits **M1** for correct use of correct limits **A1** for exact value $A = 2$ OR equivalent correct plan
	Full, complete and actioned method to find the second, corresponding area	**3**	**B1** for Area($A + B$) or $\frac{1}{2}$Area($A + B$) oe **M1** for using Area($A + B$) to find A or B or for using $\frac{1}{2}$Area($A + B$) to find $\frac{1}{2}A$ or $\frac{1}{2}B$ oe **A1** for exact value OR **B1** for $4\pi - \left(2\int_0^{\frac{\pi}{2}}(1+\cos x)\mathrm{d}x + \left(\frac{3\pi}{2}-\frac{\pi}{2}\right)\right)$ oe **M1** for correct use of correct limits **A1** for exact value $B = 2\pi - 2$ OR equivalent correct plan
	$k = \pi - 1$ cao	**B1**	**dep** on all previous marks; allow $k = \frac{2\pi - 2}{2}$