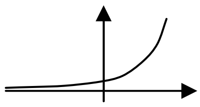
5 (i)	$\int x\,dy = \int ((y-3)^2 - 2)\,dy$	**B1**	Show $x = y^2 - 6y + 7$ convincingly
	$= \int (y^2 - 6y + 7)\,dy$ **A.G.**	**B1**	State or imply that required area $= \int x\,dy$
	$3 + \sqrt{(2+2)} = 5$, $3 + \sqrt{(14+2)} = 7$	**B1**	Use $x = 2, 14$ to show new limits of $y = 5, 7$
		$\boxed{3}$	
(ii)	$\left[\frac{1}{3}y^3 - 3y^2 + 7y\right]_5^7$	**M1**	Integration attempt, with at least one term correct
	$= (^{343}/_3 - 147 + 49) - (^{125}/_3 - 75 + 35)$	**A1**	All three terms correct
	$= 16^1/_3 - 1^2/_3$	**M1**	Attempt F(7) – F(5)
	$= 14\ ^2/_3$	**A1**	Obtain $14\ ^2/_3$, or exact equiv
		$\boxed{4}$	
6 (i)	$ABC = 360 - (150 + 110) = 100^\circ$ **A.G.**	**B1**	Show convincingly that angle ABC is 100°
		$\boxed{1}$	
(ii)	$CA^2 = 15^2 + 27^2 - 2\times15\times27\times\cos100^0$	**M1**	Attempt use of correct cosine rule
	$= 1094.655\ldots$		
	$CA = 33.1$	**A1**	Obtain 33.1 km
		$\boxed{2}$	
(iii)	$\frac{\sin C}{15} = \frac{\sin 100}{33.1}$ or $\frac{\sin A}{27} = \frac{\sin 100}{33.1}$	**M1**	Attempt use of sine rule to find angle C or A (or equiv using cosine rule)
		A1√	Correct unsimplified eqn, following their CA
	$C = 26.5^\circ$ $A = 53.5^\circ$	**A1**	Obtain $C = 26.5^\circ$ or $A = 53.5^\circ$ (allow 53.4°)
	Hence bearing is 263°	**A1√**	Obtain 263 or 264 (or 290° – their angle C / 210 + their angle A)
		$\boxed{4}$	
7 (a)	$\int (x^5 - x^4 + 5x^3)\,dx$	**M1**	Expand brackets and attempt integration, or other valid integration attempt
	$= \frac{1}{6}x^6 - \frac{1}{5}x^5 + \frac{5}{4}x^4\ (+c)$	**A1**	Obtain at least one correct term
		A1	Obtain a fully correct expression
		B1	For $+ c$, and no $\int$ or dx (can be given in **(b)(i)** if not given here)
		$\boxed{4}$	
(b) (i)	$-6x^{-3}\ (+c)$	**M1**	Obtain integral of the form kx^{-3}
		A1	Obtain $-6x^{-3}\ (+c)$
		$\boxed{2}$	
(ii)	$\left[-6x^{-3}\right]_2^\infty$	**B1***	State or imply that $F(\infty) = 0$ (for kx^n, n -1)
	$= ¾$	**B1d***	Obtain ¾ (or equiv)
		$\boxed{2}$	

8	**(i)** 	**M1**	Attempt sketch of exponential graph (1st quad) - if seen in 2nd quad must be approx correct
		A1	Correct graph in both quadrants
		B1	State or imply (0, 2) only
		$\boxed{3}$	
	(ii) $8^x = 2 \times 3^x$		
	$\log_2 8^x = \log_2 (2 \times 3^x)$	**M1**	Form equation in x and take logs (to any consistent base, or no base) – could use $\log_8$
	$x\log_2 8 = \log_2 2 + x\log_2 3$	**M1**	Use $\log a^b = b \log a$
		M1	Use $\log ab = \log a + \log b$,or equiv with $\log {}^a/_b$
	$3x = 1 + x\log_2 3$	**M1**	Use $\log_2 8 = 3$
	$x(3 - \log_2 3) = 1$, hence $x = \dfrac{1}{3-\log_2 3}$ **A.G.**	**A1**	Show given answer correctly
	OR $8^x = 2 \times 3^x$		
	$2^{3x} = 2 \times 3^x$	**M1**	Use $8^x = 2^{3x}$
	$2^{(3x-1)} = 3^x$	**M1**	Attempt to rearrange equation to $2^k = 3^x$
	$\log_2 2^{(3x-1)} = \log_2 3^x$	**M1**	Take logs (to any base)
	$(3x-1)\log_2 2 = x \log_2 3$	**M1**	Use $\log a^b = b \log a$
	$x(3 - \log_2 3) = 1$, hence $x = \dfrac{1}{3-\log_2 3}$ **A.G.**	**A1**	Show given answer correctly
		$\boxed{5}$	
9	**(a) (i)** $2\sin x.\dfrac{\sin x}{\cos x} - 5 = \cos x$	**M1**	Use $\tan x \equiv \dfrac{\sin x}{\cos x}$
	$2\sin^2 x - 5\cos x = \cos^2 x$		
	$2 - 2\cos^2 x - 5\cos x = \cos^2 x$	**M1**	Use $\sin^2 x \equiv 1 - \cos^2 x$
	$3\cos^2 x + 5\cos x - 2 = 0$	**A1**	Show given equation convincingly
		$\boxed{3}$	
	(ii) $(3\cos x - 1)(\cos x + 2) = 0$	**M1**	Attempt to solve quadratic in $\cos x$
	$\cos x = {}^1/_3$	**M1**	Attempt to find x from root(s) of quadratic
	$x = 1.23$ rad	**A1**	Obtain 1.23 rad or 70.5°
	$x = 5.05$ rad	**A1**√	Obtain 5.05 rad or 289° (or 2π / 360° - their solution)
			SR: B1 B1 for answer(s) only
		$\boxed{4}$	
	(b) 0.5x0.25x{cos0+2(cos0.25+cos0.5+cos0.75)+cos1}	**M1**	Attempt y-coords for at least 4 of the correct 5 x-coords
		M1	Use correct trapezium rule, any h, for their y values to find area between $x = 0$ and $x = 1$
		M1	Correct h (soi) for their y values
	≈ 0.837	**A1**	Obtain 0.837
		$\boxed{4}$	

10	(i)	$u_{15} = 2 + 14 \times 0.5$ $= 9$ km	M1 A1 $\boxed{2}$	Attempt use of $a + (n-1)d$ Obtain 9 km
	(ii)	$u_{20} = 2 \times 1.1^{19} = 12.2$ $u_{19} = 2 \times 1.1^{18} = 11.1$	B1 M1 A1	State, or imply, $r = 1.1$ Attempt u_{20} , using ar^{n-1} Obtain $u_{20} = 12.2$, and obtain $u_{19} = 11.1$
	OR		B1 M1 A1 $\boxed{3}$	State, or imply, $r = 1.1$ Attempt to solve $ar^{n-1} = 12$ Obtain $n = 20$ (allow $n \geq 20$)
	(iii)	$\frac{2(1.1^n - 1)}{(1.1-1)} > 200$ $1.1^n > 11$ $n > \frac{\log 11}{\log 1.1}$ $n > 25.2$ ie Day 26	B1 M1 A1 A1 $\boxed{4}$	State or imply $S_N = \frac{2(1.1^n - 1)}{(1.1-1)}$ Link (any sign) their attempt at S_N (of a GP) to 200 and attempt to solve Obtain 26, or 25.2 or better Conclude $n = 26$ only, or equiv eg Day 26
	(iv)	swum $= 2 \times 30 = 60$ km run $= \frac{1}{2} \times 30 \times (4 + 29 \times 0.5)$ $= 277.5$ km cycle $= \frac{2(1.1^{30} - 1)}{(1.1-1)}$ $= 329.0$ km total $= 666$ km	B1 M1 M1 A1 $\boxed{4}$	Obtain 60 km, or 2 x 30km Attempt sum of AP, $d = 0.5$, $a = 2$, $n = 30$ Attempt sum of GP, $r = 1.1$, $a = 2$, $n = 30$ Obtain 666 or 667 km