Mark Scheme 4722
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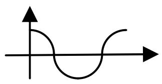
1 $15+19d=72$	M1		Attempt to find d, from $a + (n-1)d$ or $a + nd$
Hence $d = 3$	A1		Obtain $d = 3$
$S_n = {}^{100}/_2\ \{(2\times 15)+(99\times 3)\}$	M1		Use correct formula for sum of n terms
$= 16350$	A1	4	Obtain 16350
		$\boxed{4}$	
2 (i) $46\times\frac{\pi}{180}=0.802\ /\ 0.803$	M1		Attempt to convert to radians using π and 180 (or 2π & 360)
	A1	2	Obtain 0.802 / 0.803, or better
(ii) 8 x 0.803 = 6.4 cm	B1	1	State 6.4, or better
(iii) ½ x 8^2 x 0.803 = 25.6 / 25.7 cm^2	M1		Attempt area of sector using $\frac{1}{2}r^2\theta$ or $r^2\theta$, with θ in radians
	A1	2	Obtain 25.6 / 25.7, or better
		$\boxed{5}$	
3 (i) $\int(4x-5)\mathrm{d}x=2x^2-5x+c$	M1		Obtain at least one correct term
	A1	2	Obtain at least $2x^2-5x$
(ii) $y = 2x^2 - 5x + c$	B1√		State or imply y = their integral from **(i)**
$7=2\times 3^2-5\times 3+c \Rightarrow c=4$	M1		Use (3,7) to evaluate c
So equation is $y=2x^2-5x+4$	A1	3	Correct final equation
		$\boxed{5}$	
4 (i) area = $\frac{1}{2}\times 5\sqrt{2}\times 8\times\sin 60^o$	B1		State or imply that $\sin 60^o=\frac{\sqrt{3}}{2}$ or exact equiv
$=\frac{1}{2}\times 5\sqrt{2}\times 8\times\frac{\sqrt{3}}{2}$	M1		Use $\frac{1}{2}ac\sin B$
$= 10\sqrt{6}$	A1	3	Obtain $10\sqrt{6}$ only, from working in surds
(ii) $AC^2=(5\sqrt{2})^2+8^2-2\times 5\sqrt{2}\times 8\times\cos 60^o$	M1		Attempt to use the correct cosine formula
	A1		Correct unsimplified expression for AC^2
AC = 7.58 cm	A1	3	Obtain AC = 7.58, or better
		$\boxed{6}$	
5 (a) (i) $\log_3\frac{4x+7}{x}$	B1	1	Correct single logarithm, as final answer, from correct working only
(ii) $\log_3\frac{4x+7}{x}=2$			
$\frac{4x+7}{x}=9$	B1		State or imply $2=\log_3 9$
$4x+7=9x$	M1		Attempt to solve equation of form f(x) = 8 or 9
$x=1.4$	A1	3	Obtain x = 1.4, or exact equiv
(b) $\int_3^9\log_{10}x\,\mathrm{d}x\approx\frac{1}{2}\times 3\times(\log_{10}3+2\log_{10}6+\log_{10}9)$	B1		State, or imply, the 3 correct y-values only
≈ 4.48	M1		Attempt to use correct trapezium rule
	A1		Obtain correct unsimplified expression
	A1	4	Obtain 4.48, or better
		$\boxed{8}$	

6	(i)	$(1+4x)^7 = 1+28x+336x^2+2240x^3$	B1		Obtain $1 + 28x$
			M1		Attempt binomial expansion of at least 1 more term, with each term the product of binomial coeff and power of $4x$
			A1		Obtain $336x^2$
			A1	**4**	Obtain $2240x^3$
	(ii)	$28a + 1008 = 1001$	M1		Multiply together two relevant pairs of terms
		Hence $a = -\frac{1}{4}$	A1√		Obtain $28a + 1008 = 1001$
			A1	**3**	Obtain $a = -\frac{1}{4}$
				$\boxed{7}$	
7	(i)	**(a)** 	B1		Correct shape of $k\cos x$ graph
			B1	**2**	(90, 0), (270, 0) and (0, 2) stated or implied
		(b) $\cos x = 0.4$	M1		Divide by 2, and attempt to solve for x
		$x = 66.4^\circ, 294^\circ$	A1		Correct answer of 66.4° / 1.16 rads
			A1√	**3**	Second correct answer only, in degrees, following their x
	(ii)	$\tan x = 2$	M1		Use of $\tan x = \frac{\sin x}{\cos x}$ (or square and use $\sin^2 x + \cos^2 x \equiv 1$)
		$x = 63.4^\circ, -117^\circ$	A1		Correct answer of 63.4° / 1.56 rads
			A1√	**3**	Second correct answer only, in degrees, following their x
				$\boxed{8}$	
8	(i)	$-8 - 36 - 14 + 33 = -25$	M1		Substitute $x = -2$, or attempt complete division by $(x + 2)$
			A1	**2**	Obtain -25, as final answer
	(ii)	$27 - 81 + 21 + 33 = 0$ **A.G.**	B1	**1**	Confirm f(3) = 0, or equiv using division
	(iii)	$x = 3$	B1		State $x = 3$ as a root at any point
		$f(x) = (x-3)(x^2 - 6x - 11)$	M1		Attempt complete division by $(x - 3)$ or equiv
			A1		Obtain $x^2 - 6x + k$
			A1		Obtain completely correct quotient
		$x = \dfrac{6 \pm \sqrt{36+44}}{2}$	M1		Attempt use of quadratic formula, or equiv, to find roots
		$= 3 \pm 2\sqrt{5}$ or $3 \pm \sqrt{20}$	A1	**6**	Obtain $3 \pm 2\sqrt{5}$ or $3 \pm \sqrt{20}$
				$\boxed{9}$	
9	(i)	$u_5 = 1.5 \times 1.02^4$	M1		Use $1.5r^4$, or find u_2, u_3, u_4
		$= 1.624$ tonnes **A.G.**	A1	**2**	Obtain 1.624 or better
	(ii)	$\dfrac{1.5(1.02^N - 1)}{1.02 - 1} \le 39$	M1		Use correct formula for S_N
			A1		Correct unsimplified expressions for S_N
		$(1.02^N - 1) \le (39 \times 0.02 \div 1.5)$	M1		Link S_N to 39 and attempt to rearrange
		$(1.02^N - 1) \le 0.52$			
		Hence $1.02^N \le 1.52$	A1	**4**	Obtain given inequality convincingly, with no sign errors
	(iii)	$\log 1.02^N \le \log 1.52$	M1		Introduce logarithms on both sides and use $\log a^b = b \log$
		$N \log 1.02 \le \log 1.52$	A1		Obtain $N \log 1.02 \le \log 1.52$ (ignore linking sign)
		$N \le 21.144..$	M1		Attempt to solve for N
		$N = 21$ trips	A1	**4**	Obtain $N = 21$ only
				$\boxed{10}$	

10	**(i)** $0 = 1 - \frac{3}{\sqrt{9}}$	B1	**1**	Verification of (9, 0), with at least one step shown
	(ii) $\int_9^a 1 - 3x^{-\frac{1}{2}}\,\mathrm{dx} = \left[x - 6\sqrt{x}\right]_9^a$	M1		Attempt integration – increase in power for at least 1 term
		A1		For second term of form k$x^{½}$
		A1		For correct integral
	$= \left(a - 6\sqrt{a}\right) - \left(9 - 6\sqrt{9}\right)$	M1		Attempt F(a) – F(9)
	$= a - 6\sqrt{a} + 9$	A1		Obtain $a - 6\sqrt{a} + 9$
	$a - 6\sqrt{a} + 9 = 4$	M1		Equate expression for area to 4
	$a - 6\sqrt{a} + 5 = 0$	M1		Attempt to solve 'disguised' quadratic
	$\left(\sqrt{a} - 1\right)\left(\sqrt{a} - 5\right) = 0$			
	$\sqrt{a} = 1, \sqrt{a} = 5$	A1		Obtain at least $\sqrt{a} = 5$
	a = 1, a = 25			
	but a > 9, so a =25	A1	**9**	Obtain a = 25 only
			10	