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Mark Scheme (Results)
January 2010

GCE O Level

Pure Mathematics (7362/01)
Paper 1

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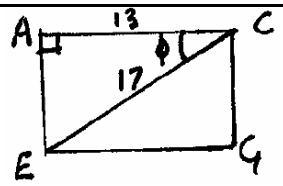
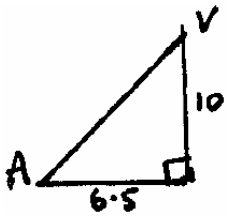
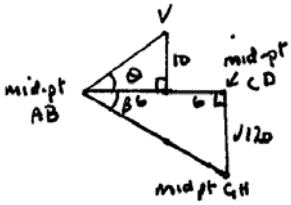
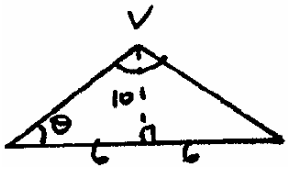
AO Pure Mathematics 7362 Mark Scheme

Paper 1

Q.	Scheme	Marks
1	$\frac{\sin 42°}{5.7} = \frac{\sin A}{8.4}$ $\sin A = \frac{8.4}{5.7}\sin 42°$ $\quad A = 80.4°$ or $99.6°$	M1A1 A1A1ft **(4)**
2	(a) $(x-4)(x-\alpha)(x-\alpha) = x^3 + px^2 + qx - 36$ $-4\alpha^2 = -36 \quad \alpha = \pm 3$ $\therefore$ repeated root is 3 (must be positive) *	M1 A1 (2)
	(b) Mult out brackets (may be seen in (a)) $p = -10,\ q = 33$	M1 A1A1 (3) **(5)**
3	$V = \frac{4}{3}\pi r^3 \quad \frac{dV}{dr} = 4\pi r^2$ $A = 4\pi r^2 \quad \frac{dA}{dr} = 8\pi r$ $\frac{dA}{dt} = \frac{dA}{dr} \times \frac{dr}{dV} \times \frac{dV}{dt}$ $= 8\pi r \times \frac{1}{4\pi r^2} \times 25, \ = \frac{50}{2.5} = 20\,\text{cm}^2/\text{s}$	M1A1 A1 M1 A1ftA1 **(6)**
4	$x + y = 11 - 6 \quad y = 5 - x$ $x(5-x) = 6$ $x^2 - 5x + 6 = 0$ $(x-2)(x-3) = 0$ $x = 2 \quad y = 3$ $x = 3 \quad y = 2$	OR: $y = \frac{6}{x}$ $x \times \frac{6}{x} + x + \frac{6}{x} = 11$ $6x + x^2 + 6 = 11x$ $x^2 - 5x + 6 = 0$ etc M1 M1 A1 M1A1 A1 **(6)**
5	(a) $\overrightarrow{AB} = 12\mathbf{i} + q\mathbf{j} - (3\mathbf{i} + 8\mathbf{j})$ $\overrightarrow{OC} = \overrightarrow{OA} + \frac{1}{3}\overrightarrow{AB} = 3\mathbf{i} + 8\mathbf{j} + \frac{1}{3}(12\mathbf{i} + q\mathbf{j} - (3\mathbf{i} + 8\mathbf{j}))$ $p\mathbf{i} + 4\mathbf{j} = 6\mathbf{i} + \left(\frac{16}{3} + \frac{q}{3}\right)\mathbf{j}$ $p = 6 \quad 4 = \frac{16}{3} + \frac{q}{3} \quad q = -4$	M1 M1 A1 M1A1 (5)
	(b) $\overrightarrow{OD} = \frac{1}{3}\overrightarrow{OB} = 4\mathbf{i} - \frac{4}{3}\mathbf{j}$ $\overrightarrow{OM} = \frac{1}{2}(\overrightarrow{OC} + \overrightarrow{OD}) = \frac{1}{2}(6\mathbf{i} + 4\mathbf{j} + 4\mathbf{i} - \frac{4}{3}\mathbf{j}) = 5\mathbf{i} + \frac{4}{3}\mathbf{j}$	B1 M1A1 (3) **(8)**

6	(a) $8x+4=8-4x$ $12x=4 \quad x=\frac{1}{3}$ $y^2=8-\frac{4}{3}=\frac{20}{3} \quad y=2\sqrt{\frac{5}{3}}$ (o.e.) (b) C_1 meets x-axis at $-\frac{1}{2}$; C_2 meets x-axis at 2 $\text{Vol} = \int_{-\frac{1}{2}}^{\frac{1}{3}} \pi(8x+4)\,\mathrm{d}x + \int_{\frac{1}{3}}^{2} \pi(8-4x)\,\mathrm{d}x$ $= \pi\left[4x^2+4x\right]_{-\frac{1}{2}}^{\frac{1}{3}} + \pi\left[8x-2x^2\right]_{\frac{1}{3}}^{2}$ $= \pi\left[\frac{4}{9}+\frac{4}{3}-(1-2)\right] + \pi\left[16-8-\left(\frac{8}{3}-\frac{2}{9}\right)\right] = \frac{25}{3}\pi$	M1 A1 A1 (3) M1A1 M1 A1 M1A1 (6) **(9)**
7	(a) $S_1=\frac{1}{4}(13+7)=5 \quad a=5$ (b) rth term $= S_r - S_{r-1} = \frac{r}{4}(13+7r) - \frac{(r-1)}{4}(13+7r-7) = \frac{7r}{2}+\frac{3}{2}$ (c) $r=2$ 2nd term $=8\frac{1}{2}$ $d=8\frac{1}{2}-5=3\frac{1}{2}$ (d) $5+\frac{7}{2}(p-1)=5k$ $7p-7=10k-10$ $7p=10k-3$ least $p=11$	B1 (1) M1A1A1 (3) M1A1 (2) M1 M1 A1 (3) **(9)**
8	(a) $(a+bx)^6 = a^6+6a^5bx+\frac{6.5}{2!}a^4b^2x^2+\frac{6.5.4}{3!}a^3b^3x^3$ $+\frac{6.5.4.3}{4!}a^2b^4x^4+\frac{6.5.4.3.2}{5!}ab^5x^5+b^6x^6$ $= a^6+6a^5bx+15a^4b^2x^2+20a^3b^3x^3+15a^2b^4x^4+6ab^5x^5+b^6x^6$ (b) $20a^3b^3=2\times15a^2b^4$ $2a^3b^3=3a^2b^4 \quad 2a=3b$ $(a+3b)^6=46656, \quad a+3b=\pm6$ $3a=\pm6 \quad a=2 \quad b=\frac{4}{3}$ $a=-2 \quad b=-\frac{4}{3}$	M1 A3,2,1,0 (4) M1 A1 M1A1 M1 A1 (6) **(10)**

9	(a) $x^3 = 125 \quad x = 5$	M1A1 (2)
	(b) $9y + 4 = 4^4 (= 256)$	M1
	$9y = 252 \quad y = 28$	M1A1 (3)
	(c) $3 - \frac{1}{\log_p 3} = 2\log_p 3$	M1
	$3\log_p 3 - 1 = 2\left(\log_p 3\right)^2$	M1
	$2\left(\log_p 3\right)^2 - 3\log_p 3 + 1 = 0$	A1
	$\left(2\log_p 3 - 1\right)\left(\log_p 3 - 1\right) = 0$	
	$\log_p 3 = 0.5 \quad p^{0.5} = 3 \quad p = 9$	M1A1
	$\log_p 3 = 1 \quad p = 3$	A1 (6)
		(11)
10	(a) $x^2 = \frac{x^2}{x-1}$	M1
	$x^2\left(x-2\right) = 0 \quad x = 0 \quad x = 2$	M1A1
	$\therefore A$ is $\left(2, 4\right)$	A1 (4)
	(b) $y = x^2 \quad \frac{\mathrm{d}y}{\mathrm{d}x} = 2x, \quad$ at $A \ \frac{\mathrm{d}y}{\mathrm{d}x} = 4$	M1A1
	Tangent $y - 4 = 4\left(x-2\right)$	
	$y = 4x - 4$	M1A1 (4)
	(c) $y = \frac{x^2}{x-1} \quad \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{2x\left(x-1\right) - x^2}{\left(x-1\right)^2}$	M1A1
	at $A \ \frac{\mathrm{d}y}{\mathrm{d}x} = 0, \quad$ tgt $y = 4$	M1A1 (4)
	(d) $y = 4x - 4$	
	$x = 0 \ \ y = -4$	B1
	Area $\Delta \ = \frac{1}{2} \times 2 \times 8 = 8$ units^2	M1A1 (3)
		(15)

11	(a)		$AC^2 = 12^2 + 5^2 \quad AC = 13$ $AE^2 = 17^2 - 13^2$ $AE = \sqrt{120} = 10.954... = 11.0$ cm	M1 M1 A1 (3)
	(b)		$VA^2 = 10^2 + 6.5^2, \quad VA = 11.9$ cm	M1A1ftA1 (3)
	(c)		$\sin\phi = \frac{\sqrt{120}}{17}$ $\phi = 40.1°$	M1A1ftA1 (3)
	(d)		$\tan\theta = \frac{10}{6} \quad \theta = 59.03°$ $\tan\beta = \frac{\sqrt{120}}{12} \quad \beta = 42.39°$ Reqd. angle $= 59.03 + 42.39$ $= 101.4°$	M1A1 A1 B1ft (4)
	(e)		Identify angle Reqd angle $= 2\tan^{-1}\left(\frac{6}{10}\right)$ $= 61.9°$	B1 M1A1 A1 (4)
				(17)

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