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Mark Scheme (Pre-Standardisation)
Summer 2008

GCE

GCE Mathematics (6664/01)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate’s response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate’s response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

EDEXCEL
June 2008
Core Mathematics C2
Mark Scheme

Question number	Scheme	Marks	
1.	(a) Attempt to evaluate f(–4) or f(4). $\left(\mathrm{f}(-4) = 2(-4)^3 - 3(-4)^2 - 39(-4) + 20\right)$	M1	
	$(= -128 - 48 + 156 + 20)$ $= 0$, so $(x + 4)$ is a factor.	A1	(2)
	(b) $2x^3 - 3x^2 - 39x + 20 = (x + 4)(2x^2 - 11x + 5)$	M1 A1	
	$\ldots\ldots(2x - 1)(x - 5)$	M1 A1	(4)
			6
	(a) A1 requires zero and a simple conclusion (even just a tick, or Q.E.D.). (b) First M requires division by $(x + 4)$ to get $(2x^2 + ax + b)$, $a \neq 0, b \neq 0$. Second M for the attempt to factorise their quadratic. Usual rule: $(2x^2 + ax + b) = (2x + c)(x + d)$, where $\lvert cd\rvert = \lvert b\rvert$. <u>Alternative (first 2 marks):</u> $(x + 4)(2x^2 + ax + b) = 2x^3 + (8 + a)x^2 + (4a + b)x + 4b = 0$, then compare coefficients to find <u>values</u> of a and b. [M1] $a = -11$, $b = 5$ [A1] <u>Alternative:</u> Factor theorem: Finding that $\mathrm{f}\left(\frac{1}{2}\right) = 0$ $\therefore$ factor is, $(2x - 1)$ [M1, A1] Finding that $\mathrm{f}(5) = 0$ $\therefore$ factor is, $(x - 5)$ [M1, A1] "Combining" all 3 factors is <u>not</u> required. If just one of these is found, score the <u>first 2 marks</u> M1 A1 M0 A0. <u>Losing a factor of 2:</u> $(x + 4)\left(x - \frac{1}{2}\right)(x - 5)$ scores M1 A1 M1 A0. <u>Answer only, one sign wrong:</u> e.g. $(x + 4)(2x - 1)(x + 5)$ scores M1 A1 M1 A0		

EDEXCEL
June 2008
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Question number	Scheme	Marks
2.	(a) 1.732, 2.058, 5.196 (One correct B1, All correct B1 B1)	B1 B1 (2)
	(b) $\frac{1}{2} \times 0.5$, $\{(1.732 + 5.196) + 2(2.058 + 2.646 + 3.630)\}$	B1, M1 A1ft
	$= 5.899$ (awrt 5.9)	A1 (4)
		6
	(a) Accept awrt. (b) Bracketing mistake: i.e. $\frac{1}{2} \times 0.5(1.732 + 5.196) + 2(2.058 + 2.646 + 3.630)$ scores B1 M1 A0 A0 unless the final answer implies that the calculation has been done correctly (then full marks can be given).	

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June 2008
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3.	(a) $(1+ax)^{10} = 1+10ax......$	B1
	$+\frac{10\times 9}{2}(ax)^2 + \frac{10\times 9\times 8}{6}(ax)^3, \quad = ...+45(ax)^2+120(ax)^3$	M1, A1 A1 (4)
	(b) $120a^3 = 2\times 45a^2 \qquad a = \frac{3}{4}$	M1 A1 (2)
		6

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June 2008
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4.	(a) $x = \frac{\log 7}{\log 5}$, $= 1.21$	M1, A1 (2)
	(b) $(5^x - 7)(5^x - 5)$	M1 A1
	$(5^x = 7 \text{ or } 5^x = 5)$ $x = 1.21$, $x = 1$	A1ft, B1 (4)
		6
	(a) 1.21 with no working: M1 A1. Other answers which round to 1.2 with no working: M1 A0. (b) Allow $\log_5 7$ or $\frac{\log 7}{\log 5}$ instead of 1.21 for A1ft.	

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June 2008
Core Mathematics C2
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5.	(a) $(8-3)^2+(3-1)^2$	M1 A1
	$(x-3)^2+(y-1)^2=29$ M1: $(x\pm a)^2+(y\pm b)^2=k$	M1 A1 (4)
	(b) Gradient of radius $=\dfrac{3-1}{8-3}$, Gradient of tangent $=\dfrac{-5}{2}$	B1, M1
	$y-3=\dfrac{-5}{2}(x-8)$, $5x+2y-46=0$	M1 A1ft, A1 (5)
		9
	(b) 2nd M: Equation of straight line through (8, 3), any gradient (except 0 or ∞). Alternative: M1: Using (8, 3) and an *m* value in *y* = *mx* + *c* to find a value of *c*. A1ft: Correct ft value of *m* used (dependent on both M's).	

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June 2008
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6.	(a) $T_{20} = 5 \times \left(\frac{4}{5}\right)^{19} = 0.072$ (Accept awrt)	M1 A1	(2)
	(b) $S_\infty = \frac{5}{1-0.8} = 25$	M1 A1	(2)
	(c) $\frac{5(1-0.8^k)}{1-0.8} > 24.95$, $1-0.8^k > 0.998$ (or equiv.) (Allow with = or <)	M1, A1	
	$k\log 0.8 < \log 0.002$, $k > \frac{\log 0.002}{\log 0.8}$ (*)	M1 A1	(4)
	(d) $k = 28$	B1	(1)
			9

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June 2008
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7.	(a) $r\theta = 7 \times 0.8 = 5.6$ (cm)		M1 A1	(2)
	(b) $\frac{1}{2}r^2\theta = \frac{1}{2} \times 7^2 \times 0.8 = 19.6$ (cm^2)		M1 A1	(2)
	(c) $BD^2 = 7^2 + 3.5^2 - (2 \times 7 \times 3.5 \times \cos 0.8)$	$(BD = 5.21)$	M1 A1	
	Perimeter = 3.5 + “5.6” + “5.21”, = 14.3 (cm)	(Accept awrt)	M1 A1	(4)
	(d) $\Delta\, ABD = \frac{1}{2} \times 7 \times 3.5 \times \sin 0.8$	(= 8.78)	M1 A1	
	Area = “19.6” – “8.78”, = 10.8 (cm^2)	(Accept awrt)	M1 A1	(4)
				12

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June 2008
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Question number	Scheme	Marks
8.	(a) $\frac{dy}{dx} = 8 + 2x - 3x^2$	M1 A1
	$3x^2 - 2x - 8 = 0$ $\quad (3x+4)(x-2) = 0 \quad x = 2$ $\quad$ (*)	A1 (3)
	(b) Area of triangle = $\frac{1}{2} \times 2 \times 22$	M1 A1
	$\int 10 + 8x + x^2 - x^3 \, dx = 10x + \frac{8x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4}$ $\quad (+C)$	M1 A1 A1
	$\left[10x + \frac{8x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4}\right]_0^2 = 20 + 16 + \frac{8}{3} - 4$	M1
	Area of $R = 34\frac{2}{3} - 22 = \frac{38}{3}$ $\quad \left(= 12\frac{2}{3}\right)$	M1 A1 (8)
		11
	(b) <u>Alternative</u>:	
	Eqn. of line $y = 11x$. $\quad$ (Marks dependent on subsequent use in integration)	M1 A1
	$\int 10 + kx + x^2 - x^3 \, dx = 10x + \frac{kx^2}{2} + \frac{x^3}{3} - \frac{x^4}{4}$ $(+C)$ $\quad$ (k perhaps -3)	M1 A1 A1
	$\left[10x + \frac{kx^2}{2} + \frac{x^3}{3} - \frac{x^4}{4}\right]_0^2 = \ldots\ldots$ $\quad$ (Substitute limit)	M1
	Area of $R = \left[10x - \frac{3x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4}\right]_0^2 = 20 - 6 + \frac{8}{3} - 4 = \frac{38}{3}$ $\quad \left(= 12\frac{2}{3}\right)$	M1 A1 (8)
	Final M1 for $\int(\text{line}) - \int(\text{curve})$.	

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9.	(a) 45 (α)	B1
	$180-\alpha$, Add 20	M1, M1
	65 155	A1 (4)
	(b) 120 (β):	B1
	$360-\beta$, $360+\beta$	M1, M1
	Dividing by 3	M1
	40 80 160 200 280 320 First A1: at least 3 correct	A1 A1 (6)
		10