edexcel

GCE

Edexcel GCE

Core Mathematics C1(6663)

Summer 2005

advancing learning, changing lives

Mark Scheme (Results)

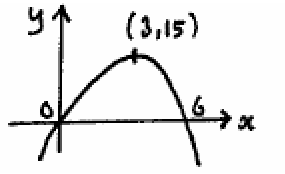
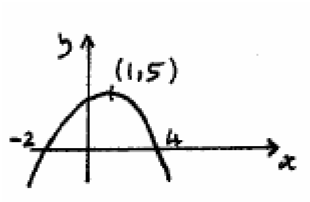
Edexcel GCE
Core Mathematics C1 (6663)

edexcel

June 2005
6663 Core Mathematics C1
Mark Scheme

Question Number	Scheme	Marks
1. (a)	$\underline{2}$ Penalise $\pm$	B1 (1)
(b)	$8^{-\frac{2}{3}} = \frac{1}{\sqrt[3]{64}}$ or $\frac{1}{(a)^2}$ or $\frac{1}{\sqrt[3]{8^2}}$ *or* $\frac{1}{8^{\frac{2}{3}}}$ Allow $\pm$	M1
	$= \frac{1}{4}$ or 0.25	A1 (2)
		(3)
(b)	M1 for understanding that "-" power means reciprocal $8^{\frac{2}{3}} = 4$ is M0A0 and $-\frac{1}{4}$ is M1A0	
2. (a)	$\frac{dy}{dx} = 6 + 8x^{-3}$ $x^n \to x^{n-1}$	M1
	both	A1 (2)
(b)	$\int (6x - 4x^{-2})dx = \frac{6x^2}{2} + 4x^{-1} + c$	M1 A1 A1 (3)
		(5)
(b)	1st A1 for one correct term in x: $\frac{6x^2}{2}$ $\underline{\text{or}}$ $+4x^{-1}$ (or better simplified versions) 2nd A1 for all 3 terms as printed or better in one line.	

Question Number	Scheme	Marks
3. (a)	$x^2 - 8x - 29 \equiv (x-4)^2 - 45$ $(x \pm 4)^2$ $(x-4)^2 - 16 + (-29)$ $(x \pm 4)^2 - 45$	M1 A1 A1 (3)
ALT	Compare coefficients $-8 = 2a$ equation for a $a = -4$ <u>AND</u> $a^2 + b = -29$ $b = -45$	M1 A1 A1 (3)
(b)	$(x-4)^2 = 45$ (follow through their a and b from (a)) $\Rightarrow x - 4 = \pm\sqrt{45}$ $c = 4$ $x = 4 \pm 3\sqrt{5}$ $d = 3$	M1 A1 A1 (3) **(6)**
(a) (b)	M1 for $(x \pm 4)^2$ or an equation for a. M1 for a full method leading to $x - 4 = ...$ or $x = ...$ A1 for c and A1 for d <u>Note</u> Use of formula that ends with $\frac{8 \pm 6\sqrt{5}}{2}$ scores M1 A1 A0 (but must be $\sqrt{5}$) i.e. only penalise non-integers by one mark.	

Question Number	Scheme	Marks
4. (a)	 Shape Points	B1 B1 (2)
(b)	 -2 and 4 max	M1 A1 A1 (3) **(5)**
 (a) (b)	Marks for shape: graphs must have curved sides and round top. 1st B1 for $\cap$ shape through (0, 0) and ($(k,0)$ where $k>0$) 2nd B1 for max at (3, 15) and 6 labelled or (6, 0) seen Condone (15,3) if 3 and 15 are correct on axes. Similarly (5,1) in (b) M1 for $\cap$ shape <u>NOT</u> through (0, 0) but must cut x-axis twice. 1st A1 for -2 and 4 labelled or (-2, 0) and (4, 0) seen 2nd A1 for max at (1, 5). Must be clearly in 1st quadrant	
5.	$x=1+2y$ and sub $\rightarrow (1+2y)^2+y^2=29$ $\Rightarrow 5y^2+4y-28(=0)$ i.e. $(5y+14)(y-2)=0$ $(\ y=)2$ or $-\frac{14}{5}$ (o.e.) (both) $y=2 \Rightarrow x=1+4=5$; $y=-\frac{14}{5} \Rightarrow x=-\frac{23}{5}$ (o.e)	M1 A1 M1 A1 M1A1 f.t. **(6)**
	1st M1 Attempt to sub leading to equation in 1 variable 1st A1 Correct 3TQ (condone = 0 missing) 2nd M1 Attempt to solve 3TQ leading to 2 values for y. 2nd A1 Condone mislabelling x = for y = … but then M0A0 in part (c). 3rd M1 Attempt to find at least one x value 3rd A1 f.t. f.t. only in $x=1+2y$ (3sf if not exact) Both values N.B. False squaring (e.g. $y=x^2+4y^2=1$) can only score the last 2 marks.	

Question Number	Scheme	Marks
6. (a)	$6x + 3 > 5 - 2x \quad \Rightarrow 8x > 2$	M1
	$x > \frac{1}{4}$ or 0.25 or $\frac{2}{8}$	A1
		(2)
(b)	$(2x-1)(x-3) \quad (> 0)$	M1
	Critical values $x = \frac{1}{2}, \ 3$ (both)	A1
	 Choosing "outside" region	M1
	$x > 3$ or $x < \frac{1}{2}$	A1 f.t.
		(4)
(c)	$x > 3$ or $\frac{1}{4} < x < \frac{1}{2}$	B1f.t. B1f.t.
		(2)
		(8)
(a)	M1 Multiply out and collect terms (allow one slip and allow use of = here)	
(b)	1st M1 Attempting to factorise 3TQ $\rightarrow x = \ldots$	
	2nd M1 Choosing the outside region	
	2nd A1 f.t. f.t. their critical values N.B.(x>3, $x > \frac{1}{2}$ is M0A0)	
	For $p < x < q$ where $p > q$ penalise the final A1 in (b).	
(c)	**f.t. their answers to (a) and (b)**	
	1st B1 a correct f.t. leading to an <u>infinite</u> region	
	2nd B1 a correct f.t. leading to a <u>finite</u> region	
	Penalise $\leq$ or $\geq$ once only at first offence.	
	e.g. (a) (b) (c) Mark	
	$x > \frac{1}{4}$ $\frac{1}{2} < x < 3$ $\frac{1}{2} < x < 3$ B0 B1	
	$x > \frac{1}{4}$ $x > 3, \ x > \frac{1}{2}$ $x > 3$ B1 B0	

Question Number	Scheme	Marks
7. (a)	$(3-\sqrt{x})^2 = 9-6\sqrt{x}+x$	M1
	$\div by\sqrt{x} \quad \rightarrow 9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}}$	A1 c.s.o.
		(2)
(b)	$\int (9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}})dx = \frac{9x^{\frac{1}{2}}}{\frac{1}{2}} - 6x + \frac{x^{\frac{3}{2}}}{\frac{3}{2}} (+c)$	M1 A2/1/0
	use $y=\frac{2}{3}$ and $x=1$: $\quad \frac{2}{3} = 18 - 6 + \frac{2}{3} + c$	M1
	c = - 12	A1 c.s..o.
	So $\quad y = 18x^{\frac{1}{2}} - 6x + \frac{2}{3}x^{\frac{3}{2}}$ -12	A1f.t.
		(6)
		(8)
(a)	M1 Attempt to multiply out $(3-\sqrt{x})^2$. Must have 3 or 4 terms, allow one sign error A1 cso Fully correct solution to printed answer. Penalise wrong working.	
(b)	1st M1 Some correct integration: $x^n \rightarrow x^{n+1}$ A1 At least 2 correct unsimplified terms Ignore + c A2 All 3 terms correct (unsimplified) 2nd M1 Use of $y=\frac{2}{3}$ and $x=1$ to find c. No + c is M0. A1c.s.o. for -12. (o.e.) Award this mark if " $c=-12$ " stated i.e. not as part of an expression for y A1f.t. for 3 simplified x terms with $y = \ldots$ and a numerical value for c. Follow through their value of c but it must be a number.	

Question Number	Scheme	Marks
8. (a)	$y-(-4)=\frac{1}{3}(x-9)$	M1 A1
	$3y-x+21=0$ (o.e.) (condone 3 terms with integer coefficients e.g. 3*y*+21=*x*)	A1
		(3)
(b)	Equation of l_2 is: $y=-2x$ (o.e.)	B1
	Solving l_1 and l_2 : $-6x-x+21=0$	M1
	p is point where $x_p=3$, $y_p=-6$ x_p or y_p	A1
	y_p or x_p	A1f.t.
		(4)
(c)	(l_1 is $y=\frac{1}{3}x-7$) C is (0, -7) or OC = 7	B1f.t.
	Area of $\Delta OCP=\frac{1}{2}OC\times x_p$, $=\frac{1}{2}\times 7\times 3=10.5$ or $\frac{21}{2}$	M1 A1c.a.o.
		(3)
		(10)
(a)	M1 for full method to find equation of l_1 1stA1 any unsimplified form	
(b)	M1 Attempt to solve two linear equations leading to linear equation in one variable 2nd A1 f.t. only f.t. their x_p or y_p in $y=-2x$	
(c)	B1f.t. Either a correct OC or f.t. from their l_1 M1 for correct attempt in letters or symbols for ΔOCP A1 c.a.o. $-\frac{1}{2}\times 7\times 3$ scores M1 A0	

Question Number	Scheme	Marks
9 (a)	$(S =) a + (a+d) + \dots \quad \dots + [a + (n-1)d]$ $(S =) [a + (n-1)d] + \dots \quad \dots + a$ $2S = [2a + (n-1)d] + \dots \quad \dots + [2a + (n-1)d]$ } either $2S = n[2a + (n-1)d]$ $S = \frac{n}{2}[2a + (n-1)d]$	B1 M1 dM1 A1 c.s.o (4)
(b)	$(a = 149, \ d = -2)$ $u_{21} = 149 + 20(-2) = £109$	M1 A1 (2)
(c)	$S_n = \frac{n}{2}[2 \times 149 + (n-1)(-2)] \quad (= n(150-n))$ $S_n = 5000 \Rightarrow n^2 - 150n + 5000 = 0 \quad (*)$	M1 A1 A1 c.s.o (3)
(d)	$(n-100)(n-50) = 0$ $n = 50$ or 100	M1 A2/1/0 (3)
(e)	$u_{100} < 0 \quad \therefore n = 100$ not sensible	B1 f.t. (1) **(13)**
(a)	B1 requires at least 3 terms, must include first and last terms, an adjacent term dots and + signs. 1st M1 for reversing series. Must be arithmetic with *a*, *d* (or *a*, *l*) and *n*. 2nd dM1 for adding, must have 2*S* and be a genuine attempt. Either line is sufficient. Dependent on 1st M1 (NB Allow first 3 marks for use of *l* for last term but as given for final mark)	
(b)	M1 for using $a = 149$ and $d = \pm 2$ in $a + (n-1)d$ formula.	
(c)	M1 for using their a, d in S_n A1 any correct expression A1cso for putting S_n=5000 and simplifying to given expression. No wrong work	
(d)	M1 Attempt to solve leading to $n = \dots$ A2/1/0 Give A1A0 for 1 correct value and A1A1 for both correct	
(e)	B1 f.t. Must mention 100 and state $u_{100} < 0$ (or loan paid or equivalent) If giving f.t. then must have $n \geq 76$.	

Question Number	Scheme	Marks
10 (a)	$x = 3, \quad y = 9 - 36 + 24 + 3 = 0$ (9 – 36 + 27=0 is OK)	B1 (1)
(b)	$\frac{dy}{dx} = \frac{3}{3}x^2 - 2\times 4\times x + 8 \qquad (= x^2 - 8x + 8)$	M1 A1
	When $x = 3$, $\frac{dy}{dx} = 9 - 24 + 8 \Rightarrow m = -7$	M1
	Equation of tangent: $y - 0 = -7(x-3)$	M1
	$y = -7x + 21$	A1 c.a.o (5)
(c)	$\frac{dy}{dx} = m$ gives $x^2 - 8x + 8 = -7$	M1
	$(x^2 - 8x + 15 = 0)$	
	$(x-5)(x-3) = 0$	M1
	$x = (3)$ or 5 $\qquad x = 5$	A1
	$\therefore y = \frac{1}{3}5^3 - 4\times 5^2 + 8\times 5 + 3$	M1
	$y = -15\frac{1}{3}$ or $-\frac{46}{3}$	A1 (5)
		(11)
(b)	1st M1 some correct differentiation ($x^n \to x^{n-1}$ for one term) 1st A1 correct unsimplified (all 3 terms) 2nd M1 substituting $x_p (= 3)$ in their $\frac{dy}{dx}$ clear evidence 3rd M1 using their m to find tangent at p.	
(c)	1st M1 forming a correct equation " their $\frac{dy}{dx}$ = gradient of their tangent" 2nd M1 for solving a quadratic based on their $\frac{dy}{dx}$ leading to $x =$ 3rd M1 for using their x value in y to obtain y coordinate	
MR	For misreading (0, 3) for (3, 0) award B0 and then M1A1 as in scheme. Then allow all M marks but no A ft. (Max 7)	

edexcel

GENERAL PRINCIPLES FOR C1 MARKING

Method mark for solving 3 term quadratic:

1. Factorisation

$(x^2 + bx + c) = (x + p)(x + q)$, where $|pq| = |c|$, leading to $x = \ldots$

$(ax^2 + bx + c) = (mx + p)(nx + q)$, where $|pq| = |c|$ and $|mn| = |a|$, leading to $x = \ldots$

2. Formula

Attempt to use correct formula (with values for a, b and c).

3. Completing the square

Solving $x^2 + bx + c = 0$: $(x \pm p)^2 \pm q \pm c$, $p \neq 0$, $q \neq 0$, leading to $x = \ldots$

Method marks for differentiation and integration:

1. Differentiation

Power of at least one term decreased by 1. ($x^n \to x^{n-1}$)

2. Integration

Power of at least one term increased by 1. ($x^n \to x^{n+1}$)

Use of a formula

Where a method involves using a formula that has been learnt, the advice given in recent examiners' reports is that the formula should be quoted first.

Normal marking procedure is as follows:

Method mark for quoting a correct formula and attempting to use it, even if there are mistakes in the substitution of values.

Where the formula is not quoted, the method mark can be gained by implication from correct working with values, but will be lost if there is any mistake in the working.

Exact answers

Examiners' reports have emphasised that where, for example, an exact answer is asked for, or working with surds is clearly required, marks will normally be lost if the candidate resorts to using rounded decimals.

Answers without working

The rubric says that these may gain no credit. Individual mark schemes will give details of what happens in particular cases. General policy is that if it could be done "in your head", detailed working would not be required. Most candidates do show working, but there are occasional awkward cases and if the mark scheme does not cover this, please contact your team leader for advice.

Misreads

A misread must be consistent for the whole question to be interpreted as such.

These are not common. In clear cases, please deduct the first 2 A (or B) marks which would have been lost by following the scheme. (Note that 2 marks is the maximum misread penalty, but that misreads which alter the nature or difficulty of the question cannot be treated so generously and it will usually be necessary here to follow the scheme as written).

Sometimes following the scheme as written is more generous to the candidate than applying the misread rule, so in this case use the scheme as written.