Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1
Bronze Level B2

Time: 1 hour 30 minutes

Materials required for examination papers	Items included with question
Mathematical Formulae (Green)	Nil

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulas stored in them.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 10 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

Suggested grade boundaries for this paper:

A*	A	B	C	D	E
73	65	57	49	41	33

1. Given that $y = x^4 + 6x^{\frac{1}{2}}$, find in their simplest form

(*a*) $\dfrac{dy}{dx}$,

(3)

(*b*) $\int y \; dx$.

(3)

January 2012

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2. Find

$$\int (12x^5 - 3x^2 + 4x^{\frac{1}{3}}) \; dx,$$

giving each term in its simplest form.

(5)

January 2011

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3. Given that $y = 3x^2 + 4\sqrt{x}$, $x > 0$, find

(*a*) $\dfrac{dy}{dx}$,

(2)

(*b*) $\dfrac{d^2y}{dx^2}$,

(2)

(*c*) $\int y \; dx$.

(3)

May 2007

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4. $$f(x) = 3x + x^3, \qquad x > 0.$$

(*a*) Differentiate to find $f'(x)$.

(2)

Given that $f'(x) = 15$,

(*b*) find the value of x.

(3)

June 2008

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5. A sequence x_1, x_2, x_3, … is defined by

$$x_1 = 1,$$

$$x_{n+1} = ax_n - 3, \quad n \geq 1,$$

where a is a constant.

(*a*) Find an expression for x_2 in terms of a.

(1)

(*b*) Show that $x_3 = a^2 - 3a - 3$.

(2)

Given that $x_3 = 7$,

(*c*) find the possible values of a.

(3)

June 2008

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6. A boy saves some money over a period of 60 weeks. He saves 10p in week 1, 15p in week 2, 20p in week 3 and so on until week 60. His weekly savings form an arithmetic sequence.

(*a*) Find how much he saves in week 15.

(2)

(*b*) Calculate the total amount he saves over the 60 week period.

(3)

The boy's sister also saves some money each week over a period of m weeks. She saves 10p in week 1, 20p in week 2, 30p in week 3 and so on so that her weekly savings form an arithmetic sequence. She saves a total of £63 in the m weeks.

(*c*) Show that

$$m(m + 1) = 35 \times 36.$$

(4)

(*d*) Hence write down the value of m.

(1)

May 2012

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7. Given that

$$y = 8x^3 - 4\sqrt{x} + \frac{3x^2 + 2}{x}, \qquad x > 0,$$

find $\frac{\mathrm{d}y}{\mathrm{d}x}$.

(6)

May 2010

8.

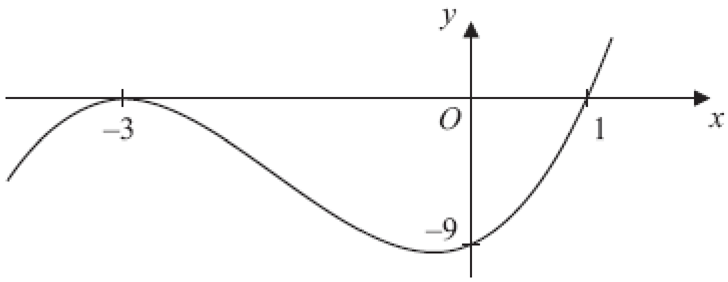


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$ where

$$f(x) = (x + 3)^2 (x - 1), \qquad x \in \mathbb{R}.$$

The curve crosses the x-axis at (1, 0), touches it at (–3, 0) and crosses the y-axis at (0, –9).

(*a*) Sketch the curve C with equation $y = f(x + 2)$ and state the coordinates of the points where the curve C meets the x-axis.

(3)

(*b*) Write down an equation of the curve C.

(1)

(*c*) Use your answer to part (*b*) to find the coordinates of the point where the curve C meets the y-axis.

(2)

May 2013

9. The line L_1 has equation $2y - 3x - k = 0$, where k is a constant.

Given that the point $A(1, 4)$ lies on L_1, find

(*a*) the value of k,

(1)

(*b*) the gradient of L_1.

(2)

The line L_2 passes through A and is perpendicular to L_1.

(*c*) Find an equation of L_2 giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

The line L_2 crosses the x-axis at the point B.

(*d*) Find the coordinates of B.

(2)

(*e*) Find the exact length of AB.

(2)

January 2011

10.

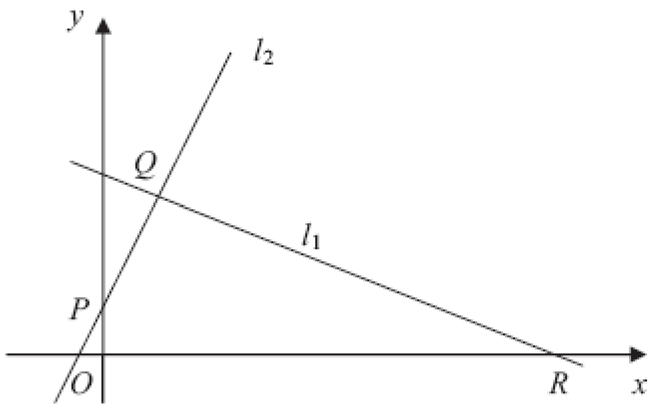


Figure 2

The points Q (1, 3) and R (7, 0) lie on the line l_1, as shown in Figure 2.

The length of QR is $a\sqrt{5}$.

(*a*) Find the value of a.

(3)

The line l_2 is perpendicular to l_1, passes through Q and crosses the y-axis at the point P, as shown in Figure 2. Find

(*b*) an equation for l_2,

(5)

(*c*) the coordinates of P,

(1)

(*d*) the area of ΔPQR.

(4)

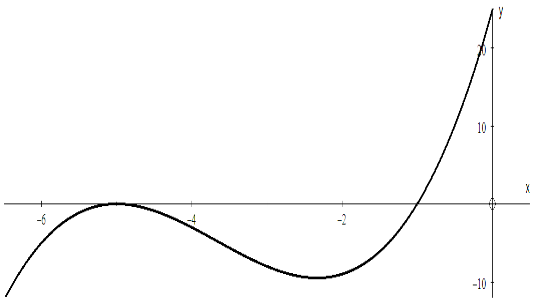
June 2008

TOTAL FOR PAPER: 75 MARKS

END

Question Number	Scheme	Marks
1. (a)	$4x^3 + 3x^{-\frac{1}{2}}$	M1A1A1 (3)
(b)	$\frac{x^5}{5} + 4x^{\frac{3}{2}} + C$	M1A1A1 (3) **[6]**
2.	$\left(\int =\right)\frac{12x^6}{6}, -\frac{3x^3}{3}, +\frac{4x^{\frac{4}{3}}}{\frac{4}{3}}, (+c)$	M1A1, A1, A1
	$= 2x^6 - x^3 + 3x^{\frac{4}{3}} + c$	A1 **[5]**
3. (a)	$\left(\frac{\mathrm{d}y}{\mathrm{d}x}\right) = 6x^1 + \frac{4}{2}x^{-\frac{1}{2}}$ or $\left(6x + 2x^{-\frac{1}{2}}\right)$	M1 A1 (2)
(b)	$6 + -x^{-\frac{3}{2}}$ or $\underline{6 + -1 \times x^{-\frac{3}{2}}}$	M1 A1ft (2)
(c)	$x^3 + \frac{8}{3}x^{\frac{3}{2}} + C$	M1 A1 A1 (3) **[7]**
4. (a)	$\mathrm{f}'(x) = 3 + 3x^2$	M1 A1 (2)
(b)	$3 + 3x^2 = 15$ and start to try and simplify	M1
	$x^2 = k \rightarrow x = \sqrt{k}$ (ignore $\pm$)	M1
	$x = 2$ (ignore $x = -2$)	A1 (3) **[5]**
5. (a)	$[x_2 =] a - 3$	B1 (1)
(b)	$[x_3 =]$ $ax_2 - 3$ or $a(a-3) - 3$	B1
	$= a(a-3) - {}_5$ $= a^2 - 3a - 3$ **(*)**	A1 cso (2)
(c)	$a^2 - 3a - 3 = 7$	
	$a^2 - 3a - 10 = 0$ or $a^2 - 3a = 10$	M1
	$(a-5)(a+2) = 0$	M1
	$a = 5$ or -2	A1 (3) **[6]**

Question Number	Scheme	Marks
	Boy's Sequence: 10, 15, 20, 25, ...	
6. (a)	$\{a = 10,\ d = 5 \Rightarrow T_{15} =\}\ a + 14d = 10 + 14(5);\ = 80$ or $0.1 + 14(0.05);\ = £0.80$	M1; A1
		(2)
(b)	$\{S_{60} =\}\ \frac{60}{2}\left[2(10) + 59(5)\right]$	M1 A1
	$= 30(315) = 9450$ or £94.50	A1
		(3)
	Boy's Sister's Sequence: 10, 20, 30, 40, ...	
(c)	$\{a = 10,\ d = 10 \Rightarrow S_m =\}\ \frac{m}{2}\left(2(10) + (m-1)(10)\right)$	M1 A1
	$\left(\text{or } \frac{m}{2} \times 10(m+1) \text{ or } 5m(m+1)\right)$	
	63 or $6300 = \frac{m}{2}\left(2(10) + (m-1)(10)\right)$	dM1
	$6300 = \frac{m}{2}(10)(m+1)$ or $12600 = 10m(m+1)$	
	$1260 = m(m+1)$	
	$35 \times 36 = m(m+1)$ **(*)**	A1 cso
		(4)
(d)	$\{m =\}\ 35$	B1
		(1)
		[10]
7.	$\frac{3x^2 + 2}{x} = 3x + 2x^{-1}$	M1 A1
	$(y' =) 24x^2, -2x^{-\frac{1}{2}}, +3 - 2x^{-2}$	M1 A1 A1A1
	$\left[24x^2 - 2x^{-\frac{1}{2}} + 3 - 2x^{-2}\right]$	
		[6]

Question Number	Scheme	Marks
8. (a)	 Horizontal translation	B1
	Touching at (–5, 0).	B1
	The right hand tail of their cubic shape crossing at (–1, 0).	B1
		(3)
(b)	$(x+5)^2(x+1)$	B1
		(1)
(c)	When $x = 0$, $y = 25$	M1 A1
		(2) **[6]**
9. (a)	$(8 - 3 - k = 0)$ so $k = 5$	B1 (1)
(b)	$2y = 3x + k$	M1
	$y = \frac{3}{2}x + \dots$ and so m = $\frac{3}{2}$ oe	A1
		(2)
(c)	Perpendicular gradient = $-\frac{2}{3}$	B1ft
	Equation of line is: $y - 4 = -\frac{2}{3}(x-1)$	M1A1ft
	$3y + 2x - 14 = 0$ oe	A1
		(4)
(d)	$y = 0$, $\Rightarrow$ B(7, 0) or $x = 7$ $x = 7$ or $-\frac{c}{a}$	M1A1ft
		(2)
(e)	$AB^2 = (7-1)^2 + (4-0)^2$	M1
	$AB = \sqrt{52}$ or $2\sqrt{13}$	A1
		(2) **[11]**

Question Number	Scheme	Marks
10. (*a*)	$QR = \sqrt{(7-1)^2 + (0-3)^2}$	M1
	$= \sqrt{36+9}$ or $\sqrt{45}$	A1
	$= 3\sqrt{5}$ or $a = 3$	A1 (3)
(*b*)	Gradient of QR (or l_1) = $\dfrac{3-0}{1-7}$ or $\dfrac{3}{-6}, = -\dfrac{1}{2}$	M1 A1
	Gradient of l_2 is $-\dfrac{1}{-\frac{1}{2}}$ or 2	M1
	Equation for l_2 is: $y-3 = 2(x-1)$ or $\frac{y-3}{x-1} = 2$ [or $y = 2x + 1$]	M1 A1 ft (5)
(*c*)	P is (0, 1) (allow "$x = 0$, $y = 1$" but it must be clearly identifiable as P)	B1 (1)
(*d*)	$PQ = \sqrt{(1-x_P)^2 + (3-y_P)^2}$	M1
	$PQ = \sqrt{1^2 + 2^2} = \sqrt{5}$	A1
	Area of triangle is $\frac{1}{2}QR \times PQ = \frac{1}{2}3\sqrt{5} \times \sqrt{5}, = \dfrac{15}{2}$ or 7.5	M1 A1 (4)
		[13]

Examiner reports

Question 1

This question was answered very well with many candidates scoring 5 or 6 marks. In part (a) a few struggled with the fractional power and some included + c. Simplifying the second term in part (b) was the usual place where candidates lost a mark, $\frac{6x^{\frac{3}{2}}}{\frac{3}{2}}$ was often obtained but not simplified correctly. A few lost a mark for failing to include + c in part (b). Some candidates are in the habit of writing fractions on a single line such as $\frac{1}{5}$. This is not encouraged as expressions like $\frac{1}{5x^5}$ are not clear and candidates themselves often misread this as $\frac{1}{5x^5}$.

Question 2

This question was attempted by all and was well answered by most candidates. The integration was generally recognised and usually carried out correctly with many candidates scoring full marks with two or three lines of working. Only very few tried to differentiate. Virtually all knew that they had to increase the power by 1 and then divide by the new power. Usually if mistakes occurred it was when simplifying. The third term presented the most challenge, highlighting weaknesses in dealing with fractions and reciprocals: many had difficulty when trying to simplify terms involving fractions such as 4/(4/3). The third term was often left as $4x^{\frac{4}{3}}$. The constant of integration was missed in only a minority of cases resulting in the loss of the final mark.

Question 3

Most knew the rules for differentiation and integration and could apply them successfully here. A few failed to write $4\sqrt{x}$ as $4x^{\frac{1}{2}}$ but they often benefited from the follow through mark in part (b). In part (c) the x^3 term was usually correct but some failed to simplify $\frac{4x^{\frac{3}{2}}}{\frac{3}{2}}$ correctly whilst others forgot the + C.

Question 4

Most candidates differentiated in part (a) and usually scored both marks. Sometimes the coefficient of the second term was incorrect (values of 2, $\frac{1}{2}$ or $\frac{1}{3}$ were seen). In part (b) most candidates were able to form a suitable equation and start to collect terms but a few simply evaluated f(15)′. There were a number of instances of poor algebraic processing from a correct equation with steps such as $3x^2 = 12 \Rightarrow 3x = \sqrt{12}$ or $3x^2 = 12 \Rightarrow x^2 = 9 \Rightarrow x = 3$ appearing far too often.

Question 5

The notation associated with sequences given in this form still causes difficulties for some candidates and as a result parts (a) and (b) were often answered less well than part (c). A common error in the first two parts was to leave an x in the expression but most of those who could handle the notation gave clear and accurate answers. There were the usual errors in part (c), with $a^2 - 3a - 4 = 0$ appearing quite often and it was encouraging to see most candidates factorising their quadratic expression confidently as a means of solving the equation. A few candidates still use a trial and improvement approach to questions of this type and they often stopped after finding just one solution and gained no credit.

Question 6

This question was both well answered and discriminating with about three-quarters of the candidature gaining at least 7 of the 10 marks available and one-quarter achieving full marks.

Part (a) was well answered with the majority using $a + 14d$ and a small minority using $5n + 5$ in order to find the 15th term. Few candidates listed each term and a number identified the 15th term correctly. A small number of candidates found the total amount saved over the 15 weeks.

Question 7

There were many perfect answers here with candidates securing their marks in 3 or 4 clear lines of working. The division caused problems for some but even these candidates could differentiate $8x^3$ correctly and sometimes $-4\sqrt{x}$ as well.

There were two common approaches to the division with splitting and dividing usually proving more successful than multiplying by x^{-1} as this often resulted in a $3x^{-2}$.

A minority of candidates had problems in writing $\sqrt{x}$ as $x^{\frac{1}{2}}$ choosing x^{-1} instead and it was encouraging to see very few cases of integration or correct differentiation with a $+c$ this year.

Question 8

In part (a) nearly all candidates produced a horizontal translation in the right direction with the required coordinates marked on the graph. Errors mainly consisted of translating horizontally in the wrong direction or attempting $f(x) + 2$.

In part (b) a large number of candidates successfully wrote down $y = (x + 5)^2(x + 1)$; however it was quite common to see $y = (x + 1)^2(x - 3)$. Some candidates chose to expand $f(x)$ correctly as $x^3 + 5x^2 + 3x - 9$ but then incorrectly deduced $f(x + 2) = x^3 + 5x^2 + 3x - 7$.

In part (c), most knew to substitute $x = 0$ in their answer to (b). Some used the original equation, writing $f(2) = (2 + 3)^2(2 - 1)$. Common errors or misconceptions included, putting $y = 0$ giving $(-5, 0)$ and $(-1, 0)$, expanding the brackets incorrectly before substituting and evaluating $(0 + 5)^2(0 + 1)$ as $25 + 1 = 26$.

Question 9

Part (a) was done well by the majority of candidates. Most were able to obtain $k = 5$ after the substitution of the coordinates for A.

To find the gradient in part (b) most candidates realised that they needed to rearrange the equation of the line into the form $y = mx + c$, and the vast majority were able to do this accurately, with only a few getting mixed up with signs. Unsurprisingly, those candidates that attempted differentiation on the given equation without first rearranging to $y = mx + c$ were generally unsuccessful in determining the gradient. A significant number of candidates found a second point on the line and used the two points to find the gradient. Many candidates gave their answer as 1.5 which sometimes caused them problems when finding the negative reciprocal in part (c). Common incorrect gradients were 3 and $\frac{3x}{2}$.

Part (c) was done quite well. Most candidates were able to write down an expression for the negative reciprocal. It was pleasing to see so many of them writing down the correct form, i.e. $\frac{1}{m}$ before attempting to work it out. The most common error here was the 'half remembered' negative reciprocal leading to $\frac{2}{3}$ or $-\frac{3}{2}$. Many of the candidates who failed to obtain the correct gradient in part (b) were able to score the majority of the marks here. Most candidates were able to use the negative reciprocal gradient to write down an expression for equation of L_2. Methods of approach were roughly equally divided between those using $y - y_1 = m(x - x_1)$ and $y = mx + c$. Those using the former method were generally more successful in scoring the first accuracy mark. Only the better candidates were able to simplify their equation into the correct form.

In part (d), many candidates were able to substitute $y = 0$ into their equation to find the coordinates of B. By far the most common mistake (from about 20% of the candidates) was to substitute $x = 0$ into their equation. The next most common error here was to substitute $y = 0$ correctly but then not being able to solve their equation for x.

In part (e), it was pleasing to see so many candidates able to make a good attempt at finding the distance between the points A and B. Many drew diagrams and many quoted the formula. Relatively few candidates this session got mixed up when determining the differences in the x values and the differences in the y values. However, candidates should still be advised to draw a diagram or to quote the formula before attempting to work out the differences. The correct answer of $\sqrt{52}$ was frequently seen with 38% of candidates scoring full marks on this question.

Question 10

Most candidates answered part (a) correctly. Diagrams were helpful and led to fewer mistakes than substitution into a formula especially when this was sometimes incorrect with the following versions being seen: $\sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2}$ or $\sqrt{(x_2 + x_1)^2 \pm (y_2 + y_1)^2}$. There were few errors in simplifying $\sqrt{45}$ although some had $a = 9$.

Those who had learnt the formulae for gradient, perpendicular gradients and the equation of a straight line usually had few problems here but some failed to quote a correct formula and then when their resulting expression was incorrect received no marks for that part. Others suffered from poor arithmetic with $-\frac{3}{6}$ being simplified to $-\frac{1}{3}$ or -2. More mistakes occurred with the use of the formula $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$ than other approaches to finding the equation of a straight line.

Because the diagram was nearly to scale a significant minority of candidates "spotted" the gradient and intercept and wrote down the correct equation with no evidence to support this. Such a strategy is not recommended.

Part (c) was often correct although a number substituted $y = 0$ into their line equation.

Finding the area of a triangle once again caused problems. Many failed to identify the correct triangle and took P to be on the negative x-axis and others assumed there were right angles in different, incorrect places. Most attempted to find PQ and used $\frac{1}{2} PQ \times QR$ as intended but there were some successful attempts using composite methods or a determinant approach too.

Statistics for C1 Practice Paper Bronze Level B2

				Mean score for students achieving grade:							
Qu	**Max score**	**Modal score**	**Mean %**	**ALL**	**A***	**A**	**B**	**C**	**D**	**E**	**U**
1	6		90	5.39	5.95	5.81	5.74	5.64	5.51	5.39	4.43
2	5		89	4.43	5.00	4.92	4.83	4.66	4.51	4.38	3.44
3	7		86	6.00		6.82	6.64	6.45	6.17	5.83	4.21
4	5		90	4.49		4.90	4.83	4.75	4.63	4.47	3.39
5	6		83	4.97		5.98	5.85	5.62	5.13	4.39	2.33
6	10		75	7.53	9.60	9.34	8.67	8.06	7.47	6.74	4.66
7	6		85	5.12	5.94	5.90	5.76	5.62	5.35	4.87	3.34
8	6		79	4.74	5.96	5.82	5.53	5.21	4.80	4.34	3.13
9	11		73	8.07	10.89	10.70	10.22	9.62	8.59	7.34	4.49
10	13		67	8.67		12.17	10.81	9.62	7.96	5.95	2.51
	75		**79**	**59.41**		**72.36**	**68.88**	**65.25**	**60.12**	**53.70**	**35.93**