Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1
Gold Level G3

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
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 11 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
64	**57**	**49**	**41**	**34**	**27**

1. (*a*) Evaluate $(32)^{\frac{3}{5}}$, giving your answer as an integer.

(2)

(*b*) Simplify fully $\left(\dfrac{25x^4}{4}\right)^{-\frac{1}{2}}$.

(2)

May 2012

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2. The points P and Q have coordinates (–1, 6) and (9, 0) respectively.

The line l is perpendicular to PQ and passes through the mid-point of PQ.

Find an equation for l, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(5)

May 2011

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3. (i) Express

$$(5 - \sqrt{8})(1 + \sqrt{2})$$

in the form $a + b\sqrt{2}$, where a and b are integers.

(3)

(ii) Express

$$\sqrt{80} + \frac{30}{\sqrt{5}}$$

in the form $c\sqrt{5}$, where c is an integer.

(3)

January 2013

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4. Find the set of values of x for which

(*a*) $4x - 3 > 7 - x$

(2)

(*b*) $2x^2 - 5x - 12 < 0$

(4)

(*c*) **both** $4x - 3 > 7 - x$ **and** $2x^2 - 5x - 12 < 0$

(1)

June 2009

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5. The equation

$$(p-1)x^2 + 4x + (p-5) = 0, \text{ where } p \text{ is a constant,}$$

has no real roots.

(*a*) Show that p satisfies $p^2 - 6p + 1 > 0$.

(3)

(*b*) Hence find the set of possible values of p.

(4)

May 2015

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6. The curve C has equation

$$y = \frac{(x+3)(x-8)}{x}, \quad x > 0.$$

(*a*) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ in its simplest form.

(4)

(*b*) Find an equation of the tangent to C at the point where $x = 2$.

(4)

January 2010

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7. A sequence is given by

$$x_1 = 1,$$

$$x_{n+1} = x_n(p + x_n),$$

where p is a constant ($p \neq 0$).

(*a*) Find x_2 in terms of p.

(1)

(*b*) Show that $x_3 = 1 + 3p + 2p^2$.

(2)

Given that $x_3 = 1$,

(*c*) find the value of p,

(3)

(*d*) write down the value of x_{2008}.

(2)

January 2008

8. The equation $x^2 + kx + (k + 3) = 0$, where k is a constant, has different real roots.

(*a*) Show that $k^2 - 4k - 12 > 0$.

(2)

(*b*) Find the set of possible values of k.

(4)

May 2007

9.

$$\frac{dy}{dx} = -x^3 + \frac{4x - 5}{2x^3}, \quad x \neq 0.$$

Given that $y = 7$ at $x = 1$, find y in terms of x, giving each term in its simplest form.

(6)

January 2013

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10. The curve C has equation $y = kx^3 - x^2 + x - 5$, where k is a constant.

(*a*) Find $\frac{dy}{dx}$.

(2)

The point A with x-coordinate $-\frac{1}{2}$ lies on C. The tangent to C at A is parallel to the line with equation $2y - 7x + 1 = 0$.

Find

(*b*) the value of k,

(4)

(*c*) the value of the y-coordinate of A.

(2)

June 2008

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11. $f(x) = x^2 + 4kx + (3 + 11k)$, where k is a constant.

(a) Express $f(x)$ in the form $(x + p)^2 + q$, where p and q are constants to be found in terms of k.
(3)

Given that the equation $f(x) = 0$ has no real roots,

(b) find the set of possible values of k.
(4)

Given that $k = 1$,

(c) sketch the graph of $y = f(x)$, showing the coordinates of any point at which the graph crosses a coordinate axis.
(3)

January 2010

TOTAL FOR PAPER: 75 MARKS

END

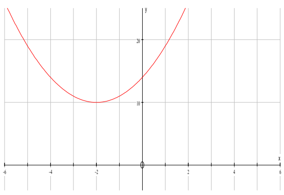
Question number	Scheme	Marks
1 (a)	$\left\{(32)^{\frac{3}{5}}\right\} = \left(\sqrt[5]{32}\right)^3$ or $\sqrt[5]{(32)^3}$ or 2^3 or $\sqrt[5]{32768}$	M1
	$= 8$	A1
		(2)
(b)	$\left\{\left(\frac{25x^4}{4}\right)^{-\frac{1}{2}}\right\} = \left(\frac{4}{25x^4}\right)^{\frac{1}{2}}$ or $\left(\frac{5x^2}{2}\right)^{-1}$ or $\frac{1}{\left(\frac{25x^4}{4}\right)^{\frac{1}{2}}}$	M1
	$= \frac{2}{5x^2}$ or $\frac{2}{5}x^{-2}$	A1
		(2)
		[4]
2	Mid-point of PQ is (4, 3)	B1
	PQ: $m = \frac{0-6}{9-(-1)}$, $\left(= -\frac{3}{5}\right)$	B1
	Gradient perpendicular to PQ $= -\frac{1}{m}$ $\left(= \frac{5}{3}\right)$	M1
	$y - 3 = \frac{5}{3}(x-4)$	M1
	$5x - 3y - 11 = 0$ or $3y - 5x + 11 = 0$ or multiples e.g. $10x - 6y - 22 = 0$	A1
		[5]

Question number	Scheme	Marks
3 (i)	$\left(5-\sqrt{8}\right)\left(1+\sqrt{2}\right)$	
	$= 5 + 5\sqrt{2} - \sqrt{8} - 4$	M1
	$= 5 + 5\sqrt{2} - 2\sqrt{2} - 4$ $\sqrt{8} = 2\sqrt{2}$, seen or implied at any point.	B1
	$= 1 + 3\sqrt{2}$ $1 + 3\sqrt{2}$ or $a = 1$ and $b = 3$.	A1
		(3)
(ii)	Method 1 Method 2 Method 3	
	Either $\sqrt{80}+\dfrac{30}{\sqrt{5}}\left(\dfrac{\sqrt{5}}{\sqrt{5}}\right)$ **Or** $\left(\dfrac{\sqrt{400}+30}{\sqrt{5}}\right)\dfrac{\sqrt{5}}{\sqrt{5}}$ $\sqrt{80}+\dfrac{\sqrt{900}}{\sqrt{5}}=\sqrt{80}+\sqrt{180}$	M1
	$= 4\sqrt{5} + \ldots$ $=\left(\dfrac{20+..}{..}\right)\dfrac{..}{..}$ $= 4\sqrt{5} + \ldots$	B1
	$= 4\sqrt{5} + 6\sqrt{5}$ $=\left(\dfrac{50\sqrt{5}}{5}\right)$ $= 4\sqrt{5} + 6\sqrt{5}$	
	$= 10\sqrt{5}$	A1
		(3)
		[6]
4 (a)	$5x > 10$, $x > 2$ [Condone $x > \frac{10}{2} = 2$]	M1 A1
		(2)
(b)	$(2x+3)(x-4)=0$, 'Critical values' are $-\dfrac{3}{2}$ and 4	M1 A1
	$-\dfrac{3}{2} < x < 4$	M1
		A1ft
		(4)
(c)	$2 < x < 4$	B1ft
		(1)
		[7]

Question number	Scheme	Marks
5 (a)	$b^2 - 4ac < 0 \Rightarrow$ e.g. $4^2 - 4(p-1)(p-5) < 0$ or $0 > 4^2 - 4(p-1)(p-5)$ or $4^2 < 4(p-1)(p-5)$ or $4(p-1)(p-5) > 4^2$ $4 < p^2 - 6p + 5$ $p^2 - 6p + 1 > 0$	M1 A1 A1* **(3)**
(b)	$p^2 - 6p + 1 = 0 \Rightarrow p = ...$ $p = 3 \pm \sqrt{8}$ $p < 3 - \sqrt{8}$ or $p > 3 + \sqrt{8}$	M1 A1 M1 A1 **(4)** **[7]**
6 (a)	$y = \frac{x^2 - 5x - 24}{x} = x - 5 - 24x^{-1}$ (or equiv., e.g. $x + 3 - 8 - \frac{24}{x}$) $\frac{dy}{dx} = 1 + 24x^{-2}$ or $\frac{dy}{dx} = 1 + \frac{24}{x^2}$	M1 A1 M1 A1 **(4)**
(b)	$x = 2$: $y = -15$ Allow if seen in part (a). $\left(\frac{dy}{dx} =\right)$ $1 + \frac{24}{4} = 7$ Follow-through from candidate's <u>non-constant</u> $\frac{dy}{dx}$ This must be simplified to a "single value". $y + 15 = 7(x - 2)$ (or equiv., e.g. $y = 7x - 29$) Allow $\frac{y+15}{x-2} = 7$	B1 B1ft M1 A1 **(4)** **[8]**

Question number	Scheme	Marks
7 (a)	$1(p + 1)$ or $p + 1$	B1
		(1)
(b)	$((a))(p + (a))$ [(a) must be a function of p]. $[(p + 1)(p + p + 1)]$	M1
	$= 1 + 3p + 2p^2$ (*)	A1cso
		(2)
(c)	$1 + 3p + 2p^2 = 1$	M1
	$p(2p + 3) = 0$ $p = \ldots$	M1
	$p = -\frac{3}{2}$ (ignore $p = 0$ if seen, even if 'chosen' as the answer	A1
		(3)
(d)	Noting that even terms are the same.	M1
	This M mark can be implied by listing at least 4 terms, e.g. $1, -\frac{1}{2}, 1, -\frac{1}{2}, \ldots$	
	$x_{2008} = -\frac{1}{2}$	A1
		(2)
		[8]
8 (a)	Attempt to use discriminant $b^2 - 4ac$	M1
	$k^2 - 4(k+3) > 0 \Rightarrow k^2 - 4k - 12 > 0$ (*)	A1cso
		(2)
(b)	$k^2 - 4k - 12 = 0 \Rightarrow$	
	$(k \pm a)(k \pm b)$, with $ab = 12$ or $(k =)\frac{4 \pm \sqrt{4^2 - -4 \times 12}}{2}$ or $(k-2)^2 \pm 2^2 - 12$	M1
	$k = -2$ and 6 (both)	A1
	$\underline{k < -2, \ k > 6}$ or $\underline{(-\infty, -2); (6, \infty)}$ M: choosing "outside"	M1
		A1ft
		(4)
		[6]

Question number	Scheme	Marks
9	$(\frac{dy}{dx}=)\quad -x^3+"2"x^{-2}-"\left(\frac{5}{2}\right)"x^{-3}$	M1
	$(y=)\quad -\frac{1}{4}x^4+\frac{"2"x^{-1}}{(-1)}-"\left(\frac{5}{2}\right)"\frac{x^{-2}}{(-2)}\ (+c)$ — Raises power correctly on any one term. Any two follow through terms correct.	M1 A1ft
	$(y=)\quad -\frac{1}{4}x^4+\frac{2x^{-1}}{(-1)}-\frac{5}{2}\frac{x^{-2}}{(-2)}\ (+c)$ — This is not follow through - must be correct.	A1
	Given that $y=7$, at $x=1$, then $7=-\frac{1}{4}-2+\frac{5}{4}+c \Rightarrow c=$	M1
	So, $(y=)\quad -\frac{1}{4}x^4-2x^{-1}+\frac{5}{4}x^{-2}+c,\quad c=8$ **or** $(y=)-\frac{1}{4}x^4-2x^{-1}+\frac{5}{4}x^{-2}+8$	A1
		[6]
10 (a)	$\left[\frac{dy}{dx}=\right]3kx^2-2x+1$	M1 A1
		(2)
(b)	Gradient of line is $\frac{7}{2}$	B1
	When $x=-\frac{1}{2}$: $\quad 3k\times\left(\frac{1}{4}\right)-2\times\left(-\frac{1}{2}\right)+1,=\frac{7}{2}$	M1
	$\frac{3k}{4}=\frac{3}{2}\Rightarrow k=2$	A1 A1
		(4)
(c)	$x=-\frac{1}{2}\Rightarrow y=k\times\left(-\frac{1}{8}\right)-\left(\frac{1}{4}\right)-\frac{1}{2}-5,=-6$	M1 A1
		(2)
		[8]

Question number	Scheme	Marks
11 (a)	$(x+2k)^2$ or $\left(x+\frac{4k}{2}\right)^2$	M1
	$(x \pm F)^2 \pm G \pm 3 \pm 11k$ (where F and G are any functions of k, not involving x	M1
	$(x+2k)^2 - 4k^2 + (3+11k)$ Accept unsimplified equivalents such as $\left(x+\frac{4k}{2}\right)^2 - \left(\frac{4k}{2}\right)^2 + 3 + 11k$, and i.s.w. if necessary.	A1
		(3)
(b)	Accept part (b) solutions seen in part (a)	
	$"4k^2 - 11k - 3" = 0 \quad (4k+1)(k-3) = 0 \quad k = \ldots,$	M1
	[Or, 'starting again', $b^2 - 4ac = (4k)^2 - 4(3+11k)$ and proceed to $k = \ldots$]	
	$-\frac{1}{4}$ and 3 (Ignore any inequalities for the first 2 marks in (b)).	A1
	Using $b^2 - 4ac < 0$ for no real roots, i.e. $"4k^2 - 11k - 3" < 0$, to establish inequalities involving their two critical values m and n (even if the inequalities are wrong, e.g. $k < m$, $k < n$).	M1
	$-\frac{1}{4} < k < 3$ (See conditions below) Follow through their critical values.	A1ft
	The final A1ft is still scored if the answer $m < k < n$ follows $k < m$, $k < n$. Using x instead of k in the final answer loses only the 2nd A mark, (condone use of x in earlier working).	**(4)**
(c)	 Shape (seen in (c))	B1
	Minimum in correct quadrant, not touching the x-axis, not on the y-axis, and there must be no other minimum or maximum	B1
	0, 14) or 14 on y-axis. Allow (14, 0) marked on y-axis.	B1
	.b. Minimum is at $(-2, 10)$, (but there is no mark for this).	**(3)**
		[10]

Examiner reports

Question 1

This question proved discriminating with about a third of the candidature gaining all 4 marks.

In part (a), the majority of candidates were able to evaluate $32^{\frac{3}{5}}$ as 8. Many of those who were unable to achieve 8, were able to score one mark by rewriting $32^{\frac{3}{5}}$ as either $\left(\sqrt[5]{32}\right)^3$ or $\sqrt[5]{32^3}$. Those candidates who chose to cube 32 first to give 32768 were usually unable to find $\sqrt[5]{32768}$. Common errors in this part included rewriting $32^{\frac{3}{5}}$ as either $\frac{3}{5}\times 32$ or $3\left(\sqrt[5]{32}\right)$; or evaluating 2^3 as 6.

Part (b) proved more challenging than part (a), with the majority of candidates managing to obtain at least one of the two marks available by demonstrating the correct use of either the reciprocal or square root on $\left(\frac{25x^4}{4}\right)$. The most able candidates (who usually reciprocated first before square rooting) were able to proceed efficiently to the correct answer. The most common mistake was for candidates not to square root or not to reciprocate all three elements in the brackets. It was common for candidates to give any of the following incorrect answers: $\frac{5}{2}x^{-2}$, $\frac{25}{4}x^{-2}$, $\frac{2}{5}x^{\frac{7}{2}}$, $100x^{-2}$, $\frac{2}{5x^4}$ or $\frac{5x^4}{2}$.

Question 2

This question was generally done well with many candidates scoring full marks. However, there were a number of errors seen and these included solutions where the equation of the line *PQ* was given as their answer for the equation of *l*. A number of candidates did not attempt to find the midpoint and instead used the points given in the question in their equation for *l*. This was the most common mistake. A popular incorrect formula for the midpoint was $\left(\frac{x_2 - x_1}{2}, \frac{y_2 - y_1}{2}\right)$, giving (5, –3). Errors were also seen in finding the gradient, where a large number of responses got the original gradient upside down. Finding the negative reciprocal of a negative fraction resulted in further errors.

After completely correct work some candidates did not give an integer form of the equation for *l* and lost the final mark. Time was wasted here; by those who worked out the equation of *PQ* as well as that of *l*. Candidates need to be reminded to quote formulae and substitute numbers into them carefully, to avoid the more common errors.

Question 3
In Q3(i) a significant number of candidates were unable to expand the brackets correctly: common errors were $\sqrt{8} \times 2 = 16$ and $-\sqrt{8} \times \sqrt{2} = +4$ or $+\sqrt{16}$.

Most converted $\sqrt{8}$ to $2\sqrt{2}$ after they attempted to expand the brackets, but a common error was to use $\sqrt{8} = 4\sqrt{2}$.

Some found collecting terms challenging so followed a correct $5 + 5\sqrt{2} - 2\sqrt{2}$ by an incorrect $9 + 3\sqrt{2}$.

In Q3(ii) most candidates were able to change $\sqrt{80}$ to $4\sqrt{5}$ but few knew that they needed to multiply the top **and bottom** of $\frac{30}{\sqrt{5}}$ by $\sqrt{5}$ to rationalise the denominator. A number of candidates multiplied the top and bottom of the fraction by $-\sqrt{5}$ and then did not use the correct signs so ended up with $4\sqrt{5} - 6\sqrt{5}$. Some of the candidates who were able to change $\frac{30}{\sqrt{5}}$ to $\frac{30\sqrt{5}}{5}$ were unable to simplify this to $6\sqrt{5}$.

Changing $\sqrt{80} + \frac{30}{\sqrt{5}}$ to $\frac{\sqrt{400}+30}{\sqrt{5}}$ was not a common method used but a common incorrect approach was to multiply each term of $\sqrt{80} + \frac{30}{\sqrt{5}}$ by $\sqrt{5}$ (i.e. as if it was an equation) and to forget the denominator. Some other candidates who were able to reach $\frac{50}{\sqrt{5}}$ could not then rationalise the denominator to obtain the correct $10\sqrt{5}$.

Question 4
Part (a) provided a simple start for the majority of the candidates and apart from a few arithmetic errors most scored full marks.

In part (b) the quadratic expression was factorised and the critical values were usually found correctly however many candidates were unable to identify the solution as a closed region. Many just left their answer as $x < -\frac{3}{2}$ and $x < 4$, others chose the outside regions and some just stopped after finding the critical values. Candidates who successfully answered part (b) often answered part (c) correctly as well although some repeated their previous working to achieve this result.

The use of a sketch in part (b) and a number line in part (c) was effective and is a highly recommended strategy for questions of this type.

Question 5
In part (a) almost all knew they had to consider the discriminant, with the majority scoring the first mark. Some candidates included x's in their expression or used the discriminant for the quadratic expression given in (a) or began with an incorrect expression for the discriminant.

Having seen the inequality that they had to work towards, many began by setting their discriminant "> 0" and so immediately lost both accuracy marks. Some realised their mistake and changed the direction of their inequality signs to provide a correct solution.

Those who began with "< 0" correctly had little difficulty achieving the final inequality, either by dividing both sides by a negative (most commonly) or by changing the terms to the other side of the inequality (less commonly). A few made errors in their simplification of the discriminant, usually sign errors, and so lost the final accuracy mark. Those who began with $b^2 < 4ac$ often reached the required inequality more efficiently.

In part (b) most scored the first method mark often by completing the square, although some only considered the positive square root. Of those who used the quadratic formula, a surprising number made an error in their simplification, e.g. "36 – 4" becoming "40" a significant number of times. Many candidates stopped after finding their two roots, without attempting to give a range of values. Relatively few gave the inequalities for the correct "outside" regions and some candidates, realising that the "outside" regions were required attempted to combine them as a single interval. A few did give the two correct inequalities but used x as their variable.

Question 6
This was a successful question for many candidates, although for some the required division by x in part (a) proved too difficult. Sometimes the numerator was multiplied by x, or x^{-1} was added to the numerator. Occasionally the numerator and denominator were differentiated separately.

In part (b), most candidates substituted $x = 2$ into their $\frac{dy}{dx}$, but in finding the equation of the tangent numerical mistakes were common and there was sometimes confusion between the value of $\frac{dy}{dx}$ and the value of y.

Question 7
Although just a few candidates failed to understand the idea of the recurrence relation, most managed to complete the first two parts successfully. A major concern in part (b), however, was the widespread lack of brackets in the algebraic expressions. It was usually possible for examiners to interpret candidates' intentions generously, but there needs to be a greater awareness that, for example, $1+p(1+2p)$ is not an acceptable alternative to $(1+p)(1+2p)$.

The given answer to part (b) enabled the vast majority of candidates to start part (c) correctly, but the main problem with this part was in solving $2p^2+3p=0$, which proved surprisingly difficult for some. Attempts to complete the square usually failed, while the quadratic formula method, although generally more successful, often suffered from mistakes related to the fact that *c* was zero. Those who did manage to factorise the expression sometimes gave the answer $p=\frac{3}{2}$ instead of $p=-\frac{3}{2}$. It was clear that candidates would have been much happier solving a 3-term quadratic equation. Those who trivialised the question by giving only the zero solution (despite the condition $p>0$) scored no further marks in the question.

Part (d) proved challenging for many candidates. Some used the solution $p=0$ and some tried to make use of the sum formula for an arithmetic series. Few candidates were successful, but those who wrote out the first few terms were more likely to spot the 'oscillatory' nature of the sequence. Good candidates stated that even terms were all equal to $-\frac{1}{2}$ and therefore the 2008th term was $-\frac{1}{2}$. Quite a large number of candidates were able to express x_{2008} in terms of x_{2007}, but those who simply substituted 2007 into one of their expressions often wasted time in tedious arithmetic that led to a very large answer.

Question 8
The quality of answers to this question was better than to similar questions in previous years. Most used the discriminant to answer part (a) and, apart from occasional slips with signs, were able to establish the inequality correctly. A few realised that the discriminant had to be used but tried to apply it to $k^2-4k-12$. In part (b) the majority were able to find the critical values of –2 and 6 but many then failed to find the correct inequalities with $x>-2$ and $x>6$ being a common incorrect answer. Some candidates still thought that the correct regions could be written as $6<k<-2$ but there were many fully correct solutions seen often accompanied by correct sketches.

Question 9
Some candidates were able to obtain full marks on this question. Less able candidates found it challenging to separate the fraction into its two parts ready for integration. Those that were able to obtain a three term polynomial often made mistakes with the coefficients which they found numerically difficult to manipulate. A common step before they attempted the integration was to write $-x^3+8x^{-2}-10x^{-3}$ with incorrect coefficients of the second and third term. Usually integration of the first term was fine and the general principle of integration was understood, but negative powers caused difficulties e.g. $-3+1=-4$ was a common error.

Some tried to integrate the terms in the fraction without simplifying first. So they integrated the numerator and they integrated the denominator. The majority of candidates were able to obtain the method mark for finding the constant of integration but the subsequent arithmetic was often found to be a challenge for the candidates.

Question 10

Most candidates could start this question and there were many fully correct solutions to part (a) although some weaker candidates were confused by the k and answers such as $2kx^2$ or $3k^2$ were seen. Part (b) though required some careful thought and proved quite discriminating. Many candidates identified the gradient of the line as 3.5 and sometimes they equated this to their answer to part (a). Those who realised that they needed to use x = - 0.5 in the resulting equation often went on to find k correctly but there were many who failed to give a convincing argument that $k = 2$. Some found $f'(-0.5)$ but they set this equal to 7, -7 or 0 and a few, who confused tangents and normals, used $-\frac{2}{7}$. In part (c) there were attempts to substitute x = -0.5 into the equation of the line or the differential and those who did substitute into the equation of the curve along with their value of k (even when this was correct) often floundered with the resulting arithmetic and so completely correct solutions to this question were rare.

Question 11

This was a demanding question on which few candidates scored full marks. In part (a), many found the algebra challenging and their attempts to complete the square often led to mistakes such as $x^2 + 4kx = (x + 2k)^2 - 4k$.

Rather than using the result of part (a) to answer part (b), the vast majority used the discriminant of the given equation. Numerical and algebraic errors were extremely common at this stage, and even those who obtained the correct condition $4k^2 - 11k - 3 < 0$ were often unable to solve this inequality to find the required set of values for k.

The sketch in part (c) could have been done independently of the rest of the question, so it was disappointing to see so many poor attempts. Methods were too often overcomplicated, with many candidates wasting time by unnecessarily solving the equation with $k = 1$. Where a sketch was eventually seen, common mistakes were to have the curve touching the x-axis or to have the minimum on the y-axis.

Statistics for C1 Practice Paper Gold Level G3

Qu	Max score	Modal score	Mean %	Mean score for students achieving grade: ALL	A*	A	B	C	D	E	U
1	4		68	2.72	3.92	3.58	3.18	2.84	2.54	2.28	1.53
2	5		69	3.43	4.80	4.59	4.16	3.78	3.34	2.78	1.53
3	6	6	73	4.36	5.98	5.48	4.84	4.25	3.93	3.61	2.78
4	7		70	4.90		6.41	5.61	5.12	4.58	3.98	2.63
5	7	7	61	4.25	6.57	6.10	5.11	4.35	3.64	2.85	1.41
6	8		64	5.12		7.65	6.99	6.09	4.60	3.96	2.10
7	8		66	5.24		7.59	6.64	5.92	5.46	4.79	3.11
8	6		63	3.80		5.51	4.70	4.00	3.24	2.62	1.38
9	6	4	58	3.48	5.96	5.05	4.23	3.71	3.34	2.84	1.43
10	8		57	4.58		7.22	5.72	4.44	3.36	2.64	1.65
11	10		45	4.54		8.65	6.35	4.77	3.29	2.14	0.97
	75		**61.89**	**46.42**	**27.23**	**67.83**	**57.53**	**49.27**	**41.32**	**34.49**	**20.52**