Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Bronze Level B2

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
73	65	59	54	49	43

1. Given $y = x^3 + 4x + 1$, find the value of $\frac{dy}{dx}$ when $x = 3$.

(4)

May 2013 (R)

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2. Find $\int (12x^5 - 8x^3 + 3) \; dx$, giving each term in its simplest form.

(4)

Jan 2009

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3. Given that $y = 4x^3 - \frac{5}{x^2}$, $x \neq 0$, find in their simplest form

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

(3)

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

(3)

May 2015

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4. The line L_1 has equation $4x + 2y - 3 = 0$.

(*a*) Find the gradient of L_1.

(2)

The line L_2 is perpendicular to L_1 and passes through the point (2, 5).

(*b*) Find the equation of L_2 in the form $y = mx + c$, where m and c are constants.

(3)

May 2013 (R)

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5. A sequence of numbers $a_1, a_2, a_3 \ldots$ is defined by

$$a_{n+1} = 5a_n - 3, \qquad n \geq 1.$$

Given that $a_2 = 7$,

(*a*) find the value of a_1.

(2)

(*b*) Find the value of $\sum_{r=1}^{4} a_r$.

(3)

May 2014

6.

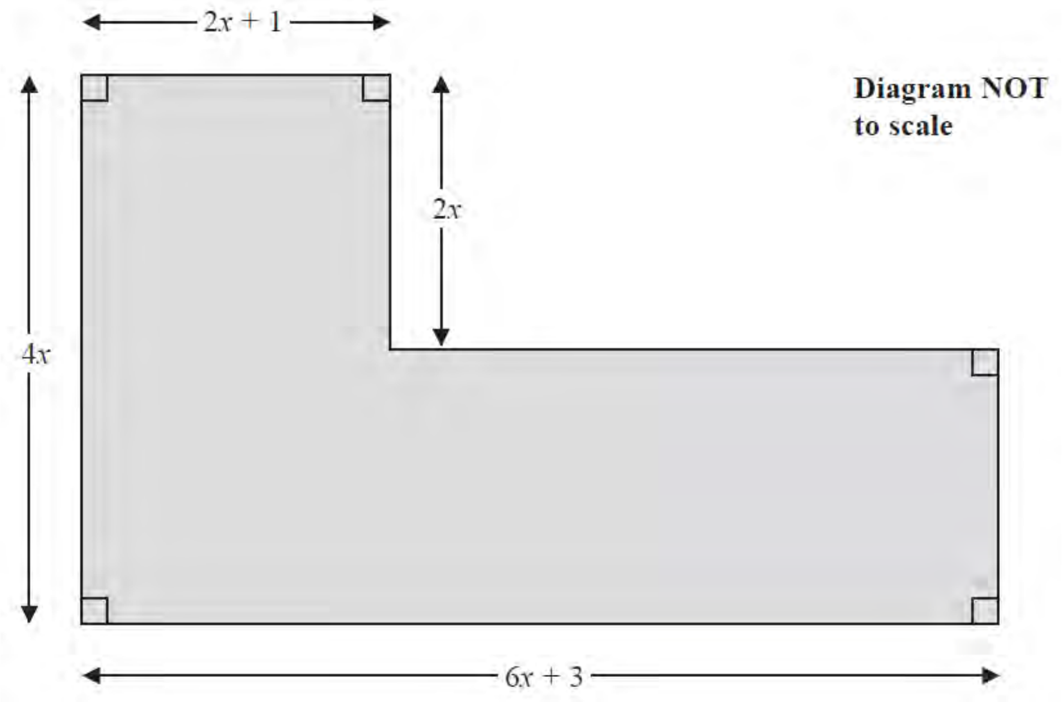


Figure 1

Figure 1 shows the plan of a garden. The marked angles are right angles.

The six edges are straight lines.

The lengths shown in the diagram are given in metres.

Given that the perimeter of the garden is greater than 40 m,

(a) show that $x > 1.7$.

(3)

Given that the area of the garden is less than 120 m^2,

(b) form and solve a quadratic inequality in x.

(5)

(c) Hence state the range of the possible values of x.

(1)

May 2014 (R)

7.
$$\frac{dy}{dx} = 6x^{-\frac{1}{2}} + x\sqrt{x}, \qquad x > 0$$

Given that $y = 37$ at $x = 4$, find y in terms of x, giving each term in its simplest form.

(7)

May 2014 (R)

8.

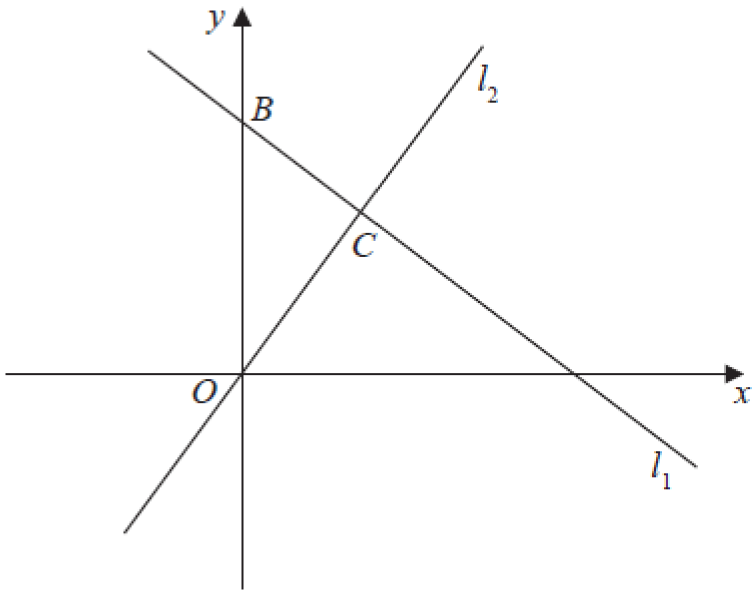


Figure 2

The line l_1, shown in Figure 2 has equation $2x + 3y = 26$.

The line l_2 passes through the origin O and is perpendicular to l_1.

(*a*) Find an equation for the line l_2.

(4)

The line l_2 intersects the line l_1 at the point C. Line l_1 crosses the y-axis at the point B as shown in Figure 2.

(*b*) Find the area of triangle OBC. Give your answer in the form $\frac{a}{b}$, where a and b are integers to be determined.

(6)

May 2014

9.

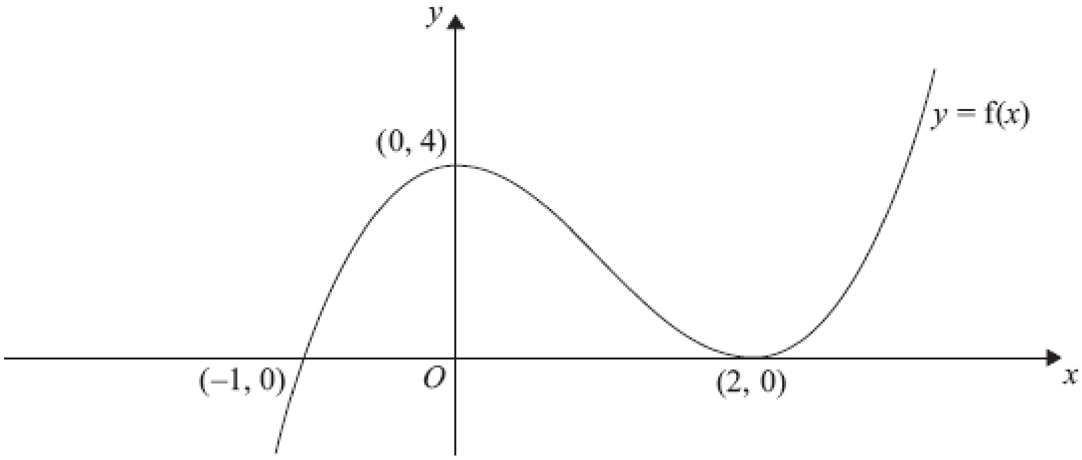


Figure 3

Figure 3 shows a sketch of the curve C with equation $y = f(x)$.

The curve C passes through the point (–1, 0) and touches the x-axis at the point (2, 0).

The curve C has a maximum at the point (0, 4).

The equation of the curve C can be written in the form.

$$y = x^3 + ax^2 + bx + c,$$

where a, b and c are integers.

(a) Calculate the values of a, b and c.

(5)

(b) Sketch the curve with equation $y = f(\frac{1}{2}x)$.

Show clearly the coordinates of all points where the curve crosses or meets the coordinate axes.

(3)

May 2013 (R)

10. Xin has been given a 14 day training schedule by her coach.

Xin will run for A minutes on day 1, where A is a constant.

She will then increase her running time by $(d + 1)$ minutes each day, where d is a constant.

(*a*) Show that on day 14, Xin will run for

$$(A + 13d + 13) \text{ minutes.}$$

(2)

Yi has also been given a 14 day training schedule by her coach.

Yi will run for $(A – 13)$ minutes on day 1.

She will then increase her running time by $(2d – 1)$ minutes each day.

Given that Yi and Xin will run for the same length of time on day 14,

(*b*) find the value of d.

(3)

Given that Xin runs for a total time of 784 minutes over the 14 days,

(*c*) find the value of A.

(3)

May 2014 (R)

11.

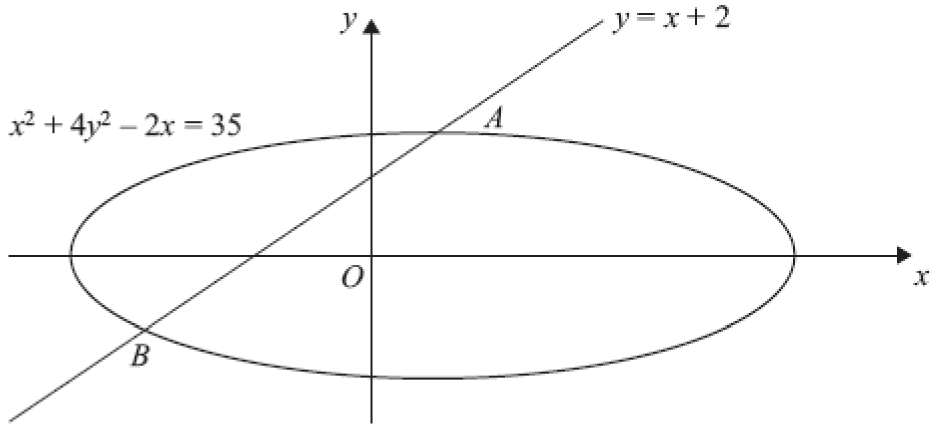


Figure 4

The line $y = x + 2$ meets the curve $x^2 + 4y^2 - 2x = 35$ at the points A and B as shown in Figure 4.

(a) Find the coordinates of A and the coordinates of B.

(6)

(b) Find the distance AB in the form $r\sqrt{2}$, where r is a rational number.

(3)

May 2014 (R)

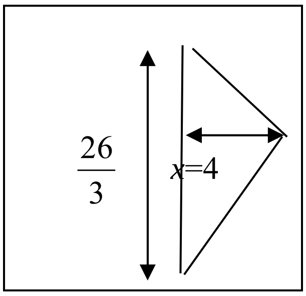
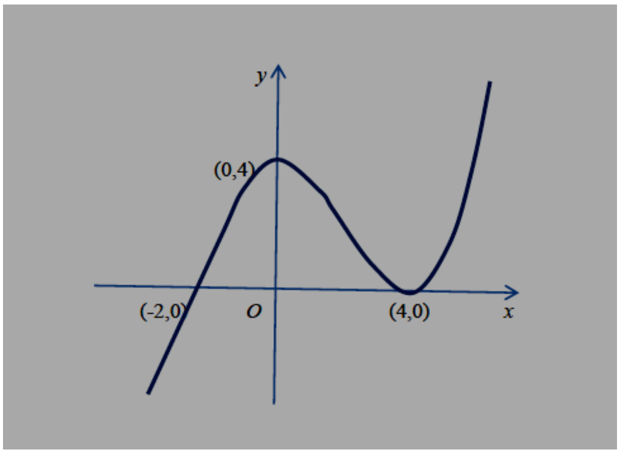
TOTAL FOR PAPER: 75 MARKS

END

Question Number	Scheme	Marks
1	$y = x^3 + 4x + 1 \Rightarrow \frac{dy}{dx} = 3x^2 + 4(+0)$ substitute $x = 3 \Rightarrow$ gradient = 31	M1A1 M1 A1 cao **[4]**
2	$(I =)\frac{12}{6}x^6 - \frac{8}{4}x^4 + 3x + c$ $= 2x^6 - 2x^4 + 3x + c$	M1 A1A1A1 **[4]**
3 (a)	$y = 4x^3 - \frac{5}{x^2}$ M1: $x^n \to x^{n-1}$ e.g. Sight of x^2 or x^{-3} or $\frac{1}{x^3}$ A1: $3\times 4x^2$ or $-5\times -2x^{-3}$ (oe) (Ignore + c for this mark) A1: $12x^2 + \frac{10}{x^3}$ or $12x^2 + 10x^{-3}$ <u>all on one line</u> and no + c	M1 A1 A1 **(3)**
(b)	M1: $x^n \to x^{n+1}$. e.g. Sight of x^4 or x^{-1} or $\frac{1}{x^1}$ **Do <u>not</u> award for integrating their answer to part (a)** A1: $4\frac{x^4}{4}$ or $-5\times\frac{x^{-1}}{-1}$ A1: For fully correct and simplified answer with + c <u>all on one line</u>. Allow $x^4 + 5\times\frac{1}{x} + c$ Allow $1x^4$ for x^4	M1 A1 A1 **(3)** **[6]**

Question Number	Scheme	Marks
4 (a)	$4x+2y-3=0 \Rightarrow y=-2x+\frac{3}{2}$	M1
	$\Rightarrow$ gradient $=-2$	A1
		[2]
(b)	Using $m_N = -\frac{1}{m_T}$	M1
	$y-5='\frac{1}{2}'(x-2)$ or Uses $y = mx + c$ in an attempt to find c	M1
	$y=\frac{1}{2}x+4$	A1 cao
		(3)
		[5]
5 (a)	$7=5a_1-3 \quad \Rightarrow a_1=..$	M1
	$a_1=2$	A1
		(2)
(b)	$a_3="32"$ and $a_4="157"$	M1
	$\sum_{r=1}^{r=4} a_r = a_1+a_2+a_3+a_4$	
	= "2"+ "7"+ "32"+ "157"	dM1
	= 198	A1
		(3)
		[5]

Question Number	Scheme	Marks
6(a).	$P = 20x + 6$ o.e	B1
	$20x + 6 > 40 \Rightarrow x >$	M1
	$x > 1.7$	A1*
		(3)
	Mark parts (b) and (c) together	
(b)	$A = 2x(2x+1) + 2x(6x+3) = 16x^2 + 8x$	B1
	$16x^2 + 8x - 120 < 0$	M1
	Try to solve their $2x^2 + x - 15 = 0$ e.g. $(2x-5)(x+3) = 0$ so $x =$	M1
	Choose inside region	M1
	$-3 < x < \frac{5}{2}$ or $0 < x < \frac{5}{2}$ (as x is a length)	A1
		(5)
(c)	$1.7 < x < \frac{5}{2}$	B1cao
		(1)
		[9]
7	$\frac{\mathrm{d}y}{\mathrm{d}x} = 6x^{-\frac{1}{2}} + x\sqrt{x}$	
	$x\sqrt{x} = x^{\frac{3}{2}}$	B1
	$x^n \to x^{n+1}$	M1
	$y = \frac{6}{\frac{1}{2}}x^{\frac{1}{2}} + \frac{x^{\frac{5}{2}}}{\frac{5}{2}}(+c)$	A1, A1
	Use x =4, y =37 to give equation in c , $37 = 12\sqrt{4} + \frac{2}{5}(\sqrt{4})^5 + c$	M1
	$\Rightarrow c = \frac{1}{5}$ or equivalent eg. 0.2	A1
	$(y) = 12x^{\frac{1}{2}} + \frac{2}{5}x^{\frac{5}{2}} + \frac{1}{5}$	A1
		[7]

Question Number	Scheme	Marks
8 (a)	$2x+3y=26 \Rightarrow 3y=26\pm 2x$ and attempt to find m from $y=mx+c$	M1
	$(\Rightarrow y=\frac{26}{3}-\frac{2}{3}x)$ so gradient $= -\frac{2}{3}$	A1
	Gradient of perpendicular $=\frac{-1}{\text{their gradient}}$ $(=\frac{3}{2})$	
	Line goes through (0,0) so $y=\frac{3}{2}x$	A1
		(4)
(b)	Solves their $y=\frac{3}{2}x$ with their $2x+3y=26$ to form equation in x or in y	M1
	Solves their equation in x or in y to obtain $x=$ **or** $y=$	dM1
	x=4 or any equivalent e.g. 156/39 or $y=6$ o.a.e	A1
	B= $(0,\frac{26}{3})$ used or stated in (b)	B1
	 **Method 1** (see other methods in notes below)	
	Area $=\frac{1}{2}\times"4"\times\frac{"26"}{3}$	dM1
	$=\frac{52}{3}$	A1
	(oe with integer numerator and denominator)	
		(6) **[10]**
9 (a)	$f(x)=(x+1)(x-2)^2$	M1A1B1
	$=(x+1)(x^2-4x+4)=x^3-3x^2+4$	M1A1
		(5)
(b)		B1 B1ft B1
		(3)
		[8]

Question Number	Scheme	Marks
10 (a)	Attempts to use $a+(n-1)"d"$ with a=A and "d"=d+1 and n = 14 $A+13(d+1)=A+13d+13$ *	M1 A1* **(2)**
(b)	Calculates time for Yi on Day 14=$(A-13)+13(2d-1)$ Sets **times** equal $A+13d+13=\ (A-13)+13(2d-1)\Rightarrow d=...$ $d=3$	M1 M1 A1 cso **(3)**
(c)	Uses $\frac{n}{2}\{2A+(n-1)(D)\}$ with n =14, and with D=d or d + 1 Attempts to solve $\frac{14}{2}\{2A+13\times'(d+1)'\}=784\Rightarrow A=...$ $A=30$	M1 dM1 A1 **(3)** **[8]**
11 (a)	$y=x+2\Rightarrow x^2+4(x+2)^2-2x=35$ Alternative: $\frac{2x-x^2+35}{4}=(x+2)^2$ or $\sqrt{\frac{2x-x^2+35}{4}}=(x+2)$ $5x^2+14x-19=0$ $(5x+19)(x-1)=0\Rightarrow x=..$ $x=-\frac{19}{5},x=1$ $y=-\frac{9}{5},y=3$ Coordinates are ($-\frac{19}{5}$, $-\frac{9}{5}$) and (1, 3)	M1 M1 dM1 A1 for both M1 A1 **(6)**
(b)	$d^2=(1--\frac{19}{5})^2+(3--\frac{9}{5})^2$ or $d=\sqrt{(1--\frac{19}{5})^2+(3--\frac{9}{5})^2}$ $d=\frac{24}{5}\sqrt{2}$	M1A1ft A1cao **(3)** **[9]**

Examiner reports

Question 1

Almost all (94.6%) candidates scored full marks. The most common error was to substitute $x = 3$ into the expression for y without differentiating. Largely, the only other errors were mistakes made when substituting into a correct derivative.

Question 2

This question was generally answered very well, with most candidates scoring at least 3 marks out of 4. Omission of the integration constant occurred less frequently than usual and the terms were usually simplified correctly. Just a few candidates differentiated, and a few thought that the integral of x^n was $\frac{x^{n+1}}{n}$.

Question 3

This question was well answered with the majority of candidates dealing with the negative index correctly. A very small number of candidates interchanged differentiation and integration and so scored no marks. Other than these, almost all scored at least 2 marks in each part. In part (a), the first term was almost always differentiated correctly but some obtained a power of –1 instead of –3 for the second term. In part (b), predictably, the omission of "+c" was seen occasionally and a few candidates integrated their answer to part (a).

Question 4

Most candidates obtained full marks (86.6%).

In part (a) most used $y = mx + c$ correctly to obtain the gradient although a few did not divide by 2 to get the correct form.

In part (b) the majority of lost marks were a result of an incorrect calculation for the perpendicular gradient.

Question 5

This question was answered very well by most candidates with 77% gaining full marks.

Part (a) was usually correct with a good method shown. The main mistake was candidates simply substituting 1 into the formula to get the correct answer 2 fortuitously, which scored no marks. Generally when candidates made this mistake in (a), they then went on to find the third and fourth terms by substituting "3" and "4" into the formula in (b).

The majority of candidates obtained full marks in part (b) and most applied the correct method. A small number of candidates used a wrong a_1 from (a) and there were quite a few who wrote $a_4 = 160$ where they had neglected to subtract the 3. A significant number of candidates wrongly used the arithmetic sum, using $a = 2$ and $d = 5$ with $n = 4$. Some also evaluated the first four terms but failed to add them up.

Question 6
Most students did fairly well on this question. The most common mistake was putting their inequality in part (b) as their answer to part (c) and not trying to combine their two inequalities.

In part (a) the most common error was to give a wrong expression for perimeter (usually neglecting one or two of the sides). Those who gave a correct expression usually completed part (a) successfully.

In part (b) a wrong expression for area was less common - most divided up the inside region to obtain their expression. The resulting quadratic was usually solved correctly and most students chose the inside region, as required. A minority put $A = 120$ so did not have an inequality or put $A > 120$ and obtained the wrong inequalities. Credit was given to those giving the answer as $-3 < x < 2.5$ and also to those who realised that x was a length and so gave the answer as $0 < x < 2.5$.

In part (c) some students made no attempt to combine their answers to part (a) and part (b).

Question 7
Most students integrated the two terms correctly, though a few could not deal correctly with $x\sqrt{x}$. Those who gave it as x to the power $\frac{3}{2}$ usually had no problem integrating and dividing by the fraction $\frac{5}{2}$. A minority missed the constant hence losing the last three marks. Some students made arithmetic mistakes in working out the constant. A very small minority tried to differentiate instead of using integration as the reverse of differentiation.

Question 8
40% gained full marks on this question and a further 26% lost one or two marks only.

Part (a) was well answered with the majority of candidates correctly identifying $-\frac{2}{3}$ as the gradient of line one and using $m_1 \times m_2 = -1$ to find the gradient of line two. Some candidates did not divide the constant term by three when rearranging the equation into the form $y = mx + c$ and this led to problems in part (b). A surprising number of candidates did not rearrange the original equation for line one and it was quite common to see the gradient of the original equation given as –2, although most knew to use the negative reciprocal to get the perpendicular gradient. Another common error was to substitute a point other than the origin (usually B) into their line equation, leading to an incorrect answer with a non-zero constant and making part (b) more difficult.

Part (b) proved to be quite challenging for some candidates and a number of candidates failed to attempt the question due to a lack of understanding. The majority, however, realised what was required. Most candidates realised that they had to find the coordinates of C and knew to use simultaneous equations to find the intersection of the two lines. However many arithmetic errors frequently ensued due to poor manipulation of fractions and an inability to simplify: many candidates made their subsequent calculations more difficult by failing to realise that, for example, $52 \div 13 = 4$, although many did get the correct coordinates of C, including some who made no further progress. Some candidates used the y-coordinate of B as 26 or 13 rather than 26/3.

Many missed the simplicity of the triangle in question and embarked on the more complicated methods given as alternatives in the mark scheme. Those who tried to work with *OC* and *BC* almost always made mistakes manipulating surds and many were unable to simplify their final answer to a fraction. Those using the easier method often used the y-coordinate (6) instead of the x-coordinate (4) in the $\frac{1}{2}$ base × height. Also, in finding *B*, many candidates found where line one intercepts the x axis and as a result tried to find the area of the incorrect triangle. Some forgot the $\frac{1}{2}$ in the area of a triangle formula. On the other hand, there were a number of concise and accurate solutions.

This question in particular tested the ability to deal with calculations involving fractions, and poor arithmetical skills led to lost accuracy marks which was disappointing to see.

Question 9

For part (a), by far the most popular method was firstly to use the y-intercept to obtain the value of c and then to set up two simultaneous equations using both x-intercepts to find a and b. A minority used the x-intercepts to efficiently write down $f(x)$ in factorised form and then expand to give the required coefficients. Some candidates also chose to differentiate the given form of C and use the turning points in an attempt to find the coefficients but this was often met with less success.

In part (b), sketches were often correct with some candidates, not unexpectedly, sketching $f(\frac{1}{2}x)$.

Question 10

Given the wording of the question, most candidates chose to eliminate y and obtain a quadratic in x and could proceed to find the correct coordinates. Because of the fractions involved with one of the intersections, candidates using the quadratic formula were often less successful than those who chose to factorise.

In part (b) most could use Pythagoras' theorem correctly for their coordinates but a sizeable minority could not simplify their answer to the given form.

Question 11

Given the wording of the question, most candidates chose to eliminate y and obtain a quadratic in x and could proceed to find the correct coordinates. Because of the fractions involved with one of the intersections, candidates using the quadratic formula were often less successful than those who chose to factorise.

In part (b) most could use Pythagoras' theorem correctly for their coordinates but a sizeable minority could not simplify their answer to the given form.

Statistics for C1 Practice Paper Bronze Level B2

Qu	Max score	Modal score	Mean %	Mean score for students achieving grade: ALL	A*	A	B	C	D	E	U
1	4		97	3.88	3.97	3.98	3.91	3.93	3.92	3.98	3.46
2	4		92	3.66		3.96	3.89	3.86	3.70	3.65	2.86
3	6	6	94	5.63	5.97	5.91	5.86	5.79	5.72	5.60	4.83
4	5		93	4.67	4.99	4.93	4.84	4.81	4.73	4.40	3.34
5	5		89	4.45	4.92	4.88	4.75	4.64	4.51	4.34	3.44
6	9		82.6	7.43	8.76	8.34	7.66	7.33	6.80	5.74	4.42
7	7		81.4	5.70	6.70	6.61	6.10	5.83	5.17	3.88	2.29
8	10		76	7.59	9.81	9.53	8.90	8.32	7.59	6.48	3.37
9	8		82	6.53	7.95	7.56	6.59	6.32	5.98	4.63	3.17
10	8		79.9	6.39	7.36	7.16	6.65	6.04	5.84	5.62	3.94
11	9		82	7.38	8.90	8.65	7.80	7.39	6.50	5.68	3.00
	75		**84.41**	**63.31**	**69.33**	**71.51**	**66.95**	**64.26**	**60.46**	**54.00**	**38.12**