Paper Reference(s)

6664/01

Edexcel GCE

Core Mathematics C2

Gold Level G5

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 C2), the paper reference (6664), 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
58	50	43	35	28	21

1. Find the first 3 terms, in ascending powers of x, of the binomial expansion of $(3 - 2x)^5$, giving each term in its simplest form.

(4)

January 2009

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2. The curve C has equation

$$y = 8 - 2^{x-1}, \qquad 0 \leq x \leq 4.$$

(*a*) Complete the table below with the value of y corresponding to $x = 1$

x	0	1	2	3	4
y	7.5		6	4	0

(1)

(*b*) Use the trapezium rule, with all the values of y in the completed table, to find an approximate value for $\int_0^4 (8 - 2^{x-1})\ \mathrm{d}x$.

(3)

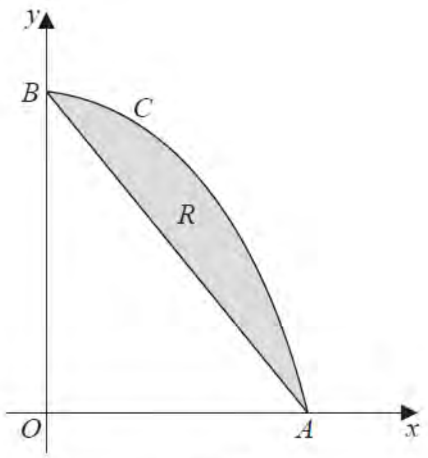

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = 8 - 2^{x-1}$, $\quad 0 \leq x \leq 4$.

The curve C meets the x-axis at the point A and meets the y-axis at the point B.

The region R, shown shaded in Figure 1, is bounded by the curve C and the straight line through A and B.

(*c*) Use your answer to part (*b*) to find an approximate value for the area of R.

(2)

May 2016

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3. $$y = x^2 - k\sqrt{x}, \quad \text{where } k \text{ is a constant.}$$

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

(2)

(*b*) Given that y is decreasing at $x = 4$, find the set of possible values of k.

(2)

May 2010

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4. (*a*) Find, to 3 significant figures, the value of x for which $5^x = 7$.

(2)

(*b*) Solve the equation $5^{2x} - 12(5^x) + 35 = 0$.

(4)

June 2008

5.

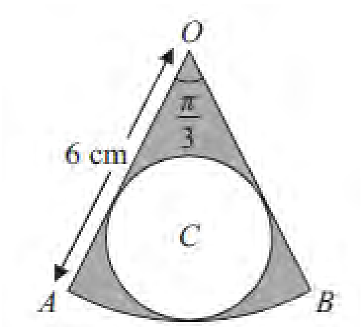

Figure 2

The shape shown in Figure 2 is a pattern for a pendant. It consists of a sector *OAB* of a circle centre *O*, of radius 6 cm, and angle $AOB = \dfrac{\pi}{3}$. The circle *C*, inside the sector, touches the two straight edges, *OA* and *OB*, and the arc *AB* as shown.

Find

(*a*) the area of the sector *OAB*,

(2)

(*b*) the radius of the circle *C*.

(3)

The region outside the circle *C* and inside the sector *OAB* is shown shaded in Figure 2.

(*c*) Find the area of the shaded region.

(2)

May 2011

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6. The circle C has equation

$$x^2 + y^2 - 6x + 4y = 12$$

(*a*) Find the centre and the radius of C.

(5)

The point $P(-1, 1)$ and the point $Q(7, -5)$ both lie on C.

(*b*) Show that PQ is a diameter of C.

(2)

The point R lies on the positive y-axis and the angle $PRQ = 90°$.

(*c*) Find the coordinates of R.

(4)

June 2009

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7. (i) Solve, for $0 \leq \theta < 360°$, the equation $9 \sin(\theta + 60°) = 4$, giving your answers to 1 decimal place. You must show each step of your working.

(4)

(ii) Solve, for $-\pi \leq x < \pi$, the equation $2 \tan x - 3 \sin x = 0$, giving your answers to 2 decimal places where appropriate.

[*Solutions based entirely on graphical or numerical methods are not acceptable.*]

(5)

May 2014

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8. (*a*) Find the value of y such that

$$\log_2 y = -3.$$

(2)

(*b*) Find the values of x such that

$$\frac{\log_2 32 + \log_2 16}{\log_2 x} = \log_2 x.$$

(5)

June 2009

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9. (i) Find the solutions of the equation $\sin(3x - 15°) = \frac{1}{2}$, for which $0 \leq x \leq 180°$.

(6)

(ii)

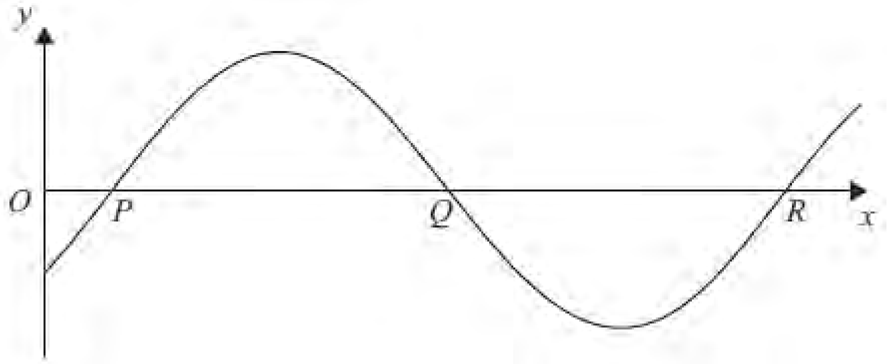

Figure 3

Figure 3 shows part of the curve with equation

$$y = \sin(ax - b), \text{ where } a > 0, \quad 0 < b < \pi.$$

The curve cuts the x-axis at the points P, Q and R as shown.

Given that the coordinates of P, Q and R are $\left(\frac{\pi}{10}, 0\right)$, $\left(\frac{3\pi}{5}, 0\right)$ and $\left(\frac{11\pi}{10}, 0\right)$ respectively, find the values of a and b.

(4)

January 2012

10.

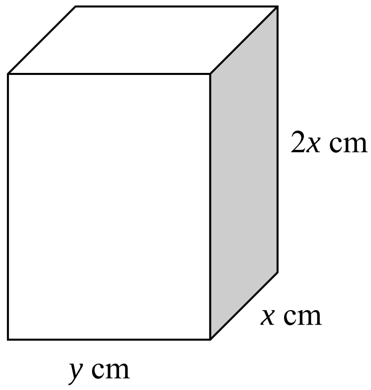

Figure 4

Figure 4 shows a solid brick in the shape of a cuboid measuring $2x$ cm by x cm by y cm.

The total surface area of the brick is 600 cm^2.

(a) Show that the volume, V cm^3, of the brick is given by

$$V = 200x - \frac{4x^3}{3}.$$

(4)

Given that x can vary,

(b) use calculus to find the maximum value of V, giving your answer to the nearest cm^3.

(5)

(c) Justify that the value of V you have found is a maximum.

(2)

May 2007

TOTAL FOR PAPER: 75 MARKS

END

Question number	Scheme	Marks
1	$(3-2x)^5 = 243$, $\quad \ldots\ldots + 5\times(3)^4(-2x) = -810x \quad \ldots\ldots$	B1, B1
	$+\dfrac{5\times4}{2}(3)^3(-2x)^2 = \quad +1080x^2$	M1 A1
		[4]
2 (a)	7	B1 cao
		(1)
(b)	$\left(\int_0^4 (8-2^{x-1})\,dx \approx\right) \ \frac{1}{2}\times1; \times \underline{\{7.5+2(\text{"their 7"}+6+4)+0\}}$	B1; <u>M1</u>
	$\left\{=\frac{1}{2}\times 41.5\right\} = 20.75$ o.e.	A1 cao
		(3)
(c)	$\text{Area}\,(R) = \text{"20.75"} - \frac{1}{2}(7.5)(4)$	M1
	$= 5.75$	A1 cao
		(2)]
		[6]
3 (a)	$\left(\frac{dy}{dx}=\right)\ 2x - \frac{1}{2}kx^{-\frac{1}{2}}$ (Having an extra term, e.g. $+C$, is A0)	M1 A1
		(2)
(b)	Substituting $x = 4$ into their $\frac{dy}{dx}$ and 'compare with zero' (The mark is allowed for : $<, >, =, \leq, \geq$)	M1
	$8-\frac{k}{4}<0 \quad k>32 \quad (\text{or } 32<k)$ <u>Correct inequality needed</u>	A1
		(2)
		[4]

Question number	Scheme	Marks
4 (a)	$x = \dfrac{\log 7}{\log 5}$ or $x = \log_5 7$	M1
	1.21	A1
		(2)
(b)	$(5^x - 7)(5^x - 5)$	M1 A1
	$(5^x = 7$ or $5^x = 5)$ $x = 1.2$ (awrt)	A1 ft
	$x = 1$	B1
		(4)
		[6]
5 (a)	$\frac{1}{2}r^2\theta = \frac{1}{2}(6)^2\left(\frac{\pi}{3}\right) = 6\pi$ or 18.85 or awrt 18.8 (cm)^2 Using $\frac{1}{2}r^2\theta$ (See notes)	M1
	6π or 18.85 or awrt 18.8	A1
		(2)
(b)	$\sin\left(\frac{\pi}{6}\right) = \dfrac{r}{6-r}$ $\sin\left(\frac{\pi}{6}\right)$ or $\sin 30^\circ = \dfrac{r}{6-r}$	M1
	$\frac{1}{2} = \dfrac{r}{6-r}$ Replaces sin by numeric value	dM1
	$6 - r = 2r \Rightarrow r = 2$ $r = 2$	A1 cso
		(3)
(c)	Area $= 6\pi - \pi(2)^2 = 2\pi$ or awrt 6.3 (cm)^2 their area of sector $- \pi r^2$	M1
	2π or awrt 6.3	A1 cao
		(2)
		[7]

Question number	Scheme	Marks
6 (a)	$(x-3)^2-9+(y+2)^2-4=12$ Centre is (3, –2)	M1 A1, A1
	$(x-3)^2+(y+2)^2=12+"9"+"4"$ $r=\sqrt{12+"9"+"4"}=5$ (or $\sqrt{25}$)	M1 A1
		(5)
(b)	$PQ=\sqrt{(7--1)^2+(-5-1)^2}$ or $\sqrt{8^2+6^2}$	M1
	= 10 = $2\times$radius, $\therefore$ diam. (N.B. For A1, need a comment or conclusion)	A1
	[ALT: midpt. of PQ $\left(\frac{7+(-1)}{2},\frac{1+(-5)}{2}\right)$: M1, = (3, –2) = centre: A1]	
	[ALT: eqn. of PQ $3x+4y-1=0$: M1, verify (3, –2) lies on this A1]	
	[ALT: find two grads, e.g. PQ and P to centre: M1, equal $\therefore$ diameter: A1]	
	[ALT: show that point $S(-1,-5)$ or (7, 1) lies on circle: M1	
		(2)
(c)	R must lie on the circle (angle in a semicircle theorem)… often <u>implied</u> by <u>a diagram with R on the circle</u> or by subsequent working)	B1
	$x=0\Rightarrow$ $y^2+4y-12=0$	M1
	$(y-2)(y+6)=0$ $y=.....$ (M is dependent on previous M)	dM1
	$y=-6$ or 2	
	(Ignore $y=-6$ if seen, and 'coordinates' are not required))	A1
		(4)
		[11]

Question number	Scheme	Marks
7	(i) $9\sin(\theta+60^{\circ})=4$; $0\le\theta<360^{\circ}$ (ii) $2\tan x-3\sin x=0$; $-\pi\le x<\pi$	
(i)	$\sin(\theta+60^{\circ})=\frac{4}{9}$, so $(\theta+60^{\circ})=26.3877...$ $(\alpha=26.3877...)$	M1
	So, $\theta+60^{\circ}=\{153.6122...,\ 386.3877...\}$	M1
	and $\theta=\{93.6122...,\ 326.3877...\}$	A1 A1
	Both answers are cso and must come from correct work	**(4)**
(ii)	$2\left(\frac{\sin x}{\cos x}\right)-3\sin x=0$	M1
	$2\sin x-3\sin x\cos x=0$	
	$\sin x(2-3\cos x)=0$	
	$\cos x=\frac{2}{3}$	A1
	$x=\text{awrt}\{0.84,-0.84\}$	A1A1ft
	$\{\sin x=0\Rightarrow\}\ x=0$ **and** $-\pi$	B1
		(5)
		[9]
8 (a)	$\log_2 y=-3\quad\Rightarrow\quad y=2^{-3}$	M1
	$y=\frac{1}{8}$ or 0.125	A1
		(2)
(b)	$32=2^5$ or $16=2^4$ or $512=2^9$	M1
	[or $\log_2 32=5\log_2 2$ or $\log_2 16=4\log_2 2$ or $\log_2 512=9\log_2 2$]	
	[or $\log_2 32=\frac{\log_{10}32}{\log_{10}2}$ or $\log_2 16=\frac{\log_{10}16}{\log_{10}2}$ or $\log_2 512=\frac{\log_{10}512}{\log_{10}2}$]	
	$\log_2 32+\log_2 16=9$	A1
	$(\log x)^2=...$ or $(\log x)(\log x)=...$ (May not be seen explicitly, so M1 may be implied by later work, and the base may be 10 rather than 2)	M1
	$\log_2 x=3\quad\Rightarrow\quad x=2^3=\ 8$	A1
	$\log_2 x=-3\quad\Rightarrow\quad x=2^{-3}=\frac{1}{8}$	A1ft
		(5)
		[7]

Question number	Scheme	Marks
9 (i)	$\sin(3x-15)=\frac{1}{2}$ so $3x-15=30$ (α) and $x = 15$	M1 A1
	Need $3x-15=180-\alpha$ or $3x-15=540-\alpha$	M1
	Need $3x-15=180-\alpha$ and $3x-15=360+\alpha$ and $3x-15=540-\alpha$	M1
	$x = 55$ or 175	A1
	$x =$ 55 , 135 , 175	A1
		(6)
(ii)	At least one of $(\frac{a\pi}{10}-b)=$ 0 (or $n\pi$)	
	$(\frac{a3\pi}{5}-b)=$ π {or $(n+1)\pi$} or in degrees	M1
	or $(\frac{a11\pi}{10}-b)=$ 2π {or $(n+2)\pi$}	
	If two of **above equations** used eliminates a or b to find one or both of these or uses period property of curve to find a or uses other valid method to find either a or b (May see $\frac{5\pi}{10}a=\pi$ so $a=$)	M1
	Obtains $a = 2$	A1
	Obtains $b=\frac{\pi}{5}$ (must be in radians)	A1
		(4)
		[10]
10 (a)	$4x^2+6xy=600$	M1 A1
	$V=2x^2y=2x^2\left(\frac{600-4x^2}{6x}\right)$ $V=200x-\frac{4x^3}{3}$ (*)	M1 A1cso
		(4)
(b)	$\frac{dV}{dx}=200-4x^2$	B1
	Equate their $\frac{dV}{dx}$ to 0 and solve for x^2 or x : $x^2=50$ or $x=\sqrt{50}$ (7.07…)	M1 A1
	Evaluate V: $V=200(\sqrt{50})-\frac{4}{3}(50\sqrt{50})=943\text{ cm}^3$ Allow awrt	M1 A1
		(5)
(c)	$\frac{d^2V}{dx^2}=-8x$ Negative, $\therefore$ Maximum	M1, A1ft
		(2)
		[11]

Examiner reports

Question 1
This binomial expansion was answered well with a majority of the candidates scoring full marks. The most common errors involved signs and slips in evaluating the powers and binomial coefficients. A number of weaker candidates changed the question and instead expanded $(1 \pm 2x)^5$. This gained no credit.

Question 2
This proved accessible to everyone with only a small number of candidates failing to achieve full marks on parts (a) and (b).

Part (a) was answered successfully by almost all candidates. The requirement was to calculate a value for $8 - 2^0$ and to complete the table with the value 7.

In part (b) candidates generally completed the trapezium rule correctly, however some made errors. These inaccuracies fell into two categories: miscalculating h as $\frac{4}{5}$ (thinking 5 strips because there were 5 ordinates), giving an answer of 16.6; or omitting the large brackets and giving an answer of 37.75. Candidates who found the value of h from the table of values for x and y rather than from the formula were more successful. There were, as in previous years, a number of candidates who did not bracket their work. The majority of candidates reached the answer of 20.75, which was an exact answer. Some then rounded to 20.8 which caused problems for part (c).

Part (c) was well answered by the majority, who correctly calculated the 15 for the area of the triangle to subtract. There was, however, a varied approach to this question with a large number of candidates not seeing or using the area of a triangle and instead using more complicated approaches like integrating. A sizeable number attempted (unsuccessfully) to integrate the original equation of the curve rather than use their previous answer. There were some very long solutions to part (c). These indicated a lack of understanding about exactly what area had been calculated in part (b) and about the fact that the table had provided the coordinates for A and B. A significant number failed to realise that they had the dimensions of the required triangle, preferring instead to try and calculate where the curve crossed the axes by putting x and y equal to zero.

Question 3
The differentiation in part (a) of this question was usually completed correctly, although the $k\sqrt{x}$ term sometimes caused problems, with k being omitted or $\sqrt{x}$ misinterpreted.

It was clear in part (b), however, that many candidates did not know the condition for a function to be decreasing. Some substituted $x = 4$ into y rather than $\frac{dy}{dx}$ and some used the second derivative. Even those who correctly used $\frac{dy}{dx}$ were usually unable to proceed to a correct solution, either making numerical mistakes (often being unable to find the correct value of $4^{-\frac{1}{2}}$) or failing to deal correctly with the required inequality. The answer $k = 32$ was commonly seen instead of $k > 32$.

Question 4
Most candidates completed part (a) successfully (sometimes by 'trial and error'), but sometimes a mark was lost through incorrectly rounding to 3 decimal places instead of 3 significant figures.

Responses to part (b) varied considerably. Many candidates failed to appreciate that $5^{(2x)}$ is equivalent to $(5^x)^2$ and either substituted the answer to part (a) into the given equation or took logs of each separate term, resulting in expressions such as $2x\log 5 - x\log 60 + \log 35 = 0$. The candidates who managed to form the correct quadratic in 5^x were usually able to proceed to a correct solution, but sometimes the final answers were left as 5 and 7. Notation was sometimes confusing, especially where the substitution $x = 5^x$ appeared.

Some candidates wasted a significant amount of time on part (b), producing a number of different wrong responses with a variety of logarithmic mistakes.

Question 5
Part (a) was well answered with the vast majority of candidates using the correct sector formula $\frac{1}{2}r^2\theta$ or perhaps finding a fraction of πr^2. Occasionally an incorrect formula was quoted. Often the exact answer 6π was given, but otherwise rounding errors were rare. Only a few candidates attempted to convert θ to degrees.

Surprisingly, for a question which only required knowledge of GCSE work, part (b) proved to be the worst answered question on the paper. Although a good number of candidates realised the question was a combination of circle properties with trigonometry, only a small number of these were able to proceed successfully by writing down a correct equation for a right-angled triangle. It is disappointing at this level to see a number of candidates who used the sine rule, and even the cosine rule, when dealing with right-angled triangles. There were however, neat, succinct solutions from some good candidates, and a few correct solutions using more complicated strategies. There were occasional correct solutions using the ratios of the edges of a 30°, 60°, 90° triangle but many complicated, incorrect methods were often seen. While many candidates left this part blank, some resorted to guessing the value of *r*. A number of candidates correctly guessed that *r* was 2 and other common wrong guesses were 1.5 and 3. There were many wrong answers for *r*, some of which gave the area of the circle greater than the sector area found in part (a); a problem when it came to answering part (c).

After failing to answer part (b), many candidates ignored part (c), but others were able to gain a mark by using an incorrect value for *r* or by indicating their intended method of "their sector area $-\ \pi r^2$". Premature rounding sometimes led to the loss of the final mark.

Question 6
Many candidates had difficulty with this question, with part (c) being particularly badly answered.

In part (a) the method of completing the square was the most popular approach, but poor algebra was often seen, leading to many incorrect answers. Although the correct centre coordinates $(3, -2)$ were often achieved (not always very convincingly), the radius caused rather more problems and answers such as $\sqrt{12}$ appeared frequently. Some candidates inappropriately used the information about the diameter in part (b) to find their answers for part (a), scoring no marks.

There were various possible methods for part (b), the most popular of which were either to show that the mid-point of *PQ* was the centre of the circle or to show that the length of *PQ* was twice the radius of the circle. Provided that either the centre or the radius was correct in part (a), candidates therefore had at least two possible routes to success in part (b), and many scored both marks here. Some, however, thought that it was sufficient to show that both *P* and *Q* were on the circle.

Part (c) could have been done by using the fact that the point *R* was on the circle (angle in a semicircle result), or by consideration of gradients, or by use of Pythagoras' Theorem. A common mistake in the 'gradient' method was to consider the gradient of *PQ*, which was not directly relevant to the required solution.

Many candidates were unable to make any progress in part (c), perhaps omitting it completely, and time was often wasted in pursuing completely wrong methods such as finding an equation of a line perpendicular to *PQ* (presumably thinking of questions involving the tangent to a circle).

Question 7

In part (i) most students achieved the first mark, though a minority expanded $\sin(\theta+60)$ as $\sin\theta+\sin 60$, which was the main reason that this mark was lost. Generally, most students did proceed to find a correct solution for the equation, with 326.4° being the more common of the two. In many cases this arose from adding 360° to their value of α – 60°, with the second solution either not considered at all or attempts at 180° – (value of α – 60°). Adding 60° instead of subtracting was also occasionally seen, with no evidence of correct use of $\theta+60° = ...$ first. Some students tried to obtain more solutions by adding 90° and thus lost the last mark despite having correctly found the two genuine solutions.

In part (ii) the major problem was the identity for tan *x*. Students sometimes incorrectly quoted $\tan x = \dfrac{\cos x}{\sin x}$ or replaced 2 tan *x* with $\dfrac{2\sin x}{2\cos x}$, leading to the loss of all but potentially the final mark, and it was a rarity for this to be gained in such cases. Students are advised to state identities of this type before attempting to apply them. Even where the correct identity was used, solutions were frequently lost by dividing through by sin *x*. Some who quoted $\sin x = 0$ after factorising correctly, failed to find both solutions 0 and $-\pi$. In many cases no solutions to sin *x* = 0 were seen. Correctly obtaining $\cos x = \dfrac{2}{3}$ proved more troublesome than might be expected. There were some interesting attempts including squaring, obtaining an equation in $\sin^2 x$ or $\cos^2 x$, the latter often leading to a correct solution. Some were not able to proceed further, or used incorrect identities such as cos *x* = 1 – sin *x*. Mostly these were unsuccessful with students getting lost in the algebra. In the few cases where they did get to sin *x* = $\dfrac{\sqrt{5}}{3}$, the negative possibility was missing and no appreciation of the extra answers generated were shown. Students who did get to $\cos x = \dfrac{2}{3}$ were often not able to go on to get both correct answers from this equation, with 0.84 and 2π – 0.84 the ones often given. Occasionally π – 0.84 was given as the second solution. Some students chose to work in degrees and then convert to radians at the end.

The final mark for the solutions to sin $x = 0$ was only scored by a small proportion of students, with most students who reached a solution having done so by dividing through by sin x. Even in cases where sin $x = 0$ was quoted after factorising their equation, many then ignored it, or only gave 0 and π as the solutions. Overall, there were very few completely correct responses to this part. But those that were completely correct were often very well answered and presented.

Question 8

In part (a), the majority of candidates showed an understanding of the definition of a logarithm, although the answers - 8 and 8 appeared occasionally instead of $\frac{1}{8}$.

Part (b), however, was often badly done. Not realising that $\log_2 32$ and $\log_2 16$ could be immediately written as 5 and 4 respectively, most candidates launched unnecessarily into laws of logarithms, replacing the numerator by $\log_2 512$ (or sometimes by $\log_2 48$). Although it would have been quite possible to proceed from here to correct answers, confusion often followed at the next stage, with $(\log_2 x)\times(\log_2 x)$ becoming $\log_2 x^2$ and then, perhaps, $2\log_2 x$. Other unfortunate mistakes included writing $\frac{\log 512}{\log x}$ as either $\log_2(512-x)$ or $\frac{512}{x}$. Those candidates who managed to reach $(\log_2 x)^2 = 9$ were usually able to find one correct answer from $\log_2 x = 3$, but the second answer (from $\log_2 x = -3$) appeared much less frequently.

Question 9

Part (i) was attempted by most candidates and many scored full marks. Most correctly used inverse sine before addition and division, although a significant number manipulated the algebra incorrectly, solving $3x - 15 = 30$ as $x = \frac{30}{3} + 15 = 25$ or as $x = (30-15)/3 = 5$.

Many found 30 and 150 from their inverse sine leading to x = 15 and 55 but missed the later 390 and 510, thus failing to obtain the other two solutions in the range.

A large number did not keep to the order of operations required, applying $\sin(180-\theta) = \sin\theta$ to some angle they had obtained in the process of trying to solve $3x - 15 = 30$. Regrettably a few candidates began with $\sin 3x - \sin 15 =$, which gained them no marks.

In Part (ii) successful solutions were rare and were evenly split between the simultaneous equation and the translation and stretches approach. There were some excellent full mark solutions. Most, however, were unable to formulate the equations required to solve for a and b. Some began correctly with $\sin\left(\frac{a\pi}{10} - b\right) = 0$, but proceeded no further. Those who continued frequently wrote $\left(\frac{a\pi}{10} - b\right) = 0$ (worth the first method mark) but followed it by $\left(\frac{3a\pi}{5} - b\right) = 0$ from which they could only get $a = 0$ and $b = 0$ from correct algebra applied to their equations. The second equation should have been $\left(\frac{3a\pi}{5} - b\right) = \pi$. Some other candidates mixed degrees and radians, for example with $\frac{a\pi}{10} - b = 0$ and $\frac{a3\pi}{5} - b = 180$ producing $a = \frac{360}{\pi}$. Some converted all angles into degrees, which could produce a correct value for a, but of course b = 36 was not acceptable.

There were some who apparently confused the value of x with that of $(ax - b)$, producing equations such as $a.0 - b = n/10$, and $a\pi - b = \frac{3\pi}{5}$. In some cases, it was unclear, e.g. $\frac{\pi}{a} + b = 108$ or similar, seen occasionally. This last expression (usually appearing with no explanation) might have been due to incorrect algebra, as $\frac{\pi + b}{a} = \frac{3\pi}{5}$ is correct.

Using the period of the graph was often a successful starting point, and many found $a = 2$ quite easily, though some mistakenly gave $a = \frac{1}{2}$. The most common answer using this approach was $a = 2$ and $b = \frac{n}{10}$ rather than the correct $a = 2$ and $b = \frac{\pi}{5}$. Few appeared to have the time to check that their solution crossed the x-axis at the correct places.

Question 10

Responses to this question that were blank or lacking in substance suggested that some candidates were short of time at the end of the examination. Although many good solutions were seen, it was common for part (b) to be incomplete.

The algebra in part (a) was challenging for many candidates, some of whom had difficulty in writing down an expression for the total surface area of the brick and others who were unable to combine this appropriately with the volume formula. It was common to see several attempts at part (a) with much algebraic confusion.

Working with the given formula, most candidates were able to score the first three marks in part (b), but surprisingly many, having found $x \approx 7.1$, seemed to think that this represented the maximum value of V. Failing to substitute the value of x back into the volume formula lost them two marks.

Almost all candidates used the second derivative method, usually successfully, to justify the maximum value in part (c), but conclusions with a valid reason were sometimes lacking.

Statistics for C2 Practice Paper Gold Level G5

				Mean score for students achieving grade:							
Qu	**Max score**	**Modal score**	**Mean %**	**ALL**	**A***	**A**	**B**	**C**	**D**	**E**	**U**
1	4		76	3.05		3.70	3.26	2.91	2.58	2.21	1.43
2	6	6	84	5.03	5.94	5.85	5.60	5.27	4.90	4.39	3.13
3	4		64	2.54	3.55	3.16	2.75	2.57	2.40	2.18	1.55
4	6		55	3.28		4.83	3.63	3.02	2.48	2.05	1.33
5	7		37	2.56	4.83	3.61	2.87	2.49	2.11	1.74	0.90
6	11		46	5.11		8.71	6.39	4.80	3.28	2.03	0.66
7	9		54	4.84	8.39	7.42	6.13	5.07	4.03	2.89	1.15
8	7		44	3.11		4.64	3.32	2.83	2.47	2.09	1.22
9	10		44	4.43	9.18	6.67	4.66	3.73	2.57	1.85	0.74
10	11		48	5.24		9.41	6.72	4.55	2.81	1.58	0.52
	75		**52.25**	**39.19**	**31.89**	**58.00**	**45.33**	**37.24**	**29.63**	**23.01**	**12.63**