Paper Reference(s)

6664/01

Edexcel GCE

Core Mathematics C2

Silver Level S4

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
70	63	54	45	36	29

1. The first three terms of a geometric series are

$$18,\ 12 \text{ and } p$$

respectively, where p is a constant.

Find

(a) the value of the common ratio of the series,

(1)

(b) the value of p,

(1)

(c) the sum of the first 15 terms of the series, giving your answer to 3 decimal places.

(2)

May 2013

2.

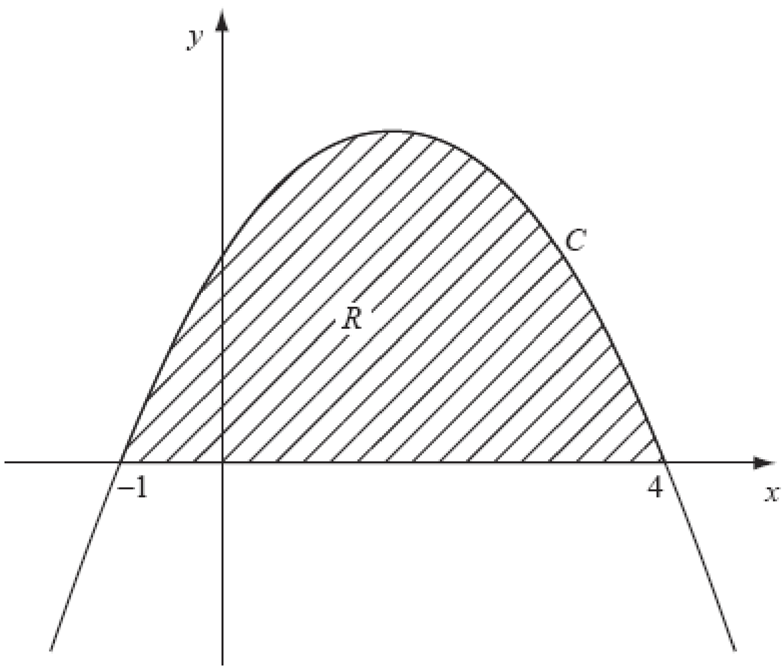

Figure 1

Figure 1 shows part of the curve C with equation $y = (1 + x)(4 - x)$.

The curve intersects the x-axis at $x = -1$ and $x = 4$. The region R, shown shaded in Figure 1, is bounded by C and the x-axis.

Use calculus to find the exact area of R.

(5)

January 2009

3.
$$y = \sqrt{(5^x + 2)}$$

(*a*) Copy and complete the table below, giving the values of y to 3 decimal places.

x	0	0.5	1	1.5	2
y			2.646	3.630	

(2)

(*b*) Use the trapezium rule, with all the values of y from your table, to find an approximation for the value of $\int_0^2 \sqrt{(5^x + 2)}\ \mathrm{d}x$.

(4)

June 2008

4.
$$\mathrm{f}(x) = 2x^3 + ax^2 + bx - 6,$$

where a and b are constants.

When $\mathrm{f}(x)$ is divided by $(2x - 1)$ the remainder is -5.

When $\mathrm{f}(x)$ is divided by $(x + 2)$ there is no remainder.

(*a*) Find the value of a and the value of b.

(6)

(*b*) Factorise $\mathrm{f}(x)$ completely.

(3)

January 2010

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5. (*a*) Find the first 4 terms, in ascending powers of x, of the binomial expansion of $(1 + ax)^7$, where a is a constant. Give each term in its simplest form.

(4)

Given that the coefficient of x^2 in this expansion is 525,

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

(2)

May 2010

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6. Solve, for $0 \leq x < 180°$,

$$\cos(3x - 10°) = -0.4,$$

giving your answers to 1 decimal place. You should show each step in your working.

(7)

January 2013

7.

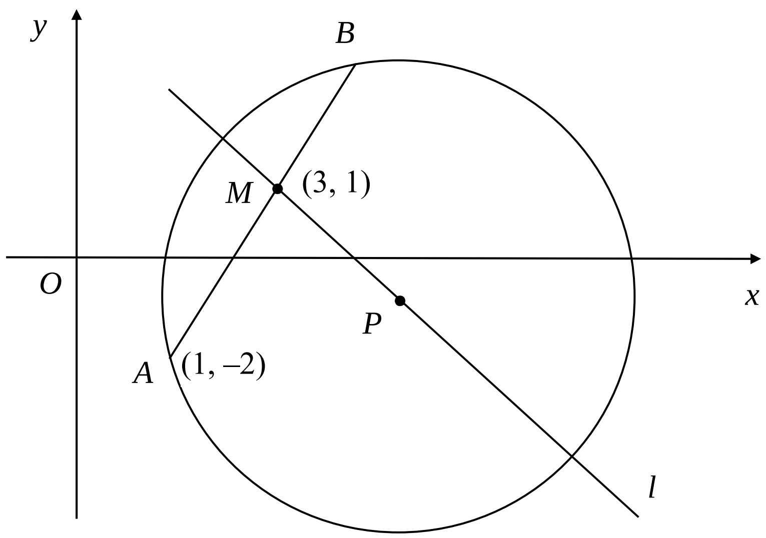

Figure 2

The points A and B lie on a circle with centre P, as shown in Figure 2.
The point A has coordinates $(1, -2)$ and the mid-point M of AB has coordinates $(3, 1)$.
The line l passes through the points M and P.

(*a*) Find an equation for l.

(4)

Given that the x-coordinate of P is 6,

(*b*) use your answer to part (*a*) to show that the y-coordinate of P is -1,

(1)

(*c*) find an equation for the circle.

(4)

May 2007

8.

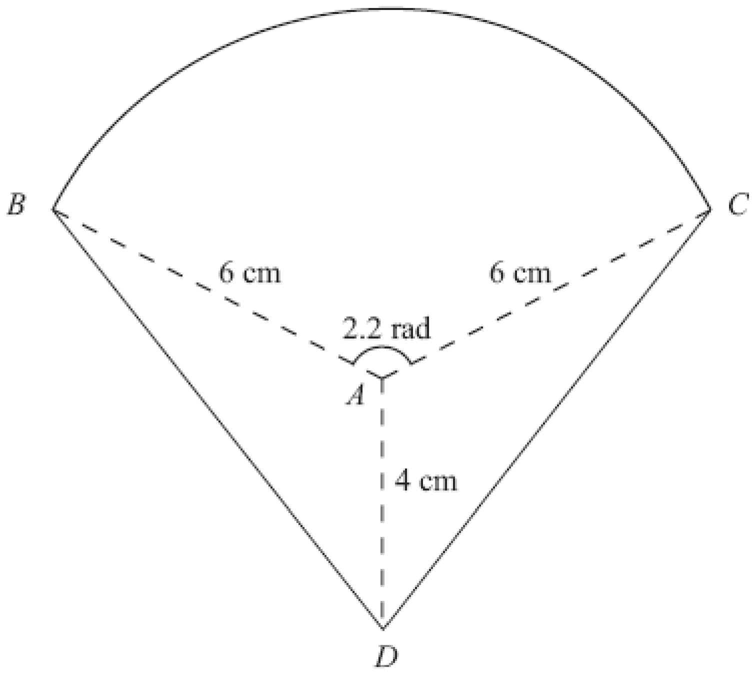

Figure 3

The shape *BCD* shown in Figure 3 is a design for a logo.

The straight lines *DB* and *DC* are equal in length. The curve *BC* is an arc of a circle with centre *A* and radius 6 cm. The size of $\angle BAC$ is 2.2 radians and $AD = 4$ cm.

Find

(a) the area of the sector *BAC*, in cm^2,

(2)

(b) the size of $\angle DAC$, in radians to 3 significant figures,

(2)

(c) the complete area of the logo design, to the nearest cm^2.

(4)

January 2009

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9. (a) Sketch the graph of $y = 7^x$, $x \in \mathbb{R}$, showing the coordinates of any points at which the graph crosses the axes.

(2)

(b) Solve the equation

$$7^{2x} - 4(7^x) + 3 = 0,$$

giving your answers to 2 decimal places where appropriate.

(6)

January 2011

10.

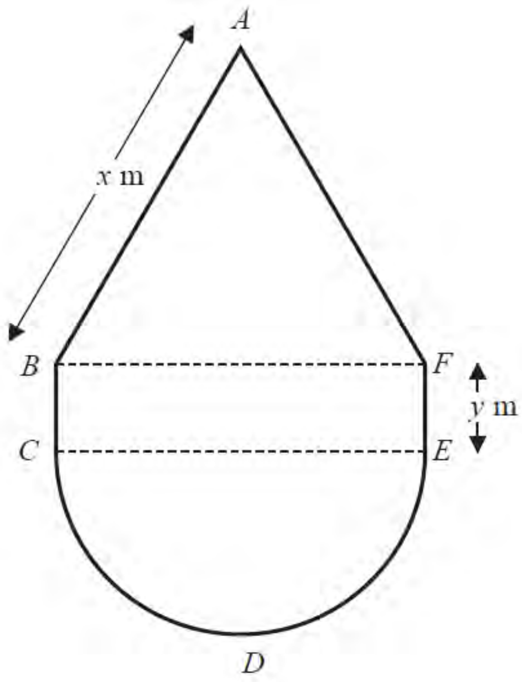


Figure 4

Figure 4 shows the plan of a pool.

The shape of the pool *ABCDEFA* consists of a rectangle *BCEF* joined to an equilateral triangle *BFA* and a semi-circle *CDE*, as shown in Figure 4.

Given that $AB = x$ metres, $EF = y$ metres, and the area of the pool is 50 m^2,

(*a*) show that

$$y = \frac{50}{x} - \frac{x}{8}\left(\pi + 2\sqrt{3}\right)$$

(3)

(*b*) Hence show that the perimeter, P metres, of the pool is given by

$$P = \frac{100}{x} + \frac{x}{4}\left(\pi + 8 - 2\sqrt{3}\right)$$

(3)

(*c*) Use calculus to find the minimum value of P, giving your answer to 3 significant figures.

(5)

(*d*) Justify, by further differentiation, that the value of P that you have found is a minimum.

(2)

May 2014 (R)

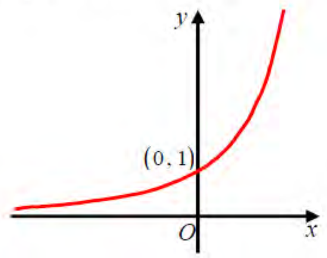
TOTAL FOR PAPER: 75 MARKS

END

Question number	Scheme	Marks
1 (a)	$\{r =\}\ \frac{2}{3}$	B1
		(1)
(b)	$\{p =\}\ 8$	B1 cao
		(1)
(c)	$\{S_{15} =\}\ \dfrac{18\left(1-\left(\frac{2}{3}\right)^{15}\right)}{1-\frac{2}{3}}$	M1
	$\{S_{15} = 53.87668...\} \Rightarrow S_{15} = \text{awrt } 53.877$	A1
		(2)
		[4]
2	$y = (1+x)(4-x) = 4+3x-x^2$ M: Expand, giving 3 (or 4) terms	M1
	$\int\left(4+3x-x^2\right)\mathrm{d}x = 4x+\dfrac{3x^2}{2}-\dfrac{x^3}{3}$ M: Attempt to integrate	M1 A1
	$= [...............]_{-1}^{4} = \left(16+24-\dfrac{64}{3}\right)-\left(-4+\dfrac{3}{2}+\dfrac{1}{3}\right)=\dfrac{125}{6}$ $\left(=20\dfrac{5}{6}\right)$	M1 A1
		[5]
3 (a)	1.732, 2.058, 5.196 awrt	B1 B1
		(2)
(b)	$\frac{1}{2}\times 0.5$	B1
	$......\{(1.732+5.196)+2(2.058+2.646+3.630)\}$	M1 A1ft
	$= 5.899$	A1
		(4)
		[6]

Question number	Scheme	Marks
4 (a)	$\mathrm{f}\left(\frac{1}{2}\right) = 2\times\frac{1}{8} + a\times\frac{1}{4} + b\times\frac{1}{2} - 6$	M1
	$\mathrm{f}\left(\frac{1}{2}\right) = -5 \;\Rightarrow\; \frac{1}{4}a + \frac{1}{2}b = \frac{3}{4}$ or $a + 2b = 3$	
	$\mathrm{f}(-2) = -16 + 4a - 2b - 6$	A1
	$\mathrm{f}(-2) = 0 \;\Rightarrow\; 4a - 2b = 22$	M1 A1
	Eliminating one variable from 2 linear simultaneous equations in a and b	M1
	$a = 5$ and $b = -1$	A1
		(6)
(b)	$2x^3 + 5x^2 - x - 6 = (x+2)(2x^2 + x - 3)$	M1
	$= (x+2)(2x+3)(x-1)$	M1 A1
	NB $(x+2)(x+\frac{3}{2})(2x-2)$ is A0 But $2(x+2)(x+\frac{3}{2})(x-1)$ is A1	**(3)**
		[9]
5 (a)	$(1+ax)^7 = 1 + 7ax....$ or $1 + 7(ax)....$ (<u>Not</u> unsimplified versions)	B1
	$+\frac{7\times 6}{2}(ax)^2 + \frac{7\times 6\times 5}{6}(ax)^3$ Evidence from <u>one</u> of these terms is enough	M1
	$+21a^2x^2$ or $+21(ax)^2$ or $+21(a^2x^2)$	A1
	$+35a^3x^3$ or $+35(ax)^3$ or $+35(a^3x^3)$	A1
		(4)
(b)	$21a^2 = 525$	M1
	$a = \pm 5$ (Both values are required) (The answer $a = 5$ with no working scores M1 A0)	A1
		(2)
		[6]

Question number	Scheme		Marks
6	$\cos^{-1}(-0.4) = 113.58\ (\alpha)$	Awrt 114	B1
	$3x - 10 = \alpha \Rightarrow x = \dfrac{\alpha + 10}{3}$	Uses their α to find x. Allow $x = \dfrac{\alpha \pm 10}{3}$ **not** $\dfrac{\alpha}{3} \pm 10$	M1
	$x = 41.2$		A1
	$(3x - 10 =)360 - \alpha\ \ (246.4....)$	$360 - \alpha$ (can be implied by 246.4...)	M1
	$x = 85.5$		A1
	$(3x - 10 =)360 + \alpha\ (= 473.57....)$	$360 + \alpha$ (Can be implied by 473.57...)	M1
	$x = 161.2$		A1
			[7]
7 (a)	Gradient of AM: $\dfrac{1-(-2)}{3-1} = \dfrac{3}{2}$ or $\dfrac{-3}{-2}$		B1
	Gradient of l: $= -\dfrac{2}{3}$	M: use of $m_1 m_2 = -1$, or equiv	M1
	$y - 1 = -\dfrac{2}{3}(x-3)$ or $\dfrac{y-1}{x-3} = -\dfrac{2}{3}$	$[3y = -2x + 9]$ (Any equiv. form)	M1 A1
			(4)
(b)	$x = 6$: $3y = -12 + 9 = -3$ $y = -1$ (or show that for $y = -1$, $x = 6$) (*) (A conclusion is <u>not</u> required).		B1
			(1)
(c)	$(r^2 =)\ (6-1)^2 + (-1-(-2))^2$	M: Attempt r^2 or r	M1 A1
	N.B. Simplification is <u>not</u> required to score M1 A1		
	$(x \pm 6)^2 + (y \pm 1)^2 = k$, $k \neq 0$	<u>Value</u> for k not needed, could be r^2 or r)	M1
	$(x-6)^2 + (y+1)^2 = 26$ (or equiv.)		A1
	Allow $(\sqrt{26})^2$ or other exact equivalents for 26		
	(But… $(x-6)^2 + (y--1)^2 = 26$ scores M1 A0)		
	(Correct answer with no working scores full marks)		
			(4)
			[9]

Question number	Scheme	Marks
8 (a)	$\frac{1}{2}r^2\theta = \frac{1}{2}\times 6^2 \times 2.2 = 39.6$	M1 A1
		(2)
(b)	$\left(\frac{2\pi - 2.2}{2} =\right) \pi - 1.1 = 2.04$ (rad)	M1 A1
		(2)
(c)	$\Delta DAC = \frac{1}{2}\times 6 \times 4\sin 2.04 \quad (\approx 10.7)$	M1 A1ft
	Total area = sector + 2 triangles = 61 $\left(\text{cm}^2\right)$	M1 A1
		(4)
		[8]
9 (a)	Graph of $y = 7^x$, $x \in \mathbb{R}$ and solving $7^{2x} - 4(7^x) + 3 = 0$	
	 At least two of the three criteria correct. **(See notes below.)**	B1
	All three criteria correct. **(See notes below.)**	B1
		(2)
(b)	$y^2 - 4y + 3\ \{= 0\}$ — Forming a quadratic {using $"y" = 7^x$}.	M1
	$y^2 - 4y + 3\ \{= 0\}$	A1
	$\{(y-3)(y-1) = 0$ or $(7^x - 3)(7^x - 1) = 0\}$	
	$y = 3,\ y = 1$ or $7^x = 3,\ 7^x = 1$ — Both $y = 3$ and $y = 1$.	A1
	$\{7^x = 3 \Rightarrow\}\ x\log 7 = \log 3$ or $x = \frac{\log 3}{\log 7}$ or $x = \log_7 3$ — A valid method for solving $7^x = k$ where $k > 0, k \neq 1$	dM1
	$x = 0.5645....$ — 0.565 or awrt 0.56	A1
	$x = 0$ — $x = 0$ stated as a solution.	B1
		(6)
		[8]

Question number	Scheme	Marks
10 (a)	$\{A=\}\ xy+\frac{\pi}{2}\left(\frac{x}{2}\right)^2+\frac{1}{2}x^2\sin 60^\circ$	M1A1
	$50= xy+\frac{\pi x^2}{8}+\frac{\sqrt{3}\,x^2}{4} \Rightarrow y=\frac{50}{x}-\frac{\pi x}{8}-\frac{\sqrt{3}\,x}{4} \Rightarrow \underline{y=\frac{50}{x}-\frac{x}{8}\left(\pi+2\sqrt{3}\right)}$ *	A1 *
		(3)
(b)	$\{P=\}\ \frac{\pi x}{2}+2x+2y$	B1
	$P=\frac{\pi x}{2}+2x+2\left(\frac{50}{x}-\frac{x}{8}\left(\pi+2\sqrt{3}\right)\right)$	M1
	$P=\frac{\pi x}{2}+2x+\frac{100}{x}-\frac{\pi x}{4}-\frac{\sqrt{3}}{2}x \Rightarrow P=\frac{100}{x}+\frac{\pi x}{4}+2x-\frac{\sqrt{3}}{2}x$	
	$\Rightarrow \underline{P=\frac{100}{x}+\frac{x}{4}\left(\pi+8-2\sqrt{3}\right)}$	A1 *
		(3)
(c) and (d) can be marked together	(Note $\frac{\pi+8-2\sqrt{3}}{4}=1.919\ldots\ldots$)	
	$\frac{\mathrm{d}P}{\mathrm{d}x}=-100x^{-2}+\frac{\pi+8-2\sqrt{3}}{4}$	M1A1
	$-100x^{-2}+\frac{\pi+8-2\sqrt{3}}{4}=0 \Rightarrow x=\ldots$	M1
	$\Rightarrow\ x=\sqrt{\frac{400}{\pi+8-2\sqrt{3}}}=7.2180574\ldots$	A1
	$\{x=7.218\ldots,\}\ \Rightarrow P=27.708\ldots$ (m) | awrt 27.7	A1
		(5)
	$\frac{\mathrm{d}^2P}{\mathrm{d}x^2}=\frac{200}{x^3}>0 \Rightarrow$ Minimum	M1A1ft
		(2)
		[13]

Examiner reports

Question 1

Candidates displayed a good knowledge of Geometric Series and generally applied formulae successfully to gain maximum marks in most responses.

A small number of candidates attempted a common difference rather than ratio, yielding r = -6 and p = 6, but usually went on to use the geometric series sum formula in (c). One error that caused a few candidates to lose marks was to give r =3/2 instead of r = 2/3, though they often then obtained p = 8 in (b). Some students also lost marks due to incorrect rounding, for example by giving r as 0.6, though many obtained the mark in (a), having written 12/18 or 2/3 previously, but then lost marks later by using 0.6 or some other approximation in their calculations.

In part (c), most students used the correct formula for the sum of a geometric progression, although some candidates were unable to use their calculators efficiently to obtain an accurate answer. Other mistakes were to give the sum as $\frac{18(1-(\frac{2}{3})^{14})}{1-\frac{2}{3}}$ or to attempt to use the formula for the sum to infinity or the formula for the sum of an arithmetic series. Attempts to find and then add all 15 terms were very rare. A significant minority went straight from a correct formula in part (c) to an answer rounded to 3 significant figures rather than 3 decimal places, losing the last mark (just one of a number of occasions where candidates were failing to read the detail of the question properly).

Question 2

Most candidates expanded the brackets correctly and most collected to three terms although a significant number then reversed the signs before integrating. A few candidates differentiated or tried to integrate without expanding first but the majority scored the M mark here. Most substituted the correct limits and subtracted correctly, although those who evaluated f(4) and f(-1) separately often made errors in subtracting. A common mistake was the substitution of 1 instead of –1. A few split the area into two parts –1 to 0 and 0 to 4. The fraction work and the inability to cope with a negative raised to a power (here and in other questions) is quite a concern. Many candidates completed correctly and this question was reasonably well done.

Question 3

Part (a) was answered correctly by the vast majority of candidates. Where an error did occur it was frequently $\sqrt{5^0+2}=\sqrt{0+2}=1.414$. The values were almost always given to the requested degree of accuracy.

Use of the trapezium rule in part (b) was often clear and accurate, but the common mistake in the value of h $\left(h=\frac{2}{5}\text{ instead of }h=\frac{2}{4}\right)$ was frequently seen. Bracketing mistakes were less common but there were some candidates who left out the main brackets and only multiplied the first two terms by $0.5h$.

A few candidates used the equivalent method of adding the areas of separate trapezia, which was acceptable and was usually successful.

Question 4

(a) Most who used the remainder theorem correctly used f($\frac{1}{2}$) and equated it to –5, then used f(-2) and equated it to zero. They then solved simultaneous equations. There were a number of errors simplifying fractions and dealing with negative numbers and so a significant minority of the candidates scored the three method marks but lost all three accuracy marks. Some candidates forgot to equate their first expression to –5 and some wrote expressions not equations. There were also a number of errors rearranging terms and dealing with fractions. A small minority thought that $a(½)^2$ became $¼a^2$. It was obvious from the multiple efforts and crossings-out that a number of candidates were unhappy with their a and b values, but were often unable to resolve their problems.

Those who used long division very rarely got as far as a correct remainder. They usually made little progress, and penalised themselves by the excessive time taken to do the complicated algebra required.

(b) Most candidates attempted this part of the question, even after limited success in part (a). It was common for those candidates who found fractional values for a or b to multiply f(x) by a denominator to create integer coefficients here. Division by (x + 2) was generally done well using "long division" or synthetic division and candidates who had achieved full marks in part (a) normally went on to achieve full marks in (b), with the common error being failing to factorise their quadratic expression correctly. A significant group stopped at the quadratic factor and so lost the final two marks.

Candidates completing this question successfully were careful and accurate candidates and the question proved discriminating. A number of candidates made several attempts, sometimes achieving success on the third try.

Question 5

In part (a), most candidates exhibited understanding of the structure of a binomial expansion and were able to gain at least the method mark. Coefficients were generally found using the $(1 + x)^n$ binomial expansion formula, but Pascal's triangle was also popular. The correctly simplified third and fourth terms, $21a^2x^2$ and $35a^3x^3$, were often obtained and it was pleasing that $21ax^2$ and $35ax^3$ appeared less frequently than might have been expected from the evidence of previous C2 papers. Candidates tend to penalise themselves due to their reluctance to use brackets in terms such as $21(ax)^2$ and $35(ax)^3$.

Part (b) was often completed successfully, but some candidates included powers of x in their 'coefficients'. There is still an apparent lack of understanding of the difference between 'coefficients' and 'terms'. Although the question asked for the 'values' of a, some candidates gave only a = 5, ignoring the other possibility $a = -5$.

Question 6

The majority of candidates began by correctly finding arccos (–0.4) (113.578...) and then proceeded to find the first angle (41.2). However, is was noted that in solving the equation $3x - 10 = 113.578..$, quite a few candidates used incorrect processing. A significant number subtracted 10 and divided by 3 and others divided by 3 and then added 10. In finding the other two angles that solved the given trigonometric equation, there were a variety of approaches including using the 'quadrant' method or by using sketches of cos x or cos ($3x$ – 10). A number of candidates found all three angles correctly and gave them to the required accuracy.

Question 7
In general, this question was very well done with many candidates scoring full marks.

Part (a) was usually correct, with most candidates realising that the required straight line *l* had to be perpendicular to the given chord. Some candidates unnecessarily found the coordinates of the point *B*, using a mid-point formula. Others, again unnecessarily, found the equation of the line *AB*. For most, part (b) provided useful verification of the accuracy of their equation of *l*, but a few persisted with a wrong *y*-coordinate for *P* despite $y = -1$ being given. Those who failed in the first two parts of the question were still able to attempt the equation of the circle in part (c). This part was, however, where many lost marks. A common mistake was to calculate the length of *PM* and to use this as the radius of the circle, and even those who correctly identified *PA* as the radius sometimes made careless sign errors in their calculations. Some candidates knew the formula $(x-a)^2 + (y-b)^2 = r^2$ but seemed unsure of how to use it, while others gave a wrong formula such as $(x-a)^2 - (y-b)^2 = r^2$ or $(x-a)^2 + (x-b)^2 = r^2$ or $(x-a) + (y-b) = r^2$. The point (3, 1) was sometimes used as the 'centre'.

Question 8
There were no problems with part (a) in most cases, but a significant number used formulae for arc length, areas of segments, or areas of triangles instead of the correct formula for the area of a sector.

The main error in part (b) was taking π rather than 2π in their calculation. Many candidates converted into and out of degrees here making their working more complicated.

The method used in (c) was correct in most cases – but there was a sizeable minority who treated BDC as a sector thus scoring 0/4. A few cases were seen where DC was taken as base of the triangle ADC, calculated (via cosine rule) along with the height (found via first calculating one of the other angles) then used in ½ x base x height – much more complicated than 1/2absinC.

Question 9
Many good sketches were seen in part (a), with a significant number of candidates constructing a table of *x* and *y*-values in order to help them sketch the correct curve. Some candidates had little idea of the shape of the curve, whilst others omitted this part completely and a significant number failed to show the curve for $x < 0$. For $x < 0$, some candidates believed the curve levelled off to give $y = 1$, whilst others showed the curve cutting through the *x*-axis. Many candidates were able to state the correct *y*-intercept of $(0, 1)$, but a few believed the intercept occurred at $(0, 7)$.

Responses to part (b) varied considerably with a number of more able candidates unable to produce work worthy of any credit. A significant number of candidates incorrectly took logs of each term to give the incorrect result of $2x\log 7 - x\log 28 + \log 3 = 0$. Some candidates provided many attempts at this part with many of them failing to appreciate that 7^{2x} is equivalent to $(7^x)^2$ and so they were not able to spot the quadratic equation in 7^x. Those candidates who wrote down the correct quadratic equation of $y^2 - 4y + 3 = 0$ proceeded to gain full marks with ease, but sometimes final answers were left as 3 and 1. Some candidates wrote down incorrect quadratic equations such as $7y^2 - 4y + 3 = 0$ or $7y^2 - 28y + 3 = 0$. Notation was confusing at times, especially where the substitution $x = 7^x$ appeared.

Question 10

In part (a) most students were able to attempt an equation with three areas and these were often correct in the un-simplified form. Students regularly used Pythagoras to find the height of the triangle in finding the area and this led to a complicated expression that was sometimes simplified incorrectly. Students chose this approach more regularly than the area formula in terms of sine. For the semi-circle, not squaring the denominator when removing the bracket led to an incorrect simplified expression. Some students gave a final answer with a subtraction inside the bracket instead of an addition.

Part (b) saw the first B1 lost with an incorrect term for the perimeter of the semi-circle for some. Students were using $2\pi r$ for the circumference but then often they used x as the radius. Most gained the M1 for the substitution. There were errors in the manipulation of the expression to reach the given equation but the most common was in expanding the bracket to reach a positive $\frac{\sqrt{3}}{2}x$ term.

In part (c) most students made a good attempt at differentiation and gained the M1 for at least one term correct (usually the x term). Many students found solving the equation difficult and errors in manipulation often led to an incorrect value for x. A large proportion of students failed to use their value of x to find the minimum value for P.

Many correct responses were seen in part (d) and students usually differentiated again successfully. Almost all substituted their value for x from part (c) but then some failed to consider the sign and/or give a conclusion.

Statistics for C2 Practice Paper Silver Level S4

Qu	Max score	Modal score	Mean %	Mean score for students achieving grade: ALL	A*	A	B	C	D	E	U
1	4	4	83	3.33	3.94	3.89	3.76	3.61	3.41	3.04	1.98
2	5		78	3.90		4.65	4.23	3.87	3.27	2.76	1.54
3	6		79	4.73		5.80	5.44	4.97	4.42	3.77	2.54
4	9		71	6.37		8.13	7.20	6.00	4.67	3.61	2.19
5	6		73	4.37	5.96	5.78	5.32	4.73	4.01	3.20	1.60
6	7	7	67	4.68	6.94	6.41	5.26	4.19	3.32	2.23	1.09
7	9		66	5.97		8.44	7.50	6.44	5.10	3.71	1.43
8	8		66	5.29		7.20	5.90	4.60	3.33	2.49	1.15
9	8		64	5.09	7.74	7.12	5.65	4.41	3.29	2.45	1.32
10	13		58.8	7.64	12.32	10.58	7.68	6.10	4.55	3.12	1.24
	75		**68.49**	**51.37**	**36.90**	**68.00**	**57.94**	**48.92**	**39.37**	**30.38**	**16.08**