FOR EDEXCEL

GCE Examinations
Advanced Subsidiary

Core Mathematics C2

Sample Paper from Solomon Press

Time: 1 hour 30 minutes

Instructions and Information

Candidates may use any calculator EXCEPT those with the facility for symbolic algebra, differentiation and / or integration.

Full marks may be obtained for answers to ALL questions.

Mathematical formulae and statistical tables are available.

This paper has nine questions.

Advice to Candidates

You must show sufficient working to make your methods clear to an examiner. Answers without working may gain no credit.

Written by Shaun Armstrong

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1. Given that the coefficient of x in the expansion of $(1 + ax)^5$ is -15,

(a) find the value of the constant a, **(2)**

(b) find the coefficient of x^2 in the expansion. **(2)**

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2.

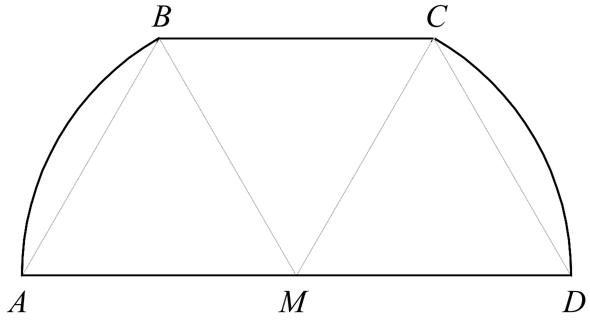

Figure 1

Figure 1 shows the shape *ABCD*. The point *M* is the mid-point of *AD* and triangles *ABM*, *BCM* and *CDM* are all equilateral. *AB* and *CD* are arcs of a circle, centre *M*.

Given that $BC = l$,

(a) find an expression in terms of l and π for the perimeter of *ABCD*, **(3)**

(b) show that the area of *ABCD* is given by $\frac{1}{12}l^2(4\pi + 3\sqrt{3})$. **(4)**

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3. $$\mathrm{f}(x) = 2x^3 - 5x^2 + kx + 3.$$

Given that when $\mathrm{f}(x)$ is divided by $(x - 2)$ the remainder is -9,

(a) find the value of the constant k. **(2)**

Given also that $\mathrm{f}(x)$ is exactly divisible by $(x - 3)$,

(b) solve the equation $\mathrm{f}(x) = 0$. **(5)**

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4. *(a)* Given that $y = \log_3 x$, find expressions in terms of y for

(i) $\log_3 (27x)$,

(ii) $\log_9 x$. **(4)**

(b) Hence, or otherwise, solve the equation

$$\log_3 (27x) + \log_9 x = 0,$$

giving your answer as an exact fraction. **(3)**

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5. Find the values of x in the interval $0 \leq x \leq 360°$ for which

$$5\sin^2 x + \sin x - \cos^2 x = 0,$$

giving your answers to 1 decimal place where appropriate. **(8)**

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6.

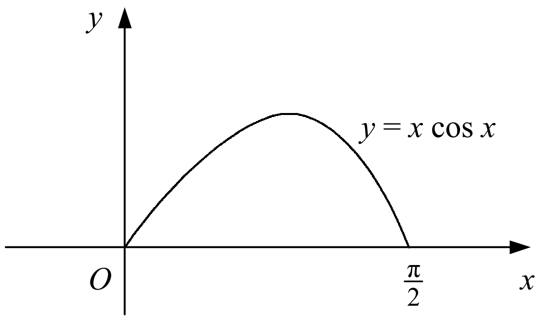

Figure 2

Figure 2 shows the curve with equation $y = x \cos x$, $0 \leq x \leq \frac{\pi}{2}$.

(a) Complete the table given below for points on the curve, giving the y values to 3 decimal places. **(2)**

(b) Use the trapezium rule with four intervals of equal width to estimate the area of the region bounded by the curve and the x-axis. **(4)**

(c) State, with a reason, whether your answer to part *(b)* is an under-estimate or an over-estimate of the true value. **(2)**

x	0	$\frac{\pi}{8}$	$\frac{\pi}{4}$	$\frac{3\pi}{8}$	$\frac{\pi}{2}$
y	0	0.363			0

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7.

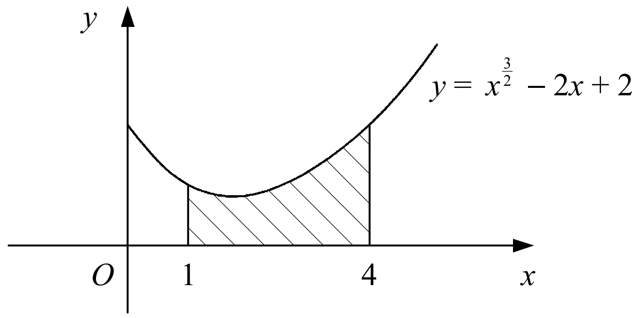

Figure 3

Figure 3 shows the curve with equation $y = x^{\frac{3}{2}} - 2x + 2$.

(a) Find the exact coordinates of the minimum point of the curve. **(5)**

The shaded region is bounded by the curve, the x-axis and the lines $x = 1$ and $x = 4$.

(b) Show that the area of the shaded region is $3\frac{2}{5}$. **(5)**

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8. *(a)* Prove that the sum, S_n, of the first n terms of a geometric series with first term a and common ratio r is given by

$$S_n = \frac{a(1-r^n)}{1-r}.$$ **(4)**

A geometric series has first term p and sum to infinity $4p$.

(b) Find the common ratio of the series. **(3)**

(c) Find the sum of the first ten terms of the series as a percentage of the sum to infinity of the series. **(4)**

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9. The points P (−8, 3), Q (4, 7) and R (6, 1) all lie on circle C.

(a) Show that $\angle PQR = 90°$. **(3)**

(b) Hence, find the coordinates of the centre of C. **(3)**

(c) Show that C has the equation

$$x^2 + y^2 + 2x - 4y - 45 = 0.$$ **(3)**

(d) Find, in the form $y = mx + c$, the equation of the tangent to C at Q. **(4)**

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