Solomon Press
Core Mathematics C2
Paper F

(Mark Scheme)

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FOR EDEXCEL

GCE Examinations

Advanced Subsidiary

Core Mathematics C2

Paper F

MARKING GUIDE

This guide is intended to be as helpful as possible to teachers by providing concise solutions and indicating how marks could be awarded. There are obviously alternative methods that would also gain full marks.

Method marks (M) are awarded for knowing and using a method.

Accuracy marks (A) can only be awarded when a correct method has been used.

(B) marks are independent of method marks.

Written by Shaun Armstrong

C2 Paper F – Marking Guide

1. *(a)* $\angle BAC = 180 - (107 + 31) = 42$ — B1

$\frac{BC}{\sin 42} = \frac{12.6}{\sin 31}$ — M1

$BC = \frac{12.6 \sin 42}{\sin 31} = 16.4$ cm (3sf) — A1

(b) $= \frac{1}{2} \times 12.6 \times 16.37 \times \sin 107 = 98.6$ cm^2 (3sf) — M1 A1 **(5)**

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2. $\int_2^3 (6\sqrt{x} - \frac{4}{\sqrt{x}})\, dx = [\, 4x^{\frac{3}{2}} - 8x^{\frac{1}{2}} \,]_2^3$ — M1 A2

$= [4(3\sqrt{3}) - 8\sqrt{3}] - [4(2\sqrt{2}) - 8\sqrt{2}]$ — M1 B1

$= (12\sqrt{3} - 8\sqrt{3}) - (8\sqrt{2} - 8\sqrt{2})$

$= 4\sqrt{3}$ $\quad [\, k = 4 \,]$ — A1 **(6)**

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3. *(a)*

x	0	0.5	1	1.5	2
$\frac{1}{x^2+1}$	1	0.8	0.5	0.3077	0.2

M1 A1

area $\approx \frac{1}{2} \times 0.5 \times [1 + 0.2 + 2(0.8 + 0.5 + 0.3077)]$ — B1 M1

$= 1.10$ (3sf) — A1

(b) area $= 8^2 \times 1.10385 = 70.6464$ — M1

volume $= 2 \times 70.6464 = 141$ cm^3 (3sf) — A1 **(7)**

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4. *(a)* $= 2^6 + 6(2^5)(y) + \binom{6}{2}(2^4)(y^2) + \binom{6}{3}(2^3)(y^3) + \ldots$ — M1 A1

$= 64 + 192y + 240y^2 + 160y^3 + \ldots$ — B1 A1

(b) let $y = x - x^2$

$(2 + x - x^2)^6 = 64 + 192(x - x^2) + 240(x - x^2)^2 + 160(x - x^2)^3 + \ldots$ — M1

$= 64 + 192(x - x^2) + 240(x^2 - 2x^3 + \ldots) + 160(x^3 + \ldots) + \ldots$ — M1

$= 64 + 192x + 48x^2 - 320x^3 + \ldots$ — A1 **(7)**

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5. *(a)* $\frac{8 \sin x}{\cos x} - 3 \cos x = 0$ — M1

$8 \sin x - 3 \cos^2 x = 0$

$8 \sin x - 3(1 - \sin^2 x) = 0$ — M1

$3 \sin^2 x + 8 \sin x - 3 = 0$ — A1

(b) $(3 \sin x - 1)(\sin x + 3) = 0$ — M1

$\sin x = -3$ (no solutions) or $\frac{1}{3}$ — A1

$x = 0.34, \pi - 0.3398$ — B1 M1

$x = 0.34, 2.80$ (2dp) — A1 **(8)**

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6. *(a)* *(i)* $= 3^1 \times 3^x = 3y$ — M1 A1

(ii) $= 3^{-1} \times (3^x)^2 = \frac{1}{3} y^2$ — M1 A1

(b) $3y - \frac{1}{3} y^2 = 6$

$y^2 - 9y + 18 = 0$

$(y - 3)(y - 6) = 0$ — M1

$y = 3, 6$ — A1

$3^x = 3, 6$

$x = 1, \frac{\lg 6}{\lg 3}$ — B1 M1

$x = 1, 1.63$ (2dp) — A1 **(9)**

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7. *(a)* $= 2 \times \sqrt{4+1} = 2\sqrt{5}$ M1 A1

(b) $(x-5)^2 + (y-2)^2 = (\sqrt{5})^2$ M1

$(x-5)^2 + (y-2)^2 = 5$ A1

(c) sub. $y = 2x - 3$ into eqn of C:

$(x-5)^2 + [(2x-3)-2]^2 = 5$ M1

$(x-5)^2 + (2x-5)^2 = 5$ A1

$x^2 - 6x + 9 = 0$

$(x-3)^2 = 0$ M1

repeated root $\therefore$ tangent A1

point of contact (3, 3) A1 **(9)**

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8. *(a)* $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} - 16x^{-3}$ M1 A2

for minimum, $\frac{1}{2}x^{-\frac{1}{2}} - 16x^{-3} = 0$ M1

$\frac{1}{2}x^{-3}(x^{\frac{5}{2}} - 32) = 0$

$x^{\frac{5}{2}} = 32$ A1

$x = (\sqrt[5]{32})^2 = 4$ M1

$\therefore$ $(4, \frac{5}{2})$ A1

(b) $= \int_1^9 (\sqrt{x} + \frac{8}{x^2})\, dx$

$= [\frac{2}{3}x^{\frac{3}{2}} - 8x^{-1}]_1^9$ M1 A2

$= (18 - \frac{8}{9}) - (\frac{2}{3} - 8)$ M1

$= 24\frac{4}{9}$ A1 **(12)**

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9. *(a)* $r = \frac{x+6}{x-2} = \frac{x^2}{x+6}$ M1

$(x+6)^2 = x^2(x-2)$ M1

$x^2 + 12x + 36 = x^3 - 2x^2$, $\quad x^3 - 3x^2 - 12x - 36 = 0$ A1

(b) when $x = 6$, LHS $= 216 - 108 - 72 - 36 = 0$ $\therefore$ $x = 6$ is a solution B1

$$
\begin{array}{r|l}
x-6 & x^2 + 3x + 6 \\
\hline
 & x^3 - 3x^2 - 12x - 36 \\
 & \underline{x^3 - 6x^2} \\
 & \quad 3x^2 - 12x \\
 & \quad \underline{3x^2 - 18x} \\
 & \quad\quad 6x - 36 \\
 & \quad\quad \underline{6x - 36} \\
 & \quad\quad\quad 0
\end{array}
$$

M1 A1

$\therefore$ $(x-6)(x^2 + 3x + 6) = 0$

$x = 6$ or $x^2 + 3x + 6 = 0$

$b^2 - 4ac = 3^2 - (4 \times 1 \times 6) = -15$ M1 A1

$b^2 - 4ac < 0$ $\therefore$ no real solutions to quadratic

$\therefore$ no other solutions A1

(c) $r = \frac{6+6}{6-2} = 3$ B1

(d) $a = 6 - 2 = 4$

$S_8 = \frac{4(3^8 - 1)}{3-1} = 13\,120$ M1 A1 **(12)**

Total **(75)**