

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.



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C2 Paper F – Marking Guide

1. (a) $\angle BAC = 180 - (107 + 31) = 42$ B1
 $\frac{BC}{\sin 42} = \frac{12.6}{\sin 31}$ M1
 $BC = \frac{12.6 \sin 42}{\sin 31} = 16.4 \text{ cm (3sf)}$ A1
- (b) $= \frac{1}{2} \times 12.6 \times 16.37 \times \sin 107 = 98.6 \text{ cm}^2 \text{ (3sf)}$ 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
 $\text{area} \approx \frac{1}{2} \times 0.5 \times [1 + 0.2 + 2(0.8 + 0.5 + 0.3077)]$ B1 M1
 $= 1.10 \text{ (3sf)}$ A1
- (b) $\text{area} = 8^2 \times 1.10385 = 70.6464$ M1
 $\text{volume} = 2 \times 70.6464 = 141 \text{ cm}^3 \text{ (3sf)}$ A1 (7)
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4. (a) $= 2^6 + 6(2^5)(y) + \binom{6}{2}(2^4)(y^2) + \binom{6}{3}(2^3)(y^3) + \dots$ M1 A1
 $= 64 + 192y + 240y^2 + 160y^3 + \dots$ B1 A1
- (b) let $y = x - x^2$
 $(2 + x - x^2)^6 = 64 + 192(x - x^2) + 240(x - x^2)^2 + 160(x - x^2)^3 + \dots$ M1
 $= 64 + 192(x - x^2) + 240(x^2 - 2x^3 + \dots) + 160(x^3 + \dots) + \dots$ M1
 $= 64 + 192x + 48x^2 - 320x^3 + \dots$ 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
 $x = 0.34, 2.80 \text{ (2dp)}$ 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
 $x = 1, 1.63 \text{ (2dp)}$ A1 (9)

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

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)

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
- $$\begin{array}{r}
 x-6 \overline{) \begin{array}{r} x^2 + 3x + 6 \\ x^3 - 3x^2 - 12x - 36 \\ \hline x^3 - 6x^2 \\ \hline 3x^2 - 12x \\ 3x^2 - 18x \\ \hline 6x - 36 \\ 6x - 36 \\ \hline 0 \end{array} \\
 \hline
 \end{array}$$
- $\therefore (x-6)(x^2 + 3x + 6) = 0$
- $x = 6$ 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)

