

**Edexcel GCE
Core Mathematics C2
Practice Paper A7
(Mark Scheme)**

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| Question number | Scheme | Marks |
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| 1. | Try to use remainder theorem i.e evaluate $f(-\frac{1}{2})$ or $f(+\frac{1}{2})$ Uses correct substitution to give $4(-\frac{1}{2})^3 + 3(-\frac{1}{2})^2 - (-\frac{1}{2}) - 6 = 4\frac{3}{4}$ | M1 M1 A1 (3) (3 marks) |
| 2. | Either Obtains centre (0, 6.5) f.t on $\frac{1}{a}$ Finds radius or diameter by Pythagoras Theorem, to obtain $r = 2.5$ or $r^2 = 6.25$ $x^2 + (y - 6.5)^2 = 2.5^2$ or $x^2 + y^2 - 13y + 36 = 0$ | B1 M1 A1 B1 (4) |
| | Or $\frac{y-8}{x+2} \times \frac{y-5}{x-2} = -1$ Gradients multiplied and put = to -1 $x^2 + y^2 - 13y + 36 = 0$ | B1 M1 A1 B1 (4) |
| | Or Obtains centre (0, 6.5) $x^2 + (y - 6.5)^2 = r^2$ or $x^2 + y^2 - 13y + c = 0$ substitutes either (2 , 5) or (-2 , 8) $x^2 + (y - 6.5)^2 = 2.5^2$ or $x^2 + y^2 - 13y + 36 = 0$ | B1 B1 M1 A1 (4) (4 marks) |
| 3. | (a) $f(-2) = (-2)^3 - (19 \times -2) - 30$ M: Evaluate $f(-2)$ or $f(2)$ $f(-2) = 0,$ so $(x + 2)$ is a factor <u>Alternative:</u> $(x^3 - 19x - 30) \div (x + 2) = (x^2 + ax + b), a \neq 0, b \neq 0$ [M1] $= (x^2 - 2x - 15),$ so $(x + 2)$ is a factor [A1] (b) $(x^3 - 19x - 30) = (x + 2)(x^2 - 2x - 15)$ $= (x + 2)(x + 3)(x - 5)$ | M1 A1 (2) M1 A1 M1 A1 (4) (6 marks) |

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| 4. | $\frac{3}{x(x+2)} + \frac{x-4}{(x+2)(x-2)}$ $= \frac{3(x-2) + x(x-4)}{x(x+2)(x-2)}$ $= \frac{(x-3)(x+2)}{x(x+2)(x-2)}$ | B1 B1 M1 A1 M1 A1 A1 (7) (7 marks) |
| 5. | $2 \cos^2 \theta - \cos \theta - 1 = 1 - \cos^2 \theta$ $3 \cos^2 \theta - \cos \theta - 2 = 0$ $(3 \cos \theta + 2)(\cos \theta - 1) = 0 \quad \cos \theta = -\frac{2}{3} \text{ or } 1$ $\theta = 0 \quad \theta = 131.8^\circ$ $\theta = (360 - "131.8")^\circ = 228.2^\circ$ | M1 A1 M1 A1 B1 A1 M1 A1 ft (8 marks) |
| 6. | <p>(a) $S = a + ar + ar^2 + \dots + ar^{n-1}$ $rS = ar + ar^2 + \dots + ar^n$ Subtract: $S(1-r) = a(1-r^n) \quad S = \frac{a(1-r^n)}{1-r}$</p> <p>(b) $ar = 3 \quad ar^3 = 1.08$ Divide: $r^2 = 0.36 \quad r = 0.6$ $a = 6 \div 1.2 = 5$</p> <p>(c) $S = \frac{5}{1-0.6}$ $= 12.5$</p> | B1 M1 M1 A1 (4) B1 B1 M1 A1 A1 (5) M1 A1 ft A1 (3) (12 marks) |

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| <p>7. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p> <p>(e)</p> | <p>$l = (50 - 2x) \quad w = (40 - 2x)$</p> <p>$V = x(50 - 2x)(40 - 2x) \quad V = xlw$</p> <p>$V = x(2000 - 80x - 100x + 4x^2) = 4x(x^2 - 45x + 500) \quad (*)$</p> <p>$0 < x < 20 \quad (\text{accept } \leq)$</p> <p>$\frac{dV}{dx} = 12x^2 - 360x + 2000 \quad (\text{accept } \div 4)$</p> <p>$\frac{dV}{dx} = 0 \Rightarrow 3x^2 - 90x + 500 = 0 \Rightarrow x = \frac{90 \pm \sqrt{8100 - 6000}}{6}$</p> <p>$x = (22.6), \quad \text{required } x = 7.36 \text{ or } 7.4 \text{ or } 7.362$</p> <p>$V_{\max} = 4 \times 7.36(7.36^2 \dots), = 6564 \text{ or } 6560 \text{ or } 6600$</p> <p>e.g. $V'' = 24x - 360 \big _{x=7.36} (= -183 \dots) < 0, \therefore \text{maximum}$</p> | <p>B1</p> <p>M1</p> <p>A1 cso (3)</p> <p>B1 (1)</p> <p>M1, A1</p> <p>M1 (dV/dx = 0 & attempt to solve)</p> <p>A1 (4)</p> <p>M1, A1 (2)</p> <p>M1 full method A1 full accuracy (2)</p> <p>(12 marks)</p> |
| <p>8. (a)</p> <p>(b)</p> <p>(c)</p> | <p>$\frac{1}{2}r^2\theta = \frac{1}{2} \times 6.5^2 \times 0.8 = 16.9 \quad (\text{a.w.r.t. if changed to degrees})$</p> <p>$\sin 0.4 = \frac{x}{6.5}, x = 6.5 \sin 0.4, (\text{where } x \text{ is half of } AB) \quad (\text{n.b. } 0.8 \text{ rad} = 45.8^\circ)$</p> <p>$AB = 2x = 5.06 \quad (\text{a.w.r.t.}) \quad (*)$</p> <p><u>Alternative:</u> $AB^2 = 6.5^2 + 6.5^2 - 2 \times 6.5 \times 6.5 \cos 0.8 \quad [M1]$</p> <p>$AB = \sqrt{6.5^2 + 6.5^2 - 2 \times 6.5 \times 6.5 \cos 0.8} \quad [A1]$</p> <p>$AB = 5.06 \quad [A1]$</p> <p>$r\theta + 5.06 = (6.5 \times 0.8) + 5.06 = 10.26 \quad (\text{a.w.r.t.}) \quad (\text{or } 10.3)$</p> | <p>M1 A1 (2)</p> <p>M1, A1</p> <p>A1 (3)</p> <p>[M1]</p> <p>[A1]</p> <p>[A1]</p> <p>M1 A1 (2)</p> <p>(7 marks)</p> |

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| 7. (a) | $x + 1 = 6x - x^2 - 3$ $x^2 - 5x + 4 = 0 \quad (x - 1)(x - 4) \quad (\text{or use of formula}) x =$ $x = 1 \quad x = 4$ $y = 2 \quad y = 5$ | M1 M1 A1 M1 A1 (5) |
| (b) | $\int (6x - x^2 - 3)dx = 3x^2 - \frac{x^3}{3} - 3x$ <p>Limits x_A and x_B: $(48 - \frac{64}{3} - 12) - (3 - \frac{1}{3} - 3) (= 15)$</p> <p>Trapezium: $\frac{1}{2}(2 + 5) \times 3 = 10.5$</p> <p>Area of R $15 - 10.5 = 4.5$</p> <hr/> <p>Alternative for (b)</p> $(6x - x^2 - 3) - (x + 1) = 5x - x^2 - 4$ $\int (5x - x^2 - 4) dx = \frac{5x^2}{2} - \frac{x^3}{3} - 4x$ <p>Limits x_A and x_B: $(40 - \frac{64}{3} - 16) - (\frac{5}{2} - \frac{1}{3} - 4), = 4.5$</p> | M1 A1 M1 A1 ft M1 A1, A1 (7) (12 marks) |