

EDEXCEL PURE MATHEMATICS C2 (6664)SPECIMEN PAPER MARK SCHEME

| Question number | Scheme | Marks |
|-----------------|--|---|
| 1. | $(2 + 3x)^6 = 2^6 + 6 \cdot 2^5 \times 3x + \binom{6}{2} 2^4 (3x)^2$ $= 64, + 576x, + 2160x^2$ | <p>>1 term correct M1</p> <p>B1 A1 A1 (4 marks)</p> |
| 2. | $r = \sqrt{(8-3)^2 + (-8-4)^2}, = 13$ <p>Equation: $(x - 3)^2 + (y - 4)^2 = 169$</p> | <p>Method for r or r^2 M1 A1</p> <p>ft their r M1 A1ft (4 marks)</p> |
| 3. | <p>(a) $(x = 2.5) \quad y = 4.077 \quad (x = 3) \quad y = 5.292$</p> <p>(b) $A \approx \frac{1}{2} \times \frac{1}{2} [1.414 + 5.292 + 2(2.092 + 3.000 + 5.292)]$</p> $= 6.261 \quad = 6.26 \text{ (2 d.p.)}$ | <p>B1 B1 (2)</p> <p>For $\frac{1}{2} \times \frac{1}{2}$ B1</p> <p>ft their y values M1 A1ft</p> <p>A1 (4) (6 marks)</p> |
| 4. | $3(1 - \cos^2 x) = 1 + \cos x$ $0 = 3 \cos^2 x + \cos x - 2$ $0 = (3 \cos x - 2)(\cos x + 1)$ $\cos x = \frac{2}{3} \text{ or } -1$ $\cos x = \frac{2}{3} \text{ gives } x = 48^\circ, 312^\circ$ $\cos x = -1 \text{ gives } x = 180^\circ$ | <p>Use of $s^2 + c^2 = 1$ M1</p> <p>3TQ in $\cos x$ M1</p> <p>Attempt to solve M1</p> <p>Both A1</p> <p>B1, B1ft</p> <p>B1 (7 marks)</p> |
| 5. | <p>(a) Arc length = $r\theta = 8 \times 0.9 = 7.2$</p> <p>Perimeter = $16 + r\theta = 23.2$ (mm)</p> <p>(b) Area of triangle = $\frac{1}{2} \cdot 8^2 \cdot \sin(0.9) = 25.066$</p> <p>Area of sector = $\frac{1}{2} \cdot 8^2 \cdot (0.9) = 28.8$</p> <p>Area of segment = $28.8 - 25.066 = 3.7(33..)$</p> <p>Area of badge = triangle – segment, = 21.3 (mm²)</p> | <p>M1 for use of $r\theta$ M1</p> <p>A1 (2)</p> <p>M1</p> <p>M1</p> <p>A1ft</p> <p>M1, A1 (5) (7 marks)</p> |

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| <p>6. (a)</p> <p>(b)</p> <p>(c)</p> | <p>$15000 \times (0.8)^2 = 9600$ (*)</p> <p>$15000 \times (0.8)^n < 500$</p> <p>$n \log(0.8) < \log(\frac{1}{30})$</p> <p>$n > 15.(24\dots)$</p> <p>So machine is replaced in 2015</p> <p>$a = 1000, r = 1.05, n = 16$ (≥ 2 correct)</p> <p>$S_{16} = \frac{1000(1.05^{16} - 1)}{1.05 - 1}$</p> <p>$= 23\ 657.49 = \pounds 23\ 700$ or $\pounds 23\ 660$ or $\pounds 23657$</p> | <p>M1 for \times by 0.8</p> <p>Suitable equation or inequality</p> <p>Take logs</p> <p>$n =$ is OK</p> <p>M1 A1 cso (2)</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>A1 (4)</p> <p>M1</p> <p>M1 A1</p> <p>A1 (4)</p> <p>(10 marks)</p> |
| <p>7. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p> | <p>$f(-1) = -1 - 1 + 10 - 8$</p> <p>$= 0$ so $(x + 1)$ is a factor</p> <p>$x^3 - x^2 = 2(5x + 4)$</p> <p>i.e. $x^3 - x^2 - 10x - 8 = 0$ (*)</p> <p>$x = -1, -2, 4$</p> <p>$\log_2 x^2 + \log_2(x - 1) = 1 + \log_2(5x + 4)$</p> <p>$\log_2 \left(\frac{x^2(x - 1)}{5x + 4} \right) = 1$</p> <p>$x = 4$, since $x < 0$ is not valid in logs</p> | <p>$f(+1)$ or $f(-1)$</p> <p>$= 0$ and comment</p> <p>Out of logs</p> <p>A1 cso (4)</p> <p>Use of $\log x^n$</p> <p>Use of $\log a + \log b$</p> <p>M1</p> <p>A1</p> <p>A2(1, 0) (4)</p> <p>M1</p> <p>M1</p> <p>B1, B1 (2)</p> <p>(12 marks)</p> |

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| <p>8. (a) $x^2 - 3x + 8 = x + 5$ $x^2 - 4x + 3 = 0$ $0 = (x - 3)(x - 1)$ <i>A</i> is (1, 6); <i>B</i> is (3, 8)</p> <p>(b) $\int (x^2 - 3x + 8) dx = \left[\frac{x^3}{3} - \frac{3x^2}{2} + 8x \right]$ Area below curve = $(9 - \frac{27}{2} + 24) - (\frac{1}{3} - \frac{3}{2} + 8) = 12\frac{2}{3}$ Trapezium = $\frac{1}{2} \times 2 \times (6 + 8) = 14$ Area = Trapezium - Integral, = $14 - 12\frac{2}{3} = 1\frac{1}{3}$</p> | <p>Line = curve 3TQ = 0 Solving Integration Use of Limits</p> | <p>M1 M1 M1 A1; A1 (5) M1 A2(1,0) M1 B1 M1, A1 (7) (12 marks)</p> |
| <p>ALT (b) $-x^2 + 4x - 3$ $\int (-x^2 + 4x - 3) dx = \left[-\frac{x^3}{3} + 2x^2 - 3x \right]$ Area = $\int_1^3 (...) dx = (-9 + 18 - 9) - (-\frac{1}{3} + 2 - 3)$ $= 1\frac{1}{3}$</p> | <p>Line - curve Integration Use of limits</p> | <p>M1 M1 A2(1,0) M1 A2 (7)</p> |

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| 9 | (a) $A = \frac{1}{2}(x+1)(4-x)^2 \sin 30^\circ$ | Use of $\frac{1}{2}ab \sin C$ M1 |
| | $= \frac{1}{4}(x+1)(16-8x+x^2)$ | Attempt to multiply out. M1 |
| | $= \frac{1}{4}(x^3 - 7x^2 + 8x + 16) \quad (*)$ | A1 cso (3) |
| | (b) $\frac{dA}{dx} = \frac{1}{4}(3x^2 - 14x + 8)$ | Ignore the $\frac{1}{4}$ M1 A1 |
| | $\frac{dA}{dx} = 0 \Rightarrow (3x-2)(x-4) = 0$ | M1 |
| | So $x = \frac{2}{3}$ or 4 | At least $x = \frac{2}{3}$ or... A1 |
| | e.g. $\frac{d^2A}{dx^2} = \frac{1}{4}(6x-14)$, when $x = \frac{2}{3}$ it is < 0 , so maximum | Any full method M1 |
| | So $x = \frac{2}{3}$ gives maximum area (*) | Full accuracy A1 (6) |
| | (c) Maximum area $= \frac{1}{4}(\frac{5}{3})(\frac{10}{3})^2 = 4.6$ or 4.63 or 4.630 | B1 (1) |
| | (d) Cosine rule: $QR^2 = (\frac{5}{3})^2 + (\frac{10}{3})^2 - 2 \times \frac{5}{3} \times (\frac{10}{3})^2 \cos 30^\circ$ | M1 for QR or QR^2 M1 A1 |
| | $= 94.159\dots$ | |
| | $QR = 9.7$ or 9.70 or 9.704 | A1 (3) |
| | | (13 marks) |