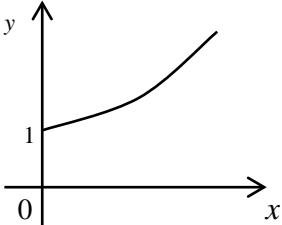


**Edexcel GCE
Core Mathematics C2
Practice Paper A4
(Mark Scheme)**

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Question number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	<p>$f(-3) = -27 - 27 + 30 + 24 = 0 \Rightarrow (x + 3)$ is factor</p> <p>$(x + 3)(x^2 - 6x + 8)$</p> <p>$(x + 3)(x - 2)(x - 4)$</p>	<p>M1 A1 (2)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>(6 marks)</p>
<p>2. (a)</p> <p>(b)</p>	<p>Using $f(\pm 2) = 3$</p> <p>Showing that $p = 6$ (*), with no wrong working seen.</p> <p>S.C. If $p = 6$ used and the remainder is shown to be 3 award B1</p> <p>Attempt to find quotient when dividing $(n + 2)$ into $f(n)$ or attempting to equate coefficients.</p> <p>Quotient = $n^2 + 4n + 3$, or finding either $q = 1$ or $r = 3$</p> <p>Finding both $q = 1$ and $r = 3$</p> <p>The product of three consecutive numbers must be divisible by 3</p> <p>Complete argument</p>	<p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>A1</p> <p>A1 (3)</p> <p>M1</p> <p>A1 (2)</p> <p>(7 marks)</p>
<p>3.</p>	<p>$2 \sin^2 \theta - 2 \sin \theta = 1 - \sin \theta$</p> <p>$3 \sin^2 \theta - 2 \sin \theta - 1 = 0$</p> <p>$(3 \sin \theta + 1)(\sin \theta - 1) = 0$ (or attempt by formula)</p> <p>$\sin \theta = \frac{1}{3}$ $\sin \theta = 1$</p> <p>$\theta = -19.5^\circ - 160.5^\circ 90^\circ$</p>	<p>M1</p> <p>A1</p> <p>M1 A1 ft</p> <p>A1</p> <p>A1 A1ft A1 (8)</p> <p>(8 marks)</p>
<p>4. (a)</p> <p>(b)</p> <p>(c)</p>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>shape</p> <p>domain, intercept</p> </div> </div> <p>cao</p>	<p>B1</p> <p>B1 (2)</p> <p>M1 A1 (2)</p> <p>M1</p> <p>M1 A1 (3)</p> <p>(7 marks)</p>

Question number	Scheme	Marks
<p>5. (a)</p> <p>(b)</p>	<p>$(0, 2)$ on $C \Rightarrow 2 = p + q$ Use of $(0, 2)$ equation in p and q</p> <p>$\frac{dy}{dx} = qe^x$, at $p \Rightarrow 5 = 2q$</p> <p>Solving $\Rightarrow q = 2.5, p = -0.5$ (or $2 - q$)</p> <p>Gradient of normal at P is $-\frac{1}{5}$</p> <p>Equation of normal at P is: $y - (p + 2q) = -\frac{1}{5}(x - \ln 2)$</p> <p>at L $y = 0 \quad \therefore x_L = 22.5 + \ln 2$ or $5(p + 2q) + \ln 2$ or $23.19\dots$</p> <p>at M $x = 0 \quad \therefore y_M = 4.5 + \frac{1}{5} \ln 2$ or $p + 2q + \frac{1}{5} \ln 2$ or $4.639\dots$</p> <p>Area of triangle OLM is: $\frac{1}{2} x_L \times y_M = 53.792\dots \approx 53.8$</p>	<p>M1</p> <p>M1, A1</p> <p>A1, A1 (5)</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>M1, A1 cso (5)</p> <p>(10 marks)</p>
<p>6. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>Solve $\frac{3}{2}x^2 - \frac{1}{4}x^3 = 0$ to find $p = 6$, or verify: $\frac{3}{2} \times 6^2 - \frac{1}{4} \times 6^3 = 0$ (*)</p> <p>$\frac{dy}{dx} = 3x - \frac{3x^2}{4}$</p> <p>$m = -9,$ $y - 0 = -9(x - 6)$ (Any correct form)</p> <p>$3x - \frac{3x^2}{4} = 0,$ $x = 4$</p> <p>$\int \left(\frac{3x^2}{2} - \frac{x^3}{4} \right) dx = \frac{x^3}{2} - \frac{x^4}{16}$ (Allow unsimplified versions)</p> <p>$[\dots\dots]_0^6 = \frac{6^3}{2} - \frac{6^4}{16} = 27$ M: Need 6 and 0 as limits.</p>	<p>B1 (1)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>M1, A1ft (2)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>(11 marks)</p>

Question number	Scheme	Marks
<p>7. (a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<p>Area of $X = 2d^2 + \frac{1}{2} \pi d^2$, Area of $Y = \frac{1}{2} (4d^2)\theta$</p> <p>Equate and divide by d^2: $2 + \frac{1}{2} \pi = 2\theta$, $\theta = 1 + \frac{1}{4} \pi$ *</p> <p>$12 + 3\pi$</p> <p>$4d + r\theta = 12 + 6(1 + \frac{1}{4} \pi) = 18 + \frac{3}{2} \pi$</p> <p>X: $12 + 3\pi = 21.425$ cm, Y: $18 + \frac{3}{2} \pi = 22.712$ cm</p> <p>Difference = 13 mm (or 12.9 mm) or 12.88 mm</p>	<p>B1, M1 A1</p> <p>M1 A1 (5)</p> <p>B1 B1 (2)</p> <p>M1, A1, A1 (3)</p> <p>M1 A1 (2)</p> <p>(12 marks)</p>
<p>8. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$f(x) = \dots + \binom{n}{2} \frac{x^2}{k^2} + \binom{n}{3} \frac{x^3}{k^3}$</p> <p>$2 \times \frac{n(n-1)}{2k^2} = \frac{n(n-1)(n-2)}{6k^3}$</p> <p>$6k = n - 2$ or $n = 6k + 2$ *</p> <p>$\frac{n(n-1)(n-2)(n-3)}{4! k^4} = \frac{n(n-1)(n-2)(n-3)(n-4)}{5! k^5} \Rightarrow 5k = n - 4$</p> <p>Solving: $5k = 6k + 2 - 4, \Rightarrow k = 2$ and $n = 14$ *</p> <p>$(1 + \frac{x}{2})^{14} = 1 + 7x + \binom{14}{2} \frac{x^2}{2} + \binom{14}{3} \left(\frac{x^3}{3}\right) + \binom{14}{4} \frac{x^4}{16} + \binom{14}{5} \frac{x^5}{32} \dots$</p> <p>$= 1 + 7x + \frac{91}{4} x^2 + \frac{91}{2} x^3 + \frac{1001}{16} x^4 + \frac{1001}{16} x^5$</p>	<p>M1</p> <p>M1</p> <p>A1 cso (3)</p> <p>M1 A1</p> <p>M1, A1 cso (4)</p> <p>M1</p> <p>B1, A1, A1 (4)</p> <p>(11 marks)</p>