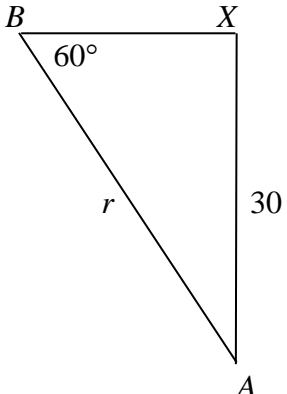


Question number	Scheme	Marks
1.	Try to use remainder theorem ie evaluate $f(-\frac{1}{2})$ or $f(+\frac{1}{2})$ Uses correct substitution to give $4(-\frac{1}{2})^3 + 3(-\frac{1}{2})^2 - 2(-\frac{1}{2}) - 6 = -4\frac{3}{4}$	M1 M1 A1 (3 marks)
2. (a) (b)	$\sin 2\theta \div \cos 2\theta = \tan 2\theta, \quad \tan 2\theta = 0.5 \quad *$ $\tan 2\theta = 0.5 \quad 2\theta = 26.6^\circ$ $2\theta = 206.6,$ $386.6, 566.6$ $\theta = 13.3. 103.3. 193.3. 283.3$ One more soln. other 2 solus in range	M1 (1) B1 B1ft B1 ft M1 A1 (5) (6 marks)
3. (a) (b)	$4^x = (2^x)^2 = u^2$ or $2^{(x+1)} = 2 \cdot 2^x = 2u, \rightarrow u^2 - 2u - 15 (=0)$ $u^2 - 2u - 15 = (u-5)(u+3)$ $u = 5 \Rightarrow 2^x = 5 \Rightarrow x = \frac{\log 5}{\log 2}, = 2.32$ [Ignore any other solution]	M1, A1 c.s.o (2) M1, A1 M1, A1 (4) (6 marks)
4. (a) (b) (c)	 $\sin 60^\circ = \frac{3}{r}$ or $r = 2x, 4x^2 = x^2 + 3^2, x = \sqrt{3}$ $r = \frac{6}{\sqrt{3}}$ or $r = 2\sqrt{3}$ Area = $\frac{1}{2} r^2 \theta^c$ or $\frac{\theta^\circ}{360^\circ} \times \pi r^2 =, \frac{1}{6} \times \pi \times 12 = 2\pi$ (cm ²) Arc = $r^2 \theta^c$ or $\frac{\theta^\circ}{360^\circ} \times 2\pi r =, \frac{1}{6} \times 2\pi \times 2\sqrt{3}$ Perimeter = Arc + 2r =, $\frac{2\sqrt{3}}{3} \pi + 2 \times 2\sqrt{3} = \frac{2\sqrt{3}}{3} (\pi + 6)$ (cm) (*)	M1 A1 (2) M1, A1 (2) M1 M1, A1 cso (3) (7 marks)

Question number	Scheme	Marks
<p>5. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$(x - 3)^2 + (y - 4)^2 = 18$</p> <p>Use $y = x + 3$ to obtain $(x - 3)^2 + (x - 1)^2 = 18$</p> <p>And thus $2x^2 - 8x = 8$</p> <p>Solve quadratic, to obtain $x = 2 \pm \sqrt{8}$, $y = 5 \pm \sqrt{8}$</p> <p>Distance = $\sqrt{((2\sqrt{8})^2 + (2\sqrt{8})^2)} = 8$</p>	<p>M1 A1 (2)</p> <p>M1</p> <p>A1</p> <p>M1, A1ft, A1ft (5)</p> <p>M1 A1 cso (2)</p> <p>(9 marks)</p>
<p>6. (a)</p> <p>(b)</p> <p>(c)</p>	<p>$u_2 = 2p + 5$</p> <p>$u_3 = p(2p + 5) + 5$</p> <p>$8 = 2p^2 + 5p + 5$ or $2p^2 + 5p - 3 = 0$</p> <p>$(2p - 1)(p + 3) = 0$</p> <p>$P = -3$, or $\frac{1}{2}$</p> <p>$\log_2 \left(\frac{1}{2}\right) = \log_2 2^{-1} = -1$</p> <p>$\log_2 \left(\frac{p^3}{\sqrt{q}}\right) = \log_2 p^3 - \log_2 \sqrt{q}$</p> <p>$b$</p> <p>$= 3\log_2 p - \frac{1}{2} \log_2 q$</p> <p>$= -3 - \frac{1}{2} t$</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1, B1 cso (5)</p> <p>B1 (1)</p> <p>Use of $\log a - \log$</p> <p>M1</p> <p>Use of $\log a^n$</p> <p>M1</p> <p>accept $3 \log_2 p - \frac{1}{2} t$</p> <p>A1 ft (3)</p> <p>(9 marks)</p>

Question number	Scheme	Marks
<p>7. (a)</p> <p>(b)</p>	$x + 1 = 6x - x^2 - 3$ $x^2 - 5x + 4 = 0 \quad (x - 1)(x - 4)$ $x = 1 \quad x = 4$ $y = 2 \quad y = 5$ $\int (6x - x^2 - 3)dx = 3x^2 - \frac{x^3}{3} - 3x$ Limits x_A and x_B : $(48 - \frac{64}{3} - 12) - (3 - \frac{1}{3} - 3) \quad (= 15)$ Trapezium: $\frac{1}{2}(2 + 5) \times 3 = 10.5$ Area of $R = 15 - 10.5 = 4.5$	<p>M1</p> <p>M1</p> <p>A1</p> <p>M1 A1 (5)</p> <p>M1 A1</p> <p>M1 A1</p> <p>B1ft</p> <p>M1 A1 (7)</p> <p>(12 marks)</p>
<p>8. (a)</p> <p>(b)</p> <p>(c)</p>	$f(x) = \dots + \binom{n}{2} \frac{x^2}{k^2} + \binom{n}{3} \frac{x^3}{k^3} \dots$ $2 \times \frac{n(n-1)}{2k^2} = \frac{n(n-1)(n-2)}{6k^3}$ $\Rightarrow 6k = n - 2 \quad \text{or } n = 6k + 2 \quad *$ $\frac{n(n-1)(n-2)(n-3)}{4! k^4} = \frac{n(n-1)(n-2)(n-3)(n-4)}{5! k^5}, \Rightarrow 5k = n - 4 \quad (\text{oe})$ Solving: $5k = 6k + 2 - 4, \Rightarrow k = 2 \text{ and } n = 14 \quad *$ $(1 + \frac{x}{2})^{14} = 1 + 7x + \binom{14}{2} \frac{x^2}{4} + \binom{14}{3} \frac{x^3}{8} + \binom{14}{4} \frac{x^4}{16} + \binom{14}{5} \frac{x^5}{32} \dots$ $= 1 + 7x + \frac{91}{4}x^2 + \frac{91}{2}x^3 + \frac{1001}{16}x^4 + \frac{1001}{16}x^5 \dots$	<p>M1</p> <p>M1</p> <p>A1 c.s.o (3)</p> <p>M1, A1</p> <p>M1, A1 cso (4)</p> <p>M1 (\geq correct)</p> <p>B1, A1, A1 (4)</p> <p>(11 marks)</p>

Question number	Scheme	Marks
<p>9. (a)</p> <p>$l = (50 - 2x) \quad w = (40 - 2x)$</p> <p>$V = x(50 - 2x)(40 - 2x)$</p> <p>$xlw$</p> <p>$V = x(2000 - 80x - 100x + 4x^2) = 4x(x^2 - 45x + 500) \quad (*)$</p>	<p>$V =$</p> <p>(accept</p> <p>(accept ÷</p>	<p>B1</p> <p>M1</p> <p>A1 cso (3)</p>
(b)	<p>$0 < x < 20$</p> <p>\leq</p>	<p>(1)</p>
(c)	<p>$\frac{dV}{dx} = 12x^2 - 360x + 2000$</p> <p>4)</p> <p>$\frac{dV}{dx} = 0 \Rightarrow 3x^2 - 90x + 500 = 0 \Rightarrow x = \frac{90 \pm \sqrt{8100 - 6000}}{6}$</p> <p>$x = (22.6),$ required $x = 7.36$ or 7.4 or 7.362</p>	<p>M1, A1</p> <p>M1 (dV/dx = 0 & attempt to solve)</p> <p>A1 (4)</p>
(d)	<p>$V_{\max} = 4 \times 7.36(7.36^2 \dots), = 6564$ or 6560 or 6600</p>	<p>M1, A1 (2)</p>
(e)	<p>e.g. $V'' = 24x - 360 \Big _{x=7.36} (= -183 \dots) < 0, \therefore$ maximum</p>	<p>M1 full method</p> <p>A1 full accuracy</p> <p>(2)</p> <p>(12 marks)</p>