

[C100/SQP248]

Higher
Mathematics

Units 1, 2 and 3

Paper 2

Specimen Marking Instructions (**Revised**)

NATIONAL
QUALIFICATIONS

Note: In the Specimen Marking Instructions the Marking Scheme indicates which marks awarded are strategy marks (st), which marks awarded are processing marks (pr) and which marks awarded are interpretation and communication marks (ic).

Qu	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
1	ans: $y = -2x - 5$ 4 marks <ul style="list-style-type: none"> •¹ st: know to use gradient formula •² pr: use gradient formula •³ ic: know parallel lines have equal gradients •⁴ ic: state equation of st. line 	<ul style="list-style-type: none"> •¹ $m = \frac{y_2 - y_1}{x_2 - x_1}$ •² $m_{AB} = 2$ •³ $m_{DC} = 2$ •⁴ $y - 11 = 2(x - 8)$
2	ans: Pestkill 6 marks <ul style="list-style-type: none"> •¹ ic: state the scaling factor •² ic: interpret the constant in recurrence relation •³ ic: state recurrence relation •⁴ st: know how to find limit •⁵ pr: complete strategy for limits •⁶ ic: limit condition & conclusion 	<ul style="list-style-type: none"> •¹ 0.4 •² $au_n + 300$ •³ $0.2u_n + 360$ •⁴ eg $L = aL + b$ •⁵ 500 and 450 •⁶ limits are valid since $a < 1$ in both cases and Pestkill more effective
3a	ans: $2(x + 2)^2 - 11$ 3 marks <ul style="list-style-type: none"> •¹ pr: start with a eg $2(x^2 + 4x)$ •² pr: continue for b eg $2(x + 2)^2$ •³ pr: complete by finding c 	<ul style="list-style-type: none"> •¹ $a = 2$ •² $b = 2$ •³ $c = -11$
3b	ans: $(-2, 11)$ 1 mark <ul style="list-style-type: none"> •⁴ ic: state turning point of $a(x + b)^2 + c$ 	<ul style="list-style-type: none"> •⁴ $(-2, 11)$

Qu	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
5a	ans: 9 4 marks <ul style="list-style-type: none"> •¹ ic: interpret lengths and angle •² pr: evaluate scalar product •³ st: know to use distributive law •⁴ pr: evaluate scalar product & complete 	<ul style="list-style-type: none"> •¹ $\mathbf{p} = \mathbf{q} = 3, \quad \widehat{VAD} = 60^\circ$ •² $\frac{9}{2}$ •³ $\mathbf{p} \cdot \mathbf{q} + \mathbf{p} \cdot \mathbf{r}$ •⁴ 9
5b	ans: proof 4 marks <ul style="list-style-type: none"> •⁵ ic: interpret 3D representation •⁶ st: know to use approp. scalar product •⁷ st: know to use distributive law •⁸ pr: evaluate scalar product & complete 	<ul style="list-style-type: none"> •⁵ $\mathbf{p} - \mathbf{q} - \mathbf{r}$ •⁶ $\mathbf{p} \cdot (\mathbf{p} - \mathbf{q} - \mathbf{r})$ •⁷ $\mathbf{p} \cdot \mathbf{p} - \mathbf{p} \cdot (\mathbf{q} + \mathbf{r})$ •⁸ 0
6a	ans: $\sqrt{13}\cos(x - 56 \cdot 3)^\circ$ 4 marks <ul style="list-style-type: none"> •¹ ic: state expansion •² ic: compare & equate coefficients •³ pr: solve for k •⁴ pr: solve for α 	<ul style="list-style-type: none"> •¹ $k \cos x \cos \alpha + k \sin x \sin \alpha$ explicitly stated •² $k \cos \alpha = 2$ and $k \sin \alpha = 3$ explicitly stated •³ $k = \sqrt{13}$ •⁴ $\alpha = 56 \cdot 3$
6b	ans: 138.8, 334.3 3 marks <ul style="list-style-type: none"> •⁵ st: know how to solve trig. equation •⁶ pr: solve for $x - \alpha$ •⁷ pr: complete solving process 	<ul style="list-style-type: none"> •⁵ $\cos(x - 56 \cdot 3)^\circ = \frac{0 \cdot 5}{\sqrt{13}}$ •⁶ $x - 56 \cdot 3 = 82 \cdot 0, 278 \cdot 0$ •⁷ $x = 138 \cdot 3, 334 \cdot 3$
6c	ans: 146.3° 2 marks <ul style="list-style-type: none"> •⁸ st: know how to set function = 0 •⁹ pr: complete solving process 	<ul style="list-style-type: none"> •⁸ $\sqrt{13} \cos(x - 56 \cdot 3)^\circ = 0$ •⁹ $x = 146 \cdot 3$

Qu	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •
7a	ans: proof 3 marks <ul style="list-style-type: none"> •¹ st: know to use approp. trig. rule •² st: know to use approp. trig. rule •³ ic: complete the proof 	<ul style="list-style-type: none"> •¹ substitute $1 - 2 \sin^2 x^\circ$ for $\cos 2x^\circ$ •² substitute $1 - \sin^2 x^\circ$ for $\cos^2 x^\circ$ •³ complete proof
7b	ans: 19.5 4 marks <ul style="list-style-type: none"> •⁴ st: know to express in standard form •⁵ pr: factorise quadratic •⁶ pr: continue solving process •⁷ ic: complete solving process 	<ul style="list-style-type: none"> •⁴ $3 \sin^2 x^\circ + 2 \sin x^\circ - 1 = 0$ •⁵ $(3 \sin x^\circ - 1)(\sin x^\circ + 1) = 0$ •⁶ $x = \frac{1}{3}$ and $x = -1$ •⁷ $x = 19.5$ and no other answers
8	ans: $k = -5$ or 3 5 marks <ul style="list-style-type: none"> •¹ st: know to express in standard form •² st: know condition for equal roots •³ pr: apply the strategy •⁴ pr: start the solving process •⁵ pr: complete the solving process 	<ul style="list-style-type: none"> •¹ $x^2 + kx - x + 4 - k = 0$ •² $b^2 - 4ac = 0$ •³ $(k - 1)^2 - 4(4 - k)$ •⁴ $k^2 + 2k - 15 = 0$ •⁵ $k = -5, k = 3$

Qu	Marking Scheme Give 1 mark for each •	Illustrations of evidence for awarding a mark at each •												
9ai	ans: $h = \frac{1}{2}(10 - \pi x - 2x)$ 2 marks <ul style="list-style-type: none"> •¹ st: know to form equ. for perimeter •² pr: make h the subject 	<ul style="list-style-type: none"> •¹ eg $2h + 2x + \text{semicircle} = 10$ •² $h = \frac{1}{2}(10 - \pi x - 2x)$ 												
9aii	ans: proof 2 marks <ul style="list-style-type: none"> •³ st: know how to set up equ. for L •⁴ ic: complete proof 	<ul style="list-style-type: none"> •³ $L = 2 \times 2xh + \frac{1}{2}\pi x^2$ •⁴ $L = 4x \times \frac{1}{2}(10 - \pi x - 2x) + \frac{1}{2}\pi x^2$ $L = 20x - 2\pi x^2 - 4x + \frac{1}{2}\pi x^2$ 												
9b	ans: $x = \frac{20}{3\pi + 8}$, $h = \frac{5(\pi + 4)}{3\pi + 8}$ 6 marks <ul style="list-style-type: none"> •⁵ st: know to differentiate •⁶ pr: differentiate •⁷ st: know that max. means $L' = 0$ •⁸ pr: solve $L' = 0$ •⁹ st: know to check nature of max/min •¹⁰ ic: complete evaluation 	<ul style="list-style-type: none"> •⁵ $\frac{dL}{dx} =$ •⁶ $\frac{dL}{dx} = 20 - 8x - 3\pi x$ •⁷ $\frac{dL}{dx} = 0$ •⁸ $x = \frac{20}{3\pi + 8} = x_0 (= 1.148)$ •⁹ eg <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">x_0^-</td> <td style="padding: 5px;">x_0</td> <td style="padding: 5px;">x_0^+</td> </tr> <tr> <td style="padding: 5px;">L'</td> <td style="padding: 5px;">+</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">-</td> </tr> <tr> <td colspan="4" style="padding: 5px; text-align: center;">maximum at x_0</td> </tr> </table> •¹⁰ $h = \frac{5\pi + 20}{3\pi + 8} (= 2.049)$ 	x	x_0^-	x_0	x_0^+	L'	+	0	-	maximum at x_0			
x	x_0^-	x_0	x_0^+											
L'	+	0	-											
maximum at x_0														
10	ans: $Y = 3X + 0.7$ 3 marks <ul style="list-style-type: none"> •¹ ic: interpret gradient from graphs •² st: know how to find “c” •³ pr: complete evaluation 	<ul style="list-style-type: none"> •¹ $m = 3$ •² eg $7.00 = 3 \times 2.10 + c$ •³ eg $Y = 3X + 0.7$ 												

[END OF SPECIMEN MARKING INSTRUCTIONS]