Part	Marks	Level	Calc.	Content	Answer	U1 OC2
(a)	2	C	NC	A5	$a = 2, b = 1$	2002 P1 Q7
(b)	4	C	NC	A3	sketch	
(c)	1	C	NC	A16, A6	$-1 < x < 5$	

- •[1] pd: process, e.g. completing the square
- •[2] pd: process, e.g. completing the square

- •[3] ic: interpret minimum
- •[4] ic: interpret y-intercept
- •[5] ss: reflect in x-axis
- •[6] ss: translate parallel to y-axis

- •[7] ic: interpret graph

- •[1] $a = 2$
- •[2] $b = 1$

- •[3] *any two from:*
  parabola; min. t.p. $(2,1)$; $(0,5)$
- •[4] the remaining one from above list
- •[5] reflecting in x-axis
- •[6] translating $+10$ units, parallel to y-axis

- •[7] $(-1,5)$ i.e. $-1 < x < 5$

Part	Marks	Level	Calc.	Content	Answer	U1 OC2
(a)	2	B	CN	A3	sketch	2009 P1 Q23
(b)	3	B	CN	A3	sketch	

- •[1] ic: scaling parallel to x-axis
- •[2] ic: annotate graph

- •[3] ss: correct order for refl(x) and trans
- •[4] ic: start to annotate final sketch
- •[5] ic: complete annotation

- •[1] sketch and one of $(0,0)$, $(1,8)$, $(-2,8)$
- •[2] remaining points

- •[3] reflect in x-axis then vertical translation
- •[4] sketch and one of $(0,1)$, $(1,-7)$, $(-2,-7)$
- •[5] remaining points

Part	Marks	Level	Calc.	Content	Answer	U3 OC2
	2	C	NC	C3		1989 P1 Q10
	2	A/B	NC	C20		

- •[1] $2x^{-\frac{1}{2}}$
- •[2] $\cos 2x$
- •[3] $\times 2$
- •[4] $-x^{-\frac{3}{2}}$

Part	Marks	Level	Calc.	Content	Answer	U1 OC3
	4	C	NC	G2, C4	$(2,4)$	2002 P1 Q4

- $\bullet^1$ sp: know to diff., and differentiate
- $\bullet^2$ pd: process gradient from angle
- $\bullet^3$ ss: equate equivalent expressions
- $\bullet^4$ pd: solve and complete

- $\bullet^1$ $\frac{dy}{dx} = 4x - 7$
- $\bullet^2$ $m_{\text{tang}} = \tan 45° = 1$
- $\bullet^3$ $4x - 7 = 1$
- $\bullet^4$ $(2,4)$

Part	Marks	Level	Calc.	Content	Answer	U1 OC3
	4	C	NC	C4		1993 P1 Q4

- $\bullet^1$ $\frac{dy}{dx} = \ldots\ldots$
- $\bullet^2$ $6x^2 - 6x - 12$
- $\bullet^3$ $\ldots\ldots = 0$
- $\bullet^4$ $x = -1, 2$

Part	Marks	Level	Calc.	Content	Answer	U2 OC1
(a)	4	C	NC	A4		1996 P2 Q4
(b)	7	C	NC	A17, A18, A6		

(a)
- $\bullet^1$ $g(2x+1)$
- $\bullet^2$ $(2x+1)^2 + k$
- $\bullet^3$ $f\left(x^2 + k\right)$
- $\bullet^4$ $2\left(x^2 + k\right) + 1$

(b)
- $\bullet^5$ $4x^2 + 4x + k + 1$ **AND** $2x^2 + 2k + 1$
- $\bullet^6$ $4x^2 + 4x + k + 1 - \left(2x^2 + 2k + 1\right) = 0$

  so $2x^2 + 4x - k = 0$
- $\bullet^7$ $b^2 - 4ac = 16 - 4 \times 2 \times (-6) = 64$
- $\bullet^8$ so roots real & distinct

- $\bullet^9$ $b^2 - 4ac = 16 - 4 \times 2 \times (-k)$
- $\bullet^{10}$ $b^2 - 4ac = 0$ for equal roots
- $\bullet^{11}$ $k = -2$

Part	Marks	Level	Calc.	Content	Answer	U2 OC1
	5	A/B	CN	A18, A16, CGD	proof	2002 P2 Q9

- $\bullet^1$ ss: know to use discriminant
- $\bullet^2$ ic: pick out discriminant
- $\bullet^3$ pd: simplify to quadratic
- $\bullet^4$ ss: choose to draw table or graph
- $\bullet^5$ pd: complete proof using disc.≥ 0

- $\bullet^1$ discriminant $= \ldots$
- $\bullet^2$ disc $= (-5k)^2 - 4(1-2k)(-2k)$
- $\bullet^3$ $9k^2 + 8k$
- $\bullet^4$ e.g. draw a table, graph, complete the square
- $\bullet^5$ complete proof and conclusion relating to disc.≥ 0

Part	Marks	Level	Calc.	Content	Answer	U2 OC1
	5	C	CN	A21		1991 P1 Q6

- $\bullet^1$ $f(2) = 114$
- $\bullet^2$ $f(-1) = 0$
- $\bullet^3$ $4p + 2q = 78$
- $\bullet^4$ $p - q = -15$
- $\bullet^5$ $p = 8, q = 23$

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
	3	C	NC	T8		1995 P1 Q12

- $\bullet^1$ "third side" $= \sqrt{20}$
- $\bullet^2$ $\sin\alpha = \frac{\sqrt{11}}{\sqrt{20}}$ or $\cos\alpha = \frac{3}{\sqrt{20}}$
- $\bullet^3$ $2 \times \frac{\sqrt{11}}{\sqrt{20}} \times \frac{3}{\sqrt{20}}$

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
(a)	1	C	CR	T8		1997 P1 Q18
(a)	1	A/B	CR	T8		
(b)	1	C	CR	T10		
(b)	3	A/B	CR	T10		

- $\bullet^1$ substitute $1 - 2\sin^2 x^\circ$ for $\cos 2x^\circ$
- $\bullet^2$ substitute $1 - \sin^2 x^\circ$ for $\cos^2 x^\circ$
- $\bullet^3$ $3\sin^2 x^\circ + 2\sin x^\circ - 1 = 0$
- $\bullet^4$ $(3\sin x^\circ - 1)(\sin x^\circ + 1) = 0$
- $\bullet^5$ $\sin x^\circ = \frac{1}{3}, -1$
- $\bullet^6$ $19{\cdot}5, \ 160{\cdot}5, \ 270$

Part	Marks	Level	Calc.	Content	Answer	U2 OC3
	5	B	CN	T10, T7	$x = 2 \cdot 419, 3 \cdot 864$	2010 P2 Q4

$\bullet^1$ ss: know to use double angle formula $\bullet^2$ ic: express as quadratic in $\cos x$ $\bullet^3$ ss: start to solve $\bullet^4$ pd: reduce to equations in $\cos x$ only $\bullet^5$ pd: complete solutions to include only one where $\cos x = k$ with $|k| > 1$	$\bullet^1$ $2 \times (2\cos^2 x - 1) \cdots$ $\bullet^2$ $4\cos^2 x - 5\cos x - 6 = 0$ $\bullet^3$ $(4\cos x + 3)(\cos x - 2) = 0$ $\bullet^4$ $\cos x = -\frac{3}{4}$ and $\cos x = 2$ $\bullet^5$ $2 \cdot 419, 3 \cdot 864$ and no solution.

Part	Marks	Level	Calc.	Content	Answer	U3 OC1
	4	C	CN	G23, G25	2 : 3 or equivalent	1996 P1 Q6

$\bullet^1$ $\vec{AB} = \begin{pmatrix} 4 \\ 2 \\ -2 \end{pmatrix}$ or $\vec{AC} = \begin{pmatrix} 10 \\ 5 \\ -5 \end{pmatrix}$ or $\vec{BC} = \begin{pmatrix} 6 \\ 3 \\ -3 \end{pmatrix}$ $\bullet^2$ $\vec{AB} = 2\begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$ and $\vec{BC} = 3\begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$ or equivalent	$\bullet^3$ $AB \parallel BC$ **and** B is point in common $\bullet^4$ $2:3$ (*or* equivalent e.g. $1:1\frac{1}{2}$)

Part	Marks	Level	Calc.	Content	Answer	U3 OC1
(a)	3	C	CR	G25		1997 P2 Q2
(b)	7	C	CR	G28		

(a)

$\bullet^1$ $\vec{PQ} = \begin{pmatrix} 6 \\ -3 \\ 3 \end{pmatrix}$ $\bullet^2$ $\begin{pmatrix} 8 \\ -4 \\ 4 \end{pmatrix}$

$\bullet^3$ $R = (7, -1, 6)$

(b)

$\bullet^4$ $\vec{SP} \cdot \vec{SR} = |SP||SR|\cos P\hat{S}R$

$\bullet^5$ $\vec{SP} = \begin{pmatrix} 1 \\ 1 \\ -3 \end{pmatrix}$ $\bullet^6$ $\vec{SR} = \begin{pmatrix} 9 \\ -3 \\ 1 \end{pmatrix}$

$\bullet^7$ $|SP| = \sqrt{11}$ $\bullet^8$ $|SR| = \sqrt{91}$

$\bullet^9$ $\vec{SP} \cdot \vec{SR} = 3$

$\bullet^{10}$ $P\hat{S}R = 84 \cdot 6°$