

Geometry Non Calculator AB Grade

[SQA] 1. Circle P has equation $x^2 + y^2 - 8x - 10y + 9 = 0$. Circle Q has centre $(-2, -1)$ and radius $2\sqrt{2}$.

(a) (i) Show that the radius of circle P is $4\sqrt{2}$.

(ii) Hence show that circles P and Q touch. 4

(b) Find the equation of the tangent to the circle Q at the point $(-4, 1)$. 3

(c) The tangent in (b) intersects circle P in two points. Find the x -coordinates of the points of intersection, expressing your answers in the form $a \pm b\sqrt{3}$. 3

Part	Marks	Level	Calc.	Content	Answer	U2 OC4
(a)	2	C	CN	G9	proof	2001 P1 Q11
(a)	2	A/B	CN	G14		
(b)	3	C	CN	G11	$y = x + 5$	
(c)	3	C	CN	G12	$x = 2 \pm 2\sqrt{3}$	

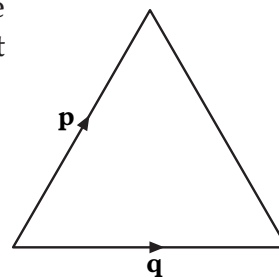
<ul style="list-style-type: none"> •¹ ic: interpret centre of circle (P) •² ss: find radius of circle (P) •³ ss: find sum of radii •⁴ pd: compare with distance between centres •⁵ ss: find gradient of radius •⁶ ss: use $m_1 m_2 = -1$ •⁷ ic: state equation of tangent •⁸ ss: substitute linear into circle •⁹ pd: express in standard form •¹⁰ pd: solve (quadratic) equation 	<ul style="list-style-type: none"> •¹ $C_P = (4, 5)$ •² $r_P = \sqrt{16 + 25 - 9} = \sqrt{32} = 4\sqrt{2}$ •³ $r_P + r_Q = 4\sqrt{2} + 2\sqrt{2} = 6\sqrt{2}$ •⁴ $C_P C_Q = \sqrt{6^2 + 6^2} = 6\sqrt{2}$ and "so touch" •⁵ $m_r = -1$ •⁶ $m_{\text{tgt}} = +1$ •⁷ $y - 1 = 1(x + 4)$ •⁸ $x^2 + (x + 5)^2 - 8x - 10(x + 5) + 9 = 0$ •⁹ $2x^2 - 8x - 16 = 0$ •¹⁰ $x = 2 \pm 2\sqrt{3}$
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[SQA] 2. For what range of values of k does the equation $x^2 + y^2 + 4kx - 2ky - k - 2 = 0$ represent a circle? 5

Part	Marks	Level	Calc.	Content	Answer	U2 OC4
	5	A	NC	G9, A17	for all k	2000 P1 Q6

<ul style="list-style-type: none"> •¹ ss: know to examine radius •² pd: process •³ pd: process •⁴ ic: interpret quadratic inequation •⁵ ic: interpret quadratic inequation 	<ul style="list-style-type: none"> •¹ $g = 2k, f = -k, c = -k - 2$ stated or implied by •² •² $r^2 = 5k^2 + k + 2$ •³ (real $r \Rightarrow 5k^2 + k + 2 > 0$ (accept \geq)) •⁴ use discr. or complete sq. or diff. •⁵ true for all k
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3. An equilateral triangle of side 3 units is shown. The vectors p and q are as represented in the diagram. What is the value of $p \cdot q$?



- A. 9
 B. $\frac{9}{2}$
 C. $\frac{9}{\sqrt{2}}$
 D. 0

2

Key	Outcome	Grade	Facility	Disc.	Calculator	Content	Source
B	3.1	A/B	0	0	CN	G26, G28	2011 P1 Q14

[END OF QUESTIONS]