Core 1 Coordinate Geometry Answers
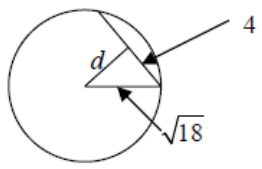
2(a)(i)	$15 + 4k = 7 \Rightarrow 4k = -8 \Rightarrow k = -2$	B1	1	AG (condone verification or $y = -2$)
(ii)	$\frac{1}{2}(x_1 + x_2)$ or $\frac{1}{2}(y_1 + y_2)$	M1		
	Midpoint coordinates $\left(3, -\frac{1}{2}\right)$	A1	2	One coordinate correct implies M1
(b)	Attempt at $\Delta y / \Delta x$ or $y = -\frac{3}{4}x + \frac{7}{4}$	M1		(Not x over y)(may use M instead of A/B)
	Gradient $AB = -\frac{3}{4}$	A1	2	-0.75 etc any correct equivalent
(c)(i)	$m_1 m_2 = -1$ used or stated		1	
	Hence gradient $AC = \frac{4}{3}$	A1√	2	Follow through their gradient of AB from part (b)
(ii)	$y - 1 = \frac{4}{3}(x - 1)$ or $3y = 4x - 1$ etc	B1√	1	Follow through their gradient of AC from part (c) (i) must be **normal** & (1,1) used
(iii)	$y = 0 \Rightarrow x - 1 = -\frac{3}{4}$	M1		Putting $y = 0$ in their AC equation and attempting to find x
	$x = \frac{1}{4}$	A1	2	CSO. C has coordinates $\left(\frac{1}{4}, 0\right)$
	Total		**10**	

(b)(i)	$12 - 2x = x^2 - 4x + 9$ $\Rightarrow x^2 - 2x - 3 = 0$	B1	1	Or $x^2 - 4x + 9 + 2x = 12$ **AG** (be convinced) (must have = 0)
(ii)	$(x - 3)(x + 1) = 0$	M1		Attempt at factors or quadratic formula or one value spotted
	$x = 3, \ -1$	A1		Both values correct & simplified
	Substitute one value of x to find y	M1		May substitute into equation for L or C
	Points are $(3, 6)$ and $(-1, 14)$	A1	4	y-coordinates correct linked to x values

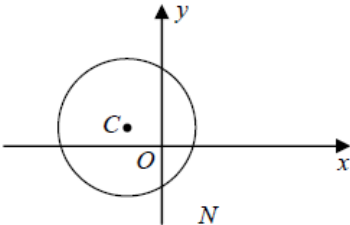|				
5(a)	$(x-4)^2 + (y+3)^2$	B2		B1 for one term correct
	$(11+16+9=36)$ RHS $=6^2$	B1	3	Condone 36
(b)(i)	Centre $(4,-3)$	B1√	1	Ft their a and b from part (a)
(ii)	Radius $= 6$	B1√	1	Ft their r from part (a)
(c)(i)	$CO^2 = (-4)^2 + 3^2$	M1		Accept $+$ or $-$ with numbers but must add
	$CO = 5$	A1√	2	Full marks for answer only
(ii)	Considering CO and radius	M1		
	$CO < r \Rightarrow O$ is **inside** the circle	A1√	2	Ft outside circle when 'their CO' $> r$ or on the circle when 'their CO' $= r$ SC B1√ *if no explanation given*
	Total		9	

1(a)(i)	Gradient $AB = \dfrac{1-7}{5-1}$	M1		Must be y on top and subtr'n of cords
	$= -\dfrac{6}{4} = -\dfrac{3}{2} = -1.5$	A1	2	Any correct equivalent
(ii)	$y-7 = m(x-1)$ or $y-1 = m(x-5)$	M1		Verifying 2 points or $y = -\dfrac{3}{2}x + c$
	leading to $3x + 2y = 17$	A1	2	AG (or grad & 1 point verified)
(b)	Attempt to eliminate x or y : $7x = 42$ etc	M1		Solving $x - 4y = 8$; $3x + 2y = 17$
	$x = 6$	A1		
	$y = -\dfrac{1}{2}$	A1	3	C is point $(6, -\dfrac{1}{2})$
(c)	Grad of perp $= -1$ / *their* gradient AB	M1		Or $m_1 m_2 = -1$ used or stated
	$= \dfrac{2}{3}$	A1√		ft their gradient AB
	$y - 7 = \dfrac{2}{3}(x-1)$ or $3y - 2x = 19$	A1	3	CSO Any correct form of equation
	Total		10	

7(a)(i)	$(x-2)^2$	M1		Attempt to complete square for x
	centre has x-coordinate = 2	A1		M1 implied if value correct or −2
	and y-coordinate = 0	B1	3	Centre (2,0)
(ii)	RHS = 18	B1		Withhold if circle equation RHS incorrect
	Radius = $\sqrt{18}$	M1		Square root of RHS of equation (if > 0)
	Radius = $3\sqrt{2}$	A1	3	
(b)	Perpendicular bisects chord so need to use			
	Length of 4	B1		
	$d^2 = (\text{radius})^2 - 4^2$	M1		
	$d^2 = 18 - 16$			
	so perpendicular distance = $\sqrt{2}$	A1	3	
(c)(i)	$x^2 + (2k-x)^2 - 4x - 14 = 0$	M1		
	$(2k-x)^2 = 4k^2 - 4kx + x^2$	B1		
	$\Rightarrow 2x^2 + 4k^2 - 4kx - 4x - 14 = 0$			
	$(\Rightarrow x^2 + 2k^2 - 2kx - 2x - 7 = 0)$			
	$\Rightarrow x^2 - 2(k+1)x + 2k^2 - 7 = 0$	A1	3	AG (be convinced about algebra and = 0)
(ii)	$4(k+1)^2 - 4(2k^2 - 7)$	M1		"$b^2 - 4ac$" in terms of k (either term correct)
	$4k^2 - 8k - 32 = 0$ or $k^2 - 2k - 8 = 0$	A1		$b^2 - 4ac = 0$ correct quadratic equation in k
	$(k-4)(k+2) = 0$	m1		Attempt to factorise, solve equation
	$k = -2$, $k = 4$	A1	4	SC B1, B1 for −2 , 4 (if M0 scored)
(iii)	Line is a tangent to the circle	E1	1	Line touches circle at one point etc
	Total		17	

2(a)(i)	$y = -\frac{3}{5}x + \ldots$; Gradient $AB = -\frac{3}{5}$	M1		**Attempt** to find $y =$ or $\Delta y / \Delta x$ or $\frac{3}{5}$ or $3x/5$
		A1	2	Gradient correct – condone slip in $y = \ldots$
(ii)	$m_1 m_2 = -1$	M1		Stated or used correctly
	Gradient of perpendicular = $\frac{5}{3}$	A1√		**ft** gradient of AB
	$\Rightarrow y + 2 = \frac{5}{3}(x-6)$	A1	3	**CSO** Any correct form eg $y = \frac{5}{3}x - 12$, $5x - 3y = 36$ etc
(b)	Eliminating x or y (unsimplified)	M1		Must use $3x + 5y = 8$; $2x + 3y = 3$
	$x = -9$	A1		
	$y = 7$	A1	3	$B(-9, 7)$
(c)	$4^2 + (k+2)^2$ (= 25) or $16 + d^2 = 25$	M1		Diagram with 3, 4, 5 triangle
	$k = 1$	A1		Condone slip in one term (or $k + 2 = 3$)
	or $k = -5$	A1	3	**SC1** with no working for spotting one correct value of k. Full marks if both values spotted with no contradictory work
	Total		11	

4(a)	$(x+1)^2 + (y-6)^2$	B2		B1 for one term correct or missing + sign
	$(1 + 36 - 12 = 25)$ RHS $= 5^2$	B1	3	Condone 25
(b)(i)	Centre $(-1, 6)$	B1√	1	**FT** their a and b from part (a) or correct
(ii)	Radius $= 5$	B1√	1	**FT** their r from part (a) RHS must be > 0
(c)	Attempt to solve "their" $x^2 + 2x + 12 = 0$	M1		Or comparing "their" $y_c = 6$ and their $r = 5$
				may use a diagram with values shown
	(all working correct) so no real roots			$\lceil$ $r < y_c$ so does not intersect
	or statement that does not intersect	A1	2	$\lfloor$ condone ± 1 or ± 6 in centre for A1
(d)(i)	$(4-x)^2 = 16 - 8x + x^2$	B1		Or $(-2-x)^2 = 4 + 4x + x^2$
	$x^2 + (4-x)^2 + 2x - 12(4-x) + 12 = 0$	M1		Sub $y = 4-x$ in circle eqn (condone slip)
	or $(x+1)^2 + (-2-x)^2 = 25$			or "their" circle equation
	$\Rightarrow 2x^2 + 6x - 20 = 0$ $\Rightarrow x^2 + 3x - 10 = 0$	A1	3	**AG CSO** (must have $= 0$)
(ii)	$(x+5)(x-2) = 0$ $\Rightarrow x = -5, x = 2$	M1		Correct factors or unsimplified solution to
	Q has coordinates $(-5, 9)$	A1	2	quadratic
				(give credit if factorised in part (i))
				SC2 if Q correct. Allow $x = -5$ $y = 9$
(iii)	Mid point of 'their' $(-5, 9)$ and $(2, 2)$	M1		Arithmetic mean of **either** x or y coords
	$\left(-1\frac{1}{2}, 5\frac{1}{2}\right)$	A1	2	Must follow from correct value in (ii)
	Total		14	

1(a)(i)	Gradient $AB = \dfrac{-1-5}{6-2}$ or $\dfrac{5--1}{2-6}$	M1		$\pm\dfrac{6}{4}$ implies M1
	$= \dfrac{-6}{4} = -\dfrac{3}{2}$	A1	2	AG
(ii)	$\left.\begin{array}{c} y-5 \\ y+1 \end{array}\right\} = -\dfrac{3}{2}\left\{\begin{array}{c} (x-2) \\ (x-6) \end{array}\right.$	M1		or $y = -\dfrac{3}{2}x + c$ and attempt to find c
	$\Rightarrow 3x + 2y = 16$	A1	2	OE; must have integer coefficients
(b)(i)	Gradient of perpendicular $= \dfrac{2}{3}$	M1		or use of $m_1 m_2 = -1$
	$\Rightarrow y - 5 = \dfrac{2}{3}(x-2)$	A1	2	$3y - 2x = 11$ (no misreads permitted)
(ii)	Substitute $x = k$, $y = 7$ into their (b)(i)	M1		or grads $\dfrac{7-5}{k-2} \times \dfrac{-3}{2} = -1$
	$\Rightarrow 2 = \dfrac{2}{3}(k-2) \Rightarrow k = 5$	A1	2	or Pythagoras $(k-2)^2 = (k-6)^2 + 8$
	Total		8	

5(a)(i)	Centre $(-3, 2)$	M1		± 3 or ± 2	
		A1	2	correct	
(ii)	Radius $= 5$	B1	1	accept $\sqrt{25}$ but not $\pm\sqrt{25}$	
(b)(i)	$3^2 + (-4)^2 = 9 + 16 = 25$ $\Rightarrow N$ lies on circle	B1	1	must have $9 + 16 = 25$ or a statement	
(ii)		M1		must draw axes; ft their centre in correct quadrant	
		A1	2	correct (reasonable freehand circle enclosing origin)	
(iii)	Attempt at gradient of CN	M1		withhold if subsequently finds tangent	
	grad $CN = -\dfrac{4}{3}$	A1		CSO	
	$y = -\dfrac{4}{3}x - 2$ (or equivalent)	A1√	3	ft their grad CN	
(c)(i)	$P(2,6)$ Hence $PC^2 = 5^2 + 4^2$	M1		"their" PC^2	
	$\Rightarrow PC = \sqrt{41}$	A1	2		
(ii)	Use of Pythagoras correctly	M1			
	$PT^2 = PC^2 - r^2 = 41 - 25$, where T is a point of contact of tangent	A1√		ft their PC^2 and r^2	
	$\Rightarrow PT = 4$	A1	3	**Alternative** sketch with vertical tangent M1 showing that tangent touches circle at point $(2, 2)$ A1 hence $PT = 4$ A1	
	Total		14		