Question Number	Scheme	Marks
7 (a)	$x^2+y^2+8x-10y=29$	
	Attempts $(x+4)^2+(y-5)^2...=...$	M1
	Correct centre $(-4,5)$	A1
	Exact radius $\sqrt{70}$	A1
		(3)
(b)	Attempts distance (or distance ^{2}) from $"(-4,5)"$ to $"(5,-8)"$	M1
	Full method. E.g. compares $\sqrt{9^2+13^2}$ to $\left(\sqrt{70}+\sqrt{52}\right)$	dM1
	States that • distance between centres $=\sqrt{250}=15.81$ • sum of radii = $\sqrt{70}+\sqrt{52}=15.58$ Concludes as sum of radii < distance between centres, result proven *	A1*
		(3) **(6 marks)**

(a)

M1: Attempts to complete the square for **both** variables. Look for $(x\pm4)^2,(y\pm5)^2...=...$ or may be implied by $(\pm4,\pm5)$ by inspection from the equation.

A1: $(-4,5)$

A1: $\sqrt{70}$ which may be scored following $(x\pm4)^2+(y\pm5)^2=70$

(b)

M1: Attempts distance (or distance ^{2}) from $"(-4,5)"$ to $"(5,-8)"$ (condone sign errors)

dM1: Full method. E.g. compares their $\sqrt{9^2+13^2}$ to their $\left("\sqrt{70}"+\sqrt{52}\right)$

A1*: Requires correct calculation(s), correct reason and minimal conclusion. Must be evidence to support the inequality – e.g. decimal values – not just the inequality stated. May use the difference between sum of radii and distance between centres.

(b) Alt

M1: Attempts to solve $x^2+y^2+8x-10y=29$ and $x^2+y^2-10x+16y=-37$ forming a linear equation (need not be simplified for this mark)
FYI: Linear equation is $18x-26y=66$ o.e. if the calculations are correct

dM1: Attempts to solves their $18x-26y=66$ simultaneously with either circle equation reaching a 3 term quadratic for either x or y.

A1*: Requires
- correct equations
- correct "solution" stating no roots and concluding no points of intersection and minimal conclusion

E.g. Substitute $y=\dfrac{9x-33}{13}$ into $x^2+y^2+8x-10y=29$ gives $250x^2-412x+478=0$

and $"b^2-4ac"=-308256<0$ so no solutions

FYI the equation in y (if correct) is $250y^2+984y+1116=0$

Question Number	Scheme	Marks
8 (i)	States or uses $\tan x = \dfrac{\sin x}{\cos x} \Rightarrow 5\sin x \times \dfrac{\sin x}{\cos x} + 13 = \cos x$	B1
	$5\sin^2 x + 13\cos x = \cos^2 x \Rightarrow 5\left(1-\cos^2 x\right) + 13\cos x = \cos^2 x$	M1
	$\Rightarrow 6\cos^2 x - 13\cos x - 5 = 0$	A1
	$\Rightarrow (3\cos x + 1)(2\cos x - 5) = 0 \Rightarrow \cos x = -\dfrac{1}{3}$	M1
	$\Rightarrow x = 1.91$	A1
		(5)
(ii) (a)	$20 = 10 + 12\sin(6k+18)^\circ \Rightarrow \sin(6k+18)^\circ = \dfrac{5}{6}$	M1
	$\Rightarrow (6k+18) = 56.4, 123.6$	dM1
	$\Rightarrow k = 6.41, 17.59$	A1, A1
		(4)
(b)	22°C	B1
		(1)
(c)	"6.41"$t + 18 = 90 \Rightarrow t = 11.23$ Time of day = 11:14	M1, A1
		(2)
		(12 marks)

(i)

B1: States or uses $\tan x = \dfrac{\sin x}{\cos x}$ E.g. $5\sin x \times \dfrac{\sin x}{\cos x} + 13 = \cos x$

M1: Attempts to use $\tan x = \dfrac{\sin x}{\cos x}$, $\sin^2 x + \cos^2 x = 1$ and multiply by $\cos x$ to form a quadratic equation in $\cos x$ (allow if there are slips in coefficients but the trig terms must be correct)

A1: Correct simplified quadratic $6\cos^2 x - 13\cos x - 5(=0)$ The "=0" may be implied.

M1: Solves a 3TQ in $\cos x$ leading to at least one value for $\cos x$

A1: awrt $x = 1.91$ (following $\cos x = -\dfrac{1}{3}$) and no other values in the range.

Note: Answers only with no working score no marks. From $6\cos^2 x - 13\cos x - 5(=0)$ to 1.91 directly, score final M0A0.

(ii) (a)

M1: Attempts to use the given information and proceeds to $\sin(6k+18)^\circ = c$, or may be implied by $A\sin(6k+18)^\circ = B \rightarrow 6k+18 = \arcsin\dfrac{B}{A}$ (evaluated) (which scores M1dM1)

dM1: Takes arcsin leading to a value for $6k+18$. Accept radian values seen for this mark. (0.985, 2.16). Allow awrt 2 s.f. answers for evidence.

A1: One value for k: 6.41 or 17.59 Must be in degrees.

SC Allow for 6.4 **and** 17.6 both given if no more accurate answers are stated.

A1: awrt $k = 6.41, 17.59$ and no other values

Note answers only scores no marks. – the requirements of the M marks must be seen to be able to score them.

(ii)(b)

B1: cao 22°C Condone just 22.

(ii)(c)

M1: Sets their "6.41"$t + 18 = 90 \Rightarrow t = ...$ May be implied by 11.23.

Note "6.41"$t + 18 = \dfrac{\pi}{2}$ is M0.

A1: cao Time of day = 11:14 o.e. (e.g. 11h 14m is acceptable).