Question Number	Scheme	Marks
1.(a)	(i) $a_2 = 1$	B1
	(ii) $a_{107} = 3$	B1 **(2)**
(b)	$\sum_{n=1}^{200}\left(2a_n - 1\right) = 5+1+5+1+.....5+1 = 100\times\left(5+1\right)$	M1
	= 600	A1 **(2)**
		(4 marks)

Notes

(a) (i)

B1 $a_2 = 1$ Accept the sight of 1. Ignore incorrect working

(a)(ii)

B1 $a_{107} = 3$ Accept sight of just 3. Ignore incorrect working

If there are lots of 1's and 3's without reference to any suffices they need to choose 3.

(b)

M1 Establishes an attempt to find the sum of a series with two distinct terms.

Look for $100\times a + 100\times b$ or $200\times a + 200\times b$ where *a* and *b* are allowable terms.

Examples of allowable terms are

$a,b = 1,5$ (which are correct)

$a,b = 1,3$ (which are the values for (a))

$a,b = 3,7$ (which is using $2a_n + 1$)

$a,b = 0,5$ (which is a slip on the first value)

Methods using AP (and GP) formulae are common and score 0 marks.

A1 600.

600 should be awarded both marks as long as no incorrect working is seen

Question Number	Scheme	Marks
2.(a)	Attempts $(x\pm 2)^2+(y\pm 5)^2 .....=0$	M1
	(i) Centre $(-2,5)$	A1
	(ii) Radius $\sqrt{50}$ or $5\sqrt{2}$	B1 **(3)**
(b)	Gradient of radius = $\frac{(5)-4}{(-2)-5}=-\frac{1}{7}$ which needs to be in simplest form	B1ft
	Uses $m_2=-\frac{1}{m_1}$ to find gradient of tangent	M1
	Equation of tangent $y-4="7"(x-5)\Rightarrow y=7x-31$	M1 A1 **(4)** **(7 marks)**

Notes

(a) **Note that the epen set up here is M1 M1 B1**

M1 Attempts to complete the square on both terms or states the centre as $(\pm 2,\pm 5)$

For completing the square look for $(x\pm 2)^2+(y\pm 5)^2 .....=...$

A1 Centre $(-2,5)$ Allow $x=-2, y=5$ This alone can score both marks even following incorrect lines eg $(x+2)^2..(y-5)^2=...$where … could be , for example a minus sign or blank

A1 Radius $\sqrt{50}$ or $5\sqrt{2}$ You may isw after a correct answer.

If a candidate attempts to use $x^2+y^2+2fx+2gy+c=0$ then M1 may be awarded for a centre of $(\pm 2,\pm 5)$

(b) **Note that the epen set up here is M1 M1 M1 A1**

B1ft Correct answer for the gradient of the line joining $P(5,4)$to their centre.

You may ft on their centre but the value must be fully simplified.

M1 Awarded for using $m_2=-\frac{1}{m_1}$ to find gradient of tangent.

Do be aware that some good candidates may do the first two marks at once so you may need to look at what value they are using for the gradient of the tangent.

M1 For an attempt to find the equation of the tangent using $P(5,4)$and a changed gradient. Condone bracketing slips only.

If the candidate uses the form $y=mx+c$ they must use *x* and *y* the correct way around and proceed as far as $c=...$

A1 $y=7x-31$ stated. It must be written in this form.

(It cannot be awarded from $y=mx+c$ by just stating $c=-31$)

.....

Attempts at (b) using differentiation.

B1 $x^2+y^2+4x-10y-21=0\rightarrow 2x+2y\frac{dy}{dx}+4-10\frac{dy}{dx}=0$.

M1 Substitutes $P(5,4)$into an expression of the form $ax+by\frac{dy}{dx}+c+d\frac{dy}{dx}=0$ AND finds the value of $\frac{dy}{dx}=(7)$. The values of *a, b , c* and *d* must be non-zero.