Topic Y2 (Pre-TT B) Coordinate geometry and binomial [38] MARKSCHEME

1.

$\left(x+\frac{2}{x}\right)^4 = x^4 + 4x^3\left(\frac{2}{x}\right) + 6x^2\left(\frac{2}{x}\right)^2 + 4x\left(\frac{2}{x}\right)^3 + \left(\frac{2}{x}\right)^4$	M1*		Attempt expansion, using powers of x and $^2/_x$ (or the two terms in their bracket), to get at least 4 terms
	M1*		Use binomial coefficients of 1, 4, 6, 4, 1
	A1dep*		Obtain two correct, simplified, terms
	A1		Obtain a further one correct, simplified, term
$= x^4 + 8x^2 + 24 + \frac{32}{x^2} + \frac{16}{x^4}$ (or equiv)	A1	5	Obtain a fully correct, simplified, expansion
OR			
	M1*		Attempt expansion using all four brackets
	M1*		Obtain expansion containing the correct 5 powers only (could be unsimplified powers eg $x^3.x^{-1}$)
	A1dep*		Obtain two correct, simplified, terms
	A1		Obtain a further one correct, simplified, term
	A1		Obtain a fully correct, simplified, expansion
		5	

2.

7(i)	Gradient $= -\frac{1}{2}$	B1 1	$-\frac{1}{2}$
(ii)	$y-5 = -\frac{1}{2}(x-6)$	M1	Equation of straight line through (6, 5) with any non-zero numerical gradient
		B1 ft	Uses gradient found in (i) in their equation of line
	$2y-10 = -x+6$		
	$x+2y-16=0$	A1 3	Correct answer in correct form (integer coefficients)
(iii)	EITHER		
	$\frac{4-x}{2} = x^2+x+1$	*M1	Substitute to find an equation in x (or y)
	$4-x = 2x^2+2x+2$		
	$2x^2+3x-2=0$	DM1	Correct method to solve quadratic
	$(2x-1)(x+2)=0$		
	$x=\frac{1}{2}, x=-2$	A1	$x=\frac{1}{2}, x=-2$
	$y=\frac{7}{4}, y=3$	A1 4	$y=\frac{7}{4}, y=3$
			SR one correct (x,y) pair www B1
	OR		
	$y=(4-2y)^2+(4-2y)+1$ *M		
	$y=16-16y+4y^2+4-2y+1$		
	$0=21-19y+4y^2$		
	$0=(4y-7)(y-3)$ DM1		
	$y=\frac{7}{4}, y=3$ A1		
	$x=\frac{1}{2}, x=-2$ A1		
		8	

3.

(i)	$\left(\frac{4+10}{2}, \frac{-2+6}{2}\right)$	M1		Uses $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
	(7, 2)	A1	2	(7, 2) (integers required)
(ii)	$\sqrt{(7-4)^2+(2--2)^2}$	M1		Uses $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
	$=\sqrt{3^2+4^2}$			
	$=5$	A1	2	5
(iii)	$(x-7)^2+(y-2)^2=25$	B1√		$(x-7)^2$ and $(y-2)^2$ used (*their* centre)
		B1√		$r^2 = 25$ used (*their* r^2)
		B1	3	$(x-7)^2+(y-2)^2=25$ cao
				Expanded form: $-14x$ and $-4y$ used B1√ $r=\sqrt{g^2+f^2-c}$ used B1√ $x^2+y^2-14x-4y+28=0$ B1 cao
				By using ends of diameter: $(x-4)(x-10)+(y+2)(y-6)=0$ Both x brackets correct B1 Both y brackets correct B1 Final equation fully correct B1
(iv)	Gradient of $AB = \frac{6--2}{10-4}=\frac{4}{3}$	B1		oe
	Gradient of tangent $= -\frac{3}{4}$	B1√		
		M1		Correct equation of straight line through A, any non-zero gradient
	$y--2=-\frac{3}{4}(x-4)$	A1		
	$3x+4y=4$	A1	5	a, b, c need not be integers

4.

(i)	$(1+4x)^7 = 1+28x+336x^2+2240x^3$	B1		Obtain $1 + 28x$
		M1		Attempt binomial expansion of at least 1 more term, with each term the product of binomial coeff and power of $4x$
		A1		Obtain $336x^2$
		A1	4	Obtain $2240x^3$
(ii)	$28a + 1008 = 1001$ Hence $a = -\frac{1}{4}$	M1		Multiply together two relevant pairs of terms
		A1√		Obtain $28a + 1008 = 1001$
		A1	3	Obtain $a = -\frac{1}{4}$
			7	

5.

		B lies on l so has coordinates $(x, 11 - 2x)$ $(x-3)^2+(11-2x-5)^2=\left(6\sqrt{5}\right)^2$ $5x^2-30x-135=0$ $5(x+3)(x-9)=0$ $x=-3,\ x=9$ $y=17,\ y=-7$	M1 M1 M1* M1dep A1 A1 [6]	Attempt to find equation of l with gradient -2 $(x-3)^2+(y-5)^2=(6\sqrt{5})^2$ o.e. seen Attempts to solve the equations simultaneously to get a quadratic Correct method to solve their quadratic Both x values Both y values	 e.g. by substitution as shown **SC** If A0 A0, one correct pair of values from correct factorisation **www B1**
		Alternative method: Use of (1, 2, $\sqrt{5}$) triangle with –ve gradient M1 Scaling to $6\sqrt{5}$ M1 (3, 5) + (6, -12) M1 (9, -7) A1 (3, 5) - (6, -12) M1 (-3, 17) A1		**SC** Spotted solutions Each correct pair **www B1** (May also earn first two Ms as in main scheme)* **-1** for one or two extra incorrect solutions **-2** for three or more extra incorrect solutions Checks solutions and justifies only two solutions **B2** * **NB** – First M1 may also be awarded for establishing gradient between (3,5) and their solution(s) is – 2	