

AS and A-level Year 1 MATHS

Binomial expansions and review of previous topics
Mark scheme

Specification content coverage: D1, sections A-C

Question	Solutions	Mark
1	$2^8 + {}^8C_1 \times 2^7 \times -3x + {}^8C_2 \times 2^6 \times (-3x)^2 + {}^8C_3 \times 2^5 \times (-3x)^3$ Correct substitution into formula for at least two terms All terms $256 - 3072x + 16128x^2 - 48384x^3$ At least two correct terms All correct terms	 1 1 1 1
2	Use of formula correctly ${}^{11}C_5 \times 2^6 \times \left(\frac{1}{2}x\right)^5$ $462 \times 64 \times \frac{1}{32}x^5$ $924x^5$	 1 1 1
3 (a)	$\left(x + \frac{7}{2}\right)^2 - \frac{169}{4}$ $\min\left(-7/2, -\frac{169}{4}\right)$	2 1
3 (b)	Sketch with intercepts at $y = -30$, $x = -10$ and $x = 3$ and min point in correct quadrant.	4 (1 for each intercept and correct shape in quadrant)

4 (a)	$p(-3) = (-3)^3 + 9(-3)^2 + 27(-3) + 27$ $= 0$ therefore $(x + 3)$ is a factor	1 for substitution 1 for correct statement
4 (b)	$(x + 3)^3$	1 correct method to find quotient 1 correct solution complete (both marks for seeing $(x + 3)^3$ directly)
4(c)	Translation (5 x -direction) (2 y -direction)	1 translation 1 for each element of vector
5 (a)	$8 + 36x + 54x^2 + 27x^3$	1 correct substitution 1 correct terms
5 (b)	Attempt to find second and third term of expansion $-\frac{5}{x}$ and $\frac{10}{x^2}$ Multiply by $54x^2$ and $27x^3$ respectively $36(x) - 270(x) + 270(x) = 36(x)$	1 1 1 1
6	Substitution of equation for line into that for circle $((3x + 2) - 1)^2 + (x - 3)^2 = 25$ $9x^2 + 6x + 1 + x^2 - 6x + 9 = 25$ $2x^2 = 3$ $x = \pm\sqrt{\frac{3}{2}}$ States that the line intersects the circle at two distinct points, therefore it cannot be a tangent.	1 2 1 1

Rationale

It is assumed that students are proficient at using calculator to solve quadratics/simultaneous equations.

21 marks scaffolded, basic skills assessed.

11 marks applying, including some basic proof and some more advanced problem-solving.