

Q	Marking Instructions	AO	Marks	Typical Solution
7	Expands at least one bracket – must reach a quartic	3.1a	M1	$(2 + 3y)^4 = 2^4 + 4 \times 2^3 \times (3y) + 6 \times 2^2 \times (3y)^2 + 4 \times 2 \times (3y)^3 + (3y)^4$ $= 16 + 96y + 216y^2 + 216y^3 + 81y^4$ $(2 - 3y)^4 = 2^4 + 4 \times 2^3 \times (-3y) + 6 \times 2^2 \times (-3y)^2 + 4 \times 2 \times (-3y)^3 + (-3y)^4$ $= 16 - 96y + 216y^2 - 216y^3 + 81y^4$ $(2 + 3y)^4 + (2 - 3y)^4$ $= 32 + 432y^2 + 162y^4$ $y^2 \geq 0 \text{ and } y^4 \geq 0 \text{ for all } y$ $(2 + 3y)^4 + (2 - 3y)^4 \geq 32 \text{ for all } y$
	Obtains at least one correct expansion – not necessarily simplified	1.1b	A1	
	Obtains two correct expansions – not necessarily simplified	1.1b	A1	
	Combines their expansions to obtain a sum containing only even power terms.	1.1a	M1	
	Explains that y^2 and y^4 are always positive or zero (for $y \in \mathbb{R}$) Or finds minimum value using calculus and justifies this as not just a local minimum	2.4	E1	
	Reaches correct conclusion. Sets out a well-constructed mathematical argument. R1 can be awarded if E1 not given.	2.1	R1	
	Total		6	