

STEP II, 2006, Q6 EC

- 6 In hindsight, it might have been more generous to have included an “or otherwise” option to the very opening part of this question, as many candidates – particularly overseas ones – preferred an algebraic approach to obtaining the given result, rather than the vector one asked-for. It does, however, illustrate a pretty important examination point: namely, that if you don’t actually answer the question that has been asked, you may not actually get any marks for your time and effort! These candidates reduced the given inequality to

$$(bx - ay)^2 + (cy - bz)^2 + (az - cx)^2 \geq 0,$$

and this represents some pretty decent mathematics. It is also very easy to deduce when equality holds in the result from this alternative statement. Such candidates were able to get the remaining sixteen marks on the question, however.

Part (i) didn’t actually require candidates to use the given result to solve this quadratic equation, but those who did were guided towards the helpful notion of considering the equality case of the given result, which was intended to help them approach part (ii). [The question cites an example of a result widely known as the *Cauchy-Schwarz Inequality*.]

Overseas candidates apart, this was not a very popular question at all. Those who attempted it generally did quite well, and a surprisingly high proportion of them saw it through right to the end.



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