

STEP II, 2022, Q12 EC

Question 12

Part (i) of the question was generally well attempted, although some candidates opted to integrate by parts rather than noticing that the integral was simple once the brackets were expanded. A small number of candidates failed to simplify the mean fully.

Part (ii) was found to be difficult. Most candidates attempted to compute an expression for the median rather than comparing the cumulative density function of the mean to $\frac{1}{2}$. Those who did follow the intended approach were generally able to work through the algebra well. Many candidates were also confused about the direction of the logic in this question and instead showed the converse of the required result. In many cases the argument provided was reversible so many of the marks could still be awarded.

Expansion of the binomial expression was generally done well, but the algebra of the part that followed proved difficult, with most candidates either giving up early on or making mistakes that either rendered the conclusion trivial or impossible to obtain. Only a handful of candidates successfully reached the correct condition and convincingly showed it to be true.

Many candidates did not attempt part (iii). Those who had been successful in part (ii) almost always realised that they needed to consider the cumulative density function of the mode and compare it to $\frac{1}{2}$ and almost all these candidates managed to deduce the argument completely and gain full credit.



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