

## **STEP II, 2019, Q11 EC**

Candidates got the correct number of pairs in the special cases  $n_3 = 9$  and  $n_3 = 10$  but sometimes the working was very unclear. A large majority found the expressions for general  $n$ , the most common error being a shift  $n \rightarrow n + 1$  in the answer.

Those who could obtain the result given for odd  $n$  in part (ii) were generally able to find the corresponding result for even  $n$  too. A common error was to double count the number of pairs of rods and not to double the number of pairs which made a triangle. Many candidates failed to explain why the conditions of part (i) were relevant for forming triangles.

The most successful candidates in part (iii) counted the number of triples which make a triangle using a sum, and divided by  $\binom{2M+1}{3}$ , while those who conditioned on the largest rod and used conditional probability did less well. A common conceptual error was to assume that each integer was equally likely to appear as the largest rod, and candidates making this assumption lost many marks. Otherwise, algebraic errors were the most common. Candidates should remember that when an answer is given in the question, they need to take care to fully justify their answers.



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