

## STEP III, 2014 , Q13 MS

13. The first result is a trivial application of the definition of a probability generating function, and the second similarly. In order to obtain the first printed result in part (iii), it is necessary to obtain a similar result to those in parts (i) and (ii) giving  $tG(t)$  as the score is one higher and then applying the conditionality of the probabilities of these three results which is done

by considering the probability of a score  $n$  in the three cases to give the coefficient of  $t^n$ . Re-arranging the formula for  $G(t)$ , either differentiation or the binomial theorem can be used to find the required probability formula. Finding  $\mu = G'(1) = c/a$  and the knowledge that  $a + b + c = 1$  enables the result of part (iii) to be rearranged to that of part (iv).



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