

STEP II, 2008, Q13

13 Bag P and bag Q each contain n counters, where $n \geq 2$. The counters are identical in shape and size, but coloured either black or white. First, k counters ($0 \leq k \leq n$) are drawn at random from bag P and placed in bag Q . Then, k counters are drawn at random from bag Q and placed in bag P .

- (i) If initially $n - 1$ counters in bag P are white and one is black, and all n counters in bag Q are white, find the probability in terms of n and k that the black counter ends up in bag P .

Find the value or values of k for which this probability is maximised.

- (ii) If initially $n - 1$ counters in bag P are white and one is black, and $n - 1$ counters in bag Q are white and one is black, find the probability in terms of n and k that the black counters end up in the same bag.

Find the value or values of k for which this probability is maximised.



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