

STEP II, 2015, Q12

- 12 Four players A , B , C and D play a coin-tossing game with a fair coin. Each player chooses a sequence of heads and tails, as follows:

Player A: HHT; Player B: THH; Player C: TTH; Player D: HTT.

The coin is then tossed until one of these sequences occurs, in which case the corresponding player is the winner.

- (i) Show that, if only A and B play, then A has a probability of $\frac{1}{4}$ of winning.
- (ii) If all four players play together, find the probabilities of each one winning.
- (iii) Only B and C play. What is the probability of C winning if the first two tosses are TT?

Let the probabilities of C winning if the first two tosses are HT, TH and HH be p , q and r , respectively. Show that $p = \frac{1}{2} + \frac{1}{2}q$.

Find the probability that C wins.



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