

STEP III, 2003 Q14

- 14 Write down the probability generating function for the score on a standard, fair six-faced die whose faces are labelled 1, 2, 3, 4, 5, 6. Hence show that the probability generating function for the sum of the scores on two standard, fair six-faced dice, rolled independently, can be written as

$$\frac{1}{36}t^2(1+t)^2(1-t+t^2)^2(1+t+t^2)^2.$$

Write down, in factorised form, the probability generating functions for the scores on two fair six-faced dice whose faces are labelled with the numbers 1, 2, 2, 3, 3, 4 and 1, 3, 4, 5, 6, 8, and hence show that when these dice are rolled independently, the probability of any given sum of the scores is the same as for the two standard fair six-faced dice.

Standard, fair four-faced dice are tetrahedra whose faces are labelled 1, 2, 3, 4, the score being taken from the face which is not visible after throwing, and each score being equally likely. Find all the ways in which two fair four-faced dice can have their faces labelled with positive integers if the probability of any given sum of the scores is to be the same as for the two standard fair four-faced dice.



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