

STEP III, 2017, Q12

- 12 The discrete random variables X and Y can each take the values $1, \dots, n$ (where $n \geq 2$). Their joint probability distribution is given by

$$P(X = x, Y = y) = k(x + y),$$

where k is a constant.

- (i) Show that

$$P(X = x) = \frac{n + 1 + 2x}{2n(n + 1)}.$$

Hence determine whether X and Y are independent.

- (ii) Show that the covariance of X and Y is negative.



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