14 The probability distribution of a random variable X is modelled as follows.

$$P(X = x) = \begin{cases} \dfrac{k}{x} & x = 1, 2, 3, 4, \\ 0 & \text{otherwise,} \end{cases}$$

where k is a constant.

(a) Show that $k = \dfrac{12}{25}$. [2]

(b) Show in a table the values of X and their probabilities. [1]

(c) The values of three independent observations of X are denoted by X_1, X_2 and X_3.

Find $P(X_1 > X_2 + X_3)$. [3]

In a game, a player notes the values of successive independent observations of X and keeps a running total. The aim of the game is to reach a total of exactly 7.

(d) Determine the probability that a total of exactly 7 is first reached on the 5th observation. [5]