15 **In this question you must show detailed reasoning.**

The random variable X has probability distribution defined as follows.

$$P(X = x) = \begin{cases} \dfrac{15}{64} \times \dfrac{2^x}{x!} & x = 2, 3, 4, 5, \\ 0 & \text{otherwise.} \end{cases}$$

(a) Show that $P(X = 2) = \dfrac{15}{32}$. [1]

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

(b) Given that $X_1 + X_2 + X_3 = 9$, determine the probability that at least one of these three values is equal to 2. [6]

Freda chooses values of X at random until she has obtained $X = 2$ exactly three times. She then stops.

(c) Determine the probability that she chooses exactly 10 values of X. [3]