13 In this question you must show detailed reasoning.

The probability that Paul's train to work is late on any day is 0.15, independently of other days.

(i) The number of days on which Paul's train to work is late during a 450-day period is denoted by the random variable Y. Find a value of a such that $\mathrm{P}(Y > a) \approx \frac{1}{6}$. **[3]**

In the expansion of $(0.15 + 0.85)^{50}$, the terms involving 0.15^r and 0.15^{r+1} are denoted by T_r and T_{r+1} respectively.

(ii) Show that $\frac{T_r}{T_{r+1}} = \frac{17(r+1)}{3(50-r)}$. **[3]**

(iii) The number of days on which Paul's train to work is late during a 50-day period is modelled by the random variable X.

(a) Find the values of r for which $\mathrm{P}(X = r) \leqslant \mathrm{P}(X = r+1)$. **[4]**

(b) Hence find the most likely number of days on which the train will be late during a 50-day period. **[2]**