3 The data produced by a certain data entry firm always include a small number of incorrect characters that occur at random. The proportion of incorrect characters is denoted by p, and experience has shown that $p = 0.0001$. A particular data set from the firm contains 14 500 characters, of which X characters are incorrect.

(a) Use a suitable approximating distribution to find $\mathrm{P}(X < 4)$. [3]

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The firm's management wishes to decrease the value of p by giving their employees some training. Their aim is that, for a data set containing 14 500 characters, the value of $\mathrm{P}(X = 0)$ for the new value of p should be double the value of $\mathrm{P}(X = 0)$ when $p = 0.0001$.

(b) Use a suitable approximating distribution to find the new value of p. [3]

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