9 Last year, market research showed that 8% of adults living in a certain town used a particular local coffee shop. Following an advertising campaign, it was expected that this proportion would increase. In order to test whether this had happened, a random sample of 150 adults in the town was chosen.

The random variable X denotes the number of these 150 adults who said that they used the local coffee shop.

(a) (i) Assuming that the proportion of adults using the local coffee shop is unchanged from the previous year, state a suitable binomial distribution with which to model the variable X.

[1]

(ii) The probabilities given by this model are the terms of the binomial expansion of an expression of the form $(a+b)^n$.

Write down this expression, using appropriate values of a, b and n.

[1]

It was found that 18 of these 150 adults said that they use the local coffee shop.

(b) Test, at the 5% significance level, whether the proportion of adults in the town who use the local coffee shop has increased.

[7]

It was later discovered by a statistician that the random sample of 150 adults had been chosen from shoppers in the town on a Friday and a Saturday.

(c) Explain why this suggests that the assumptions made when using a binomial model for X may not be valid in this context.

[1]