**1** The random variable *X* is the number of bacterial colonies on a Petri dish.

**a** State two conditions under which a Poisson distribution is a suitable model for *X*. **(2 marks)**

The number of bacterial colonies follows a Poisson distribution with an average of   
2 per cm2.

Find the probability that

**b** there will be no bacterial colonies in a given 2 cm2 section of the dish **(3 marks)**

**c** there will be at least four bacterial colonies in a given 3 cm2 section of the dish. **(3 marks)**

**2** The table shows the numbers of telesales calls received by a private number over a period of 150 days.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of telesales calls** | 0 | 1 | 2 | 3 | 4 |
| **Number of days** | 51 | 54 | 36 | 6 | 3 |

**a** Find the mean number of telesales calls received per day. **(1 mark)**

**b** Use the mean from part **a** to estimate the expected frequencies for 0, 1, 2, 3 and 4 telesales calls to the private number modelled using a Poisson distribution. **(4 marks)**

**c** By considering the observed and expected frequencies, state, with a reason, whether a Poisson distribution is a good model for this situation. **(2 marks)**