1 A sports club carries out a survey of prospective members to find out which of three sports they play regularly.

A random sample of 120 prospective members gave the following results.

		Sport		
		Hockey	**Cricket**	**Rugby**
Gender	**Male**	25	17	16
	Female	18	21	23

A test is carried out at the 5% level of significance to determine whether or not there is an association between gender and the sport the members play regularly.

a State the null hypothesis for this test. **(1 mark)**

b Calculate the number of degrees of freedom. **(1 mark)**

c Find the critical value appropriate for the test. **(1 mark)**

d Show that the expected frequency for male rugby players is 18.85. **(1 mark)**

e Calculate the test statistic for this test. **(3 marks)**

f State whether or not the null hypothesis is rejected. Justify your answer. **(1 mark)**

g Explain whether or not the null hypothesis would be rejected if the test was carried out at the 10% level of significance. **(1 mark)**

2 A second hand car dealer records the number of cars sold each day over a 30 day period.

Number of cars sold	0	1	2	3	4	5
Frequency	9	12	5	3	0	1

The dealer uses a Poisson distribution with mean 1.2 to calculate expected frequencies.

Number of cars sold	0	1	2	3	4 or more
Expected frequency	9.04	x	6.51	2.60	y

a Find, correct to two decimal places, the values of x and y. **(2 marks)**

The dealer tests, at the 10% level of significance, whether or not the data can be modelled by a Poisson distribution.

b Calculate the test statistic and state the conclusion for this test. State clearly your hypotheses and the number of degrees of freedom used in the test. **(6 marks)**

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3 A five-sided spinner with sections numbered 1–5 is spun 80 times and the results shown in a table.

Number on spinner	1	2	3	4	5
Observed frequency	18	15	18	19	10

a State the distribution that should be used to model the spinner if it is 'fair'. **(1 mark)**

b Test, at the 10% level of significance, whether or not the observed frequencies could be modelled by your stated distribution. State clearly your hypotheses and the number of degrees of freedom used. **(6 marks)**

4 A cat breeder was investigating the number of female kittens born when the litter contained five kittens. She collected data on 100 litters and recorded the data in a table.

Number of female kittens	0	1	2	3	4	5
Frequency	12	19	37	19	8	5

A colleague suggests that the distribution may be modelled by a binomial distribution with $p = 0.5$.

a By testing at the 5% level of significance, show that this model is not a good model. **(10 marks)**

The breeder still believes that a binomial model is suitable for modelling the distribution.

b Test, at the 5% level of significance, the breeder's claim. **(8 marks)**

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