

QQQ – Further Statistics 1 – Chapter 6 – Chi-Squared Tests (Version 2)

Total Marks: 22

(22 = Platinum, 20 = Gold, 18 = Silver, 15 = Bronze)

1. A leisure club offers a choice of one of three activities to its 150 members on a Tuesday evening. The manager believes that there may be an association between the choice of activity and the age of the member and collected the following data.

Activity Age a years	Badminton	Bowls	Snooker
$a < 20$	9	3	3
$20 \leq a < 40$	10	10	14
$40 \leq a < 50$	16	15	5
$50 \leq a < 60$	15	13	11
$a \geq 60$	4	19	3

(a) Write down suitable hypotheses for a test of the manager's belief. (1)

The manager calculated expected frequencies to use in the test.

(b) Calculate the expected frequency of members aged 60 or over who choose snooker, used by the manager. (1)

(c) Explain why there are 6 degrees of freedom used in this test. (2)

The test statistic used to test the manager's belief is 19.583

(d) Using a 5% level of significance, complete the test of the manager's belief. (2)

(Total 6 marks)

2. A spinner used for a game is designed to give scores with the following probabilities

Score	1	2	3	4	6
Probability	$\frac{3}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{2}{5}$	$\frac{1}{10}$

The spinner is spun 80 times and the results are as follows

Score	1	2	3	4	6
Frequency	15	4	12	41	8

Test, at the 10% level of significance, whether or not the spinner is giving scores as it is designed to do. Show your working and state your hypotheses clearly. (7)

(Total 7 marks)

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3. A researcher is investigating the number of female cubs present in litters of size 4

He believes that the number of female cubs in a litter can be modelled by $B(4, 0.5)$

He randomly selects 100 litters each of size 4 and records the number of female cubs.

The results are recorded in the table below.

Number of female cubs	0	1	2	3	4
Observed number of litters	10	33	33	15	9

He calculated the expected frequencies as follows

Number of female cubs	0	1	2	3	4
Expected number of litters	6.25	r	s	r	6.25

(a) Find the value of r and the value of s (3)

(b) Carry out a suitable test, at the 5% level of significance, to determine whether or not the number of female cubs in a litter can be modelled by $B(4, 0.5)$

You should clearly state your hypotheses and the critical value used. (6)

(Total 9 marks)

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