

BRONZE.

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.

(Total for question = 7 marks)

SILVER.

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 for question = 6 marks)

SILVER 2.

A university foreign language department carried out a survey of prospective students to find out which of three languages they were most interested in studying.

A random sample of 150 prospective students gave the following results.

		Language		
		French	Spanish	Mandarin
Gender	Male	23	22	20
	Female	38	32	15

A test is carried out at the 1% level of significance to determine whether or not there is an association between gender and choice of language.

- State the null hypothesis for this test. (1)
- Show that the expected frequency for females choosing Spanish is 30.6 (1)
- Calculate the test statistic for this test, stating the expected frequencies you have used. (3)
- State whether or not the null hypothesis is rejected. Justify your answer. (2)
- Explain whether or not the null hypothesis would be rejected if the test was carried out at the 10% level of significance. (1)

(Total for question = 8 marks)

GOLD.

Abram carried out a survey of two treatments for a plant fungus. The contingency table below shows the results of a survey of a random sample of 125 plants with the fungus.

		Treatment		
		No action	Plant sprayed once	Plant sprayed every day
Outcome	Plant died within a month	15	16	25
	Plant survived for 1 – 6 months	8	25	10
	Plant survived beyond 6 months	7	14	5

Abram calculates expected frequencies to carry out a suitable test. Seven of these are given in the partly-completed table below.

		Treatment		
		No action	Plant sprayed once	Plant sprayed every day
Outcome	Plant died within a month			17.92
	Plant survived for 1 – 6 months	10.32	18.92	13.76
	Plant survived beyond 6 months	6.24	11.44	8.32

The value of $\sum \frac{(O - E)^2}{E}$ for the 7 given values is 8.29

Test at the 2.5% level of significance, whether or not there is an association between the treatment of the plants and their survival. State your hypotheses and conclusion clearly. (7)

(Total for question = 7 marks)