







2. Students in a mixed sixth form college are classified as taking courses in either Arts, Science or Humanities. A random sample of students from the college gave the following results

		Course		
		Arts	Science	Humanities
Gender	Boy	30	50	35
	Girl	40	20	42

Showing your working clearly, test, at the 1 % level of significance, whether or not there is an association between gender and the type of course taken. State your hypotheses clearly.

(11)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---















**Question 3 continued**

Lined writing area for the answer to Question 3.

**(Total 14 marks)**

**Q3**

--	--





3. The product moment correlation coefficient is denoted by  $r$  and Spearman's rank correlation coefficient is denoted by  $r_s$ .

(a) Sketch separate scatter diagrams, with five points on each diagram, to show

(i)  $r = 1$ ,

(ii)  $r_s = -1$  but  $r > -1$ .

(3)

Two judges rank seven collie dogs in a competition. The collie dogs are labelled  $A$  to  $G$  and the rankings are as follows

Rank	1	2	3	4	5	6	7
Judge 1	$A$	$C$	$D$	$B$	$E$	$F$	$G$
Judge 2	$A$	$B$	$D$	$C$	$E$	$G$	$F$

(b) (i) Calculate Spearman's rank correlation coefficient for these data.

(6)

(ii) Stating your hypotheses clearly, test, at the 5% level of significance, whether or not the judges are generally in agreement.

(5)



**Question 4 continued**

Lined writing area for the answer to Question 4 continued.



N 3 0 9 8 4 A 0 1 3 2 4





5. A researcher is hired by a cleaning company to survey the opinions of employees on a proposed pension scheme. The company employs 55 managers and 495 cleaners.

To collect data the researcher decides to give a questionnaire to the first 50 cleaners to leave at the end of the day.

(a) Give 2 reasons why this method is likely to produce biased results. (2)

(b) Explain briefly how the researcher could select a sample of 50 employees using

(i) a systematic sample,

(ii) a stratified sample. (6)

Using the random number tables in the formulae book, and starting with the top left hand corner (8) and working across, 50 random numbers between 1 and 550 inclusive were selected. The first two suitable numbers are 384 and 100.

(c) Find the next two suitable numbers. (2)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---





**Question 5 continued**

Lined writing area for the answer to Question 5.

**(Total 10 marks)**

**Q5**

--	--



6. Ten cuttings were taken from each of 100 randomly selected garden plants. The numbers of cuttings that did not grow were recorded.

The results are as follows

No. of cuttings which did not grow	0	1	2	3	4	5	6	7	8, 9 or 10
Frequency	11	21	30	20	12	3	2	1	0

- (a) Show that the probability of a randomly selected cutting, from this sample, not growing is 0.223 (2)

A gardener believes that a binomial distribution might provide a good model for the number of cuttings, out of 10, that do not grow.

He uses a binomial distribution, with the probability 0.2 of a cutting not growing. The calculated expected frequencies are as follows

No. of cuttings which did not grow	0	1	2	3	4	5 or more
Expected frequency	$r$	26.84	$s$	20.13	8.81	$t$

- (b) Find the values of  $r$ ,  $s$  and  $t$ . (4)
- (c) State clearly the hypotheses required to test whether or not this binomial distribution is a suitable model for these data. (2)

The test statistic for the test is 4.17 and the number of degrees of freedom used is 4.

- (d) Explain fully why there are 4 degrees of freedom. (2)
- (e) Stating clearly the critical value used, carry out the test using a 5% level of significance. (3)

---

---

---

---

---

---

---

---

---

---



**Question 6 continued**

[Lined writing area for Question 6 continued]



N 3 0 9 8 4 A 0 1 9 2 4



**Question 6 continued**

Lined area for writing the answer to Question 6.

**Q6**

**(Total 13 marks)**



7. A sociologist is studying how much junk food teenagers eat. A random sample of 100 female teenagers and an independent random sample of 200 male teenagers were asked to estimate what their weekly expenditure on junk food was. The results are summarised below.

	<i>n</i>	mean	s.d.
Female teenagers	100	£5.48	£3.62
Male teenagers	200	£6.86	£4.51

- (a) Using a 5% significance level, test whether or not there is a difference in the mean amounts spent on junk food by male teenagers and female teenagers. State your hypotheses clearly.

(7)

- (b) Explain briefly the importance of the central limit theorem in this problem.

(1)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



**Question 7 continued**

Lined area for writing the answer to Question 7.



