

1. A telephone directory contains 50 000 names. A researcher wishes to select a systematic sample of 100 names from the directory.

(2)

(ii) systematic sampling.

(4)

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3. A doctor is interested in the relationship between a person's Body Mass Index (BMI) and their level of fitness. She believes that a lower BMI leads to a greater level of fitness. She randomly selects 10 female 18 year-olds and calculates each individual's BMI. The females then run a race and the doctor records their finishing positions. The results are shown in the table.

Individual	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>
BMI	17.4	21.4	18.9	24.4	19.4	20.1	22.6	18.4	25.8	28.1
Finishing position	3	5	1	9	6	4	10	2	7	8

- (a) Calculate Spearman's rank correlation coefficient for these data. (5)
- (b) Stating your hypotheses clearly and using a one tailed test with a 5% level of significance, interpret your rank correlation coefficient. (5)
- (c) Give a reason to support the use of the rank correlation coefficient rather than the product moment correlation coefficient with these data. (1)

4. A sample of size 8 is to be taken from a population that is normally distributed with mean 55 and standard deviation 3. Find the probability that the sample mean will be greater than 57.

(5)



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5. The number of goals scored by a football team is recorded for 100 games. The results are summarised in Table 1 below.

Number of goals	Frequency
0	40
1	33
2	14
3	8
4	5

Table 1

- (a) Calculate the mean number of goals scored per game.

(2)

The manager claimed that the number of goals scored per match follows a Poisson distribution. He used the answer in part (a) to calculate the expected frequencies given in Table 2.

Number of goals	Expected Frequency
0	34.994
1	r
2	s
3	6.752
≥ 4	2.221

Table 2

- (b) Find the value of r and the value of s giving your answers to 3 decimal places.

(3)

- (c) Stating your hypotheses clearly, use a 5% level of significance to test the manager's claim.

(7)



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7. A company produces climbing ropes. The lengths of the climbing ropes are normally distributed. A random sample of 5 ropes is taken and the length, in metres, of each rope is measured. The results are given below.

(a) Calculate unbiased estimates for the mean and the variance of the lengths of the climbing ropes produced by the company.

The lengths of climbing rope are known to have a standard deviation of 0.2 m. The company wants to make sure that there is a probability of at least 0.90 that the estimate of the population mean, based on a random sample size of n , lies within 0.05 m of its true value.

(b) Find the minimum sample size required.

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Question 8 continued

