

QQQ – Further Statistics 2 – Chapter 7 – Confidence Intervals and Tests Using the t-Distribution (Version 1)

Total Marks: 25

(25 = Platinum, 23 = Gold, 20 = Silver, 17 = Bronze)

1. Jemima makes jam to sell in a local shop. The jam is sold in jars and the weight of jam in a jar is normally distributed.

Jemima takes a random sample of 8 of her jars of jam and weighs the contents of each jar, x grams. Her results are summarised as follows

$$\sum x = 3552 \quad \sum x^2 = 1\,577\,314$$

(a) Calculate a 95% confidence interval for the mean weight of jam in a jar. (5)

The labels on the jars state that the average contents weigh 440 grams.

(b) State, giving a reason, whether or not Jemima should be concerned about the labels on her jars of jam. (1)

(Total 6 marks)

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2. Alexa believes that students are equally likely to achieve the same percentage score on each of two tests, paper I and paper II. She randomly selects 8 students and gives them each paper I and paper II. The percentage scores for each paper are recorded.

The following paired data are collected.

Student	A	B	C	D	E	F	G	H
Paper I (%)	70	70	84	80	64	65	65	90
Paper II (%)	64	76	72	74	68	64	58	76

Test, at the 1% significance level, whether or not there is evidence to support Alexa's belief.

State your hypotheses clearly and show your working. (7)

(Total 7 marks)

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3. A farmer is investigating the milk yields of two breeds of cow. He takes a random sample of 9 cows of breed A and an independent random sample of 12 cows of breed B . For a 5 day period he measures the amount of milk, x gallons, produced by each cow. The results are summarised in the table below.

Breed	Sample size	Mean ($\bar{x}$)	Standard deviation (s_x)
A	9	6.23	2.98
B	12	7.13	2.33

The amount of milk produced by each cow can be assumed to follow a normal distribution.

- (a) Use a two-tail test to show, at the 10% level of significance, that the variances of the yields of the two breeds can be assumed to be equal. State your hypotheses clearly. **(4)**
- (b) Stating your hypotheses clearly, test, at the 5% level of significance, whether or not there is a difference in the mean yields of the two breeds of cow. **(7)**
- (c) Explain briefly the importance of the test in part (a) for the test in part (b). **(1)**

(Total 12 marks)