

- 2 A large school is holding an essay competition and each student has submitted an essay. To ensure fairness, each essay is given a mark out of 100 by two different judges. The marks awarded to the essays submitted by a random sample of 12 students are shown in the following table.

Student	<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>	<i>K</i>	<i>L</i>
Judge 1	62	74	52	48	68	55	56	64	37	70	81	59
Judge 2	65	70	47	49	76	74	67	54	50	77	72	75

- (a) One of the students claims that Judge 2 is awarding higher marks than Judge 1.

Carry out a Wilcoxon matched-pairs signed-rank test at the 5% significance level to test whether the data supports the student's claim. [7]

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It is discovered later that the marks awarded to student *A* have been entered incorrectly. In fact, Judge 1 awarded 65 marks and Judge 2 awarded 62 marks.

- (b) By considering how this change affects the test statistic, explain why the conclusion of the test carried out in part (a) remains the same. [2]

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- 6 Nassa is researching the lengths of a particular type of snake in two countries, A and B .
- (a) He takes a random sample of 10 snakes of this type from country A and measures the length, x m, of each snake. He then calculates a 90% confidence interval for the population mean length, μ m, for snakes of this type, assuming that snake lengths have a normal distribution. This confidence interval is $3.36 \leq \mu \leq 4.22$.

Find the sample mean and an unbiased estimate for the population variance. [4]

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- (b) Nassa also measures the lengths, y m, of a random sample of 8 snakes of this type taken from country B . His results are summarised as follows.

$$\sum y = 27.86 \quad \sum y^2 = 98.02$$

Nassa claims that the mean length of snakes of this type in country B is less than the mean length of snakes of this type in country A . Nassa assumes that his sample from country B also comes from a normal distribution, with the same variance as the distribution from country A .

Test at the 10% significance level whether there is evidence to support Nassa's claim. [8]

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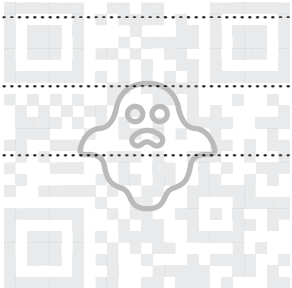
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