

Question 7 (5 marks)

Electricity usage is measured in kilowatt-hours (kWh).

In 2014 and 2015, the amount of electricity used by households in 1 week was studied. A standardised survey was used, and the number of kWh used in that week by each surveyed household was recorded.

In 2014, 1000 households were randomly selected and surveyed. The standard deviation of the weekly household electricity usage was 26.5 kWh.

In 2015, a further 50 households were randomly selected and surveyed. The mean weekly electricity usage for these 50 households was 126.3 kWh.

Assume that the standard deviation stayed the same between 2014 and 2015, and that household electricity usage is normally distributed.

- (a) Using the information provided above, fill in the boxes below to form an expression that could be used to calculate a 95% confidence interval for the mean weekly household electricity usage in 2015.

$$\boxed{} - \boxed{} \times \boxed{} \leq \mu \leq \boxed{} + \boxed{} \times \boxed{}$$

(2 marks)

Assume that the 95% confidence interval for the population mean of weekly household electricity usage in 2015 is

$$118.95 \leq \mu \leq 133.65.$$

- (b) Which *one* of the following statements is a correct interpretation of this 95% confidence interval? Circle the letter corresponding to the correct statement.

- J** The population mean is between 118.95 kWh and 133.65 kWh for 95% of weeks.
- K** If the survey is conducted 50 times, approximately 45 of the 50 resulting confidence intervals can be expected to contain the population mean.
- L** There is a 95% chance that the population mean is between 118.95 kWh and 133.65 kWh.
- M** None of J, K, or L.
- N** All of J, K, and L.

(1 mark)

Assume that the standard deviation stayed the same as during the 2014–15 period, and that household electricity usage is normally distributed.

- (c) Based on the data, the media claimed that the population mean of weekly household electricity usage increased between 2015 and 2018.
- (i) Calculate the 95% confidence interval of the 2018 survey data.

(1 mark)

- (ii) Based on your calculation in part (c)(i), can the media's claim be supported? Justify your answer.

(1 mark)