

LC 2015 (SET B): PAPER 2**QUESTION 2 (25 MARKS)****Question 2 (a)**Number in the sample $n = 100$ Mean shopping spend $\bar{x} = 90.45$ Standard deviation $\sigma = 20.73$

$$\bar{\sigma} = \frac{\sigma}{\sqrt{n}} = \frac{20.73}{\sqrt{100}} = 2.073$$

Confidence interval:

$$\bar{x} - 1.96\bar{\sigma} \leftrightarrow \bar{x} + 1.96\bar{\sigma}$$

$$90.45 - 1.96(2.073) \leftrightarrow 90.45 + 1.96(2.073)$$

$$€86.39 \leftrightarrow €94.51$$

You can be 95% confident that the mean amount spent was in the range $€86.39 < \mu < €94.51$.**FORMULAE AND TABLES BOOK****Statistics and Probability: Sampling**
(standard error of the mean) [page 34]

$$\bar{\sigma} = \frac{\sigma}{\sqrt{n}}$$

 n = Number in the sample σ = standard deviation of the sample

Confidence interval: $\bar{x} - 1.96\bar{\sigma} \leftrightarrow \bar{x} + 1.96\bar{\sigma}$

MARKING SCHEME NOTES**Question 2 (a) [Scale 10C (0, 4, 8, 10)]**

4: • Relevant formula with or without substitution

• $\frac{1}{\sqrt{n}}$ with further work8: • $1.96 \times \frac{\sigma}{\sqrt{n}}$ evaluated**Question 2 (b)** H_0 : Mean $\mu = €94$ ← Null hypothesis: Mean spend is €94 H_1 : Mean $\mu \neq €94$ ← Alternative hypothesis: Mean spend is not €94Since the mean μ is in the confidence interval, you cannot reject the null hypothesis.**MARKING SCHEME NOTES****Question 2 (b) [Scale 10D (0, 2, 5, 8, 10)]**

2: • One relevant step e.g. null hypothesis or alternative hypothesis stated

• Some work towards finding z • Mention of ± 1.96 5: • z calculated• Either null or alternative hypothesis stated and relevant work towards finding z

• Confidence interval from (a) and either null or alternative hypothesis stated

• Confidence interval based on 100 (i.e. 89.94, 98.06) and either null or alternative hypothesis stated

8: • z calculated and compared to ± 1.96 but:

o Not stating null hypothesis and/or alternative hypothesis correctly

o Not accepting or rejecting hypothesis

o Incorrect conclusion for hypothesis

• Incorrect use of 94 and confidence interval

• Incorrect use of 90.45 and confidence interval

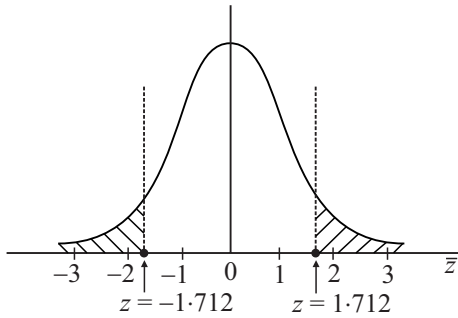
Question 2 (c)

Mean shopping spend $\bar{x} = 90.45$

Standard error of the mean $\bar{\sigma} = 2.073$

Mean amount spend $\mu = 94$

$$\bar{z} = \frac{\bar{x} - \mu}{\bar{\sigma}} = \frac{90.45 - 94}{2.073} = -1.712$$



p -value = 0.0872

Explanation: Because $p = 8.72\%$ is greater than 5% there is not a significant difference between the sample mean and the population mean. Any difference may be due to chance.

FORMULAE AND TABLES BOOK
Statistics and Probability: Probability distribution (standarding formula) [page 34]

$$\bar{z} = \frac{\bar{x} - \mu}{\bar{\sigma}}$$

n = Number in the sample
 σ = standard deviation of the sample

$$\begin{aligned} p\text{-value} &= 1 - P(\bar{z} < 1.712) + P(\bar{z} < -1.712) \\ &= 1 - P(\bar{z} < 1.712) + 1 - P(\bar{z} < 1.712) \\ &= 2(1 - P(\bar{z} < 1.712)) \\ &= 2(1 - 0.9564) \\ &= 0.0872 > 0.05 \end{aligned}$$

MARKING SCHEME NOTES

Question 2 (c) [Scale 5C (0, 2, 4, 5)]

2: • Effort at finding $P(z < -1.71)$

4: • p value correct

• Not contextualising answer correctly