

QQQ – Further Statistics 2 – Chapter 5 – Estimation, Confidence Intervals and Tests Using a Normal Distribution (Version 1)

Total Marks: 22

(22 = Platinum, 20 = Gold, 18 = Silver, 15 = Bronze)

1. A random sample of the daily sales (in £s) of a small company is taken and, using tables of the normal distribution, a 99% confidence interval for the mean daily sales is found to be

(123.5, 154.7)

Find a 95% confidence interval for the mean daily sales of the company.

(6)

(Total 6 marks)

Edexcel S3 June 2007 Q6

2. A population has mean μ and variance σ^2 .

A random sample of size 3 is to be taken from this population and $\bar{X}$ denotes its sample mean.

A second random sample of size 4 is to be taken from this population and $\bar{Y}$ denotes its sample mean.

- (a) Show that unbiased estimators for μ are given by

(i) $\hat{\mu}_1 = \frac{1}{3}\bar{X} + \frac{2}{3}\bar{Y},$ **(2)**

(ii) $\hat{\mu}_2 = \frac{5\bar{X} + 4\bar{Y}}{9}.$ **(2)**

- (b) Calculate $\text{Var}(\hat{\mu}_1)$ **(2)**

- (c) Given that $\text{Var}(\hat{\mu}_2) = \frac{37}{243}\sigma^2$, state, giving a reason, which of these two estimators should be used. **(1)**

(Total 7 marks)

Edexcel S4 January 2006 Q3

3. A company produces two colours of candles, blue and white. The standard deviation of the burning times of the blue candles is 2.6 minutes and the standard deviation of the burning times of the white candles is 2.4 minutes.

Nissim claims that the mean burning time of blue candles is more than 5 minutes greater than the mean burning time of white candles.

A random sample of 90 blue candles is found to have a mean burning time of 39.5 minutes. A random sample of 80 white candles is found to have a mean burning time of 33.7 minutes.

- (a) Stating your hypotheses clearly, use a suitable test to assess Nissim's belief. Use a 1% level of significance. **(6)**
- (b) Explain how the hypothesis test in part (a) would be carried out differently if the variances of the burning times of candles were unknown. **(1)**

The burning times for the candles may not follow a normal distribution.

- (c) Describe the effect this would have on the calculations in the hypothesis test in part (a). Give a reason for your answer. **(2)**

(Total 9 marks)