

MA20033 - Question Sheet Five

Simon Shaw
s.c.shaw@maths.bath.ac.uk

2004/05 Semester I

Attempt both questions. Hand in by 5.00pm Friday 19 November 2004 either to me, or the envelope on my door, 1W4.8.

1. The following data, which are assumed to come from a normal distribution with mean μ , representing “the passage time of light”, and variance σ^2 , may be regarded as Newcomb’s measurements of “the passage time of light”.

| | | | | | | | | | |
|----|----|----|----|----|-----|----|----|----|----|
| 28 | 26 | 33 | 24 | 34 | -44 | 27 | 16 | 40 | -2 |
| 29 | 22 | 24 | 21 | 25 | 30 | 23 | 29 | 31 | 19 |

- (a) Given that $\sum_{i=1}^{20} x_i = 435$ and $\sum_{i=1}^{20} x_i^2 = 15365$, find an unbiased estimate of the mean and the variance.
 - (b) Construct a 95% confidence interval for the “true” passage time of light.
 - (c) Omitting the two smallest data values, recalculate the unbiased estimate of the mean and variance and the corresponding 95% confidence interval. Comment briefly on differences in results compared with those using all 20 data values.
2. Recall question 3. of Question Sheet Four. To estimate the gestation period of domestic dogs, 15 randomly selected dogs are observed during pregnancy. Their gestation periods, in days, are:

| | | | | |
|------|------|------|------|------|
| 62.0 | 61.4 | 59.8 | 62.2 | 60.3 |
| 60.4 | 59.4 | 60.2 | 60.4 | 60.8 |
| 61.8 | 59.2 | 61.1 | 60.4 | 60.9 |

Once more, we will make the assumption that these 15 observations are realisations from a population which may be modelled by a $N(\mu, \sigma^2)$ distribution.

- (a) Evaluate a 99% confidence interval for μ when σ^2 is known to be 1.
- (b) Evaluate a 99% confidence interval for μ when σ^2 is assumed unknown.
- (c) Comment on the differences or similarities of these intervals.