EXERCISES IN STATISTICS

Series A, No. 9

1. The average length of a finger bone of 10 fossil skeletons of the proconsul hominid is 3.73cm, and the standard deviation is 0.34cm. Find 80% and 90% confidence intervals for the mean length of the bone in the species.

2. Mr. Smith has been threatened with the loss of his job if he persists in arriving late at the office. Prior to this threat, his average arrival time over 10 days was 10–46am. with a standard deviation of 16 minutes. For five working days since the threat, his arrival time has been 10–01am. with a standard deviation of 12 mins. Construct a 90% confidence interval for the extent to which Mr. Smith has improved his arrival time.

3. A factory that manufactures shafts of 5cm diameter has installed new lathes. Hitherto, the variance of the diameter of the shafts has been 0.49mm^2. A sample of 20 shafts, produced by the new machines, has a variance of 0.25mm^2 measured about the theoretical mean of 5cm. Find a 95% confidence interval for the new variance, and a 95% confidence interval for the ratio of the old and the new variances.

4. Two independent random samples of sizes $n = 16$ and $m = 10$, taken from independent normal distributions $N(\mu_x, \sigma_x^2)$ and $N(\mu_y, \sigma_y^2)$ yield, respectively, $\bar{x} = 3.6$, $s_x^2 = 4.14$ and $\bar{y} = 13.6$, $s_y^2 = 7.6$. Find the 90% confidence interval for σ_x^2/σ_y^2 when μ_x and μ_y are unknown.

   Find the 90% confidence interval for σ_x^2/σ_y^2 on the assumption that $\mu_x = 4$ and $\sum(x_i - \mu_x)^2/n = 5.3$ and that $\mu_y = 12$ and $\sum(y_i - \mu_y)^2/m = 7.5$.