University of Technology Sydney
School of Mathematical and Physical Sciences

Mathematical Statistics (37262) –
Class 6 Preparation Work

1. Let $Y \sim Poi(\lambda)$ where the rate parameter λ is unknown and let $\{y_1, y_2, ..., y_n\}$ be independent realisations of Y.

   i) Using the first sample moment, estimate the value of λ through the method of moments.

   ii) Write down the likelihood function $L(\{y_1, y_2, ..., y_n\} \mid \lambda)$.

   iii) Hence find the loglikelihood function $\ell(\{y_1, y_2, ..., y_n\} \mid \lambda)$.

   iv) Show that the maximum likelihood estimate of λ is the same as that obtained via the method of moments in part i).

2. Let $\{z_1, z_2, z_3, z_4, z_5\} = \{1, 4, 3, 3, 3\}$ be independent realisations of $Z \sim Bin(n, p)$.

   i) Calculate the first two sample moments.

   ii) Hence use the method of moments to estimate the parameters n and p.

   Assume now that it is known that $n = 5$ but p is unknown..

   iii) Showing all steps in your calculation, calculate the maximum likelihood estimate of p.

   Assume now that it is known that $p = 0.5$ but n is unknown.

   iv) Find the maximum likelihood estimate of n.