Tutorial Questions

Submit your solutions to ALL Tutorial Questions to your Tutor’s assignment box by 2:30 pm, Friday 7 September. Note that this assessment is in lieu of Tutorial One that was not submitted.

1. Mineraltech Industries manufactures carbide drill tips used in drilling oil wells. Mineraltech claims that, under typical drilling conditions, the life of a carbide tip has mean drilling depth of at least 32 units. Some customers disagree with Mineraltech’s claim and assert that Mineraltech is overstating the average drilling depth. A random sample of 25 carbide tips provides an observed mean of 29.5 units and a standard deviation of 4.0 units.

   (i) Is there enough evidence at the 2.5% level of significance in support of the customers assertion?
   (ii) What assumptions if any have you made in the above analysis?
   (iii) Compute a 95% confidence interval for the mean life \( \mu \) of the tips. Does this interval contain \( \mu \)?

2. From past data it is known that the average stay of tourists in Hong Kong hotels has been 3.4 nights. Recent changes in the nature of tourism to Hong Kong may have changed this average. A tourism industry analyst took a random sample of 30 hotel rooms in Hong Kong, and found that the sample mean number of nights spent by tourists was \( \bar{x} = 3.7 \) with a sample standard deviation of \( s = 0.83 \). Assume that the number of nights spent by tourists in Hong Kong hotels is normally distributed.

   (a) The analyst wishes to answer the question: “Is there enough evidence to suggest that the average stay of tourists in Hong Kong hotels has increased?” Carry out the relevant test using \( \alpha = 0.025 \).
   (b) Find a 95% confidence interval for the average stay of tourists in Hong Kong hotels.

3. A recent banking survey by Australian Consumers’ Association Choice magazine showed that for home loans, credit unions had the highest customer satisfaction at 93%. Suppose 100 home loan customers of the Big Four banks (NAB, Westpac, ANZ and Commonwealth) are surveyed and 85% of them are satisfied with their home loans. Does this mean that, compared to credit unions, a lower proportion of customers of the Big Four banks are satisfied with their home loans?

Practice Questions

1. An executive for a transport company wants to estimate the mean tonnage carried by the company’s trucks. For a random sample of 8 of the company’s deliveries, the following tonnages were measured: 19.3 21.8 20.8 21.6 23.8 20.8 22.1 17.5. Find a 90% confidence interval for the mean tonnage.

2. A certain medicine, in tablet form, has been found effective in relieving an allergy in 60% of sufferers. The manufacturers have developed a soluble form of the tablet and wish to see if this has altered the effectiveness of the medicine. In a sample of 40 people who had the allergy, the new tablet provided relief for 32 people.

   (a) Give an estimate (with estimated standard error) of the proportion \( p \) of people with the allergy who could expect relief using the new medicine.
   (b) Construct a 95% confidence interval for \( p \).
   (c) Is there enough evidence to suggest that the introduction of the soluble form of the tablet has altered the effectiveness of the medicine. Carry out the relevant test using \( \alpha = 0.05 \).
3. Last year, 20% of the employees in a large firm used public transport to commute to and from work. To determine if a recent campaign encouraging the use of public transport has been effective, 50 randomly chosen employees were interviewed and it was found that 14 of them were currently using public transport.

(a) Justify the use of a Bernoulli trials model in this problem.
(b) Is there enough evidence to suggest that the campaign was effective. Carry out the relevant test using $\alpha = 0.05$.
(c) Obtain a point estimate (with estimated standard error) and an approximate 95% confidence interval for $p$.

4. A certain antibiotic is claimed by its manufacturers to be effective against a particular infection in at least 60% of cases. In a random sample of 75 patients with this infection, the antibiotic is effective for only 30 of them.

(a) Is there enough evidence to suggest that the claim of the manufacturers is not justified. Carry out the relevant test using $\alpha = 0.01$.
(b) From the data determine a 95% confidence interval for the proportion of patients for which the antibiotic is effective. Hence state a 95% confidence interval for the percentage of patients for which the antibiotic is effective.