22.4UC2 **Tutorial Exercises — Unit 5**

Pick some of the exercises below for your tutorial.

Exercise 1 *(I picked up the following exercise in the newspaper on the bus. I wasn't convinced by their answer, but forgot what it was.)* Suppose three dice are thrown (in order). What is the probability that middle die shows a value between the other two? *[18.5% or 49.1%, depending how you interpret 'between'.]*

Exercise 2 Fuses (instead of circuit breaker) are still quite common. A manufacturer wants to know whether fuses marked 20A really burn out at 20A. (If the mean amperage is lower then customers will complain that the fuses have to be replaced too often. If the mean amperage is higher the manufacturer risks being liable for damage.) Test the following data at a 0.01 level of significance.

19.9135	20.2382	19.9627	20.0228	20.0589
19.6669	20.2378	20.1452	20.2134	19.7328
20.0251	19.9925	19.8823	20.0119	20.1429
20.0575	20.0655	20.4366	19.9809	20.3247
19.7707	20.0349	19.9727	19.8335	19.8616

[We accept the null Hypothesis that the mean of the fuses equals 20A.]

Exercise 3 A car manufacturer recommends that all new cars should be brought back to a dealer for a 5000km check-up. A random sample of 60 customers resulted in an average 5304km and sample error of 363km. Test the hypothesis that the true average is 5000km using level of significance 0.01. *[The null hypothesis is rejected.]*

Exercise 4 The relative conductivity of a semi-conductor diode is determined by the amount of impurity doped into the diode during manufacture. Suppose the diodes under consideration require a cut-off voltage of 0.60V.
A sample of 100 diodes had a sample average cup-off voltage of .63V and a sample deviation of .12V. At level 0.01 does the data indicate that the true cut-off voltage is different from .60V? *[The null hypothesis is accepted.]*

Exercise 5 A lab does a complete inventory once every year. The lab-supervisor wants to save money and selects randomly 80 items and verifies whether they are in or missing. If less than 0.0125% of the items are missing the inventory will be postponed.

(a). Among the 80 items 2 were lost. Test the relevant hypothesis at a 0.05 level of significance and advise.

(b). If the true proportion of missing items is 0.0625%, what is the probability that the inventory will be postponed?

[The null hypothesis is accepted./ 3.5%.]

Exercise 6 Sample data ($n = 35$) show that $\bar{x} = 31.4$ with sample error 1.2. Test the hypothesis that the true population mean is 32 at various levels of significance. *[At $\alpha = 0.01$ the hypothesis is rejected, at $\alpha = 0.001$ is is accepted.]*