Dirk Metzler SS 2016

STATISTICS FOR EES — EXERCISE SHEET 3

1. The R script `sem_cll.R` contains commands to perform the following steps:

(a) Simulates a population of 1,000,000 values of some variable x.

(b) Compute the mean μ and the standard deviation σ of all values x.

(c) Draw 1,000 samples of size $n = 10$ from the population of values x.

(d) Compute the sample mean $\overline{x}$ and the standard deviation s for each of the 1,000 samples.

(e) Count for which fraction of the samples the interval between $\overline{x} - s/\sqrt{n}$ and $\overline{x} + s/\sqrt{n}$ contained the population mean μ.

(f) Visually compare the distribution of sample means to the normal distribution with mean μ and standard deviation $\sigma/\sqrt{n}$.

At the end of the R script another population of values y is simulated. Perform the steps listed above also for the population y with various values for the sample size n. For which n is the normal distribution a good approximation for the distribution of sample means?

2. Two dice are tossed. Given that the sum of the pips is 8, what is the probability that at least one of the dice shows 3 pips?

3. A deck of 52 poker playing cards is shuffeled and two cards are drawn (without replacement). Which pairs of the following events are stochastically independent?

(a) The first card is an Ace.

(b) The second card is a Queen.

(c) The first card is of Spades (♠).

(d) The second card is of Hearts (♡).

Check this using the mathematical definition of stochastic independence. Does something change (and if so, what?) if you forget to remove the 53. card, which displays the rules, before you do the experiment?