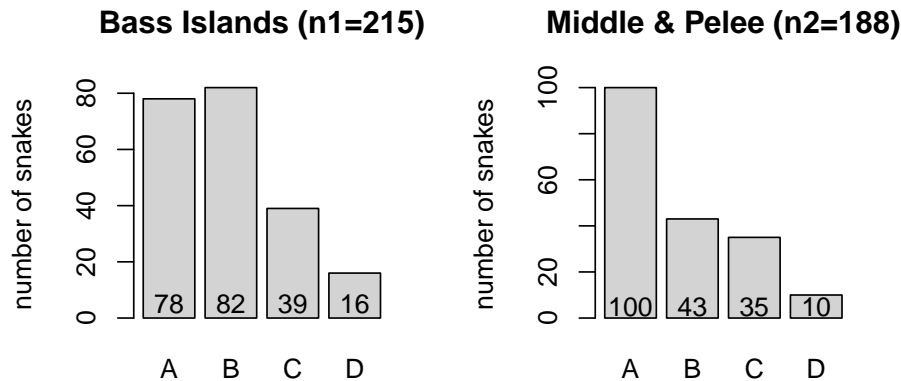


STATISTICS FOR EES — EXERCISE SHEET 8

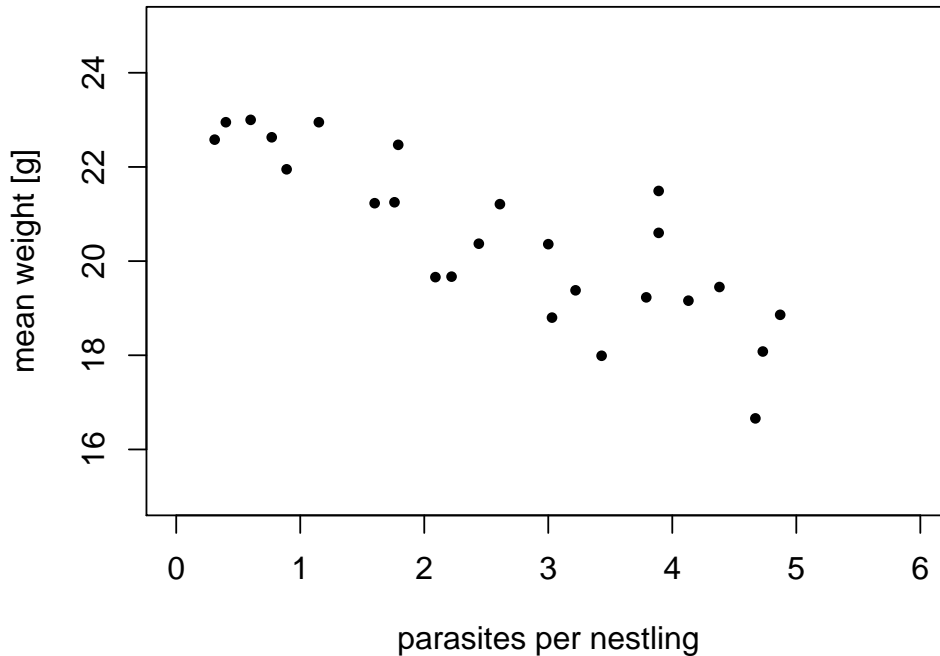
1. The markings of the water snake *Nerodia sipedon* in Lake Erie can be grouped into four classes. On the mainland all snakes have strong markings (D). On the islands many snakes have no markings (A) or only weak marking of two different types (B and C). Frequencies of the four markings in samples from the Bass islands and from Middle Island and Pelee Island are as follows.



- Let H_0 be the hypothesis that the distribution of marking classes were the same for all islands. What is the expected number of snakes of class A sampled from the Bass Islands if we assume that H_0 is true?
- We apply a Chi-square test with null hypothesis H_0 . How much does the table entry (Bass Islands : class A) contribute to the test statistic X^2 ?
- If we sum $(O_i - E_i)^2 / E_i$ for all table entries we find $X^2 = 14.74$. How many entries does the table have? How many degrees of freedom does X^2 have?
- What is the value of the quantile to which you have to compare the p value to check for significance on the 5% level?
- Which sentence is appropriate to summarize the result of the test? (One and only one is correct.)
 - The frequencies of the four markings differ significantly between the two populations.
 - The frequencies of the markings do not differ between the two populations.
 - We cannot reject the null hypothesis that the frequencies of the markings are the same in the two populations.
 - We reject the null hypothesis that the frequencies of the markings differ between the two populations.
 - The frequencies of the markings differ between the two populations.

2. Nestlings of the swallow *Hirundo pyrrhonta* are often infected by the parasite *Oeciacus vicaius*. For 25 nests the number of parasites per nestling and the average weight per nestling were determined 10 days after hatching.

mean weight and parasite infection (25 nest)



- Fit a regression line to the data by eye.
- Estimate the intercept and explain its biological meaning.
- Estimate the slope and explain its biological meaning.
- How precise is the estimation of the slope? Compute the standard error.
- A new nest is found with 1.5 parasites per nestling. What is the prediction for the average weight of the nestlings 10 days after hatching in this nest and how precise is this prediction?

3.	x	y	Use pencil, paper and pocket calculator to compute the regression line for the prediction of y from x . Is there a significant dependence between x and y ?
	1.2	5.3	
	2.4	2.2	
	3.4	3.2	
	5.0	3.0	

4. The file `moreqqplots.pdf` shows normal-qqplots for data sampled according to 6 different distributions. Draw the density polygons to show for each of the 6 distributions how it differs from a normal distribution with the same mean and the same variance.