Exercises for the course
"An introduction to R"
Sheet 03

Exercise 13:   *The role of the heartbeat in the relation between mother and infant.*
Download the file 'heartbeats.txt' from the course web page (the file 'heartbeats.readme.txt' on the
web page contains more information on the data). Read the data from 'heartbeats.txt' into a data
frame named `heartbeats`. Get an overview of the structure of the data frame. Attach `heartbeats`
to save typing work. The group of newborns which had the heartbeat treatment is referred to as
'heartbeat group'. Calculate

- the mean of the increase in weight of all newborns,
- the mean of the weight increase of the control group,
- the mean of the weight increase in the heartbeat group,
- the mean of the weight increase in each weight class of the control group,
- the mean of the weight increase in each weight class of the heartbeat group,
- the standard deviation of the weight increase of all newborns.

Are the means in the heartbeat group higher than in the control group?

Newborns often loose weight in the first days. Let's have a closer look at that with the data at
hand. Define a new vector `negwghtincr` as the elements of `wghtincr` which are ≤ 0.

- Boxplot `negwghtincr` both for the heartbeat group and for the control group.
- Plot an histogram of `negwghtincr` of the first weight class of the heartbeat group.
- Plot an histogram of `negwghtincr` of the first weight class of the control group.

Exercise 14:   Before reading data, you need to carefully prepare the data file. Consider the
following self-generated data which is supposed to be obtained from measuring mice of the two
species 'mus musculus' and 'mus spretus'. The following table contains the tail length measured in
centimeter.

mus musculus	11,3	10,6	12,1	9,5	11,7	10,8
mus spretus	5,4	5,6	6,1	4,9	5,3	4,6

Prepare a data file as described in Subsection 3.5 of the script using Excel or a text editor. Then
read the data file into a data frame.

- Calculate the mean tail length of all mice.
- Calculate the mean tail length of all mice of the species mus musculus.
- Calculate the mean tail length of all mice of the species mus spretus.

Exercise 15: Use `plot()` to produce the following plot of the sine function on the interval $[-2 \cdot \pi, 2 \cdot \pi]$:

Plotting a continuous function
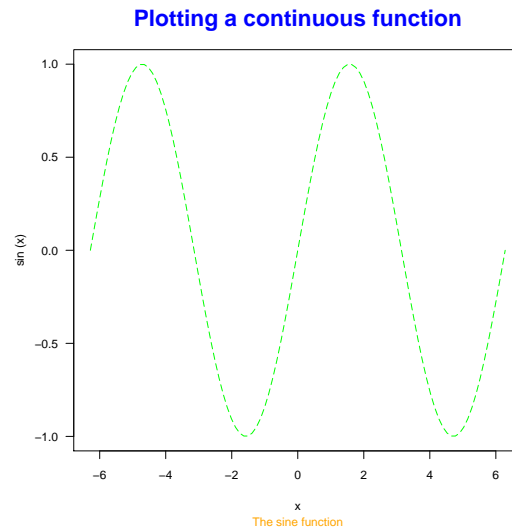
The text of the main title (`main=`) is magnified (`cex.main=`) by a factor 2. The line type is 'longdash'. The colours used in the plot are 'blue', 'green' and 'orange'. Furthermore you need the option `las=` to obtain horizontal axis labels.

**Exercise 16:** Set the seed to 1111 to obtain the same plot as below.

- Define the variable `line` to be a vector which increases from 0 to 2 and has 1000 elements. Generate 1000 values with `rnorm()` and add `line`. Denote the resulting vector as `x`. Then generate a factor named `groups` with 10 levels and total length 1000 with the command `gl()` (see ?gl for the syntax).

- Use either `plot()` or `boxplot()` to boxplot `x` grouped according to `groups`. Produce the following figure:

Box–and–whisker plot
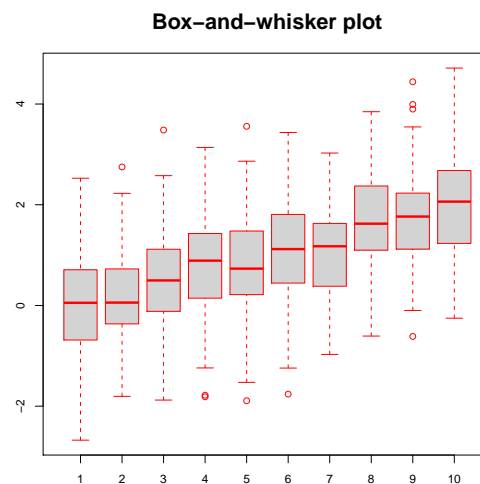
The text of the main title is magnified by 1.8. The colours used in the plot are 'red' for the border and 'lightgray' for the background.

Exercise 17: *If the data size is small, then scatter plots produced by* `stripchart()` *are a good alternative to boxplots.*

Read the data from the file 'heartbeats.txt' (see web page) into a data frame named 'heartbeats' and attach the data frame. Here we only consider weight class '2'. Let `incr2` be the subvector of `wghtincr` of newborns of this weight class. Moreover let `treat2` be the subvector of `treatment` of all newborns of weight class '2'. Grouping `incr2` according to `treat2`, use `stripchart()` to produce the following figure.

Do newborns benefit from hearing heartbeats?
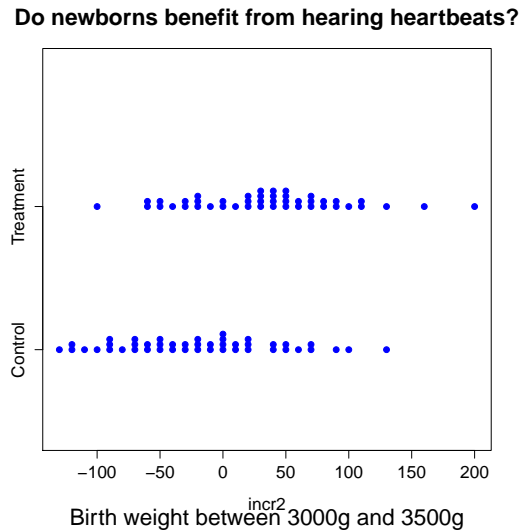
Here are hints. To avoid points being plotted at the same spot, let them be plotted on top of each other with `method="stack"`. The labels on the y-axis are set with `group.names=`. The point character to be used is 19. Both the main title and the subtitle should be magnified by a suitable factor. Use `ylim=` to suitably scale the y-axis.

Exercise 18: *Merging data frames*

Download the files 'studentsfile.txt', 'studentgrades1.csv' and 'studentgrades2.txt' from the web page and read the data into R. Merge the data frames together and write the resulting data frame to the file 'studentgradesall.txt'.