

# Homework 4

(For questions 1, 2) The following data show the liver weights (kg) taken from randomly selected cattle in two farms in southwest England during outbreaks of liver fluke disease.

```
farm1 <- c(18.0, 18.5, 18.9, 18.2, 17.9, 15.9, 16.8, 18.2, 17.3, 17.5, 17.7, 17.8, 17.1,
           17.0, 16.3)
farm2 <- c(14.3, 13.2, 17.3, 14.9, 16.4, 16.0, 18.6, 17.3, 15.5, 16.8, 15.7, 18.0, 15.2)
```

1. (a) Create the following data frame:

```
##      farm liver_weight
## 1  farm1          18.0
## 2  farm1          18.5
## 3  farm1          18.9
## 4  farm1          18.2
## 5  farm1          17.9
## 6  farm1          15.9
## 7  farm1          16.8
## 8  farm1          18.2
## 9  farm1          17.3
## 10 farm1          17.5
## 11 farm1          17.7
## 12 farm1          17.8
## 13 farm1          17.1
## 14 farm1          17.0
## 15 farm1          16.3
## 16 farm2          14.3
## 17 farm2          13.2
## 18 farm2          17.3
## 19 farm2          14.9
## 20 farm2          16.4
## 21 farm2          16.0
## 22 farm2          18.6
## 23 farm2          17.3
## 24 farm2          15.5
## 25 farm2          16.8
## 26 farm2          15.7
## 27 farm2          18.0
## 28 farm2          15.2
```

(b) Using `group_by()` and `summarize()` combination, create the following summary table:

```
## # A tibble: 2 x 3
##   farm sample_mean sample_var
##   <fct>      <dbl>      <dbl>
## 1 farm1      17.5      0.671
## 2 farm2      16.1      2.31
```

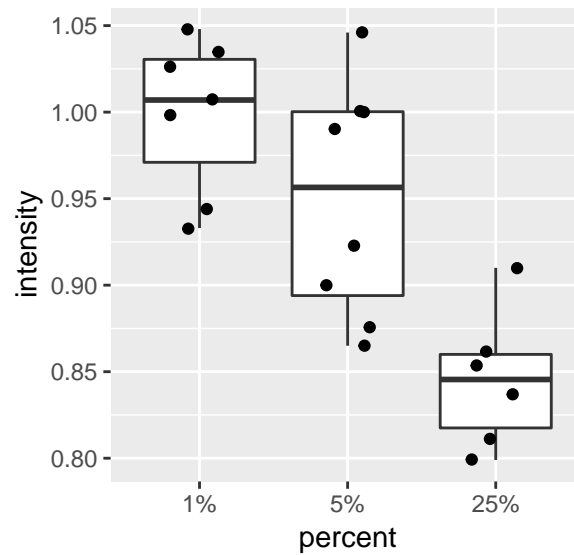
2. (a) As a preliminary to testing the null hypothesis that the mean liver weights of the cattle in the two farms are the same, check if the population variances in the two farms can be assumed to be similar.

(b) Use an appropriate test to check if `farm1` population mean is the same as `farm2` population mean.

3. In the following, the measurements of the mean fluorescence intensity of sperm cells stained with a fluorescent marker, 1-anilinonaphthalene-8-sulphonate (ANS), showing the effect of the presence of egg yolk in the diluent solution. ANS fluoresces only when bound to the sperm membrane. Each value represents the mean of 10 individual spermatozoa and is estimated by a densitometer from photographic film.

```
egg_yolk_1_percent <- c(0.944, 1.048, 1.026, 1.007, 0.933, 0.998, 1.035)
egg_yolk_5_percent <- c(0.865, 1.000, 1.001, 0.900, 0.923, 0.876, 1.046, 0.990)
egg_yolk_25_percent <- c(0.811, 0.862, 0.910, 0.799, 0.837, 0.854)
```

(a) Create the following box plot:



(b) What evidence is there that the egg yolk percentage affects the fluorescence intensity of sperm cells? Use an appropriate test to support your answer. You may assume that the population variances of the intensity in each group are the same.