Homework 6

due Mar 2, 2021

1. The following shows the daily live weight gains (in grams) of a random sample of 36 growing pigs in a rearing unit:

```
gain <- c(577, 596, 594, 612, 600, 584, 618, 627, 588, 601, 606, 559,
          615, 607, 608, 591, 565, 586, 621, 623, 598, 602, 581, 631,
          570, 595, 603, 605, 616, 574, 578, 600, 596, 619, 636, 589)
```

Are these values consistent with the claim that the true population mean of weight gains is equal to 603 grams? Clearly give the null hypothesis, p-value, the 95% confidence interval of the population mean, and your call regarding the the null hypothesis.

2. A representative sample of 602 sows from piggeries in Suffolk showed that 49 animals had joint lameness. Calculate the 95% confidence interval for the true proportion of joint lameness in the population of Suffolk sows. Test the null hypothesis that 10% of the population have joint lameness.

3. Observe the sperm numbers (in millions) obtained either by electroejaculation (EE) or artificial vagina (AV) from 23 adult tom cats. The tom cats were randomly assigned to one of the two methods:

```
AV <- c(61, 19, 51, 108, 34, 44, 57, 58, 73, 74, 85, 94, 67)
EE <- c(41, 11, 76, 23, 39, 34, 45, 49, 55, 56)
```

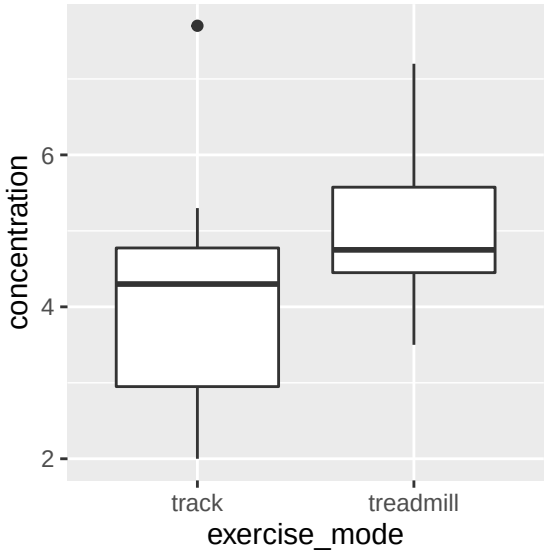
Carry out an appropriate two-sample t-test and draw your conclusion. Assume that the population variances in the two groups are the same.

(For questions **4, 5**) A study was made to compare the plasma lactate concentration in Dutch Warmblood horses cantering at a constant speed either on a track or on an inclined treadmill. The speed was chosen as the horses' own comfortable speed on the track. Samples were taken after 5 minutes' cantering on the track and treadmill, the plasma lactate concentrations (mmol/l) are given below in a data frame:

```
id <- paste0("horse", 1:10)
track <- c(2.0, 7.7, 4.7, 4.7, 2.9, 2.5, 5.3, 4.8, 3.1, 3.9)
treadmill <- c(3.5, 7.2, 4.6, 5.7, 5.5, 4.4, 5.6, 4.6, 3.5, 4.9)
PLC <- data.frame(id, track, treadmill)
PLC
```

```
##         id track treadmill
## 1   horse1   2.0       3.5
## 2   horse2   7.7       7.2
## 3   horse3   4.7       4.6
## 4   horse4   4.7       5.7
## 5   horse5   2.9       5.5
## 6   horse6   2.5       4.4
## 7   horse7   5.3       5.6
## 8   horse8   4.8       4.6
## 9   horse9   3.1       3.5
## 10 horse10   3.9       4.9
```

4. Create the following plot. *Hint*: you may first want to make the long format of the data using `pivot_longer()`.



5. State the hypothesis you would test to investigate whether the exercise exerted by the horses can be considered to be of similar metabolic demand in both situations. What conclusion do you draw? Justify your answer.