STAT2203/7203: Week 2 Practical Questions

1. Does exposure to light at night lead to weight gain? In one study to address this question, 18 mice were randomly split into two light exposure groups. One group of 8 mice lived on a normal light-dark cycle while the other group of 10 mice had light during the day but were exposed to dim light at night. The increases in body mass (grams) for the mice after 8 weeks, split between the two groups, are given in the file `LightExposure.csv`.

   (a) The researchers suspected that those exposed to the dim light at night would experience a greater increase in body mass. State the null and alternative hypotheses that they should test.

   H_0 :

   H_1 :

   (b) What type of variable is *increase in body mass*?

   (c) What type of variable is *light exposure*?

   (d) The observed difference in the mean increase in body mass between the 'Light-Dim' and 'Light-Dark' groups was 1.932g. The researchers carried out a randomisation test by splitting the 18 values into groups of size 10 and 8, recording the resulting difference between the means each time. Repeating this 100 times in `RStudio` gave the following differences between the means:

```
  [1]  2.48625 -0.57600  0.48600  0.81675 -0.22950  0.13275  2.39850 -0.25425 -0.99225
 [10]  0.62775  0.57600  0.72900  1.03050 -1.82025  0.05850  1.12950  1.43325  2.14200
 [19]  1.19475 -0.19350 -0.39825  1.03500 -1.57050  2.73825 -0.66375  1.72575 -0.27000
 [28]  1.45575 -1.53450 -1.53225  0.89100  1.84050 -0.83250  0.00675  0.64350 -0.60075
 [37]  2.47050  0.65475 -0.21150  1.66050 -1.10250  0.75375  0.60750 -1.28475 -0.27000
 [46] -1.55925 -1.43100  0.75600  0.48150  0.60975 -0.48600  0.75825 -0.24300  0.76950
 [55]  0.42750 -1.01475 -0.99225  0.58725 -0.17325  0.54225 -2.46825 -0.09675  1.26000
 [64] -1.44900  0.73575 -0.80100 -0.84825 -0.07425 -0.79875 -1.53675 -0.09225  0.63225
 [73] -1.35450 -1.20375 -1.41750 -0.67950  0.81225  1.78200 -1.84050 -1.43100 -2.44800
 [82]  0.21375 -2.15775 -1.05525 -0.12600 -0.67500  0.44100 -1.83600  0.16200 -0.07875
 [91] -1.92375 -1.42875 -0.68175  0.42750 -0.32625 -0.85050  0.60750 -0.70425 -0.06750
[100] -1.68300
```

   Based on this simulation, what is the estimated p-value for the test that the increase in body mass tends to be higher in mice exposed to dim light at night? What do you conclude?

2. The following questions concern the survey data from students contained in the file `Survey2021.csv` which was used in Lecture 1-2. Download this file and import the data into `RStudio`. A video illustrating how data is imported can be found under Learning Resources > RStudio > Video Guides. (Note that the video was created for another class so you can ignore the comments about quizzes.)

   (a) What is the median and IQR of the Height of students in the sample?

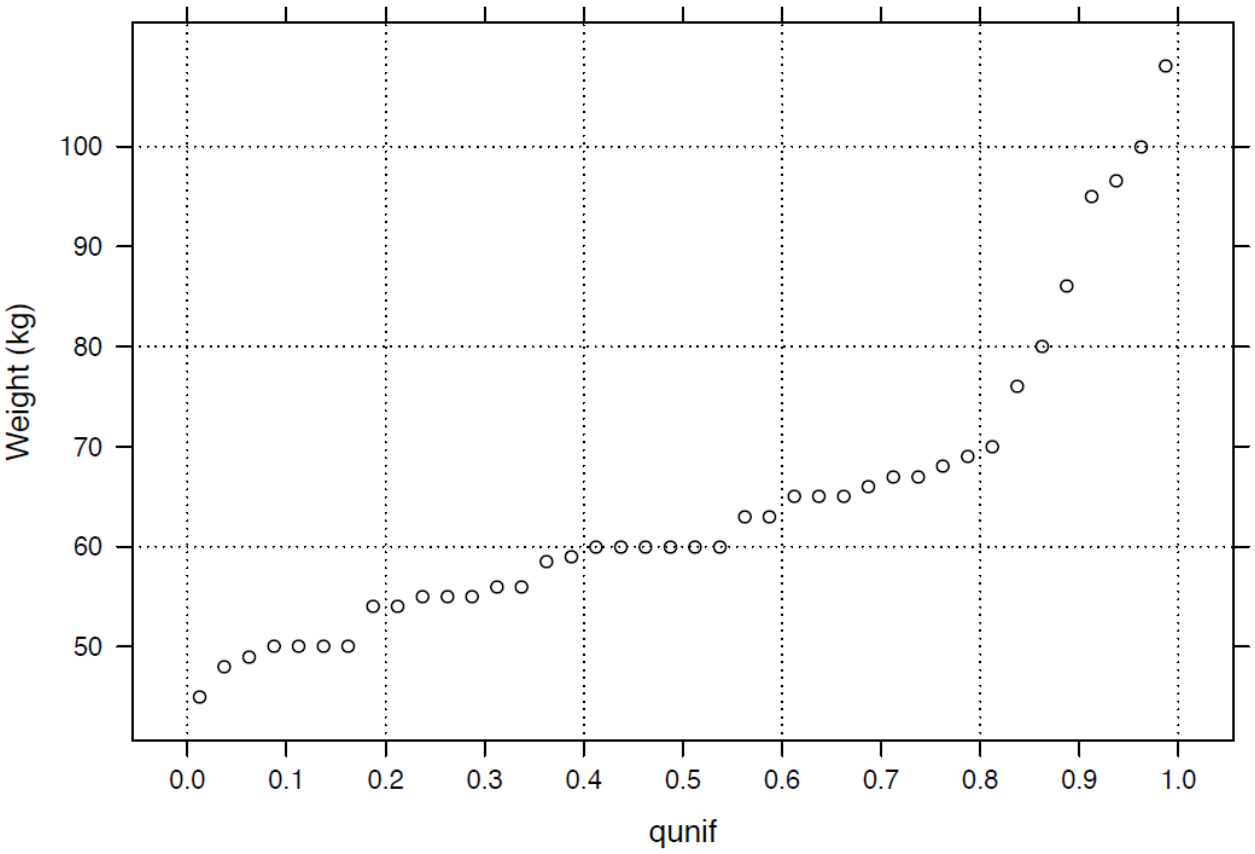
   (b) What is the mean and standard deviation of the Mass of students in the sample?

   (c) The PulseRate variable recorded the students resting pulse rate over one minute. Create a boxplot of the students' pulse rate. Do you notice any issues with the data?

   (d) How many students with brown eyes would like to have the superpower of flying?

   (e) Create a bar chart of students' eye colour.

3. The figure below shows a quantile plot of the weights of 40 students.



   Sketch a boxplot of the weights next to the quantile plot. Indicate the numerical values of the median and quartiles that you use and flag any observations that are outside the range of the $1.5 \times IQR$ rule.

4. Match the following histograms to their boxplots.