

## Homework 2, MAT 327/782, FALL 2018

1. Compute the variance of the following random variables:
  - (a) Roll a dice. Let  $X$  be the number on the dice if the number is even and 0 otherwise.
  - (b) Let  $Y$  be a random variable that takes on the value -2 with probability 0.3, the value 0 with probability 0.1, the value 1 with probability 0.15, and the value 3 with probability 0.45.
2. Calculate the sample mean and sample variance of the following 10 observations of trip distance in miles of 2016 green taxi trips:  
0.94, 1.59, 6.36, 1.35, 6.65, 2.68, 0.83, 2.31, 4.91, 0.5  
Do each calculation two ways: (i) as a traditional math problem and (ii) in R. For the R computations, submit the R commands you used and their output, either by taking a screenshot or by copying them into a text file.
3. The R dataset `swiss` contains data on fertility measures and socio-economic factors for 47 provinces in Switzerland in 1888. All data is given as a percentage. For more information about this dataset, see <https://stat.ethz.ch/R-manual/R-devel/library/datasets/html/swiss.html>.  
All computations should be done in R. Submit the R commands you used and their output, either by taking a screenshot or by copying them into a text file.
  - (a) The second column, `Agriculture`, represents the % of males involved in agriculture as an occupation. What is the mean % of males involved in agriculture over all provinces? What is the sample variance?
  - (b) The fourth column, `Education`, represents the % of army draftees with education beyond primary school. What is the mean % of draftees, over all provinces, with education beyond primary school? What is the sample variance?
4. Consider the dataset  $\{1, 2, 3\}$ , which has mean 2 and sample variance 1. For each of the following questions, either give an example of such a number or numbers, or explain why it is not possible.
  - (a) Can you add a number or numbers to the dataset to decrease the variance?
  - (b) Can you add a number or numbers to the dataset so that the variance remains the same?
  - (c) Can you add a number or numbers to the dataset to increase the variance?