

**Homework Assignment 2**  
**(Due Wednesday, February 23, 2022)**

The homework is due at 10.30am in the dropbox on the Course Plus page (you can find the dropbox under the 'Resources' tab in the upper right). For exercises involving R code, please knit a document from your R markdown (Rmd) file. Generate a single pdf file for your entire submission and give it a name that makes it identifiable (calling it `140.615.HW.Number.Lastname.Firstname` or similar). Show your work.

1. Suppose  $U$  has a Uniform(5, 10) distribution. Without using R, calculate the following:
  - (a)  $E(U)$
  - (b)  $\Pr(U = 6)$
  - (c)  $\Pr(U > 6)$
  - (d)  $\Pr(7 < U < 9)$
  
2. Suppose  $X \sim \text{Normal}(\text{mean}=5, \text{SD}=3)$ . Calculate the following:
  - (a)  $\Pr(X < 6)$
  - (b)  $\Pr(X > 0)$
  - (c)  $\Pr(0 < X < 5)$
  - (d)  $\Pr(2 < X < 8)$
  - (e)  $\Pr(|X - 5| > 2)$
  
3. A biologist made a certain pH measurement in each of 24 frogs. Typical values were 7.43, 7.16, 7.51, etc. She calculated a mean of 7.373 and a standard deviation of 0.129 for these original pH measurements. Next, she transformed the data by subtracting 7 from each observation and then multiplying by 100. The transformed data are 43, 16, 51, etc. What are the mean and standard deviation of these transformed data?
  
4. Suppose we have 100 independent draws from some population distribution whose shape is unknown but where the population mean is 10 and SD is 2.5. Suppose that  $n=100$  is sufficiently large that for the sample mean to have an approximately normal distribution.
  - (a) What is the chance that the sample mean is within 0.1 units of the population mean?
  - (b) What is the chance that the sample mean exceeds the population mean by at least 0.25 units?