MIS 6357 **Homework 1** Due: Friday, January 20, 2016

1. Functions and loops.
   (a) Write a function to test whether an integer `a` is prime. Recall (or be surprised to learn!) that 1 is not a prime.
   (b) Using your function from (a) write a second function that takes an input `n` and returns the n^{th} prime number.
   (c) Use the `sapply` function and your function from (b) to print the first 20 prime numbers.

2. Consider the following vector:

   `x <- c(91, NA, 90, 7, 67, NA, 87, 36, 2, 93, 27, 16).`

   Using only one line of code each, perform the following operations:
   (a) Remove the `NA` values from `x`.
   (b) Print the first, third, and eighth elements of `x`.
   (c) Print the elements of `x` that are greater than 50.
   (d) Print the odd elements of `x`.

3. The `mtcars` dataset is included with R. Use `?mtcars` to learn about the data.
   (a) Use `ggplot` to make a scatter plot of fuel efficiency and engine size.
   (b) Add a horizontal line to the plot at the median of the y values.
   (c) Add a vertical line to the plot at the median of the x values.
   (d) Make a box plot of $\frac{1}{4}$ mile time vs number of engine cylinders. Describe what each aspect of your plot represents. i.e. What do the lines, box widths, whiskers, etc. represent?

4. Recall the trade-off between prediction and interpretation.
   (a) Describe a situation where prediction would be more important than interpretation.
   (b) Describe a second situation where interpretation is relatively more important than in your answer to (a).