# BIOS:5510:0001 Biostatistical Computing with R
# Exercises 1

August 19, 2018

1. Given numeric variables `x`, `mu`, and `sigma`, write an expression to compute the normal probability density function

$$y = \frac{1}{\sqrt{2 \times \pi \times sigma^2}} \exp\left(-\frac{1}{2 \times sigma^2}(x - mu)^2\right).$$

2. Given numeric variables `x`, `p`, and `n`, write an expression to compute the binomial probability density function

$$y = \binom{n}{x} p^x (1 - p)^{(n-x)}$$

3. Given numeric integer variables `x1` and `x2`, determine the internal storage type of the result returned by the following operators applied to the two:

   (a) addition

   (b) subtraction

   (c) division

   (d) exponentiation

   (e) quotient, and

   (f) modulo.

4. Write expressions to add a numeric variable `x1` to variable `x2` of types specified below, so that a numeric value results and is saved to the variable `y`.

   (a) character

   (b) logical

   (c) date

5. Copy a character string in variable `x` to variable `y` so that the first occurrence of "iowa" (any mix of upper and lower case) is converted to "IOWA" (all capital letters). The rest of the characters in the string should be retained and not changed.

6. Define numeric variable `y` to be the decimal number of years between date variables for study subject birth (`birth`) and enrollment (`enroll`).

7. The `Sys.Date()` function returns today's date. Use the function to define date variable `y` to have the same calendar month and day as the system date but with the year changed to 2010.

8. Given numeric variables `x1` and `x2`, define variable `y` to be the

   (a) larger value.

(b) smaller value.

9. Given numeric variable x, define variable y to be its absolute value, using only R operators and no functions.

10. Define a variable y to be the categorization of a continuous variable x, such that

$$y = \begin{cases} \text{NA} & \text{if } x = \text{NA} \\ 0 & \text{if } x < 0 \\ 1 & \text{if } 0 \le x < 10 \\ 2 & \text{if } x \ge 10 \end{cases}$$

11. Given character variables x1 and x2 that represent dates in MM/DD/YYYY format, define numeric variable y to be the decimal number of months from the first to the second date.