# Programming Basics Exercises (Lecture 6)

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These exercises will give you some introductory experience with programming basics. Please complete the following:

1. What will this conditional expression return?

```
x <- c(1,2,-3,4)

if(all(x>0)){
  print("All Postives")
} else{
  print("Not all positives")
}
```

2. Which of the following expressions is always `FALSE` when at least one entry of a logical vector `x` is TRUE?

   a. `all(x)`
   b. `any(x)`
   c. `any(!x)`
   d. `all(!x)`

3. The function `nchar` tells you how many characters long a character vector is. Write a line of code that assigns to the object `new_names` the state abbreviation when the state name is longer than 8 characters.

4. Create a function `sum_n` that for any given value, say $n$, computes the sum of the integers from 1 to n (inclusive). Use the function to determine the sum of integers from 1 to 5,000.

5. Create a function `altman_plot` that takes two arguments, `x` and `y`, and plots the difference against the sum.

6. After running the code below, what is the value of `x`?

```
x <- 3
my_func <- function(y){
  x <- 5
  y+5
}
```

7. Write a function `compute_s_n` that for any given $n$ computes the sum $S_n = 1^2 + 2^2 + 3^2 + \ldots n^2$. Report the value of the sum when $n = 10$.

8. Define an empty numerical vector `s_n` of size 25 using `s_n <- vector("numeric", 25)` and store in the results of $S_1, S_2, \ldots S_{25}$ using a for-loop.

9. Repeat exercise 8, but this time use `sapply`.

10. Repeat exercise 8, but this time use `map_dbl`.
11. Plot $S_n$ versus $n$. Use points defined by $n = 1, \ldots, 25$.
12. Confirm that the formula for this sum is $S_n = n(n+1)(2n+1)/6$.