Quiz 1

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1. Without using R, what does this code do?

   ```
   > X <- rnorm(101)
   > Y <- runif(100, 20, 40)
   > Z <- X + Y
   ```

2. How big is Z?

3. Was this a vectorized operation or not?

4. What is the name of the rule which is used to decide how to deal with the situation where one vector is longer than another?

5. What two functions are used to print in R?

6. What does this code do:

   ```
   > print("AB" + "," + "CD")
   ```

7. If we want to concatenate two strings, we can use what function(s)?

8. How do we search for help in R? How do we lookup help for a particular function?

9. What is the R code to simulate 1000 binomial random variables with probability of success of .8?

10. True or False: Can atomic vectors have different underlying modes? What happens to 0 and TRUE below?

    ```
    > X <- c("jim", 0, TRUE)
    ```

11. If we would like to preserve the data type of the objects above what data structure must we use?

12. How do we get the dimensions of an object?

13. How do we construct a matrix of dimension $2 \times 3 \times 10$?

14. What does the following R code produce?

    ```
    > seq(1, 10, by = 3)
    ```

15. Assuming we have a matrix $X_{100\times10}$ and a vector $Y_{100\times1}$, what is the R code to perform the following matrix algebra?

$$Y - X(X^TX)^{-1}X^TY \tag{1}$$

16. Using the code below generate 10 sequences (ie. evaluate it), then write a function which takes "seqs" as its argument and returns a new list where each element in the list is a list with two items, where the first item is the most often occurring base and the second item is the least often occurring base.

```
> seqs <- lapply(1:10, function(i) {
+     paste(sample(c("A", "C", "G", "T"), size = 50, prob = c(0.1,
+         0.2, 0.5, 0.2), replace = TRUE), collapse = "")
+ })
```

17. *hard*: Augment the previous function so that it takes as a second argument a list of functions to apply to the sequences.

18. What are the classes of "a", "b", "c", and "d":

```
> a <- seqs[1]
> b <- seqs[[1]]
> c <- seqs[[1]][1]
> d <- seqs[[1]][[1]]
```

19. What is the function for getting the length of a vector in R? What about the length of a string. What does the following code return?

```
> nchar(c("ACGT", "CGTA", "AAAAAAA", "CGT"))
```