8.2 Make-up work

In this class, I've decided to specify that this fourth requirement is— always—to submit two different sample preparatory assessment questions (or two different preclass work questions) relevant to the missed lesson. Thus, the other options that ordinarily satisfy this requirement are not applicable in this class. At least one of the questions must be mathematical/computational and/or involve some sort of coding in R. Model answers must be provided for both questions.

1. How to generate a pairwise randomized assignment for 2N subjects? (ideally, you would want this program to be flexible so you can apply it to different data).

```
assignment2 <- function(foo) {
  len <- nrow(foo)

  assig <- foo[sample(1:2),]
  for (i in 3:len - 1) {
    if (i %% 2 != 0) { # get the odd index for every pair
      assig[i:i+1,]  <- foo[sample(i:i+1),]
    }
  }

  treatment.group   <- assig[seq(1, len, 2),] # getting odd indices
  control.group     <- assig[seq(2, len, 2),] # getting even indices

  return(mean(c(treatment.group[,2])) - mean(c(control.group[,2])))
}
```

2. Is Fisher's Exact Test actually exact (is the p-value well-defined?). Why is this test called exact test?

First of all, to find the FET of a sharp null in a distribution, we need to check how likely is the sharp null treatment effect, given randomized assignments, by counting the percentage of generated points greater (or less) than the observed treatment effect in the sample. In this sense, the "exactness" depends on the number of randomizations we make, and it will converge but never reach the exact p-value (since the number line is an uncountable infinity). The test is called exact test because it tests for an exact/particular point as a null hypothesis (e.g., treatment effect is 5 units) and gives out a p-value of the observation given that we settled on the null-hypothesis, so we can only tell if this particular null-hypothesis is rejected/accepted based on significance.