

1.

```
> x<-c(8,7,9,5,9,8,10,7,6,9)
> y<-c(6,5,5,4,7,7,7,5,6,5)
```

```
> library(dplyr)
```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

filter, lag

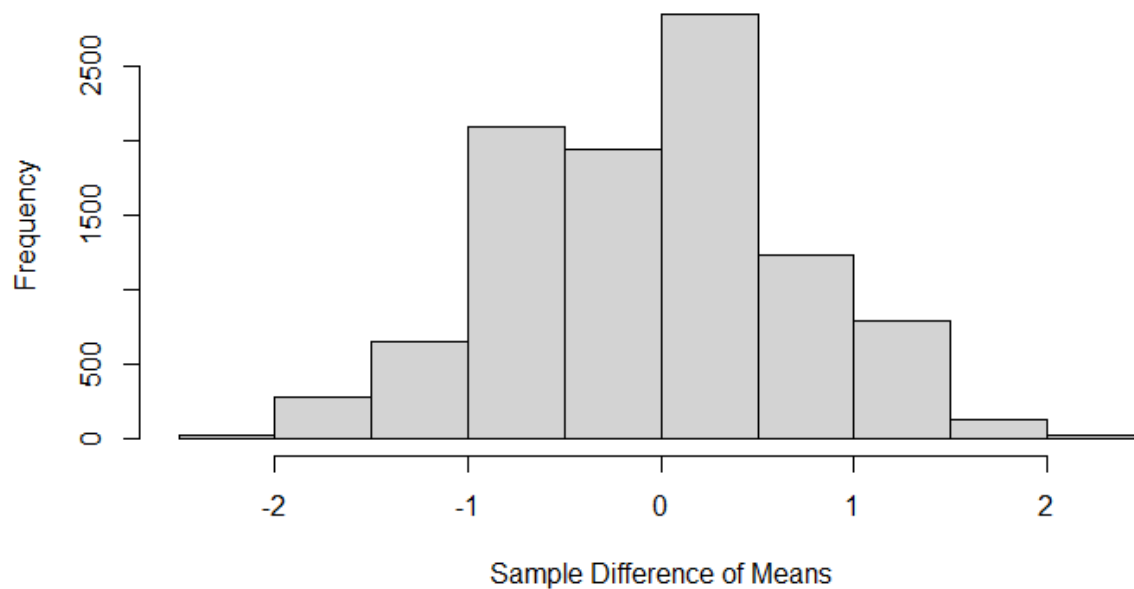
The following objects are masked from 'package:base':

intersect, setdiff, setequal, union

```
> d<-(x-y)
> orig_mean<-mean(d)
> data1<-data.frame(source = rep(1),measure=x)
> data2<-data.frame(source = rep(2),measure=y)
> data<-rbind(data1,data2)
> diffs <- c()
> N=10000
> n=20
> |
> for(i in 1:N) {
+   sample <- sample_n(data,n,replace=FALSE)
+   d1<- sample$measure[1:10] -sample$measure[11:20]
+   diff <- mean(d1)
+   diffs <- c(diffs, diff)
+ }
> hist(diffs, main="Histogram of sample Means for difference of means permutation test", xlab="Sample Difference of Means", ylab="Frequency")
> diffs1<-data.frame(diffs)
> k <- filter(diffs1, diffs >= orig_mean)
> p_val <- length(k)/N
> p_val
[1] 1e-04
> |
```

```
hist(diffs, main="Histogram of sample Means for difference of means permutation test", xlab="Sample Difference of Means", ylab="Frequency")
```

Histogram of sample Means for difference of means permutation test



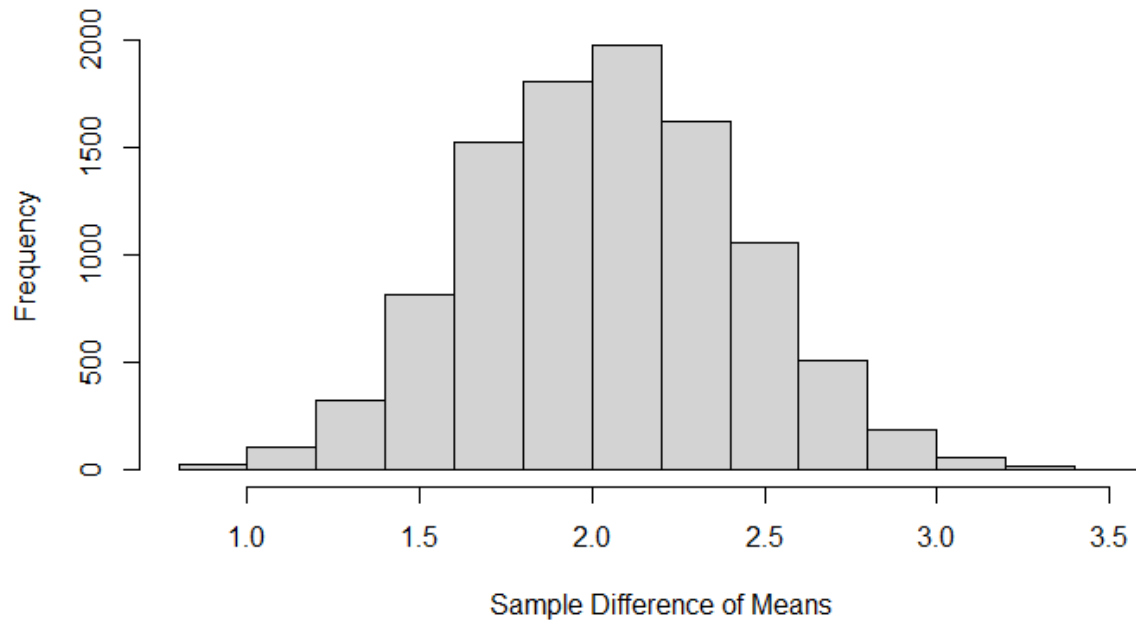
2.

```
> diffs <- c()
> N=10000
> n=10

> for(i in 1:N) {
+   sample1 <- sample_n(data.frame(d),n,replace=TRUE)
+   diff <- mean(sample1$d)
+   diffs <- c(diffs, diff)
+ }
```

```
hist(diffs, main="Histogram of sample Means for difference of means bootstrap", xlab="Sample
Difference of Means", ylab="Frequency")
```

Histogram of sample Means for difference of means bootstrap



```
> diffs_sorted<-sort(diffs)
> diffs_sorted[250]
[1] 1.4
> diffs_sorted[9751]
[1] 2.9
> |
```