The first problem was to generate a random sample of size 30 from a standard normal distribution and find the usual 95% $t$-confidence interval.

```r
> x <- rnorm(30, 0, 1)
> est <- mean(x)
> std <- sqrt(var(x))
> dum <- qt(0.975, 29) * std/sqrt(30)
> lowbd <- est - dum
> upbd <- est + dum
> ans <- c(lowbd, upbd)
> ans
[1] -0.2607382 0.5449561
```

The next bit of code writes a general function to find such intervals. Here $x$ is the data vector and we want an $(1-a)$% CI.

```r
> foo1 <- function(x, a) {
+  n <- length(x)
+  est <- mean(x)
+  std <- sqrt(var(x))
+  dum <- qt(1 - a/2, n - 1) * std/sqrt(n)
+  lowbd <- est - dum
+  upbd <- est + dum
+  ans <- c(lowbd, upbd)
+  return(ans)
+ }
> foo1(x, 0.05)
[1] -0.2607382 0.5449561
```

The next bit of code constructs a population of size 500, takes $W$ random samples of size $n$ from the population and calculates the median of each sample. Finally, it constructs the histogram of these sample medians.

```r
> foo2 <- function(y, n, W) {
+  ans <- rep(0, W)
+  for (i in 1:W) {
+    dum <- sample(y, n)
+    ans[i] <- median(dum)
+  }
+  return(ans)
+ }
> y <- rgamma(500, 4)
> simmed <- foo2(y, 50, 300)
```
Histogram of simmed

Frequency
0 20 40 60 80

Histogram of simmed