Coding

```r
1   # HW 10 Interval Estimation
2   # Peeranat Leelawattanapanit 65011445
3
4   # This function calculates the lower and upper limits of a confidence interval.
5   # The first parameter x takes in the data set as a vector.
6   # The second parameter conf is the % confidence. conf=95 means 95% CI.
7   int.est = function(x, conf)
8   {
9     area = (conf/100) + ((1-(conf/100)) / 2)
10    # Calculates area, which is the probability in the CI, from central interval
11    # and one tail because of division by 2.
12
13    se = sd(x) / sqrt(length(x))
14    # Calculates the standard error of the sample mean by dividing the sample
15    # standard deviation by the square root of the sample size.
16
17    margin = qt(area, length(x)-1) * se
18    # Calculates the margin of error. qt is the quantile function of the t-
19    # distrubution. It takes in the area and the degree of freedom, length(x)-1.
20    # Multiplying by standard error to get margin of error.
21
22      lower = mean(x) - margin
23      upper = mean(x) + margin
24      # Calculates the lower and upper limits. CI = sample mean +- margin of error
25
26    cat("lower=", lower, "upper=", upper) # Prints results.
27  }
28
29  score = c(83, 73, 62, 63, 71, 77, 77, 59, 92)
30  int.est(score, 95)
31  # Function call to find lower and upper limits of 'score' data set with 95% CI.
32
33  t.test(score)$conf.int
34  # One sample t-test on the 'score' data set to confirm the 'int.est' function.
35  # The confidence level is 0.95 by default.
36  # '$conf.int' extracts only the lower and upper limits and the CI.
```

Results

```
> int.est(score, 95)
lower= 64.78388 upper= 81.21612

> t.test(score)$conf.int
[1] 64.78388 81.21612
attr(,"conf.level")
[1] 0.95
```

Conclusion

The lower and upper limits of the 95% confidence interval of the data set 'score' is 64.78388 and 81.21612, respectively. Therefore, the confidence of the true population mean being within this interval is 95%. The results calculated from our 'int.est' function are exactly the same as the results obtained from the R t-test. This confirms the correctness of formula #2.