SOC510 Homework #7: Chapter 14–Solution

1. (a) $P(45 < \bar{x} < 55) = P(\frac{45-50}{1.67} < z_{\bar{x}} < \frac{55-50}{1.67}) = P(-3 < z_{\bar{x}} < 3) = 99.7\%$
   (b) $P(\bar{x} > 48) = P(z_{\bar{x}} > \frac{48-50}{1.67}) = P(z_{\bar{x}} > -1.2) = 1 - .1151 = .8849$
   (c) .95
   (d) Approximately 1.00

2. $P(4 < \bar{x} < 6) = P(\frac{4-5}{1} < z_{\bar{x}} < \frac{6-5}{1}) = .68$

3. $P(\bar{x} \leq 24) = P(z_{\bar{x}} \leq \frac{24-25}{3.2/\sqrt{40}}) = P(z_{\bar{x}} \leq -1.98) = .0239$

4. Yes, because
   interval estimate μ at 95% confidence level $= 31000 \pm 1.96\frac{5000}{\sqrt{100}} = 31000 \pm 980$
   interval estimate μ at 99% confidence level $= 31000 \pm 2.58\frac{5000}{\sqrt{100}} = 31000 \pm 1290$
   thus, the probability having 35,000 miles is very low.

5. (a) $P(15 < \bar{x} < 18) = P(\frac{15-16}{5.4/\sqrt{20}} < z_{\bar{x}} < \frac{18-16}{5.4/\sqrt{20}}) = P(-8.3 < z_{\bar{x}} < 1.66) = .9515 - .2033 = .7482$
   (b) $P(15 < \bar{x} < 18) = P(\frac{15-16}{5.4/\sqrt{100}} < z_{\bar{x}} < \frac{18-16}{5.4/\sqrt{100}}) = P(-1.85 < z_{\bar{x}} < 3.7) = .9999 - .0322 = .9677$
   (c) 99%
   (d) 95%

6. **14.17**: (a) Even without computations, we can say that the margin of error would have to be larger when the sample size is smaller. By examining the formula for margin of error–in particular, the fact that it depends on the square root of n–we see that with one-fourth the sample size, the margin of error would double.
   14.20: (c) A larger sample size (with the same confidence level) gives a smaller margin of error. (In fact, the margin of error would be smaller by a factor of $\sqrt{\frac{1060}{1050}} = .84$).
   14.30 (a): (a) The margin of error for 99% confidence is 2.576 ($\frac{65}{\sqrt{269}}$)=10.2090 minutes, so the interval is 137 ± 10.2090, thus 126.8 to 147.2 minutes.
   14.34: No: The interval refers to the mean NAEP score, not to individual scores, which will be much more variable. (Indeed, if more than 95% of young men score below 276.2, then very few can, for example, determine the price of a meal from a menu.)

R command for Homework #6

```
# 1-a
pnorm(55, 50, 1.67) - pnorm(45, 50, 1.67)

# 1-b
1-pnorm(48, 50, 1.67)

# 2
pnorm(6, 5, 1) - pnorm(4, 5, 1)

# 3
1-pnorm(24, 25, 3.2/sqrt(40))

# 4
E95 <- qnorm(.975)*5000/sqrt(100)
31000-E95
31000+E95

E99 <- qnorm(.995)*5000/sqrt(100)
31000-E99
31000+E99

# 5-a
pnorm(18, 16, 5.4/sqrt(20))-pnorm(15, 16, 5.4/sqrt(20))

# 5-b
pnorm(18, 16, 5.4/sqrt(100))-pnorm(15, 16, 5.4/sqrt(100))
```