Classwork #16

1. \( 93 \pm 8.11 \)
   
   \[ n = 50 \]
   
   \[ \hat{p} = 0.12 \quad \hat{q} = 1 - \hat{p} = 0.88 \]
   
   \[ \sqrt{\frac{\hat{p}(\hat{q})}{n}} = \frac{0.12(0.88)}{50} = 0.0460 \]
   
   a) \( \hat{p} = 0.12 \) so point estimate for pop percent = 0.12 = 12%
   
   b) 99% conf interval
      
      \[ \hat{p} \pm 2.58 \cdot \hat{q} \]
      
      \[ 0.12 \pm (2.58)(0.0460) \]
      
      \[ 0.12 \pm 0.12 \]
      
      0.00 to 0.24

   pop percentage is between 0% and 24% at 99% confidence

2. Find sample size for problem #8.110 so that margin of error \( E = 0.02 \)
   
   Use the preliminary sample approach with the information in #8.110 as the preliminary sample
   
   \[ n = \frac{Z^2 \hat{p}(1-\hat{p})}{E^2} = \frac{2.58^2 (0.12)(0.88)}{(0.02)^2} = 1757.29 \]
   
   round up
   
   Sample size = 1758
Class work #16

3. p 394 # 8.112

\[ n = 20 \]
\[ \hat{p} = \frac{8}{20} = .40 \quad \hat{q} = 1 - \hat{p} = .60 \]

\[ n \hat{p} = .40(20) = 8 > 5 \quad \checkmark \]
\[ n \hat{q} = .60(20) = 12 > 5 \quad \checkmark \]

So sampling dist of \( \hat{p} \) is approx normal by Central Limit theorem for proportions

\[ S_{\hat{p}} = \sqrt{\frac{\hat{p} \hat{q}}{n}} = \sqrt{\frac{.40(.60)}{20}} = .1095 \]

The 99% conf interval for the pop percentage is

\[ \hat{p} \pm 2S_{\hat{p}} \]
\[ .40 \pm 2.58(.1095) \]
\[ .40 \pm .28 \]
\[ .12 \text{ to } .68 \]

At 99% conf, between 12% and 68% of all workers would accept this deal.
Classwork #110

4) page 396 # 7

\[ n = 36 \]
\[ \bar{x} = \$159,000 \text{ Point estimate } \mu \]
\[ \sigma \geq \$27,000 \]

\[ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{27000}{\sqrt{36}} = 4500 \]

The 99% confidence interval for pop mean \( \mu \) is

\[ \overline{x} \pm z \cdot \frac{\sigma}{\sqrt{n}} \]

\[ 159000 \pm 2.58(4500) \]

\[ 159000 \pm 11,610 \]

\$147,390 to \$170,610 at 99% confidence the mean construction cost for all such homes is in this range

margin of error = \$11,610

5) Suppose you want the margin of error to be \$5000 in the problem above. What sample size is needed?

\[ n = \frac{z^2 \sigma^2}{E^2} = \frac{2.58^2(27000)^2}{5000^2} \]

round up

\[ n = 194.10 \]

\[ n = 195 \text{ is Sample Size} \]
Classwork #16

6. p 382 # 8.60

HINT: first calculate \( \bar{x} \) and \( s \) using formulas from ch 3.

\[
\bar{x} = \frac{\sum x}{n} = \frac{742}{10} = 74.2
\]

\[
S = \sqrt{\frac{\sum x^2 - (\sum x)^2}{n}} \quad \text{or} \quad \sqrt{\frac{55310 - \left(\frac{742}{2}\right)^2}{9}} = 5.30827446 \text{ mph}
\]

\[
S_{\bar{x}} = \frac{S}{\sqrt{n}} = \frac{5.30827446}{\sqrt{10}} = 1.67862377 \text{ mph}
\]

\[
df = n-1 = 10-1 = 9
\]

90% conf interval

\[
\bar{x} \pm t \cdot S_{\bar{x}}
\]

\[
74.2 \pm (1.833)(1.67862377)
\]

\[
74.2 \pm 3.1
\]

71.1 to 77.3 mph. The mean speed of all cars on this highway is in this interval, at 90% confidence.