A recent newspaper article claims that business ethics are at an all-time low. Reporting on a recent sample, the newspaper indicates that 40% of all corporate employees believe their boss possesses low ethical standards, and 15% believe their boss has committed serious criminal violations in conducting company business.

(a) (12 points.) If a random sample of 20 corporate employees is selected, what is the probability that more than five but fewer than 15 of them will believe their boss possesses low ethical standards?

(b) (12 points.) If a random sample of 100 corporate employees is selected, what is the probability that at least 10 of them will believe that their boss has committed serious criminal violations in conducting company business? (Use the normal distribution as an approximation.)
2. At a large mid-western state university, the percentage of students who purchase season football tickets varies from year to year. Past history shows that the distribution of percentages is approximately uniform between 20 percent and 40 percent. (The average percentage is $\mu = 30$ and the standard deviation is $\sigma = 5.77$.)

(a) (12 points.) For a randomly selected year, what is the probability the percentage of students purchasing season football tickets will fall within 1 standard deviation of the mean?

$$\sigma = \frac{\mu - \bar{z}}{\sqrt{n}} = 0.0577$$

$$\mu \pm 0.0577 = [0.2423, 0.3577]$$

$$P(0.2423 \leq \frac{X - \mu}{\sigma} \leq 0.3577) = (0.3577 - 0.2423)(5) = 0.577$$

(b) (12 points.) For a random sample of 50 years, what is the probability the average percentage of students purchasing season football tickets will be less than 32?

$$n = 50$$

$$P(\bar{X} < 0.32) \longrightarrow \bar{Z} = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} = \frac{0.32 - 0.3}{0.0577 / \sqrt{50}} = 2.45$$

$$P(\bar{Z} \leq 2.45) = 0.5 + P(0 \leq Z \leq 2.45) = 0.5 + 0.4929 = 0.9929$$
3. The lengths of telephone calls made by a telemarketer are approximately normally distributed with a mean of 5 minutes and a standard deviation of 2 minutes.

(a) (12 points.) The shortest 10% of calls made by the telemarketer will be

\[ z = \frac{x - \mu}{\sigma} \]

\[ x = \mu + z \sigma \]

\[ \frac{z}{1.28} = 1.29 \text{ from table} \]

\[ x = 5 + (1.28)(2) = 8.44 \]

(b) (12 points.) The proportion of calls that last more than 3 minutes is

\[ \text{Last Exam} \]
4. (8 points.) A study conducted by an airline showed that a random sample of 15 of passengers disembarking at Kennedy airport on flights from Europe took on the average 24.15 minutes with a standard deviation of 3.29 minutes to claim their luggage and get through customs. Assuming that the distribution of these times is approximately normal, find a 90% confidence interval for the mean time to claim luggage and get through customs for all passengers disembarking at Kennedy airport on flights from Europe.

\[
\bar{x} = \frac{\sum x}{n} = 24.15 \pm z_{0.05} \left( \frac{s}{\sqrt{n}} \right) = 24.15 \pm 1.645 \left( \frac{3.29}{\sqrt{15}} \right) = (22.65, 25.65)
\]

5. The population of salaries of computer consultants in a particular state have a standard deviation of \( \sigma = 7 \) thousand dollars. The mean salary is to be estimated by observing the salaries of random sample of \( n = 49 \) computer consultants.

(a) (12 points.) What is the probability the sample mean will be within 2 thousand dollars of the true, unknown population mean?

\[
Z \left( \frac{\sigma}{\sqrt{n}} \right) = Z
\]

\[
Z \left( \frac{7}{\sqrt{49}} \right) = Z
\]

\[
Z = 2 \quad \rightarrow \quad 95\%
\]

(b) (8 points.) Suppose the sample mean is observed to be \( \bar{x} = 62 \) thousand dollars. Compute a 99% confidence interval for the mean salary of all computer consultants in this particular state.

\[
\bar{x} = 62 \quad \alpha = 0.01 \quad \alpha/2 = 0.005
\]

\[
Z = 2.575
\]

\[
\bar{x} = \bar{x} \pm Z_{0.005} \left( \frac{s}{\sqrt{n}} \right) = 62 \pm 2.575 \left( \frac{7}{\sqrt{49}} \right) = (59.43, 64.58)
\]