Name: _____
Date:

Business Data Analysis
201-316-VA

In Class Exercise #12: Estimating The Mean

1. **Crop Prices**

In the third week of July, a random sample of 40 farming regions gave a sample mean of the price that farmers get for selling their watermelon crop to be \$6.88 per 100 pounds of watermelon. Assume that the population standard deviation is known to be \$6.88 per 100 pounds of watermelon.

(a) Find a 90% confidence interval for the population mean price (per 100 pounds) that farmers in these regions get for their watermelon crop. Be sure to justify your choice of distribution. What is the margin of error?

Justification: σ known, $n \geq 30$, $\bar{x} \sim$ Normal

$$E = z_c \frac{\sigma}{\sqrt{n}} = z_{0.9}\left(\frac{1.92}{\sqrt{40}}\right) = 1.645\left(\frac{1.92}{\sqrt{40}}\right) = 0.4993$$

Margin of error

$$\bar{x} - E < \mu < \bar{x} + E$$

$$6.88 - 0.4993 < \mu < 6.88 + 0.4993$$

$$6.3807 < \mu < 7.3794$$

The 90% CI for the mean price (per 100 lbs) of watermelon is

6.38\$ to 7.38\$

(b) Find the sample size necessary for a 90% confidence interval with maximal margin of error $E = 0.3$ for the mean price per 100 pounds of watermelon.

$$n = \left(\frac{z_c \sigma}{E}\right)^2 = \left(\frac{1.645 \cdot 1.92}{0.3}\right)^2 = 110.8$$

always round up $\rightarrow$ 111

A sample size of 111 is required

2. **Candy Store**

Startup costs (in thousands of dollars) for a random sample of candy store franchises is given below:

95 173 129 95 75 94 116 100 85

$\Sigma x = 962$

$\Sigma x^2 = 109,762$

(a) Compute the mean and standard deviation for the sample.

$\bar{x} = \frac{\Sigma x}{n} = \frac{962}{9} \approx$ 106.8889 thousand $

$s^2 = \frac{\Sigma x^2 - (\Sigma x)^2/n}{n-1} = \frac{109,762 - 962^2/9}{9-1} \approx 866.8611$

$s = \sqrt{s^2} =$ 29.4425 thousand $

(b) Find a 90% confidence interval for the population average startup costs for candy store franchises. Be sure to justify your choice of distribution. What is the margin of error?

Justification: σ unknown, use s instead
$n < 30$, not told $\bar{x}$ is normally distributed.
Use t-dist, but must ASSUME that x is normally distributed

t_c for $9-1=8$ d.f & 90% confidence: 1.860

$E = t_c \frac{s}{\sqrt{n}} = 1.860 \left(\frac{29.4425}{\sqrt{9}}\right) = 18.2544$

$\bar{x} \pm E$, μ is between 88.6346 to 125.1433 (in thousands of $)

(c) What does the confidence interval mean in the context of this problem?

We are 90% confident that mean start-up up costs for the population of candy store franchises is between 88,634$ and 125,143$