**Total Time needed 70 minutes**

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| **Handouts:**   * Guessing the Population Mean | **Materials:**   * TI-Navigator * TI-Nspires * ***Guessing the population mean.tns*** * Nspire QuickPoll documents ready to go. |

**Objective**

Students will use sampling distributions and the Central Limit Theorem to develop a strategy for guessing the value of an unknown population mean. As a class, we will develop our ideas to show the reasonableness of the confidence interval procedure.

**Introduction**

Tell students we are going to use sampling distributions to investigate the best way to make a guess at the unknown value of a population mean. Give students **2 minutes** to read the first page and answer question 1. **Random name call** answers to Question #1 and share for **3 minutes**.

*Recall the context of the dates of pennies in circulation in 2008. For our sampling frame in that study (all pennies in the purple box) we will now tell you the mean is 1994.57 and standard deviation is 10.64.*

*We used sampling distributions to help us think through how different samples from the sampling frame can have different means and differently shaped distributions. When we look an multiple samples' means, we find that this sampling distribution has its own shape, center, and spread. One possible sampling distribution of 100 samples (with n = 30) in this problem is displayed on page 1.2.*

1. *What does one dot represent in this distribution? What do you notice about this distribution?*

Anticipated responses:

* Dot is a sample mean
* Dot is a penny
* Distribution is normal
* Dist is normal with mean similar to population mean

Give students **5 minutes** to answer question 2 and type in a **free response Quickpoll**.

*Consider a situation where you do not have access to the whole population, but you would like to make a good solid guess at the value of the population mean. You will use ONLY ONE random sample to make this guess.*

1. *As a group agree on a strategy for how you would guess the value of the unknown population mean. How might you defend your strategy mathematically?*

Anticipated responses

* Use the sample mean
* Use the sample mean plus and minus the sample standard deviation.

Report out answers for the free response poll (**5 minutes**).

We anticipate students will use the sample mean as their guess, but the likelihood that the sample mean is EXACTLY correct is virtually nil. Give students **10 minutes** to research the CLT and revise their strategies. Type in a **free response Quickpoll**.

*The Central Limit Theorem (CLT) provides important information about sampling distributions of the mean. Find and read a description of the CLT for sample means in a textbook or on a website.*

1. *Revise your strategy in light of the CLT. Describe your revised strategy in the space below.*

Anticipated responses

* Use sample mean plus or minus the samp dist st.dev
* Use sample mean plus or minus 2 times the samp dist st.dev
* Some students will struggle with understanding CLT

Report out strategies from Quickpolls – Do not agree that one strategy is necessarily better than another (**5 minutes**).

*Page 1.6 contains two random samples (examp.samp1 and examp.samp2) of size 30 from our population of interest.*

1. *Use your strategy to determine a guess at the population mean for each of these samples. In each case, did your guess come close the true value of the population mean? Describe your work below.*

Anticipated responses

* Students will apply their above strategy to the data

Take **20 minutes** to make a poster that answers questions 5 – 7.

*Page 1.8 The next page contains a program for taking 100 samples of size n from our population of interest and displaying the means for all 100 samples (type sampdistmeandate(n)). Explore with this program using different sample sizes.*

1. *Below, make a conjecture as to how the sample size affects your strategy for guessing the value of the population mean.*
2. *What other parts of your strategy may affect your guess besides sample size?*
3. *On the flipchart paper provided, use words, pictures, and symbols to communicate what your group believes to be the best way to use a sample to make a good, solid guess at the value of an unknown population mean.*

**20 minutes to report out.**

**Total Time needed 70 minutes**