Name: ______________________________________ Hour: _____ Date: _____

What was the real average for the Semester Exam?

How did the Semester Final go? Today, we will be taking a **sample** from a **population**. We will use the average from the **sample** to estimate the average for the **population**.

Yesterday we looked at a very small class of students as the population. In reality there were many students who took the test. (*The list of the scores is in the table below*)
Take a **random sample of 5 students** and record their scores. Then find the mean. Repeat this for a total of 4 times.

Scores:______________ Mean:______ Scores:______________ Mean:______

Scores:______________ Mean:______ Scores:______________ Mean:______

Semester Final Scores (*plus extras*)

Student #	Score	Student #	Score	Student #	Score	Student #	Score	Student #	Score
Student 1	114	Student 18	93	Student 35	75	Student 52	72	Student 69	114
Student 2	99	Student 19	124	Student 36	90	Student 53	117	Student 70	93
Student 3	102	Student 20	108	Student 37	114	Student 54	81	Student 71	120
Student 4	111	Student 21	96	Student 38	90	Student 55	99	Student 72	108
Student 5	108	Student 22	69	Student 39	108	Student 56	90	Student 73	117
Student 6	90	Student 23	114	Student 40	105	Student 57	117	Student 74	72
Student 7	93	Student 24	81	Student 41	122	Student 58	105	Student 75	93
Student 8	108	Student 25	93	Student 42	96	Student 59	102	Student 76	72
Student 9	111	Student 26	122	Student 43	117	Student 60	96	Student 77	111
Student 10	105	Student 27	120	Student 44	99	Student 61	63	Student 78	114
Student 11	120	Student 28	99	Student 45	102	Student 62	111	Student 79	96
Student 12	66	Student 29	114	Student 46	108	Student 63	108	Student 80	121
Student 13	93	Student 30	87	Student 47	99	Student 64	96	Student 81	93
Student 14	108	Student 31	111	Student 48	90	Student 65	93	Student 82	114
Student 15	122	Student 32	120	Student 49	117	Student 66	111	Student 83	96
Student 16	87	Student 33	81	Student 50	114	Student 67	105	Student 84	72
Student 17	111	Student 34	90	Student 51	111	Student 68	81	Student 85	117

1. Write each mean on a different sticker and put the stickers in the appropriate location on the poster at the front of the room. Copy down the dotplot that is created on the poster.

2. What does each dot on the poster represent?

Name: ______________________________________ Hour: _____ Date: ______

3. What do you think the true Semester Final average is?

4. A **sampling distribution** shows the means calculated from all of the possible samples of size 5 from the population. Is the above dotplot a sampling distribution? Explain.

5. We took a random sample of 5 test scores at Male high school and got a mean of 80. What about 90? Is this ***convincing evidence*** that Male students did worse than students at our school or is it possible the Male has the same average?

Name: ______________________________ Hour: _____ Date: ______

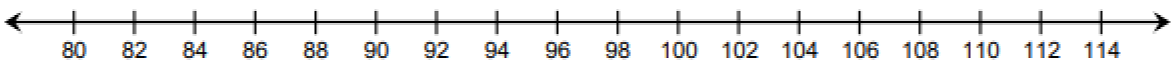
1 Random SAMPLE

Scores: 99,93,105, 90,111 Mean: $\bar{x} = 99.6$ Scores:____________ Mean:______

Scores:______________ Mean:______ Scores:____________ Mean:______

1. Write each mean on a different sticker and put the stickers in the appropriate location on the poster at the front of the room. Copy down the dotplot that is created on the poster.

   (insert class data for dot plot below)



Distribution of sample means ($\bar{x}$)

2. What does each dot on the poster represent?

   A random sample of 5 students and the mean of their exam scores, so each dot is a *statistic*!

3. What do you think the true Semester Final average is? (make a guess)

4. A **sampling distribution** shows the means calculated from all of the possible samples of size 5 from the population. Is the above dotplot a sampling distribution? Explain.

   NO, this is a ***distribution of many samples*** of the same size ($n = 5$), but it does not represent every possible unique sample from this population ($N = 85$). To create the actual **sampling distribution** would necessitate taking every possible combination of score randomly selected scores, which would result in infinitely more unique samples.

$$_{85}C_{5} = \binom{85}{5} = 32{,}801{,}517$$

5. We took a random sample of 5 test scores at Male high school and got a mean of 80. Is this ***convincing evidence*** that Male students did worse than students at our school or is it possible the Male has the same average?

   To be convincing evidence, we would want the probability of obtaining this sample mean to be small enough that we would not expect it to happen simply by chance, or to occur so rarely that it would be very unlikely to assume that the students at Male would have the same average as students from Manual based upon this sample statistic.

Name: ______________________________ Hour: _____ Date: ______

What is a Sampling Distribution? Day 2

Important ideas: **Evaluating a claim**

Check Your Understanding

Pennies made prior to 1982 were made of 95% copper. Because of their copper content, these pennies are worth about $0.023 each. Pennies made after 1982 are only 2.5% copper. Jenna reads online that 13.2% of pennies in circulation are pre-1982 copper pennies. Jenna has a large container of pennies at home. She selects a random sample of 50 pennies from the container and finds that 11 are pre-1982 copper pennies. Does this provide convincing evidence that the proportion of pennies in her container that are pre-1982 copper pennies is greater than 0.132?

1. Identify the population, parameter, sample and statistic.

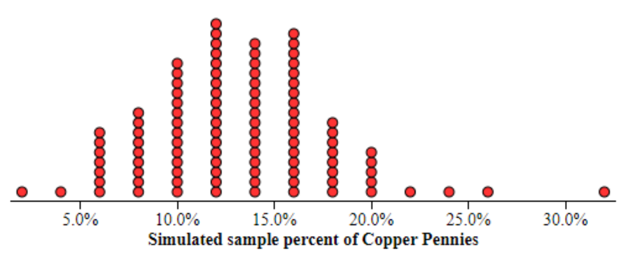
   Population: ____________________________ Parameter: __________________________

   Sample: ________________________ Statistic: ____________________________

2. Does Jenna have some evidence that more than 13.2% of her pennies are pre-1982 copper pennies?

3. Provide two explanations for the evidence described in #2.

We used technology to simulate selecting 100 SRSs of size n = 50 from a population of pennies in which 13.2% are pre-1982 copper pennies. The dotplot shows $\hat{p}$ = the sample proportion of copper pennies for each of the 100 samples.



4. There is one dot on the graph at 0.22 (or 22%). Explain what this dot represents.

5. Assuming that 13.2% of pennies in circulation are pre-1982 copper pennies, is it surprising to randomly select 50 pennies for which $\hat{p}$ = 11/50 = 22% or greater? Justify your answer.

STATS MEDIC

Name: ______________________________ Hour: _____ Date: ______

6. Based on your previous answers, is there convincing evidence that more than 13.2% of pennies in Jenna's container are pre-1982 copper pennies? Explain your reasoning.

What is a Sampling Distribution? Day 2

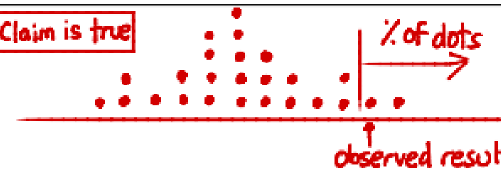
Important ideas:

LT#1 Evaluating a Claim

① Assume the claim is true.

② Create simulated sampling distribution.

③ Find % chance of getting observed result.



If < 5% → convincing evidence against claim.

If ≥ 5% → not convincing evidence against claim

Check Your Understanding

Pennies made prior to 1982 were made of 95% copper. Because of their copper content, these pennies are worth about $0.023 each. Pennies made after 1982 are only 2.5% copper. Jenna reads online that 13.2% of pennies in circulation are pre-1982 copper pennies. Jenna has a large container of pennies at home. She selects a random sample of 50 pennies from the container and finds that 11 are pre-1982 copper pennies. Does this provide convincing evidence that the proportion of pennies in her container that are pre-1982 copper pennies is greater than 0.132?

1. Identify the population, parameter, sample and statistic.

   Population: All pennies in container Parameter: 0.132 = p

   Sample: 50 pennies Statistic: $11/50 = 0.22 = \hat{p}$

2. Does Jenna have some evidence that more than 13.2% of her pennies are pre-1982 copper pennies?

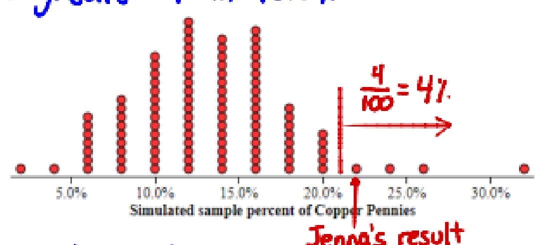
   Yes, in her sample she had 22%, which is greater than 13.2%.

3. Provide two explanations for the evidence described in #2.

   ① The percent in the container is 13.2% and she got lucky in her sample.

   ② The percent in the container really is greater than 13.2%

We used technology to simulate selecting 100 SRSs of size $n = 50$ from a population of pennies in which 13.2% are pre-1982 copper pennies. The dotplot shows $\hat{p}$ = the sample proportion of copper pennies for each of the 100 samples.



4. There is one dot on the graph at 0.22 (or 22%). Explain what this dot represents.

   One random sample of 50 pennies, which had 22% copper pennies.

5. Assuming that 13.2% of pennies in circulation are pre-1982 copper pennies, is it surprising to randomly select 50 pennies for which $\hat{p} = 11/50 = 22\%$ or greater? Justify your answer.

   Yes, only 4 of the samples had 22% or greater. $\frac{4}{100} = 4\%$

6. Based on your previous answers, is there convincing evidence that more than 13.2% of pennies in Jenna's container are pre-1982 copper pennies? Explain your reasoning.

   Yes. Assuming Jenna's container had 13.2% copper pennies, it is unlikely (4%) to get a sample of 50 with 22% or greater.

STATS MEDIC