Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MS. KLIMCZUK – AP STATISTICS

Introduction to Sampling Distribution Activity: Beads

***Before the activity, create a sentence using the following words: Data, Statistic, Parameter, Population, Inference, Sample, and Census.***

The way we make a *sampling distribution* is by *sampling!* The first one we are going to talk about is the sampling distributions for proportions.

***In this activity, what is the population?***

***What is the sample?***

We know that p stands for the actual proportion of success in the population. $\hat{p}$ stands for the observed proportion in a sample.

We also know that q stands for the proportion of failure in the population.$ \hat{q}$ stands for the observed proportion in a sample.

Here, p = % of red beads in the bucket, and $\hat{p}$ = % of red beads in the sample.

***In this activity, what type of data are we looking at?***

We are going to now compare sample distributions and sampling distributions.

We are going to take samples of size n = 1, n = 4, n = 16, and n = 64. We will then create a bar graph for the sample distribution and a histogram for the sampling distribution. Write down your $\hat{p}$ in the sample distribution. Write down the $σ\_{\hat{p}}$ and $μ\_{\hat{p}}$ in the sampling distribution.

|  |  |
| --- | --- |
| Sample Distribution (Data Categorical)n = 1 $ \hat{p}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ | Sampling Distribution (Data Quantitative)n = 1 $σ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$  $μ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ |
| Sample Distribution (Data Categorical)n = 4 $ \hat{p}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ | Sampling Distribution (Data Quantitative)n = 4 $σ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$  $μ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ |
| Sample Distribution (Data Categorical)n = 16 $ \hat{p}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ | Sampling Distribution (Data Quantitative)n = 16 $σ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$  $μ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ |
| Sample Distribution (Data Categorical)n = 64 $ \hat{p}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ | Sampling Distribution (Data Quantitative)n = 64 $σ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$  $μ\_{\hat{p}}= \\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$ |

***Does it look like something is going on? What do you notice?***

***What tells you more… using n = 1 or n = 64? Why?***

***What is happening with the standard deviation as your n increases? Why do you think this happens?***

As the sample gets bigger, we start getting closer to the truth. (Note, all your sample sizes were less than 10% of the population).

***As n grows, what is happening with your sampling distribution?***

***Make a conclusion about the percent of red beads in the population.***

Now, formulas from the formula sheet on the AP Exam.

 $μp ̂= p$

$σp ̂= \sqrt{\frac{pq}{n}}$

***Find the true mean and standard deviation for each of your sampling distributions. How well do they match your simulations?***

***How many successes and how many failures do you have to have to create a normal model?***

***Create a normal using the true proportion of red beads and a sample size of 64 beads.***

***Now plot all of the*** $\hat{p}$ ***within the normal model above. What do you notice?***

***Now stand up if you were within 1 standard deviation from the mean? What do you notice about the percent of people standing right now?***

***Now stand up if you were within 2 standard deviation from the mean? What do you notice about the percent of people standing right now?***