Stat 2153 - Statistical Methods

Written Assignment 4 - Due 2015.06.28

Directions: Please answer the following question in complete sentences. Be sure to label all geometric objects in any illustrations (if any). I will accept an answer in a scanned image format, as a pdf, or as a picture taken and sent from your awesome smart phone.

We return once again to rolling dice. This week, you will do some work on sample proportions, population proportions, sampling distributions, and mean and standard deviation of sampling distributions.

Take your favourite sided die (of at least 5 sides), and produce a sample of at least $n = 20$ rolls. Here each item in the sample should be the number of pips on the face up side of the die after it has been rolled. Define $\hat{p}$ to be the sample proportion of times a specific event occurs for this sample. For instance, if you are using a 6-sided die, and your outcomes are $\{2, 3, 1, 4, 5, 3, 6, 6, 2, 1, 2, 3, 1, 4, 5, 3, 6, 6, 2, 1\}$, and $\hat{p}$ is defined to be the sample proportion of rolls in the sample which resulted in an even result, you would have that $\hat{p} = 0.5$, which is to be expected for a 6-sided die. Repeat this process at least 25 times (so 25 samples of 20 rolls is 500 rolls), and then compute the sample mean and deviation for this experiment.

Next, compute the theoretical mean and standard deviation. You may wish to refer back to Chapter 3 here. (Be careful, how do you produce a table like Table 6.2 on page 259 for your scenario? It may be a LARGE table, so you do not have to actually work it out, but argue what it should look like so you can compute the variance). Compare the sample mean with the theoretical mean, and similarly, how closely does your sample variance come to fitting the equation at the top of page 260?

Lastly, using the Central Limit Theorem, what is the probability that if you rolled the dice 20 more times, that $\hat{p}$ would fall somewhere between $\mu_{\hat{p}}$ and your experimental sample proportion mean?

Comments: Yes, this could indeed take some time again, but it won't take that long, so don't cheat! I suggest you compute $\mu_{\hat{p}}$ so that you can find a sample size n to satisfy the Central Limit Theorem Criteria of $np \geq 10$ and $n(1-p) \geq 10$. Once again, I want a picture sent via email of you actually rolling the dice, with a piece of paper next to the dice which has the date, your name, and which class/section you are in!