MAT 223, Central Limit Theorem on Dice (Version 1) Name KEY

1. In the Monte Carlo Modeling project we collected successes for the same rule with different sample sizes. Some sample data for $p = 0.5$ appears below.

Sample Size (n)	5	10	20	25	40	50	100	200	1000
Proportions	0.4	0.6	0.3	0.48	0.5	0.48	0.45	0.51	0.49
	0.6	0.6	0.5	0.72	0.525	0.58	0.38	0.495	0.504
	0.4	0.7	0.7	0.48	0.6	0.52	0.55	0.51	0.497
	0	0.5	0.45	0.64	0.55	0.52	0.47	0.465	0.515
	0.4	0.5	0.4	0.4	0.5	0.62	0.45	0.475	0.519
Standard Deviation (Empirical)	.219	.08	.148	.131	.042	.055	.061	.020	.012
Standard Deviation (Central Limit Theorem)	.224	.158	.112	.10	.079	.071	.05	.035	.016

1. In the Monte Carlo Activity, we estimated the standard deviations. Use your calculator to find them now using the 1-VarStats feature and complete the table.

2. According to the Central Limit Theorem, the standard deviation of a sampling distribution should be $\hat{\sigma} = \sqrt{\frac{p(1-p)}{n}}$. Use $p = 0.5$ to calculate this value for each value of n and add these values to the table.

3. How close did you get?

Close in some cases, not so much in others. most likely due to small sample size

4. One group used a proportion of $p = 0.25$ for their chance of success and obtained a power regression equation of $y = 0.135x^{-0.488}$. What does the coefficient 0.135 represent in this equation? What would we expect it to be based on the Central Limit Theorem?

$\sqrt{p(1-p)} = \sqrt{.25 \cdot .75} = .433$ expected value

.135 is the sd for .433 $\sqrt{p(1-p)}$

5. Can you find the value for the data above? How does it compare?

$\sqrt{p(1-p)} = \sqrt{(.5)(.5)} = .5$

using PwrReg $y = .478x^{-.537}$ from empirical

$y = .499x^{-.499}$ for CLT.