Project. Due Dec 4.

X is a random variable taking the values $0, 1, 2, 3, 4$ with probabilities $\{p_i\}$, $i = 0, 1, 2, 3, 4$. Generate 1000 totally random digits that are 0 or 1. Divide them in to 250 blocks of size 4. Count the number of 1's in each block. Generate in this manner $\{X_j\}$ for $1 \leq j \leq 250$. Count the frequency of occurrence of $0, 1, 2, 3, 4$ among the $\{X_j\}$ and denote these frequencies by f_0, f_1, f_2, f_3, f_4. You can write a program to do all of this. Test the following models to see if the data is compatible with independent observations from the model.

Model 1.

$$p_i = \binom{4}{i} (0.6)^i (0.4)^{4-i}$$

Model 2. $\{p_i\}$ is some Binomial distribution, i.e.

$$p_i = \binom{4}{i} \theta^i (1-\theta)^{4-i}$$

for some θ between 0 and 1.

Model 3.

$$p_0 = p_1 = p_3 = p_4 = \frac{\theta}{4}; p_2 = 1 - \theta$$

for some θ between 0 and 1.