

## Quiz 4

STAT 381, APPLIED STATISTICAL METHODS I, SPRING 2015

NAME: *Key*

**Problem 1.** (5 points) The forecast for the next 7 days in Costa Rica has a 40% chance of rain each day. Assuming each day's weather is independent, what is the probability that there will be at least 5 sunny days during the week?

$$\begin{aligned} X &= \# \text{ Sunny days} \\ X &\sim \text{Binom}(7, .6) \\ P(X \geq 5) &= P(X=5) + P(X=6) + P(X=7) \\ &= \binom{7}{5} (.6)^5 (.4)^2 + \binom{7}{6} (.6)^6 (.4) + \binom{7}{7} (.6)^7 = .4199 \end{aligned}$$

OR  ~~$P(X \geq 5)$~~   $P(X \geq 5) = 1 - P(X \leq 4) = 1 - \text{binomcdf}(7, .6, 4) = .4199$

**Problem 2.** (5 points) A con man claims to be a psychic. He has you think of an integer, and he tells you if it is odd or even. Assuming you pick numbers randomly, what is the average number of attempts until he guesses incorrectly for the first time?

$$\begin{aligned} X &= \# \text{ guesses until first mistake, probability of mistake is } p = .5 \\ X &\sim \text{Geom}(.5) \\ E(X) &= \frac{1}{p} = \frac{1}{.5} = 2 \end{aligned}$$

On average, 2 guesses until a mistake

**Bonus** (3 points) A mark will believe the con man if he gets odd/even correct 7 times without a mistake. How many marks should he expect to try this trick on until he gets someone to believe him?

$$P(7 \text{ correct in a row}) = \frac{1}{2^7} = \frac{1}{128}$$

$$\begin{aligned} X &= \# \text{ marks until a success} \\ X &\sim \text{Geom}\left(\frac{1}{128}\right) \end{aligned}$$

$$E(X) = 128 \text{ people}$$