

Name _____

Student Number _____

STA107H5S Quiz 6A

Let X be a binomial random variable with $n=2$ and $p=0.7$. Recall that a binomial random variable has probability density function $P(x) = \binom{n}{x} p^x (1-p)^{n-x}$

1. (2 marks) Give the probability density function of x , this would be a table with each value of x along with its corresponding probability.

X	0	1	2
p(X)	$\binom{2}{0} 0.7^0 0.3^2$	$\binom{2}{1} 0.7^1 0.3^1$	$\binom{2}{2} 0.7^2 0.3^0$

2. (2 marks) Find the expected value of X and variance of X using the usual mean and variance formula. Do you notice anything interesting?

$E(X)=1.4$, $\text{Var}(X)=0.42$; can calculate this using above PDF or can use the binomial expected value and variance formulas

3. (3 marks) Now consider 2 different random variables $Y \sim \text{Pois}(a)$ and $Z \sim \text{Pois}(b)$, where $b \geq a$. Is $P(Y=0) \geq P(Z=0)$? Explain your reasoning or you get no marks.

True, since $e^{-a} > e^{-b}$

4. (3 marks) Consider the random variable W such that $W \sim \text{Geometric}(\alpha)$, where W is the number of iid Bernoulli trials until a success. Now consider a new random variable W^* which is the number of trials until a failure. What distribution does W^* have? Explain.
- $W^* \sim \text{Geometric}(1 - \alpha)$