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Student Number _____

STA107H5S Quiz 6B

Let X be a binomial random variable with $n=2$ and $p=0.3$. 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	2	1	0
$p(X)$	$\binom{2}{0} 0.7^0 0.3^2$	$\binom{2}{1} 0.7^1 0.3^1$	$\binom{2}{2} 0.7^2 0.3^0$

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?

$E(X)=0.6$, $\text{Var}(X)=0.42$; 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 $Y \sim \text{Geometric}(a)$ and $Z \sim \text{Geometric}(b)$, where a and b are the probabilities of success for Y and Z respectively with $b \geq a$. Is $P(Y=1) \geq P(Z=1)$? Explain your reasoning or you get no marks.

$P(Y=1)=a$, $P(Z=1)=b$, and since $b \geq a \Rightarrow P(Y=1) \geq P(Z=1)$ is False

4. (3 marks) Consider the random variable W such that $W \sim \text{Binomial}(n, p)$ where W is the number of successes. Now consider a new random variable W^* which is the number of failures. What distribution does W^* have? Explain.

$$W^* \sim \text{Binomial}(n, 1 - p)$$