ECS 315: In-Class Exercise # 14 - Sol

Instructions

1. Separate into groups of no more than three students each. **The group cannot be the same as any of your former groups after the midterm.**
2. [ENRE] Explanation is not required for this exercise.
3. **Do not panic.**

Date: 1 7 / 1 0 / 2019			
Name	ID (last 3 digits)		
Prapun	5	5	5

Consider the random variable specified in each part below.

i) Write down its (minimal) support.

ii) Find $P[X=0]$. Your answer should be of the form 0.XXXX.

iii) Find $P[X=2]$. Your answer should be of the form 0.XXXX.

	(minimal) support	$P[X=0]$	$P[X=2]$
$X \sim \mathcal{U}(\{-2,0,2\})$ $X \sim \text{Uniform}(S)$	The minimal support of a uniform RV is the set S being specified. Here, $S = \{-2,0,2\}$.	$p_X(x) = \begin{cases} \frac{1}{\lvert S \rvert}, & x \in S, \\ 0, & \text{otherwise.} \end{cases}$ Here, $\lvert S \rvert = 3$. Because $0 \in S$, we have $p_X(0) = \frac{1}{3}$. Therefore, $P[X=0] = \frac{1}{3} \approx 0.3333$.	Because $2 \in S$, we have $p_X(2) = \frac{1}{3}$. Therefore, $P[X=2] = \frac{1}{3} \approx 0.3333$.
$X \sim \text{Bernoulli}\left(\frac{1}{4}\right)$ $X \sim \text{Bernoulli}(p)$	The (minimal) support of any Bernoulli RV is $\{0,1\}$.	$p_X(x) = \begin{cases} 1-p, & x = 0, \\ p, & x = 1, \\ 0, & \text{otherwise.} \end{cases}$ Here, $p = \frac{1}{4}$. $P[X=0] = p_X(0) = 1-p$ $= 1 - \frac{1}{4} = \frac{3}{4} = 0.7500$.	$P[X=2] = p_X(2) = 0.0000$.
$X \sim \mathcal{B}(4,0.6)$ $X \sim \text{Binomial}(n,p)$	The (minimal) support of a Binomial RV is $\{0,1,\dots,n\}$. Here, $n=4$. Therefore, the (minimal) support is $\{0,1,2,3,4\}$.	$p_X(x) = \begin{cases} \binom{n}{x} p^x (1-p)^{n-x}, & x = 0,1,2,\dots,n, \\ 0, & \text{otherwise.} \end{cases}$ Here, $n = 4$ and $p = 0.6$. $p_X(x) = \begin{cases} \binom{4}{x} 0.6^x (1-0.6)^{4-x}, & x = 0,1,2,3,4, \\ 0, & \text{otherwise.} \end{cases}$ Therefore, $P[X=0] = p_X(0) = \binom{4}{0} 0.6^0 (1-0.6)^4$ $= 0.4^4 = 0.0256$	$P[X=2] = p_X(2)$ $= \binom{4}{2} 0.6^2 (1-0.6)^2$ $= 6 \times 0.6^2 \times 0.4^2$ $= 0.3456$