

Quiz 5

$$1. a) P(X=x|N=4) = \text{Bin}(4, \frac{1}{2}) = \binom{4}{x} (\frac{1}{2})^x (\frac{1}{2})^{4-x}$$

b) $P(X=x, N=n)$

$x=1$	2	3	4	5	6
$n=1$	0				
2		0			
3			0		
4	$\frac{1}{6} \cdot \text{Bin}(n, \frac{1}{2})$			0	
5					0
6					

$$P(X=x, N=n) \begin{cases} \frac{1}{6} \cdot \text{Bin}(n, \frac{1}{2}), & 1 \leq x \leq n \leq 6 \\ 0 & \text{o/w} \quad \text{can't pick } x \text{ head flips out of } n \text{ if } x > n \end{cases}$$

$$c) P_X(x) = \begin{cases} \frac{1}{6} (\text{Bin}(1, \frac{1}{2}) + \text{Bin}(2, \frac{1}{2}) + \dots + \text{Bin}(6, \frac{1}{2})), & x=1 \\ \frac{1}{6} (\text{Bin}(2, \frac{1}{2}) + \dots + \text{Bin}(6, \frac{1}{2})), & x=2 \\ \frac{1}{6} (\text{Bin}(3, \frac{1}{2}) + \dots + \text{Bin}(6, \frac{1}{2})), & x=3 \\ \vdots \\ \frac{1}{6} (\text{Bin}(6, \frac{1}{2})), & x=6 \end{cases}$$

Made by simply adding all the columns of x

$$p_X(x) = \sum_{n=1}^6 P(X=x, N=n)$$