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CMPE 320 HW 04

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1. Given,

   Probability of not losing the first game: $p_1 = 0.4$

   Probability of losing the first game: $p_1^c = 1 - 0.4 = 0.6$

   Probability of not losing the second game: $p_2 = 0.7$

   Probability of losing the second game: $p_2^c = 1 - 0.7 = 0.3$

   Therefore, the $pmf(X)$ where $X = 0, 1, 2, 4$ represents the number of points earned over the weekend:

$$
\begin{aligned}
P(X = 0) &= p_1^c \cdot p_2^c \\
&= 0.6 \cdot 0.3 \\
&= 0.18
\end{aligned}
$$

$$
\begin{aligned}
P(X = 1) &= \frac{p_1^c \cdot p_2}{2} + \frac{p_1 \cdot p_2^c}{2} \\
&= \frac{0.6 \cdot 0.7}{2} + \frac{0.4 \cdot 0.3}{2} \\
&= 0.27
\end{aligned}
$$

□

2. Given $p = 1/649640$. Therefore,

$$
\begin{aligned}
P(X \geq 1) &= 1 - P(X = 0) \\
&= 1 - \left(\frac{649640 - 1}{649640}\right)^{649640} \\
&= 1 - \left(1 - \frac{1}{649640}\right)^{649640}
\end{aligned}
$$

If $n = 649640$

$$
\begin{aligned}
P(X \geq 1) &= 1 - \left(1 - \frac{1}{n}\right)^n \\
&= 1 - \lim_{n \to \infty} \left(1 - \frac{1}{n}\right)^n \\
&= 1 - \frac{1}{e}
\end{aligned}
\qquad \square
$$

3. A claim is first filed with the probability
   $pq = (0.05)(1 - 0.05)^{n-1} = (0.05)(0.095)^{n-1}$ $\square$

4. (a) $Y = X \ (mod\, 3)$

$$
\begin{aligned}
P(Y = 0) &= P(X = \{0, 3, 6, 9\}) \\
&= \frac{4}{10} \\
&= 0.4
\end{aligned}
$$

$$
\begin{aligned}
P(Y = 0) &= P(X = \{0, 3, 6, 9\}) \\
&= \frac{4}{10} \\
&= 0.4
\end{aligned}
$$

$$
\begin{aligned}
P(Y = 1) &= P(X = \{1, 4, 7\}) \\
&= \frac{3}{10} \\
&= 0.3
\end{aligned}
$$

$$
\begin{aligned}
P(Y = 2) &= P(X = \{2, 5, 8\}) \\
&= \frac{3}{10} \\
&= 0.3
\end{aligned}
$$

(b) $Y = 5 \ (mod \ X + 1)$

$$\begin{aligned} P(Y=0) &= P(X=\{0,4\}) \\ &= \frac{2}{10} \\ &= 0.2 \end{aligned}$$

$$\begin{aligned} P(Y=1) &= P(X=\{1,5\}) \\ &= \frac{2}{10} \\ &= 0.2 \end{aligned}$$

$$\begin{aligned} P(Y=2) &= P(X=\{2\}) \\ &= \frac{1}{10} \\ &= 0.1 \end{aligned}$$

$$\begin{aligned} P(Y=5) &= P(X=\{5,6,7,8,9\}) \\ &= \frac{5}{10} \\ &= 0.5 \end{aligned}$$

□

5. □

6. □

7. □

8. □

9. □

10. □