EE 131A DOLECEK

NEVIN LIANG

1. $P(A) = 1/2 \quad P(B) = 1/2 \quad P(C) = 4/36 = 1/9$

$P(A \cap B) = 1/3 \quad P(A \cap C) = 1/36 \quad P(B \cap C) = 2/36 = 1/18$

$P(A \cap B \cap C) = 1/36$

① $P(A \cap B) = P(A)\,P(B)$ ✗ b/c $1/3 \neq 1/2 \cdot 1/2 = 1/4$.

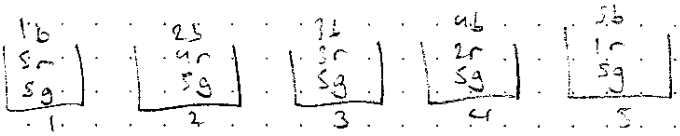
②

NO

$A: \left\{ \begin{matrix} 1 \\ 2 \\ 3 \end{matrix} \middle| (1\text{-}6) \right\}$

$B: \left\{ \begin{matrix} 2 \\ 3 \\ 6 \end{matrix} \middle| (1\text{-}6) \right\}$

$C: \left\{ \begin{matrix} 26, 45 \\ 54, 63 \end{matrix} \right\}$

2. 

a) $P(B \mid J_k)$ = prob of black ball given k^{th} jar

k^{th} jar = k black, 6−k red, 5 green $= \boxed{\frac{k}{11}}$

b) $P(G) = \frac{1}{5}\left(\frac{5}{11}\right) + \frac{1}{5} \cdot \frac{5}{11} \cdots = \boxed{\frac{5}{11}}$

$P(B) = \frac{1}{5} \cdot \frac{1}{11} + \frac{1}{5} \cdot \frac{2}{11} \cdots = \frac{15}{5 \cdot 11} = \boxed{\frac{3}{11}}$

$P(R) = 1 - P(G) - P(B) = \boxed{\frac{3}{11}}$

c) $\dfrac{P(J_k \cap B)}{P(B)} = \dfrac{\frac{k}{11} \cdot \frac{1}{5}}{\frac{3}{11}} = \boxed{\frac{k}{15}}$

3. a) $P(\text{out } 0) = P(\text{out } 0 \cap \text{in } 0) + P(\text{out } 0 \cap \text{in } 1) + P(\text{out } 0 \cap \text{in } 2)$

$= \dfrac{\frac{1}{4}(1-e)}{\frac{1}{4}} + \dfrac{\frac{1}{2}(e)}{\frac{1}{2}} + \dfrac{\frac{1}{4}(e)}{\frac{1}{4}} = \boxed{1/4}$

4)

0 girls $P=0$

1 girl $P=0$

2 girls $P=\left(\frac{1}{2}\right)^5$

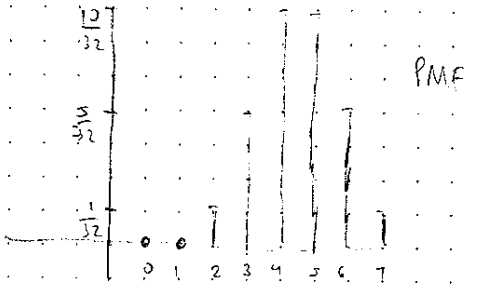
3 girls $P=5\cdot\left(\frac{1}{2}\right)^5$

4 girls $P=10\left(\frac{1}{2}\right)^5$

5 girls $P=5\left(\frac{1}{2}\right)^5$

6 girls $P=5\left(\frac{1}{2}\right)^5$

7 girls $P=\left(\frac{1}{2}\right)^5$



5) (a) $P(2)=\frac{1}{36}$ $P(3)=\frac{2}{36}=\frac{1}{18}$ $P(4)=\frac{3}{36}=\frac{1}{12}$ $P(5)=\frac{4}{36}=\frac{1}{9}$ $P(6)=\frac{5}{36}$

$P(7)=\frac{6}{36}=\frac{1}{6}$ $P(8)=\frac{5}{36}$ $P(9)=\frac{4}{36}=\frac{1}{9}$ $P(10)=\frac{3}{36}=\frac{1}{12}$ $P(11)=\frac{2}{36}=\frac{1}{18}$

$P(12)=\frac{1}{36}$

(b) $E(Z)=\frac{1}{18}+\frac{1}{16}+\frac{1}{3}+\frac{8}{9}+\frac{7}{6}+\frac{7}{6}+\frac{8}{9}+1+\frac{3}{4}+\frac{1}{18}+\frac{1}{3}$

$1+1+2=\frac{2}{2}+\frac{1}{3}+2=$ **7**

$\frac{1}{18}+\frac{1}{8}+\frac{4}{3}+\frac{25}{9}+7+\frac{49}{6}+\frac{81}{18}+9+\frac{25}{3}+\frac{121}{18}+4$

$=$ ~~28~~ $54.8333\ldots=$ **5.833**

(c) If $Z=10$, ~~4~~

$X_1=k \rightarrow X_2=10-k$

$P(X_1=k)=$

$k=1$, $Z\neq 10$, so $P(X_1=1)=0$

$k=2$, $Z\neq 10$ $P(X_1=2)=0$

$P(X_1=3)=0$

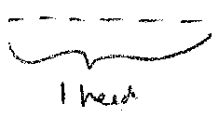
$P(X_1=4)=1/3$

$P(X_1=5)=1/3$

$P(X_1=6)=1/3$

6.

n flips



$$P(X_n) = (n-1) \cdot p^2 \cdot (1-p)^{n-2}$$

$$E(\text{flips till 2H}) = E(\text{flips till 1H}) + E(\text{flips till HH})$$

$$= \frac{1}{p} + \frac{1}{p} = \boxed{\frac{2}{p}}$$