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Mat 135

Homework 3

1. a.

1	6	6	1
2	65	5	12
3	654	4	123
4	6543	3	1234
5	65432	2	12345
6	654321	1	123456

$\boxed{\dfrac{21}{36}}$

b.

5.

G

R   W

a. $P(R_w \mid W_f) = \frac{1}{18}$

b. $P(R_w) = \frac{3}{18} \cdot \frac{1}{9}$

c. Not independent

$P(R_w \cap W_f) = P(R)P(W)$

$\frac{1}{6} \cdot \frac{1}{3} = \frac{1}{6} \cdot \frac{1}{3}$

2. $\boxed{A = \text{Blue is Odd}, \; B = \text{Green is even}}$
   $C = \text{Sum is odd}$

$P(A) = \frac{1}{2}, \; P(B) = \frac{1}{2}, \; P(C) = \frac{1}{2}, \; P(A \cap B) = P(A \cap C) = P(B \cap C) = P(A)P(B) =, \; P(A)P(C) = P(B)P(C)$

$= \frac{1}{4} \leftarrow$ Pairwise independent. Check for mutual: not mutually independent

$P(A \cap B \cap C) = 0 \text{ (Not possible)} \quad P(A \cap B \cap C) \neq P(A)P(B)P(C) = \frac{1}{8}$

3. $S = 7 \quad B = 5 \quad X = 4$

a. Assume English is only overlap $\quad P(S \cup B \cup X) = P(S) \cup P(B) \cup P(X) - 2 P(S \cap B \cap X)$
   $= \boxed{14 \text{ languages}}$ Means $P(S \cap B) \cup P(S \cap X) \cup P(B \cap X) = 0 \; \checkmark$

b. Assume max overlap. $\boxed{8 \text{ languages}}$ at minimum? at least one
   can speak

4.

Win 70	Win 50	
Lose 30	Lose 50	
Black lotus	No black lotus	B = Black lotus W = Win

a. $(0.7)(0.05) + (0.5)(.95)$
   $\boxed{51\%}$

b. $P(B/W) = \dfrac{P(B \cap W)}{P(W)} = \dfrac{0.7 \cdot 0.05}{0.51} = \boxed{6.8627\%}$