AMS310 Fall 2017

Instructor: Prof. F. Rispoli

Homework Set #2 Solutions

1.
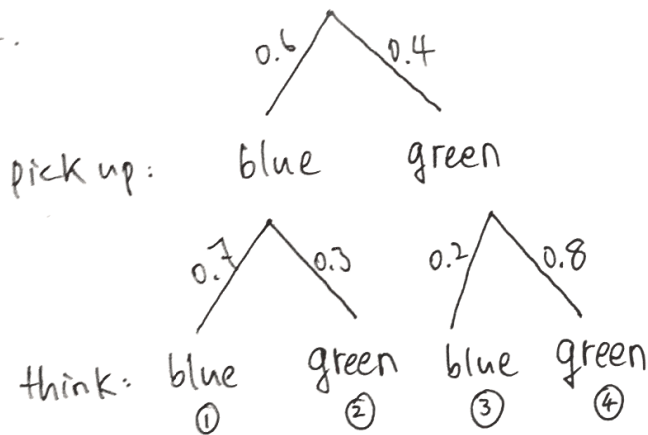
a). P(think blue ∩ pick up blue) = P(think blue | pick up blue) · P(pick up blue)

$$= 0.7 * 0.6 = \boxed{0.42}$$ 4pts

b). P(think blue) = P(path①) + P(path③)

$$= 0.6 * 0.7 + 0.4 * 0.2$$

$$= 0.42 + 0.08 = \boxed{0.50}$$ 4pts

c). P(pick up blue pen | think blue) = $\dfrac{P(\text{pick up blue} \cap \text{think blue})}{P(\text{think blue})}$ = $\dfrac{0.42}{0.50}$

$$= \boxed{0.84}$$ 4pts

2. a). $P(B) = P(A \cup B) - P(A) = 0.6 - 0.4 = 0.2$ 3pts

b). $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = P(A) + P(B) - P(A) \cdot P(B)$

$0.6 = 0.4 + P(B) - 0.4 P(B)$ $\Rightarrow P(B) = \frac{1}{3} = 0.33$ 3pts

c). $P(A|B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{P(A) + P(B) - P(A \cup B)}{P(B)} = \dfrac{0.4 + P(B) - 0.6}{P(B)} = 0.2$

$P(B) = 0.25$ 3pts

d). $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

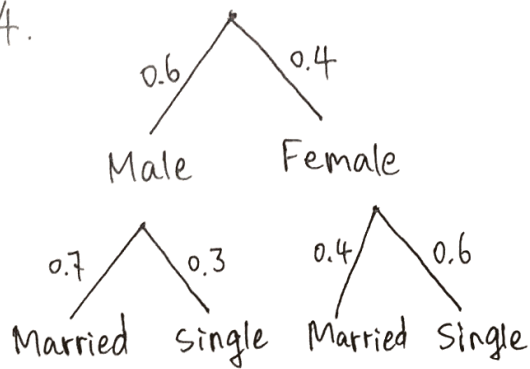$0.6 = 0.4 + P(B) - 0.3$

$P(B) = 0.5$ 3pts

3. a). $5 * 6 * 3 * 4 = 360 \text{ ways}$ 4pts

b). $_{25}P_4 = 303600$ 4 pts

c). $_2C_1 * _2C_1 * _2C_1 * _2C_1 * _2C_1 = 32$ 4pts
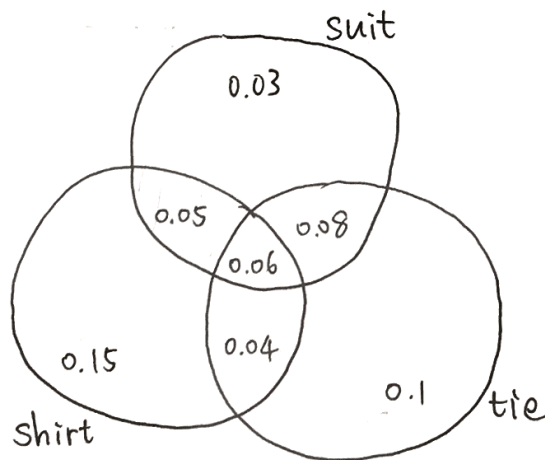
d). $_{52}C_7 = 133784560$ 4 pts

4.

$$P(\text{Male} \mid \text{Married}) = \frac{0.6 * 0.7}{0.6 * 0.7 + 0.4 * 0.4} = \frac{0.42}{0.58} = 0.72 \quad \text{5pts}$$

5. $26 * 26 * 10 * 10 * 10 * 10 * 10 = 67600000 \quad$ 2pts

$26 * 25 * 10 * 9 * 8 * 7 * 6 = 19656000 \quad$ 3pts

6. $P(\text{full house}) = \dfrac{13 * \binom{4}{3} * 12 * \binom{4}{2}}{\binom{52}{5}} = 0.0014 \quad$ 5pts

3pts

a). $P(\text{none of these}) = 1 - (0.03 + 0.05 + 0.06 + 0.08 + 0.15 + 0.04 + 0.1) = 0.49$

b). $P(\text{exactly one of these items}) = 0.03 + 0.15 + 0.1 = 0.28 \quad$ 2pts

8. a). $P(X=0) = \dfrac{\binom{8}{0} \ast \binom{12}{4}}{\binom{20}{4}} = 0.102$ Hypergeometric 4pts

b). $P(X=3) = \dfrac{4^3 \cdot e^{-4}}{3!} = 0.195$ Poisson   4-pts

c). $P(X=5) = 0.03 \ast (1-0.03)^{5-1} = 0.027$ Geometric   4pts

d). $P(X=2) = \dfrac{\binom{25}{2} \ast \binom{75}{8}}{\binom{100}{10}} = \dfrac{300 \ast 16871053725}{1.731031 e+13} = 0.292$ 4pts

Hypergeometric

e). $P(X \geqslant 5) = P(X=5) + P(X=6) + P(X=7)$ 4pts

For each part, 1pt for
name the distribution
correctly, 3pts for correct
set up.

$= \binom{7}{5} 0.6^5 \cdot 0.4^2 + \binom{7}{6} 0.6^6 \cdot 0.4^1 + \binom{7}{7} 0.6^7 \cdot 0.4^0$

$= 0.42$ Binomial

10. a).

X	-2	-1	0	1	2
P(x)	1/8	1/4	1/4	1/4	1/8

4pts

b). $E[X] = \sum\limits_{all\,x} X \cdot P(x) = (-2) \ast 1/8 + (-1) \ast 1/4 + 0 \ast 1/4 + 1 \ast 1/4 + 2 \ast 1/8 = 0$ 2pts

$Var[X] = E[X^2] - (E[X])^2 = \sum\limits_{all\,x} X^2 \cdot P(x) - \sigma^2 = 1.5$ 1pts

$SD[X] = \sqrt{Var[X]} = \sqrt{1.5} = 1.224$. 1pts

c). $P(-1 \leq X \leq 1) = P(X=-1) + P(X=0) + P(X=1) = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$ 4pts

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> dhyper(4, 12, 8, 4)
[1] 0.1021672
>
> dpois(3, 4)
[1] 0.1953668
>
> dgeom(4, 0.03)
[1] 0.02655878
>
> dhyper(2, 25, 75, 10)
[1] 0.2923874
>
> pbinom(7, 7, 0.6) - pbinom(4, 7, 0.6)
[1] 0.419904
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