Homework 2

● Graded

Student

Jacob Hauptman

Total Points

24 / 24 pts

Question 1

Conditional probability

4 / 4 pts

✔ **– 0 pts** Correct

– 1 pt Part a is wrong.

– 1 pt Part b is wrong

– 1 pt Part c is wrong

– 4 pts No attempt

Question 2

Independence

4 / 4 pts

✔ **– 0 pts** Correct

– 1 pt Part a is wrong.

– 1 pt Part b is wrong.

– 1 pt Part c is wrong.

– 4 pts No attempt.

Question 3

Bayes Tea

4 / 4 pts

✔ **+ 4 pts** Correct

+ 3 pts Small mistake.

+ 2 pts writing down both formulas

+ 2 pts wrong event in numerator or denominator

+ 1 pt Only found P(Taste white)

+ 0 pts Wrong / No answer.

Question 4

Bayes Coins

4 / 4 pts

✔ **+ 4 pts** All Correct

+ 3 pts Small mistake

+ 2 pts Part 1 is correct

+ 2 pts Part 2 is correct

+ 0 pts Wrong / No answer

Question 5

Counting Passwords

4 / 4 pts

✔ **– 0 pts** Correct

– 1 pt One wrong / missing part

– 2 pts Two wrong / missing parts

– 3 pts Three wrong / missing parts

– 3.5 pts Four wrong / missing parts

– 4 pts Five wrong parts / no answer

Question 6

Counting Meals

4 / 4 pts

✔ **– 0 pts** attempted

– 4 pts Not attempted

Questions assigned to the following page: 1 and 2

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1a) $P(E|F) = \frac{P(E \cap F)}{P(F)} = \frac{1/36}{1/6} = \boxed{1/6}$

2a) $P(E|H) = \frac{P(E \cap H)}{P(H)} = \frac{0}{P(H)} = \boxed{0}$

3a) $P(H|F) = \frac{P(H \cap F)}{P(F)} = \frac{3/36}{1/6} = \frac{3}{6} = \boxed{\frac{1}{2}}$

2a) $P(F \cap G) = P(F)P(G) \Rightarrow 0 \neq 1/36$ **not independent**

2b) $P(H) = P(\{(5,5),(6,4),(4,6),(6,5),(5,6),(6,6)\}) = \frac{6}{36} = \frac{1}{6}$

$P(F \cap H) = P(F)P(H) \Rightarrow \frac{3}{36} \neq \frac{1}{6}\left(\frac{1}{6}\right) \Rightarrow \frac{3}{36} \neq \frac{1}{36}$ **not independent**

2c) $P(E \cap F) = P(E)P(F) \Rightarrow \frac{1}{36} = \frac{2}{36}\left(\frac{1}{6}\right) \Rightarrow \frac{1}{36} = \frac{1}{36}$ **independent**

Questions assigned to the following page: 3 and 4

3) $P(w) = 0.1 \quad P(G) = 0.9 \quad P(\text{Guess } w \mid w) = 0.6$

$P(\text{Guess } w \mid G) = 0.4$

$P(\text{Guess } w) = P(w)P(\text{Guess } w \mid w) + P(G)P(\text{Guess } w \mid G)$

$= 0.1(0.6) + 0.9(0.4) = 0.42$

$$P(w \mid \text{Guess } w) = \frac{P(w \cap \text{Guess } w)}{P(\text{Guess } w)} = \frac{P(w)P(\text{Guess } w \mid w)}{P(\text{Guess } w)}$$

$$= \frac{0.1(0.6)}{0.42} \approx \boxed{0.143}$$

4) 2x Fair coin : $P(H) = P(T) = 0.5$

2x Unfair coin : $P(H) = 0.2 \quad P(T) = 0.8$

3x Heads coin : $P(H) = 1 \quad P(T) = 0.$

(1) $P(\text{Fair}) = 2/7$

$$P(\text{Fair} \mid \{H, H\}) = \frac{P(\{H, H\} \mid \text{Fair})\, P(\text{Fair})}{P(\{H, H\})}$$

$$= \frac{\frac{1}{4}\left(\frac{2}{7}\right)}{\frac{3}{7}(1) + \frac{2}{7}\left(\frac{1}{5}\right)^2 + \frac{2}{7}\left(\frac{1}{2}\right)^2} \approx \boxed{0.1397}$$

Questions assigned to the following page: 4, 5, and 6

(c)

$$P(\text{Fair} \mid \{HHH\}) = \frac{P(\{HHH\} \mid \text{Fair}) P(\text{Fair})}{P(\{HHH\})}$$

$$= \frac{\frac{1}{8}\left(\frac{2}{7}\right)}{\frac{3}{7} + \frac{2}{7}\left(\frac{1}{5}\right)^3 + \frac{2}{7}\left(\frac{1}{2}\right)^3} = \boxed{0.0765}$$

5a) $6^4 = \boxed{1296}$

5b) $12^4 = \boxed{20736}$

5c) $\frac{6!}{2!} = \boxed{360}$

5d) $\frac{12!}{8!} = \boxed{11880}$

5e) $6^3 \cdot 3(4) = \boxed{2592}$

6a) $8^2 \cdot 6^2 \cdot 6^3 = \boxed{497,664}$

6b) $\frac{8!}{2!\,6!} \cdot \frac{6!}{2!\,4!} \cdot \frac{6!}{3!\,3!} = \boxed{8400}$