Student: _____	Instructor: Andreas Lazari	Assignment: Chapter 5.4-Homework
Date: _____	Course: Math2620 F - Fall 2018	

1. The notation P(F| E) means the probability of event (1) F given event (2) E.

(1) ○ E ● F ○ P (2) ○ F ○ P ● E

2. Suppose that E and F are two events and that P(E and F) = 0.7 and P(E) = 0.8. What is P(F|E)? $= \frac{P(F \cap E)}{P(E)} = \frac{.7}{.8} = 0.875$

P(F|E) = 0.875 (Type an integer or a decimal.)

3. Suppose that E and F are two events and that P(E) = 0.2 and P(F|E) = 0.1. What is P(E and F)?

P(E and F) = 0.02 (Simplify your answer.)

$P(E \text{ and } F) = P(F|E) \cdot P(E) = (0.1)(0.2) = 0.02$

4. The probability that a randomly selected individual in a country earns more than $75,000 per year is 7.5%. The probability that a randomly selected individual in the country earns more than $75,000 per year, given that the individual has earned a bachelor's degree, is 7.5%. Are the events "earn more than $75,000 per year" and "earned a bachelor's degree" independent?

Are these events independent?

● Yes ○ No

$P(>75000) = 0.075$

$P(>75000 / \text{Has Bachelors}) = P(>75000) = 0.075$

Yes, they are Independent

5. In a recent poll, a random sample of adults in some country (18 years and older) was asked, "When you see an ad emphasizing that a product is "Made in our country," are you more likely to buy it, less likely to buy it, or neither more nor less likely to buy it?" The results of the survey, by age group, are presented in the following contingency table. Complete parts (a) through (c).

Purchase likelihood	18-34	35-44	45-54	55 +	Total
More likely	214	382	389	408	**1393**
Less likely	24	5	27	11	**67**
Neither more nor less likely	296	216	156	129	**797**
Total	**534**	**603**	**572**	**548**	**2257**

(a) What is the probability that a randomly selected individual is at least 55 years of age, given the individual is more likely to buy a product emphasized as "Made in our country"?

The probability is approximately 0.293.
(Round to three decimal places as needed.)

$P(>55 / \text{more likely}) = \frac{P(>55 \cap \text{more likely})}{P(\text{more likely})} = \frac{\frac{408}{2257}}{\frac{1393}{2257}} = \frac{408}{1393} = 0.29289 \approx 0.293$

(b) What is the probability that a randomly selected individual is more likely to buy a product emphasized as "Made in our country," given the individual is at least 55 years of age?

The probability is approximately 0.745.
(Round to three decimal places as needed.)

$P(\text{more likely} / >55) = \frac{P(>55 \cap \text{more likely})}{P(>55)} = \frac{\frac{408}{2257}}{\frac{548}{2257}} = \frac{408}{548} = 0.744525 \approx 0.745$

(c) Are 18- to 34-year-olds more likely to buy a product emphasized as "Made in our country" than individuals in general?

○ Yes, more likely ● No, less likely

$P(18\text{ to }34 \cap \text{more likely}) = 214/2257 = 0.09481$

$P(\text{Individuals in General} \cap \text{more likely}) = 1393/2257 = 0.61719$

6. The data represent the number of driving fatalities for a certain area by age for male and female drivers.

	Male	Female
under 16	271	117
16-20	5317	2204
21-34	12,585	4302
35-54	11,733	5321 = 17054
55-69	5735	1848
70 and over	3224	1549

38865

(a) What is the probability that a randomly selected driver fatality who was male was 35 to 54 years old?

The probability that a randomly selected driver fatality who was male was 35 to 54 years old is approximately 0.302.
(Round to three decimal places as needed.)

$P(35\text{to}54 \mid M) = 11733/38865 = 0.30189 \approx 0.302$

(b) What is the probability that a randomly selected driver fatality who was 35 to 54 was male? $P(M \mid 35\text{to}54) = \frac{11733}{17054}$

The probability that a randomly selected driver fatality who was 35 to 54 was male is approximately 0.688. (Round to three decimal places as needed.)

$= 0.68799$
≈ 0.688

(c) Is a victim of a fatal accident aged 35 to 54 more likely to be male or female? Choose the correct statement below.

$P(M \mid 35\text{-}54) = \frac{11733}{17054} \approx 0.688$

$P(F \mid 35\text{-}54) = \frac{5321}{17054} \approx 0.312$

- (●) **A.** The driver is more likely to be male because the probability is greater than 0.5.
- ( ) **B.** The driver is more likely to be male because the probability is less than 0.5.
- ( ) **C.** The driver is more likely to be female because the probability is less than 0.5.
- ( ) **D.** The driver is more likely to be female because the probability is greater than 0.5.

7. Suppose that two cards are randomly selected from a standard 52-card deck.

(a) What is the probability that the first card is a king and the second card is a king if the sampling is done without replacement?
(b) What is the probability that the first card is a king and the second card is a king if the sampling is done with replacement?

(a) If the sampling is done without replacement, the probability that the first card is a king and the second card is a king is 0.005. (Round to three decimal places as needed.)

$P(K_1 \cap K_2) = P(K_1) \cdot P(K_2 \mid K_1) = \frac{4}{52} \cdot \frac{3}{51} = .004613 \approx 0.005$

(b) If the sampling is done with replacement, the probability that the first card is a king and the second card is a king is 0.006. (Round to three decimal places as needed.)

$P(K_1 \cap K_2) = P(K_1) \cdot P(K_2) = \frac{4}{52} \cdot \frac{4}{52} = 0.005917 \approx 0.006$

8. This past semester, a professor had a small business calculus section. The students in the class were Kristin, Jinita, Al, William, and Mike. Suppose the professor randomly selects two people to go to the board to work problems. What is the probability that Mike is the first person chosen to go to the board and Kristin is the second?

P(Mike is chosen first and Kristin is second) = $\frac{1}{20}$ (Type an integer or a simplified fraction.)

$P(\text{Mike} \cap \text{Kristin}) = P(\text{Mike}) \cdot P(\text{Kristine} \mid \text{Mike}) = \frac{1}{5} \cdot \frac{1}{4} = \frac{1}{20}$

9. Suppose you just purchased a digital music player and have put 8 tracks on it. After listening to them you decide that you like 2 of the songs. With the random feature on your player, each of the 8 songs is played once in random order. Find the probability that among the first two songs played
(a) You like both of them. Would this be unusual?
(b) You like neither of them.
(c) You like exactly one of them.
(d) Redo (a)-(c) if a song can be replayed before all 8 songs are played.

(a) The probablility that you like both songs is 0.036. $P(L_1 \cap L_2) = P(L_1) \cdot P(L_2|L_1)$
(Round to three decimal places as needed.) $= (2/8)(1/7) = 2/56$
$= 0.035714 \approx 0.036$

Would it be unusual for you to like both of the songs?

● Yes Yes, since less than 0.05
○ No

(b) The probability that you like neither song is 0.536 $P(L_1^c \cap L_2^c) = P(L_1^c) \cdot P(L_2^c|L_1^c)$
(Round to three decimal places as needed.) $(6/8)(5/7) = 0.535714$
$= 0.536$

(c) The probability that you like exactly one song is 0.429
(Round to three decimal places as needed.) $P(L_1^c \cap L_2) + P(L_1 \cap L_2^c)$
$= P(L_1^c) \cdot P(L_2|L_1^c) + P(L_1) \cdot P(L_2^c|L_1)$
$= \frac{6}{8} \cdot \frac{2}{7} + \frac{2}{8} \cdot \frac{6}{7} = 2\left(\frac{2}{8} \cdot \frac{6}{7}\right)$
$= 0.428571 \approx 0.429$

(d) The probability that you like both songs is 0.063.
(Round to three decimal places as needed.) $P(L_1 \cap L_2) = P(L_1) \cdot P(L_2) = \frac{2}{8} \cdot \frac{1}{7} = \frac{4}{64} = 0.0625 \approx 0.063$
The probability that you like neither song is 0.563
(Round to three decimal places as needed.) $P(\text{Neither}) = \frac{6}{8} \cdot \frac{6}{8} = \frac{36}{64} = 0.5625 \approx 0.563$
The probability that you like exactly one song is 0.375
(Round to three decimal places as needed.) $2\left(\frac{6}{8} \cdot \frac{2}{8}\right) = \frac{24}{64} \approx 0.375$

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10. Due to a manufacturing error, six cans of regular soda were accidentally filled with diet soda and placed into a 18-pack. Suppose that two cans are randomly selected from the 18-pack. Complete parts (a) through (c).

(a) Determine the probability that both contain diet soda.

P(both diet) = 0.0980 (Round to four decimal places as needed.) $P(D_1 \cap D_2) = P(D_1) \cdot P(D_2|D_1)$
$= \frac{16}{18} \cdot \frac{5}{17} = 0.098039$
≈ 0.0980

(b) Determine the probability that both contain regular soda.

P(both regular) = 0.4314 (Round to four decimal places as needed.) $P(R_1 \cap R_2) = \frac{12}{18} \cdot \frac{11}{17} = 0.431372$
≈ 0.4314

Would this be unusual?

○ Yes Since $0.4314 > 0.05$, No
● No

(c) Determine the probability that exactly one is diet and exactly one is regular.

P(one diet and one regular) = 0.4706 (Round to four decimal places as needed.)

$P(D \cap R) = P(D) \cdot P(R|D) + P(R) \cdot P(D|R)$
$= \frac{6}{18} \cdot \frac{12}{17} + \frac{12}{18} \cdot \frac{6}{17}$
$= 2\left(\frac{6}{18} \cdot \frac{12}{17}\right) = 0.470588$
≈ 0.4706

1. (1) F

   (2) E

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2. 0.875

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3. 0.02

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4. Yes

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5. 0.293

   0.745

   No, less likely

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6. 0.302

   0.688

   A. The driver is more likely to be male because the probability is greater than 0.5.

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7. 0.005

   0.006

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8. $\frac{1}{20}$

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9. 0.036

   Yes

   0.536

   0.429

   0.063

   0.563

   0.375

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10. 0.0980

    0.4314

    No

    0.4706
