



## PSTAT 5A: Homework 02

Summer Session A 2023, with Ethan P. Marzban

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As a reminder, homework is neither collected nor graded. We encourage you to stop by Office Hours to ask any questions you may have about your work, or the problems themselves!

1. A recent survey at a cinema revealed that 80% of moviegoers purchase popcorn and 60% purchase a drink. Additionally, 62.5% of those who purchase popcorn also purchase a drink.

(a) Define events, and translate the information provided in the problem. Remember: the events you define should not be conditional.

**Final Answer(s):** No numerical answers.

(b) What is the probability that a randomly selected moviegoer purchases both popcorn and a drink?

**Final Answer(s):** 50%

(c) What is the probability that a randomly selected moviegoer purchases neither popcorn nor a drink?

**Final Answer(s):** 10%

2. Consider the experiment of selecting a number at random from the set of positive integers between 1 and 100, inclusive on both ends, and recording the number selected.

(a) Write down the outcome space  $\Omega$  for this experiment.

**Final Answer(s):** No numerical answers.

(b) What is the probability that the number selected is even?

**Final Answer(s):**  $1/2$

(c) What is the probability that the number selected is strictly greater than 65?

**Final Answer(s):** 7/20

- (d) What is the probability that the number selected is even, given that it is strictly greater than 65?

**Final Answer(s):** 18/35

- (e) If the number is a multiple of three, what is the probability that it is odd?

**Final Answer(s):** 16/33

3. A researcher is interested in the relationship between exercise habits and mental health. To that effect, she surveyed several individuals on their exercise habits as well as their mental health; the results of her survey are displayed in the following contingency table:

Exercise_Habits	Mental_Health		
	Poor	Fair	Good
Sedentary	30	25	20
Moderately Active	40	35	30
Very Active	45	50	25

A person is selected at random. Use the Classical Approach to Probability wherever necessary.

- (a) What is the probability that the selected person has a sedentary lifestyle?

**Final Answer(s):** 75/300

- (b) What is the probability that the selected person has 'fair' mental health?

**Final Answer(s):** 110/300

- (c) What is the probability that the selected person has both a 'moderately active' lifestyle and 'good' mental health?

**Final Answer(s):** 30/300

- (d) Given that the person has 'good' mental health, what is the probability that they have a 'very active' lifestyle?

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Final Answer(s):** 25/75

- (e) If the person has a 'moderately active' lifestyle, what is the probability that they have 'fair' mental health?

**Final Answer(s):** 35/105

4. Consider events  $E$  and  $F$  with  $\mathbb{P}(E) = 0.5$ ,  $\mathbb{P}(F) = 0.7$ , and  $\mathbb{P}(E \cap F) = 0.35$ .

- (a) What is  $\mathbb{P}(E \cup F)$ ?

**Final Answer(s):** 85%

- (b) What is  $\mathbb{P}(E | F)$ ?

**Final Answer(s):** 1/2

- (c) What is  $\mathbb{P}(F | E)$ ?

**Final Answer(s):** 7/10

- (d) Are  $E$  and  $F$  mutually exclusive? Why or why not?

**Final Answer(s):** No.

- (e) Are  $E$  and  $F$  independent? Why or why not?

**Final Answer(s):** Yes.

