

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

MATH 108

Fall 2021

HW 11: Due 12/09

*“Earth is amazing! There are these things called farms. They put seeds in the ground, pour water on them, and they grow into food, like pizzas!”*

*–Captain, Wall-E*

**Problem 1.** (10pt) The probabilities of several events in a finite probability space are given below:

$$P(A) = 0.45 \quad P(A \text{ and } B) = 0.11$$

$$P(B) = 0.21 \quad P(A \text{ and } C) = 0.81$$

$$P(C) = 0.73 \quad P(B \text{ and } C) = 0.00$$

$$P(D) = 0.55 \quad P(B \text{ or } D) = 0.91$$

- (a) Find  $P(A \text{ or } B)$ .
- (b) Assuming  $A$  and  $D$  are independent events, find  $P(A \text{ and } D)$ .
- (c) Find  $P(A \mid B)$ .
- (d) Find  $P(B \text{ and } D)$ .
- (e) Are  $C$  and  $D$  disjoint? Explain.
- (f) Are  $A$  and  $C$  independent? Explain.
- (g) Are  $B$  and  $C$  independent? Explain.

**Problem 2.** (10pt) At a financial analysis firm with 66 employees, 37 employees perform algorithmic trading as part of their job, 16 perform audits, and 3 perform both.

- (a) Find the probability that a randomly selected employees performs algorithmic trading or audits.
- (b) Find the probability that a randomly selected employees performs neither algorithmic trading or nor audits.
- (c) Find the probability that a randomly selected employees only performs audits as part of their job.
- (d) Find the probability that an employee that performs audits also performs algorithmic trading as part of their job.
- (e) Find the probability that a randomly selected employee performs both audits and algorithmic trading as part of their job.

**Problem 3.** (10pt) A construction company places bids on various construction projects. The company underbids 30% of the time. If they underbid, they get the job 80% of the time. If they do not underbid, they fail to get the job 90% of the time.

- (a) Find the probability that they underbid and get the job.
- (b) Find the probability that they get the job if they make a bid.
- (c) Find the probability that they get the job or underbid.
- (d) Find probability that they did not underbid if they got the job.

**Problem 4.** (10pt) Suppose you play a game where you roll a tetrahedral die with sides labeled one through four. The probabilities for which are (partially) given below. If you roll a four, you must pay \$3; if you roll a two or three, you win nothing; if you roll a one, you win \$20.

$n$	1	2	3	4
$P(n)$	$\frac{1}{10}$	$\frac{2}{10}$		$\frac{5}{10}$

- Find  $P(3)$ .
- Find the probability that if you roll the die twice, you win both times.
- Find the average amount you win per game.
- Should you play this game? Explain.
- Suppose you had to pay \$2 each time you wanted to play this game. How does this affect the answer from (d)? Explain.