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MATH 108

Fall 2023

HW 8: Due 10/17

*“The consequences of an act affect the probability of its occurring again.”*

*—B.F. Skinner*

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

$$P(A) = 0.45 \qquad P(D) = 0.10$$

$$P(B) = 0.20 \qquad P(A \text{ and } C) = 0.01$$

$$P(C) = 0.85 \qquad P(B \text{ and } C) = 0.10$$

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

**Solution.**

- (a)
- (b)
- (c)
- (d)
- (e)

**Problem 2.** (10pt) A statistician is examining tax rebates for small businesses in the area. She finds that of the 227 small businesses in the county, 109 qualified for a state tax rebate, 80 qualified for a federal tax rebate, and 38 qualified for both.

- (a) Find the probability that a randomly selected local small business qualified for a state or federal tax rebate.
- (b) Find the probability that a randomly selected local small business qualified for a state and federal tax rebate.
- (c) Find the probability that a randomly selected local small business qualified for neither a state nor a federal tax rebate.
- (d) Find the probability that a randomly selected local small business qualified for only a state tax rebate.
- (e) Find the probability that a randomly selected local small business that qualified for a state tax rebate also qualified for a federal tax rebate.

**Solution.**

- (a)
- (b)
- (c)
- (d)
- (e)

**Problem 3.** (10pt) A large accounting class has 156 students. A chart summarizing the pass/fail/withdraw results for students, broken down by class, is given below.

	Pass	Fail	Withdraw
Freshmen	41	14	6
Sophomore	56	11	3
Junior	18	3	1
Senior	3	0	0

Given the data above, answer the following:

- (a) Find the probability that a randomly selected student failed the course.
- (b) Find the probability that a randomly selected student was a sophomore or withdrew from the course.
- (c) Find the probability that a randomly selected student was a junior and failed the course.
- (d) Find the probability that a randomly selected freshman failed the course.
- (e) Are freshmen status and failing the course independent events? Explain.

**Solution.**

- (a)
- (b)
- (c)
- (d)
- (e)

**Problem 4.** (10pt) Administrators at a college are examining job placement for their graduates. Only 4% of their graduates are Computer Science majors. They find that 85% of their computer science majors obtain a job within 6 months of graduating. For all other majors at the college, 70% of their graduates find a job within 6 months of graduating.

- (a) Find the percentage of graduates that received a job within 6 months of graduating.
- (b) Find the percentage of graduates that were a computer science major and obtained a job within 6 months of graduating.
- (c) Find the percentage of graduates that obtained a job within 6 months of graduating or were not a computer science major.
- (d) Of the graduates that obtained a job within 6 months of graduating, what percentage were computer science majors?

**Solution.**

- (a)
- (b)
- (c)
- (d)