

Show all your work.

70 points maximum score

50 minutes allowed

You do not need to evaluate binomial coefficients.

The test is printed on both sides of the paper.

1. (14 points) A club has 50 members, 30 men and 20 women.
 - a. In how many different ways can three officers (president, vice-president, and treasurer) be chosen?
 - b. If the officers are chosen randomly (for example, by putting all 50 names in a hat and drawing three names, with the first drawn becoming president, the second vice-president and the third treasurer), find the probability that all three officers are men.
 - c. In how many different ways can ten members be chosen to attend a convention?
 - d. If the ten members to attend the convention are selected by randomly drawing ten names out of a hat containing all 50 names, find the probability that four men and six women are selected.

2. (15 points) Let $S = \{ E_1, E_2, E_3, E_4 \}$ be a sample space containing four sample points, and $A = \{ E_1, E_2 \}$ and $B = \{ E_1, E_3 \}$ be two events in S . Suppose also that $P(E_1) = 0.4$, $P(E_2) = 0.1$, and $P(E_3) = 0.2$.

a. List the sample points in each of the following events:

$A \cap B$ _____ $\overline{A} \cap B$ _____ $\overline{A} \cup \overline{B}$ _____

b. Find the following probabilities:

$P(A)$ _____ $P(E_4)$ _____

3. (15 points) If A and B are events with $P(A) = 0.6$, $P(A \cap B) = 0.3$, and $P(A \cup B) = 0.8$, find:

a. $P(B)$

b. $P(\overline{A})$

c. $P(B|A)$

d. Are A and B independent? _____ *Explain* for credit.

e. Are A and B mutually exclusive? _____ *Explain* for credit

4. (10 points) Of the travelers arriving at a small airport, 60% fly on major airlines, 30% fly on privately owned planes, and the remainder fly on commercially owned planes not belonging to a major airline. Of those traveling on major airlines, 50% are traveling for business reasons, whereas 60% of those arriving on private planes and 90% of those arriving on other commercially owned planes are traveling for business reasons. Suppose that we randomly select one person arriving at this airport. What is the probability that the person
- is traveling for business reasons?
 - is traveling for business reasons on a privately owned plane?
 - arrived on a privately owned plane, given that the person is traveling for business reasons?

5. (16 points) Let Y be a random variable with the following probability distribution:

y	1	2	3	4	5	sum
$p(y) = P(Y = y)$	0.10	0.35	0.20	0.25	0.10	

a. Draw a probability histogram for Y .

d. Find $E(Y)$.

b. Find $P(Y \leq 3)$.

e. Find $V(Y)$.

c. Find $P(Y \leq 3 \mid Y \text{ is odd})$.

f. Find $E(6Y - 5)$.