

Exam 2

Answer all 9 questions for a total of 100 points. Write your solutions in the accompanying blue book, and put a box around your final answers. If you solve the problems out of order, please skip pages so that your solutions stay in order. Good luck!

1. (8 points) Let A , B , and C be subsets of the universal set U .

- $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
- $A = \{1, 2, 3, 4, 6\}$
- $B = \{1, 5, 7, 9\}$
- $C = \{1, 5, 8\}$

Find $A' \cup (B \cap C)$.

2. When setting up a new phone, the owner must set a 6-digit password consisting of digits 0-9. How many passwords are possible if ...

- (a) (4 points) there are no password restrictions?
- (b) (4 points) consecutive digits cannot be the same?

3. Three companies have 8, 12, and 20 employees, respectively.

- (a) (6 points) If each company sends 3 representatives to a conference, how many way can this be done?
- (b) (6 points) If each company sends 1 person to present, 1 person to sell merchandise, and 1 person to assist, how many ways can this be done?

4. (8 points) A catering company offers its customers 5 vegetable dishes, 4 meat dishes, and 3 pasta dishes. When hiring this company to cater an event, a customer must create a menu by choosing 6 distinct dishes that include at least one vegetable dish and at least one pasta dish. How many different menus can a customer create?

5. A company has 10 equally qualified applicants for 5 identical positions, and so they decide to hire 5 randomly selected applicants. Suppose 4 of the applicants are sisters.

- (a) (6 points) What is the probability that at least one of the sisters is hired?
- (b) (6 points) What is the probability that at most one of the sisters is hired?

6. Events A and B happen with probabilities summarized in the table below.

	A	A'
B	.11	.29
B'	.19	.41

- (a) (4 points) What is $P(A|B)$?
- (b) (4 points) Are the events A and B independent? Why or why not?
- (c) (4 points) Are the events A and B mutually exclusive? Why or why not?

7. Suppose $P(A) = .3$, $P(B) = .2$, $P(A|B) = .5$.

- (a) (6 points) Find $P(A \cap B)$.
- (b) (6 points) Find $P(A \cup B)$.

8. A streaming service offers its users a free subscription with ads, a premium subscription with less ads, and a VIP subscription with no ads. Suppose 90% of VIP subscribers are employed, 70% of premium subscribers are employed, and 40% of free subscribers are employed. Furthermore, suppose 55% of users have a VIP subscription, 25% of users have a premium subscription, and 30% of users have a free subscription.
- (a) (8 points) Find the probability that a user of this streaming service is employed.
- (b) (8 points) Find the probability that an employed user of this streaming service has a VIP subscription.

9. A game consists of selecting 2 marbles from a jar that contains 3 blue and 2 red marbles. For every blue marble you select, you lose \$1. For every red marble you select, you win \$2. Let x be the amount of money you win/lose (+/-) playing this game.

- (a) (8 points) Describe the probability distribution for x by filling in a table like the one below.

x	
$p(x)$	

- (b) (4 points) Find the expected value $E(x)$.