

1. (10 pts) Let A denote the event that a randomly selected individual has a Visa credit card, and B denote the event that a randomly selected individual has a MasterCard. Based on previous research, you know that 50% of people have Visa cards, 40% have MasterCards, and 25% have both.
 - (a) Compute the probability that a randomly selected individual has at least one of the two types of cards.
 - (b) What is the probability that the selected individual has neither type of card?
 - (c) What proportion of individuals who have Visa cards do NOT have MasterCards?
 - (d) Suppose I randomly select 8 individuals. What is the probability that at least 5 of them have MasterCards? (Note: you don't need to give the exact decimal answer, just show how you'd set this up).
 - (e) Give the R code that you would use to compute your answer from part (d).

2. (8 pts) Let X represent the number of students who show up at Prof. Lewis' office hours on a given day. Suppose that the only possible values of X are 0, 1, 2, 3, 4.

k	0	1	2	3	4
$P(X = k)$	0.30	0.25	0.20	0.15	

- (a) Fill in the missing value for $P(X = 4)$.
- (b) What is the probability that 3 or more students show up for office hours?
- (c) How many students should Prof. Lewis *expect* to show up?
- (d) Find $\sigma(X)$.

3. (4 pts) Give the output of the following R code snippet:

```
b = 20
for (i in 1:4){
  b = b - i
}
b
```

4. (6 pts) At a certain gas station, 60% of the customers use regular unleaded gas, 25% use extra unleaded gas, and 15% use premium unleaded gas. Of those customers using regular gas, only 30% fill their tanks. Of those customers using extra unleaded gas, 50% fill their tanks, whereas of those using premium unleaded gas, 40% fill their tanks.

a. What is the probability that the next customer fills their tank?

b. If the next customer fills the tank, what is the probability that regular gas is requested?

5. (6 pts) A box in a supply room contains four 40-W lightbulbs, five 60-W bulbs, and six 75-W bulbs. Suppose that three bulbs are randomly selected from the box. (Note: you don't need to compute the exact quantities for the following two parts; just set them up).

(a) In how many ways can you select the three bulbs so that exactly two of them are 75-W?

(b) What is the probability that all three of the selected bulbs have the same wattage?

6. (6 pts) The breakdown voltage of a randomly chosen diode of a certain type is known to be normally distributed with mean value 40V and standard deviation 1.5V.
- a. What is the probability that the voltage of a single diode is between 39 and 42?

 - b. What value is such that only 15% of all diodes have voltages exceeding that value?

 - c. If four diodes are randomly selected, what is the probability that their mean voltage exceeds 42?