

**BDSC 322
Business Statistics
Fall 2021**

**Midterm Exam
100 Points
8 Problems**

**SHOW YOUR WORK
EXPLAIN YOUR ANSWERS**

First/Given Name: _____

Last/Family/Surname: _____

University User Name: _____

My signature below indicates that I did not give or receive any assistance on this exam and that the solutions submitted are wholly my own.

1. (15 points) For a data sample of 17 observations, we have $\sum_{i=1}^{17} x_i = 34$ and $\sum_{i=1}^{17} x_i^2 = 468$.

Calculate:

- (a) (5 points) the sample mean
- (b) (5 points) the sample standard deviation
- (c) (5 points) the coefficient of variation

2. (10 points) Given the following data:

4 2 1 1 5 3 0 1 0 2

Calculate:

- (a) (5 points) the sample median
- (b) (5 points) the sample range

3. (15 points) An insurance company has collected the following data on the gender and marital status of 300 customers [HINT: THIS PROBLEM IS SIMILAR TO THE ONE DISCUSSED IN CHAPTER 2 , SLIDE # 31]:

	Single (S)	Married (M)	Divorced (D)	Totals
Female (F)	30	50	20	
Male (\bar{F})	25	125	50	
Totals				

A customer is selected at random. Calculate the probability that the selected customer is:

- (a) (3 points) a married female
- (b) (3 points) not single
- (c) (3 points) married given that the customer is male
- (d) (6 points) Are marital status and gender independent? Explain using probabilities.

4. (10 points) Consider the follow probabilities for events A and B.

$$P[A|B] = 0.25$$

$$P[A|B'] = 0.5$$

$$P[B] = 0.35$$

Calculate $P[A]$ [HINT: YOU NEED TO USE BAYES' THEOREM TO CALCULATE THIS PROBABILITY, AND DON'T FORGET ABOUT LAW OF TOTAL PROBABILITY].

5. (20 points) Consider a Normal random variable X with mean $\mu = 5$ and standard deviation $\sigma = 2.5$.

(a) (10 points) Calculate $P[X < 7.5]$.

(b) (10 points) Calculate $P[X > 6.25]$.

6. (10 points) The joint probability distribution of X and Y is shown in the table:

	X		
Y	5	10	15
1	0.30	0.18	0.12
2	0.20	0.12	0.08

- (a) (5 points) Determine the marginal probability distributions for X and Y .
(b) (5 points) Find the expected value and variance for X .

7. (5 points) Customers arrive randomly to a barber shop with the following probability distribution.

$$P_n = \begin{cases} 0.177 & \text{when } n = 0 \\ 0.221 & \text{when } n = 1 \\ 0.276 & \text{when } n = 2 \\ 0.230 & \text{when } n = 3 \\ 0.096 & \text{when } n = 4 \end{cases}$$

Here, P_n is the probability that there are n number of customers in the barber shop. What is the minimum number of stools needed to accommodate all of the customers at least 70% of the time?

8. (15 points) Assume the time required to pass through security at a particular airport follows the continuous uniform distribution with a minimum time of 5 minutes and maximum time of 30 minutes.

(a) (5 points) Calculate the value of $f(x)$.

(b) (5 points) What are the mean and standard deviation of this distribution?

(c) (5 points) What is the probability that the next passenger will require less than 25 minutes to pass through security?