CONCORDIA COLLEGE
MOORHEAD, MINNESOTA

- Name: _____
- Date: _____
- Section: ○ Mon/Wed ○ Tue/Thu

BUSN 320: Business Statistics

Problem Set #2

Fall 2026

INSTRUCTIONS:

- These practice problems are intended to help you prepare for Quiz #2.
- You may use your textbook, class notes, calculator, and other course resources while completing these problems.
- The problem set consists of three parts: Definitions, True / False, and Short Answers.
- The practice problems are broader than the quiz and do not necessarily represent the exact questions that will appear on Quiz #2.

Problem 1. Definitions

The following terms are fair game for definition questions on Quiz #2. You should be able to define each term and distinguish it from closely related concepts.

Chapter 4

- Probability
- Random Experiment
- Sample Space
- Sample Point
- Event
- Classical Method
- Relative Frequency Method
- Subjective Method
- Conditional Probability

Chapter 5

- Random Variable
- Discrete Random Variable
- Continuous Random Variable
- Probability Distribution
- Empirical Discrete Distribution
- Probability Mass Function (PMF)
- Expected Value
- Variance
- Standard Deviation
- Bivariate Probability Distribution
- Marginal Probability
- Discrete Uniform Probability Distribution
- Bernoulli Trial
- Binomial Probability Distribution
- Poisson Probability Distribution

Chapter 6

- Probability Density Function (PDF)
- Z-table
- Normal Probability Distribution
- Standard Normal Probability Distribution
- Continuous Uniform Probability Distribution

Problem 2. True / False

For each statement, indicate whether it is `TRUE` or `FALSE`. A correct `TRUE` response will receive full credit. For a `FALSE` statement, you must briefly explain why the statement is false to receive full credit.

2.A. An event may contain every sample point in the sample space.

2.B. The classical method assigns equal probabilities to all possible outcomes, even when some outcomes are more likely than others.

2.C. If $P(A) = 0.40$ and $P(B) = 0.30$, then $P(A \cup B)$ must equal 0.70.

2.D. When calculating $P(A \mid B)$, we restrict the sample space to the outcomes belonging to event B.

2.E. A discrete random variable must have a finite number of possible values.

2.F. A discrete probability distribution can be valid even if one of its possible values has a probability of zero.

2.G. The expected value of a random variable must be one of the values that the random variable can actually take.

Problem 2. True / False (continued)

For each statement, indicate whether it is `TRUE` or `FALSE`. A correct `TRUE` response will receive full credit. For a `FALSE` statement, you must briefly explain why the statement is false to receive full credit.

2.H. If a random variable is measured in dollars, its variance is measured in squared dollars and its standard deviation is measured in dollars.

2.I. A marginal probability describes the probability of a value of one random variable, regardless of the value of the other random variable.

2.J. A binomial distribution can describe the number of successes in a fixed number of independent Bernoulli trials even when the probability of success differs across trials.

2.K. For a continuous random variable, the height of the probability density function at x equals $P(X = x)$.

2.L. If X has a continuous uniform distribution between 0 and 10, then $P(1 \leq X \leq 3) = P(6 \leq X \leq 8)$.

2.M. Increasing the standard deviation of a normal distribution while keeping its mean fixed makes the curve narrower and taller.

2.N. If X follows a normal distribution with mean 100 and standard deviation 10, then $P(X \leq 110) = P(Z \leq 1)$, where Z follows the standard normal distribution.

Problem 3. Short Answers

3.A. A hotel records the following information about 200 reservations. Let D be the event that a reservation was booked directly, and C be the event that it was canceled. Select one reservation at random.

	Canceled	Not Canceled	Total
Booked Directly	12	68	80
Booked Through a Third Party	36	84	120
Total	48	152	200

- Find $P(D)$ and $P(C)$.

- Find $P(D \cap C)$. Explain what this probability represents.

- Find $P(D \cup C)$.

- Find $P(C \mid D)$ and $P(C \mid D^c)$.

- Based on your answers, which booking method has a higher cancellation rate? Explain.

Problem 3. Short Answers (continued)

3.B. A café estimates the following probability distribution for the number of unsold pastries at closing, X.

x	0	1	2	3	4
$P(X = x)$	0.10	0.20	0.40	0.20	0.10

- Explain why this is a valid probability mass function.

- Find the probability that at least three pastries remain unsold.

- Calculate the expected value of X and interpret it.

- Calculate the variance and standard deviation of X.

- Each unsold pastry represents \$3 in lost revenue. Find the expected lost revenue per day.

Problem 3. Short Answers (continued)

3.C. Let X be the number of canceled morning flights and Y the number of canceled evening flights on a particular route during a randomly selected day. Their joint probability distribution is given below.

	$Y = 0$	$Y = 1$	$Y = 2$
$X = 0$	0.30	0.10	0.05
$X = 1$	0.10	0.20	0.05
$X = 2$	0.05	0.05	0.10

- Find the marginal probability distributions of X and Y.

- Find the probability that there are no canceled flights in either the morning or the evening.

- Let $W = X + Y$. Construct the probability distribution of W.

- Calculate $E(X)$, $E(Y)$, and $E(W)$. What relationship do you observe?

- Given that $\text{Var}(X) = \text{Var}(Y) = 0.5875$ and $\text{Var}(W) = 1.775$, calculate the covariance between X and Y. Interpret its sign.

Problem 3. Short Answers (continued)

3.D. A delivery company gives a customer a delivery window from 1:00 PM to 5:00 PM. Assume the arrival time follows a continuous uniform distribution. Let X be the number of hours after 1:00 PM until the delivery arrives.

- State the distribution of X and determine the height of its probability density function.

- Sketch the probability density function and label its axes.

- Find the probability that the delivery arrives before 2:00 PM.

- Find the probability that the delivery arrives between 2:30 PM and 4:00 PM. Shade the corresponding area on your sketch.

- Find the probability that the delivery arrives at exactly 3:00 PM. Explain why your answer does not mean that arrival at 3:00 PM is impossible.

Problem 3. Short Answers (continued)

3.E. The time required to process a customer's application is normally distributed with a mean of 40 minutes and a standard deviation of 8 minutes. Use the Z-table and show your standardization steps.

- Find the probability that an application takes less than 32 minutes.

- Find the probability that an application takes more than 52 minutes.

- Find the probability that an application takes between 36 and 48 minutes.

- The company promises to finish applications within 48 minutes. What proportion of applications will meet this promise?

- Another processing system has normally distributed processing times with the same mean but a standard deviation of 4 minutes. Under this system, would a greater or smaller proportion of applications meet the 48-minute promise? Explain without calculating.

Problem 3. Short Answers (continued)

3.F. An airline estimates that each passenger has an 80% probability of checking in online. Suppose 100 passengers independently decide whether to check in online. Let X be the number who check in online.

- Explain why a binomial distribution is appropriate. Identify n and p.

- Check whether the normal approximation is appropriate.

- Calculate the mean and standard deviation of X.

- Using the normal approximation and the approach shown in class, estimate the probability that fewer than 72 passengers check in online.

- Estimate the probability that between 76 and 84 passengers, inclusive, check in online using the same normal approximation approach.