BUSINESS STATISTICS: PRACTICE WORKSHEET

Chapters 1 – 8 — Student Handout

Chapter 1: Data and Statistics

Q1 (Scenario): A hotel manager collects data on guests. Categorize the following variables by their **Scale of Measurement** (Nominal, Ordinal, Interval, or Ratio):

- Customer Room Number: _____
- Star Rating of the Hotel (1–5 stars): _____
- Temperature of the Pool (Fahrenheit): _____
- Total Bill Amount ($): _____

Q2 (Table): Complete the frequency table for 50 customer survey responses regarding "Preferred Payment Method."

Payment Method	Frequency	Relative Frequency	Percent Frequency
Credit Card	25		
Debit Card	15		
Cash	10		
Total	**50**	**1.00**	**100%**

Q3: Give a business-related example of a **Quantitative Continuous** variable and explain why it is continuous rather than discrete.

Q4: Explain the difference between a **Population** and a **Sample** in the context of a national election poll.

Chapter 2: Tabular and Graphical Methods

Q5 (Bin Calculation): A dataset of 100 stock prices has a low of \$12 and a high of \$82. You decide to create a frequency distribution with **7 bins**. Calculate the bin width and list the lower/upper limits for the first two bins.

Q6 (Visual Interpretation): If you are looking at a **Histogram** of employee salaries and notice a very long tail extending toward the high-value (right) side, what does this tell you about the relationship between the mean and the median?

Q7 (Crosstabulation): Create a simple 2x2 Crosstabulation table from the following data: Out of 100 men, 20 like Product A. Out of 100 women, 60 like Product A.

Q8 (Scatter Plot): Draw a rough sketch of a scatter diagram representing a **Strong Negative Linear Relationship** between "Price of a Product" and "Quantity Sold."

Chapter 3: Numerical Measures

Q9 (Computation): Calculate the Mean, Median, and Mode for the following daily sales counts: $\{12, 15, 12, 10, 22, 17, 24\}$.

Q10 (Variance): Using the same data as Q9, calculate the **Sample Variance (s^2)** and **Standard Deviation (s)**. Show every step of the deviation calculations.

Q11 (Z-Score): An investment has an average return of 8% with a standard deviation of 2%. Calculate the z-score for a return of 3%. Is this an outlier?

Q12 (Boxplot): Given the Five-Number Summary: [Min=5, $Q_1 = 12$, Med=20, $Q_3 = 30$, Max=80], identify the **Interquartile Range (IQR)** and check for potential outliers using the $1.5 \times IQR$ rule.

Chapter 4: Probability Concepts

Q13 (Counting): A software team of 4 people needs to be chosen from a pool of 10 engineers. How many different combinations are possible?

Q14 (Conditional): In a company, 60% of employees use Mac (M) and 40% use PC (P). 30% of the Mac users are Designers (D). What is the probability that a randomly selected employee is a Mac user AND a Designer?

Q15 (Addition Law): $P(A) = 0.5$, $P(B) = 0.4$. If $P(A \cup B) = 0.7$, are the events A and B mutually exclusive? Justify your answer using the addition law formula.

Q16 (Bayes' Insight): A test for a rare disease is 99% accurate. If a person tests positive, why is the probability that they actually have the disease often much lower than 99%? (Explain the concept).

Chapter 5: Discrete Distributions

Q17 (Binomial): A telemarketer has a 10% success rate per call. If they make 5 calls, what is the probability of getting **exactly 1** success?

Q18 (Poisson): A retail store averages 2 customer arrivals per 10-minute interval. What is the probability that **exactly 3** customers arrive in the next 10 minutes?

Q19 (Expected Value): A contractor bids on a project. There is a 20% chance they profit $50,000, a 50% chance they profit $10,000, and a 30% chance they lose $5,000. Calculate the **Expected Value** of this bid.

Q20 (Excel logic): Write out the full Excel formula you would use to find the probability of a student getting **at least 15** questions right on a 20-question true/false quiz by guessing.

Chapter 6: Continuous Distributions

Q21 (Uniform): A bus arrives every 15 minutes. The wait time is uniformly distributed between 0 and 15 minutes. What is the probability a passenger waits **between 5 and 10 minutes**?

Q22 (Normal - Standardizing): The weight of a cereal box is normally distributed with $\mu = 16$oz and $\sigma = 0.5$oz. Find the probability that a box weighs **less than 15.25oz**. (Use Z-table).

Q23 (Normal - Between): Using the data from Q22, find the probability that a box weighs **between 15.5oz and 16.5oz**.

Q24 (Exponential): The time between failures of a machine is exponentially distributed with a mean of 100 hours. Find the probability the machine fails **within the first 50 hours**.

Chapter 7: Sampling Distributions

Q25 (Standard Error): A population has a mean of 500 and a standard deviation of 80. If we take a sample of $n = 64$, calculate the **Standard Error of the Mean**.

Q26 (CLT Application): A population is heavily skewed to the left. If we take a sample of $n = 10$, can we assume the sampling distribution of $\bar{x}$ is normal? What if we increase n to 40?

Q27 (Proportion): A candidate has 50% support in a city. In a sample of $n = 100$ voters, what is the probability that the **sample proportion** $\bar{p}$ is greater than 0.60?

Q28 (Finite Correction): You are sampling 200 students from a small college of 1,000 students. Calculate the **Finite Population Correction (FPC)** factor.

Chapter 8: Interval Estimation

Q29 (Z-Interval): You want to estimate the average height of a population. You know $\sigma = 3$ inches. A sample of $n = 36$ people has $\bar{x} = 68$ inches. Construct a **95% Confidence Interval**.

Q30 (T-Interval): You sample 16 lightbulbs and find a mean life of 1,000 hours with a **sample** standard deviation (s) of 50 hours. Construct a **95% Confidence Interval**. (Include Degrees of Freedom).

Q31 (Proportion Interval): Out of 100 surveyed customers, 40 said they would buy a new product. Construct a **99% Confidence Interval** for the true population proportion.

Q32 (Sample Size): You want to estimate the mean weight of a shipment within ± 2 lbs ($E = 2$) with 95% confidence ($z = 1.96$). Based on past data, $\sigma = 10$. How large of a sample do you need?

SOLUTION GUIDE & EXPLANATIONS

Chapter 1

S1: 1. **Nominal** (The number is just a label). 2. **Ordinal** (Stars show rank, but the difference between 2 and 3 stars isn't a measurable quantity). 3. **Interval** (Fahrenheit has equal units but no "true zero"). 4. **Ratio** (0 dollars means no cost; you can have twice as much money).

S2: Relative Frequencies: $25/50 = \mathbf{0.50}$, $15/50 = \mathbf{0.30}$, $10/50 = \mathbf{0.20}$. Percentages: **50%, 30%, 20%**.

Chapter 2

S5: Width $= (82 - 12)/7 = 10$. Bins: [12–21.9], [22–31.9], etc. **S6:** A right-skewed tail means the **Mean is greater than the Median**. Extreme high salaries pull the mean up.

Chapter 3

S9: Mean $= (12 + 15 + 12 + 10 + 22 + 17 + 24)/7 = \mathbf{16}$. Median $=$ **15** (Order: 10, 12, 12, **15**, 17, 22, 24). Mode $=$ **12**. **S10:** Deviations from 16: $(-4, -1, -4, -6, 6, 1, 8)$. Squares: $(16, 1, 16, 36, 36, 1, 64)$. Sum $= 170$. Variance $s^2 = 170/6 = \mathbf{28.33}$. Std Dev $s = \mathbf{5.32}$.

Chapter 4

S13: $\binom{10}{4} = (10 \times 9 \times 8 \times 7)/(4 \times 3 \times 2 \times 1) = \mathbf{210}$. **S14:** $P(M \cap D) = P(M) \times P(D|M) = 0.60 \times 0.30 = \mathbf{0.18}$.

Chapter 5

S17: $f(1) = \binom{5}{1}(0.10)^1(0.90)^4 = 5 \times 0.1 \times 0.6561 = \mathbf{0.328}$. **S19:** $(50000 \times 0.2) + (10000 \times 0.5) + (-5000 \times 0.3) = 10000 + 5000 - 1500 = \$\mathbf{13,500}$.

Chapter 6

S22: $z = (15.25 - 16)/0.5 = -1.5$. Table for -1.5 gives **0.0668**. **S24:** $P(X \leq 50) = 1 - e^{-(50/100)} = 1 - e^{-0.5} = 1 - 0.6065 = \mathbf{0.3935}$.

Chapter 7

S25: $SE = 80/\sqrt{64} = 80/8 = \mathbf{10}$. **S27:** $SE = \sqrt{(.5 \times .5)/100} = 0.05$. $z = (0.60 - 0.50)/0.05 = 2.0$. Table for $z = 2$ is 0.9772. Prob *greater* than 0.60 is $1 - 0.9772 = \mathbf{0.0228}$.

Chapter 8

S30: $df = 15$. t for 95% (0.025 tail) is 2.131. $SE = 50/\sqrt{16} = 12.5$. Error $= 2.131 \times 12.5 = 26.64$. CI $=$ **[973.36, 1026.64]**. **S32:** $n = (1.96^2 \times 10^2)/2^2 = (3.8416 \times 100)/4 = 384.16/4 = 96.04 \rightarrow$ **97** units.