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1. Exploring One-Variable Data

1.1 Introducing Statistics: What Can We Learn from Data?

- ☐☐☐ Identify questions to be answered, based on variation in one-variable data. [Skill 1.A]

1.2 The Language of Variation: Variables

- ☐☐☐ Identify variables in a set of data. [Skill 2.A]
☐☐☐ Classify types of variables. [Skill 2.A]

1.3 Representing a Categorical Variable with Tables

- ☐☐☐ Represent categorical data using frequency or relative frequency tables. [Skill 2.B]
☐☐☐ Describe categorical data represented in frequency or relative tables. [Skill 2.A]

1.4 Representing a Categorical Variable with Graphs

- ☐☐☐ Represent categorical data graphically. [Skill 2.B]
☐☐☐ Describe categorical data represented graphically. [Skill 2.A]
☐☐☐ Compare multiple sets of categorical data. [Skill 2.D]

1.5 Representing a Quantitative Variable with Graphs

- ☐☐☐ Classify types of quantitative variables. [Skill 2.A]
☐☐☐ Represent quantitative data graphically. [Skill 2.B]

1.6 Describing the Distribution of a Quantitative Variable

- ☐☐☐ Describe the characteristics of quantitative data distributions. [Skill 2.A]

1.7 Summary Statistics for a Quantitative Variable

- ☐☐☐ Calculate measures of center and position for quantitative data. [Skill 2.C]
☐☐☐ Calculate measures of variability for quantitative data. [Skill 2.C]
☐☐☐ Explain the selection of a particular measure of center and/or variability for describing a set of quantitative data. [Skill 4.B]

1.8 Graphical Representations of Summary Statistics

- ☐☐☐ Represent summary statistics for quantitative data graphically. [Skill 2.B]
☐☐☐ Describe summary statistics of quantitative data represented graphically. [Skill 2.A]

1.9 Comparing Distributions of a Quantitative Variable

- ☐☐☐ Compare graphical representations for multiple sets of quantitative data. [Skill 2.D]
☐☐☐ Compare summary statistics for multiple sets of quantitative data. [Skill 2.D]

1.10 The Normal Distribution

- ☐☐☐ Compare a data distribution to the normal distribution model. [Skill 2.D]
- ☐☐☐ Determine proportions and percentiles from a normal distribution. [Skill 3.A]
- ☐☐☐ Compare measures of relative position in data sets. [Skill 2.D]

2. Exploring Two-Variable Data

2.1 Introducing Statistics: Are Variables Related?

- ☐☐☐ Identify questions to be answered about possible relationships in data. [Skill 1.A]

2.2 Representing Two Categorical Variables

- ☐☐☐ Compare numerical and graphical representations for two categorical variables. [Skill 2.D]

2.3 Statistics for Two Categorical Variables

- ☐☐☐ Calculate statistics for two categorical variables. [Skill 2.C]
- ☐☐☐ Compare statistics for two categorical variables. [Skill 2.D]

2.4 Representing the Relationship Between Two Quantitative Variables

- ☐☐☐ Represent bivariate quantitative data using scatterplots. [Skill 2.B]
- ☐☐☐ Describe the characteristics of a scatter plot. [Skill 2.A]

2.5 Correlation

- ☐☐☐ Determine the correlation for a linear relationship. [Skill 2.C]
- ☐☐☐ Interpret the correlation for a linear relationship. [Skill 4.B]

2.6 Linear Regression Models

- ☐☐☐ Calculate a predicted response value using a linear regression model. [Skill 2.C]

2.7 Residuals

- ☐☐☐ Represent differences between measured and predicted responses using residual plots. [Skill 2.B]
- ☐☐☐ Describe the form of association of bivariate data using residual plots. [Skill 2.A]

2.8 Least Squares Regression

- ☐☐☐ Estimate parameters for the least-squares regression line model. [Skill 2.C]
- ☐☐☐ Interpret coefficients for the least-squares regression line model. [Skill 4.B]

2.9 Analyzing Departures from Linearity

- ☐☐☐ Identify influential points in regression. [Skill 2.A]
- ☐☐☐ Calculate a predicted response using a least-squares regression line for a transformed data set. [Skill 2.C]

3. Collecting Data

3.1 Introducing Statistics: Do the Data We Collected Tell the Truth?

- ☐☐☐ Identify questions to be answered about data collection methods. [Skill 1.A]

3.2 Introduction to Planning a Study

- ☐☐☐ Identify the type of a study. [Skill 1.C]
- ☐☐☐ Identify appropriate generalizations and determinations based on observational studies. [Skill 4.A]

3.3 Random Sampling and Data Collection

- ☐☐☐ Identify a sampling method, given a description of a study. [Skill 1.C]
- ☐☐☐ Explain why a particular sampling method is or is not appropriate for a given situation. [Skill 1.C]

3.4 Potential Problems with Sampling

- ☐☐☐ Identify potential sources of bias in sampling methods. [Skill 1.C]

3.5 Introduction to Experimental Design

- ☐☐☐ Identify the components of an experiment. [Skill 1.C]
- ☐☐☐ Describe elements of a well-designed experiment. [Skill 1.B]
- ☐☐☐ Compare experimental designs and methods. [Skill 1.C]

3.6 Selecting an Experimental Design

- ☐☐☐ Explain why a particular experimental design is appropriate. [Skill 1.C]

3.7 Inference and Experiments

- ☐☐☐ Interpret the results of a well-designed experiment. [Skill 4.B]

4. Probability, Random Variables, and Probability Distributions

4.1 Introducing Statistics: Random and Non-Random Patterns?

- ☐☐☐ Identify questions suggested by patterns in data. [Skill 1.A]

4.2 Estimating Probabilities Using Simulation

- ☐☐☐ Estimate probabilities using simulation. [Skill 3.A]

4.3 Introduction to Probability

- ☐☐☐ Calculate probabilities for events and their complements. [Skill 3.A]
- ☐☐☐ Interpret probabilities for events. [Skill 4.B]

4.4 Mutually Exclusive Events

- ☐☐☐ Explain why two events are (or are not) mutually exclusive. [Skill 4.B]

4.5 Conditional Probability

- ☐☐☐ Calculate conditional probabilities. [Skill 3.A]

4.6 Independent Events and Unions of Events

- ☐☐☐ Calculate probabilities for independent events and for the union of two events. [Skill 3.A]

4.7 Introduction to Random Variables and Probability Distributions

- ☐☐☐ Represent the probability distribution for a discrete random variable. [Skill 2.B]
- ☐☐☐ Interpret a probability distribution. [Skill 4.B]

4.8 Mean and Standard Deviation of Random Variables

- ☐☐☐ Calculate parameters for a discrete random variable. [Skill 3.B]
- ☐☐☐ Interpret parameters for a discrete random variable. [Skill 4.B]

4.9 Combining Random Variables

- ☐☐☐ Calculate parameters for linear combinations of random variables. [Skill 3.B]
- ☐☐☐ Describe the effects of linear transformations of parameters of random variables. [Skill 3.C]

4.10 Introduction to the Binomial Distribution

- ☐☐☐ Estimate probabilities of binomial random variables using data from a simulation. [Skill 3.A]
- ☐☐☐ Calculate probabilities for a binomial distribution. [Skill 3.A]

4.11 Parameters for a Binomial Distribution

- ☐☐☐ Calculate parameters for a binomial distribution. [Skill 3.B]
- ☐☐☐ Interpret probabilities and parameters for a binomial distribution. [Skill 4.B]

4.12 The Geometric Distribution

- ☐☐☐ Calculate probabilities for geometric random variables. [Skill 3.A]
- ☐☐☐ Calculate parameters of a geometric distribution. [Skill 3.B]
- ☐☐☐ Interpret probabilities and parameters for a geometric distribution. [Skill 4.B]

5. Sampling Distributions

5.1 Introducing Statistics: Why Is My Sample Not Like Yours?

- ☐☐☐ Identify questions suggested by variation in statistics for samples collected from the same population. [Skill 1.A]

5.2 The Normal Distribution, Revisited

- ☐☐☐ Calculate the probability that a particular value lies in a given interval of a normal distribution. [Skill 3.A]
- ☐☐☐ Determine the interval associated with a given area in a normal distribution. [Skill 3.A]
- ☐☐☐ Determine the appropriateness of using the normal distribution to approximate probabilities for unknown distributions. [Skill 3.C]

5.3 The Central Limit Theorem

- ☐☐☐ Estimate sampling distributions using simulation. [Skill 3.C]

5.4 Biased and Unbiased Point Estimates

- ☐☐☐ Explain why an estimator is or is not unbiased. [Skill 4.B]
- ☐☐☐ Calculate estimates for a population parameter. [Skill 3.B]

5.5 Sampling Distributions for Sample Proportions

- ☐☐☐ Determine parameters of a sampling distribution for sample proportions. [Skill 3.B]
- ☐☐☐ Determine whether a sampling distribution for a sample proportion can be described as approximately normal. [Skill 3.C]
- ☐☐☐ Interpret probabilities and parameters for a sampling distribution for a sample proportion. [Skill 4.B]

5.6 Sampling Distributions for Differences in Sample Proportions

- ☐☐☐ Determine parameters of a sampling distribution for a difference in sample proportions. [Skill 3.B]
- ☐☐☐ Determine whether a sampling distribution for a difference of sample proportions can be described as approximately normal. [Skill 3.C]
- ☐☐☐ Interpret probabilities and parameters for a sampling distribution for a difference in proportions. [Skill 4.B]

5.7 Sampling Distributions for Sample Means

- ☐☐☐ Determine parameters for a sampling distribution for sample means. [Skill 3.B]
- ☐☐☐ Determine whether a sampling distribution of a sample mean can be described as approximately normal. [Skill 3.C]
- ☐☐☐ Interpret probabilities and parameters for a sampling distribution for a sample mean. [Skill 4.B]

5.8 Sampling Distributions for Differences in Sample Means

- ☐☐☐ Determine parameters of a sampling distribution for a difference in sample means. [Skill 3.B]
- ☐☐☐ Determine whether a sampling distribution of a difference in sample means can be described as approximately normal. [Skill 3.C]
- ☐☐☐ Interpret probabilities and parameters for a sampling distribution for a difference in sample means. [Skill 4.B]

6. Inference for Categorical Data: Proportions

6.1 Introducing Statistics: Why Be Normal?

- ☐☐☐ Identify questions suggested by variation in the shapes of distributions of samples taken from the same population. [Skill 1.A]

6.2 Constructing a Confidence Interval for a Population Proportion

- ☐☐☐ Identify an appropriate confidence interval procedure for a population proportion. [Skill 1.D]
- ☐☐☐ Verify the conditions for calculating confidence intervals for a population proportion. [Skill 4.C]
- ☐☐☐ Determine the margin of error for a given sample size and an estimate for the sample size that will result in a given margin of error for a population proportion. [Skill 3.D]

- ☐☐☐ Calculate an appropriate confidence interval for a population proportion. [Skill 3.D]
- ☐☐☐ Calculate an interval estimate based on a confidence interval for a population proportion. [Skill 3.D]

6.3 Justifying a Claim Based on a Confidence Interval for a Population Proportion

- ☐☐☐ Interpret a confidence interval for a population proportion. [Skill 4.B]
- ☐☐☐ Justify a claim based on a confidence interval for a population proportion. [Skill 4.D]
- ☐☐☐ Identify the relationships between sample size, width of a confidence interval, confidence level, and margin of error for a population proportion. [Skill 4.A]

6.4 Setting Up a Test for a Population Proportion

- ☐☐☐ Identify the null and alternative hypotheses for a population proportion. [Skill 1.F]
- ☐☐☐ Identify an appropriate testing method for a population proportion. [Skill 1.E]
- ☐☐☐ Verify the conditions for making statistical inferences when testing a population proportion. [Skill 4.C]

6.5 Interpreting p -Values

- ☐☐☐ Calculate an appropriate test statistic and p -value for a population proportion. [Skill 3.E]
- ☐☐☐ Interpret the p -value of a significance test for a population proportion. [Skill 4.B]

6.6 Concluding a Test for a Population Proportion

- ☐☐☐ Justify a claim about the population based on the results of a significance test for a population proportion. [Skill 4.E]

6.7 Potential Errors When Performing Tests

- ☐☐☐ Identify Type I and Type II errors. [Skill 1.B]
- ☐☐☐ Calculate the probability of a Type I and Type II errors. [Skill 3.A]
- ☐☐☐ Identify factors that affect the probability of errors in significance testing. [Skill 4.A]
- ☐☐☐ Interpret Type I and Type II errors. [Skill 4.B]

6.8 Confidence Intervals for the Difference of Two Proportions

- ☐☐☐ Identify an appropriate confidence interval procedure for a comparison of population proportions. [Skill 1.D]
- ☐☐☐ Verify the conditions for calculating confidence intervals for a difference between population proportions. [Skill 4.C]
- ☐☐☐ Calculate an appropriate confidence interval for a comparison of population proportions. [Skill 3.D]
- ☐☐☐ Calculate an interval estimate based on a confidence interval for a difference of proportions. [Skill 3.D]

6.9 Justifying a Claim Based on a Confidence Interval for a Difference of Population Proportions

- ☐☐☐ Interpret a confidence interval for a difference of proportions. [Skill 4.B]
- ☐☐☐ Justify a claim based on a confidence interval for a difference of proportions. [Skill 4.D]

6.10 Setting Up a Test for the Difference of Two Population Proportions

- ☐☐☐ Identify the null and alternative hypotheses for a difference of two population proportions. [Skill 1.F]
- ☐☐☐ Identify an appropriate testing method for the difference of two population proportions. [Skill 1.E]
- ☐☐☐ Verify the conditions for making statistical inferences when testing a difference of two population proportions. [Skill 4.C]

6.11 Carrying Out a Test for the Difference of Two Population Proportions

- ☐☐☐ Calculate an appropriate test statistic for the difference of two population proportions. [Skill 3.E]
- ☐☐☐ Interpret the p -value of a significance test for a difference of population proportions. [Skill 4.B]
- ☐☐☐ Justify a claim about the population based on the results of a significance test for a difference of population proportions. [Skill 4.E]

7. Inference for Quantitative Data: Means

7.1 Introducing Statistics: Should I Worry About Error?

- ☐☐☐ Identify questions suggested by probabilities of errors in statistical inference. [Skill 1.A]

7.2 Constructing a Confidence Interval for a Population Mean

- ☐☐☐ Describe t -distributions. [Skill 3.C]
- ☐☐☐ Identify an appropriate confidence interval procedure for a population mean, including the mean difference between values in matched pairs. [Skill 1.D]
- ☐☐☐ Verify the conditions for calculating confidence intervals for a population mean, including the mean difference between values in matched pairs. [Skill 4.C]
- ☐☐☐ Determine the margin of error for a given sample size for a one-sample t -interval. [Skill 3.D]
- ☐☐☐ Calculate an appropriate confidence interval for a population mean, including the mean difference between values in matched pairs. [Skill 3.D]

7.3 Justifying a Claim About a Population Mean Based on a Confidence Interval

- ☐☐☐ Interpret a confidence interval for a population mean, including the mean difference between values in matched pairs. [Skill 4.B]
- ☐☐☐ Justify a claim based on a confidence interval for a population mean, including the mean difference between values in matched pairs. [Skill 4.D]
- ☐☐☐ Identify the relationships between sample size, width of a confidence interval, confidence level, and margin of error for a population mean. [Skill 4.A]

7.4 Setting Up a Test for a Population Mean

- ☐☐☐ Identify an appropriate testing method for a population mean with unknown σ , including the mean difference between values in matched pairs. [Skill 1.E]
- ☐☐☐ Identify the null and alternative hypotheses for a population mean with unknown σ , including the mean difference between values in matched pairs. [Skill 1.F]
- ☐☐☐ Verify the conditions for the test for a population mean, including the mean difference between values in matched pairs. [Skill 4.C]

7.5 Carrying Out a Test for a Population Mean

- ☐☐☐ Calculate an appropriate test statistic for a population mean, including the mean difference between values in matched pairs. [Skill 3.E]
- ☐☐☐ Interpret the p -value of a significance test for a population mean, including the mean difference between values in matched pairs. [Skill 4.B]
- ☐☐☐ Justify a claim about the population based on the results of a significance test for a population mean. [Skill 4.E]

7.6 Confidence Intervals for the Difference of Two Means

- ☐☐☐ Identify an appropriate confidence interval procedure for a difference of two population means. [Skill 1.D]
- ☐☐☐ Verify the conditions to calculate confidence intervals for the difference of two population means. [Skill 4.C]
- ☐☐☐ Determine the margin of error for the difference of two population means. [Skill 3.D]
- ☐☐☐ Calculate an appropriate confidence interval for a difference of two population means. [Skill 3.D]

7.7 Justifying a Claim About the Difference of Two Means Based on a Confidence Interval

- ☐☐☐ Interpret a confidence interval for a difference of population means. [Skill 4.B]
- ☐☐☐ Justify a claim based on a confidence interval for a difference of population means. [Skill 4.D]
- ☐☐☐ Identify the effects of sample size on the width of a confidence interval for the difference of two means. [Skill 4.A]

7.8 Setting Up a Test for the Difference of Two Population Means

- ☐☐☐ Identify an appropriate selection of a testing method for a difference of two population means. [Skill 1.E]
- ☐☐☐ Identify the null and alternative hypotheses for a difference of two population means. [Skill 1.F]
- ☐☐☐ Verify the conditions for the significance test for the difference of two population means. [Skill 4.C]

7.9 Carrying Out a Test for the Difference of Two Population Means

- ☐☐☐ Calculate an appropriate test statistic for a difference of two means. [Skill 3.E]
- ☐☐☐ Interpret the p -value of a significance test for a difference of population means. [Skill 4.B]
- ☐☐☐ Justify a claim about the population based on the results of a significance test for a difference of two population means in context. [Skill 4.E]

7.10 Skills Focus: Selecting, Implementing, and Communicating Inference Procedures

- ☐☐☐ Skills Focus: Selecting, Implementing, and Communicating Inference Procedures

8. Inference for Categorical Data: Chi-Square

8.1 Introducing Statistics: Are My Results Unexpected?

- ☐☐☐ Identify questions suggested by variation between observed and expected counts in categorical data. [Skill 1.A]

8.2 Setting Up a Chi-Square Goodness of Fit Test

- ☐☐☐ Describe chi-square distributions. [Skill 3.C]

- ☐☐☐ Identify the null and alternative hypotheses in a test for a distribution of proportions in a set of categorical data. [Skill 1.F]
- ☐☐☐ Identify an appropriate testing method for a distribution of proportions in a set of categorical data. [Skill 1.E]
- ☐☐☐ Calculate expected counts for the chi-square test for goodness of fit. [Skill 3.A]
- ☐☐☐ Verify the conditions for making statistical inferences when testing goodness of fit for a chi-square distribution. [Skill 4.C]

8.3 Carrying Out a Chi-Square Test for Goodness of Fit

- ☐☐☐ Calculate the appropriate statistic for the chi-square test for goodness of fit. [Skill 3.E]
- ☐☐☐ Determine the p -value for chi-square test for goodness of fit significance test. [Skill 3.E]
- ☐☐☐ Interpret the p -value for the chi-square test for goodness of fit. [Skill 4.B]
- ☐☐☐ Justify a claim about the population based on the results of a chi-square test for goodness of fit. [Skill 4.E]

8.4 Expected Counts in Two-Way Tables

- ☐☐☐ Calculate expected counts for two-way tables of categorical data. [Skill 3.A]

8.5 Setting Up a Chi-Square Test for Homogeneity or Independence

- ☐☐☐ Identify the null and alternative hypotheses for a chi-square test for homogeneity or independence. [Skill 1.F]
- ☐☐☐ Identify an appropriate testing method for comparing distributions in two-way tables of categorical data. [Skill 1.E]
- ☐☐☐ Verify the conditions for making statistical inferences when testing a chi-square distribution for independence or homogeneity. [Skill 4.C]

8.6 Carrying Out a Chi-Square Test for Homogeneity or Independence

- ☐☐☐ Calculate the appropriate statistic for a chi-square test for homogeneity or independence. [Skill 3.E]
- ☐☐☐ Determine the p -value for a chi-square significance test for independence or homogeneity. [Skill 3.E]
- ☐☐☐ Interpret the p -value for the chi-square test for homogeneity or independence. [Skill 4.B]
- ☐☐☐ Justify a claim about the population based on the results of a chi-square test for homogeneity or independence. [Skill 4.E]

8.7 Skills Focus: Selecting an Appropriate Inference Procedure for Categorical Data

- ☐☐☐ Skills Focus: Selecting an Appropriate Inference Procedure for Categorical Data

9. Inference for Quantitative Data: Slopes

9.1 Introducing Statistics: Do Those Points Align?

- ☐☐☐ Identify questions suggested by variation in scatter plots. [Skill 1.A]

9.2 Confidence Intervals for the Slope of a Regression Model

- ☐☐☐ Identify an appropriate confidence interval procedure for a slope of a regression model. [Skill 1.D]

- ☐☐☐ Verify the conditions to calculate confidence intervals for the slope of a regression model. [Skill 4.C]
- ☐☐☐ Determine the given margin of error for the slope of a regression model. [Skill 3.D]
- ☐☐☐ Calculate an appropriate confidence interval for the slope of a regression model. [Skill 3.D]

9.3 Justifying a Claim About the Slope of a Regression Model Based on a Confidence Interval

- ☐☐☐ Interpret a confidence interval for the slope of a regression model. [Skill 4.B]
- ☐☐☐ Justify a claim based on a confidence interval for the slope of a regression model. [Skill 4.D]
- ☐☐☐ Identify the effects of sample size on the width of a confidence interval for the slope of a regression model. [Skill 4.A]

9.4 Setting Up a Test for the Slope of a Regression Model

- ☐☐☐ Identify the appropriate selection of a testing method for a slope of a regression model. [Skill 1.E]
- ☐☐☐ Identify appropriate null and alternative hypotheses for a slope of a regression model. [Skill 1.F]
- ☐☐☐ Verify the conditions for the significance test for the slope of a regression model. [Skill 4.C]

9.5 Carrying Out a Test for the Slope of a Regression Model

- ☐☐☐ Calculate an appropriate test statistic for the slope of a regression model. [Skill 3.E]
- ☐☐☐ Interpret the p -value of a significance test for the slope of a regression model. [Skill 4.B]
- ☐☐☐ Justify a claim about the population based on the results of a significance test for the slope of a regression model. [Skill 4.E]

9.6 Skills Focus: Selecting an Appropriate Inference Procedure

- ☐☐☐ Skills Focus: Selecting an Appropriate Inference Procedure