Probability and Statistics

Teacher: Sarah Salo

September 2020

Content	Skills	Learning Targets	Assessment	Resources & Technology
CEQ: *How do we effectively interpret information from graphical and numerical displays and summaries? *How do we efficiently and effectively collect data? *How does probability and the use of random variables aid in inference? *With what confidence can conclusions be made when working with statistics?				

UEQ: ● *What kind of data is there?* ● *Why is context important when describing data?* ● *What can categorical data tell us and how is it displayed?* **A. Stats Introduction** A1. Samples & Population A2. Context and Variables **B. Categorical Data** B1. Bar & Pie Charts B2. Conditional Distributions	**A. Stats Introduction** A1. Describe statistics, sample and population for a set of data A2. Distinguish between categorical and quantitative variables **B. Categorical Data** B1. Read, create and understand bar graphs and pie charts. B2. Use conditional distributions to argue independence or association.	**A1. LT** I can describe statistics, sample and population for a set of data. **A2.LT** I can distinguish between categorical and quantitative variables. **B. Categorical Data** **B1. LT** I can read, create and understand bar graphs and pie charts. **B2. LT** Use conditional distributions to argue independence or association.	**CSA: A1-A2, B1-B2: Chapter 1 & 2 Test**

	C. Exploring Quantitative Data		CFA: C1-C2: Chapter 3 Quiz
UEQ:	C1. Create and interpret histograms, box plots, stem and leaf plots, and dot plots.		
● *How is quantitative data displayed and used?*		**C. Exploring Quantitative Data**	
● *Which statistics work best for different data situations?*	C2. Find and discuss measures of shape, center, and spread.	**C1. LT** I can create and interpret histograms, box plots, stem and leaf plots, and dot plots.	**CSA: C1-C2, D1-D2, E1-E2: Chapter 3-5 Test**
● *How can quantitative data be rescaled?*	**D. Using Quantitative Data**	**C2. LT** I can find and discuss measures of shape, center, and spread.	
● *Why do we use normal curves in statistics?*	D1. Compare distributions by describing shape, center, and spread D2. Describe how shifting and rescaling data affects statistics		
		D. Using Quantitative Data	
C. Exploring Quantitative Data C1. Graphical Displays C2. Measures of shape, center and spread		**D1. LT** I can compare distributions by describing shape, center, and spread	
	E. Normal Curves		
D. Using Quantitative Data	E1. Describe the normal model and why it's useful	**D2. LT** I can describe how shifting and	

D1. Comparing data D2. Rescaling data **E. Normal Curves** E1. Normal Model E2. Z-scores & Percentiles *UEQ:* - *What do scatterplots tell us about two variables?* - *How is a line of best fit used in statistics?* - *What kind of models are there and how do we decide which model fits data the best?* **F. Two Variables** F1. Scatterplots F2. Correlation & Lurking Variables	E2. Find z-scores and percentiles using the normal model **F. Two Variables** F1. Read and interpret scatterplots F2. Describe correlation and when we can use it to describe data **G. Line of Best Fit** G1. Calculate a line of best fit G2. Calculate a residual and understand how it is used G3. Extrapolate and understand its drawbacks	rescaling data affects statistics **E. Normal Curves** E1. LT I can describe the normal model and why it's useful E2. LT I can find z-scores and percentiles using the normal model **F. Two Variables** **F1. LT** I can read and interpret scatterplots **F2. LT** I can describe correlation and when	**CFA: F1-F2, G1-G3: Chapter 6-7 Quiz** **CSA: F1-F2, G1-G3, H1-H3: Chapter 6-8 Test**	

G. Line of Best Fit G1. Line of Best Fit G2. Residuals G3. Extrapolation **H. Curved Models** H1. Exponential Models H2. Power Models H3. Determining the Best Model *UEQ:* ● *How can we collect data?* ● *How do we choose a method for collecting data?* ● *How can we use studies and experiments to draw conclusions?* ● *How does randomness help us in statistics?* ● *Why do we run simulations*	**H. Curved Models** H1. Calculate an exponential model for a set of data H2. Calculate a power model for a set of data H3. Determine which model is appropriate for a set of data **I. Samples** I1. Distinguish between different sampling methods and understand the benefits and disadvantages of each I2. Identify response biases and how they can occur	we can use it to describe data **G. Line of Best Fit** **G1. LT** I can calculate a line of best fit **G2. LT** I can calculate a residual and understand how it is used **G3. LT** I can extrapolate and understand its drawbacks **H. Curved Models** **H1. LT** I can calculate an exponential model for a set of data	 **CFA: I1-I2, J1-J2: Chapter 9-10 Quiz**

and how are they designed? **I. Samples** I1. Sampling Methods I2. Response Biases **J. Observational Studies & Experiments** J1. Experiments J2. Poor Designs **K. Randomness** K1. Randomness K2. Simulations	**J. Observational Studies & Experiments** J1. Understand how to best design a study and experiment J2. Describe disadvantages of poorly designed experiments and studies **K. Randomness** K1. Understand randomness and use it to randomly select or assign K2. Design and run simulations	**H2. LT** I can calculate a power model for a set of data **H3. LT** I can determine which model is appropriate for a set of data **I. Samples** **I1.LT** I can distinguish between different sampling methods and understand the benefits and disadvantages of each **I2. LT** I can identify response biases and how they can occur **J. Observational Studies & Experiments** **J1. LT** I can understand how to	**CSA: I1-I2, J1-J2, K1-K2: Chapter 9-11 Test**

		best design a study and experiment	**CSA: I1-I2, J1-J2, K1-K2: Chapter 9-11 Project**	
		J2. LT I can describe disadvantages of poorly designed experiments and studies		
		K. Randomness	**CSA: A-K: Part 1 Final**	
		K1. LT I can understand randomness and use it to randomly select or assign		
		K2. LT I can design and run simulations		

March 2020

Content	Skills	Learning Targets	Assessment	Resources & Technology
CEQ: *How do we effectively interpret information from graphical	**O. Probability Models** O1. Describe the Law of Large Numbers and the faulty reasoning behind the	**O1. LT** I can describe the Law of Large Numbers and understand the faulty	**CSA: O1-O4, P1-P2 Chapters 12-13 Test**	

and numerical displays and summaries? *How do we efficiently and effectively collect data ? *How does probability and the use of random variables aid in inference? *With what confidence can conclusions be made when working with statistics? *UEQ:* ● *How are probabilities assigned to a sample space?* ● *How are the rules of probability used to study random phenomenon?* **O. Probability Models** O1. Law of Large Numbers O2. Sample Space O3. Permutations and Combinations O4. Probability with Combinations	Law of Averages O2. Find and describe the sample space O3. Count the number of ways for an event using the counting principle, permutations, and combinations O4. Determine probabilities using combinations **P. Probability Rules** P1. Calculate probabilities of compound events P2. Distinguish when to use addition rule vs. multiplication rule **Q. More Probability Rules** Q1. Use the addition rule and Venn diagrams to calculate probabilities. Q2. Calculate conditional probabilities and use them to show independence. Q3. Understand the difference between independent and disjoint events.	reasoning behind the Law of Averages **O2. LT** I can find and describe the sample space. **O3. LT** I can count the number of ways for an event using the counting principle, permutations, and combinations **O4. LT** I can determine probabilities using combinations **P1. LT** I can calculate probabilities of compound events using rules of probability. **P2. LT** I can distinguish between when to use which rule in probability. **Q1. LT** I can use the general addition rule and Venn diagrams to calculate probabilities. **Q2. LT** I can calculate conditional probabilities	**CFA: P1-P2: Chapter 14 Quiz**	

P. Probability Rules
P1. Compound Events
P2. Union vs. Intersection

UEQ:
- *How do the mean and standard deviation of discrete random variables help describe a distribution?*
- *What conditions are required for a binomial distribution?*
- *How is the binomial distribution used to determine probability?*

Q. More Probability Rules
Q1. Addition Rule and Venn Diagrams
Q2. Conditional Probabilities and Independence
Q3. Independence vs. Disjoint
Q4. Tree Diagrams

Q4. Create tree diagrams in order to calculate probabilities.

R. Random Variables
R1. Find the expected value and standard deviation of a random variable
R2. Use a binomial model to calculate probabilities
R3. Verify conditions and use a Normal model to approximate a binomial model

S. Confidence Intervals for Proportions
S1. Construct and interpret sampling distributions for proportions
S2. Construct and interpret confidence intervals for proportions
S3. Determine how margin of error is affected by changes in sample size

T. Hypothesis Testing for Proportions
T1. Run a hypothesis test about a proportion

and use them to show independence.

Q3. LT I can identify events as independent and/or disjoint.

Q4. LT I can create tree diagrams in order to calculate probabilities.

R1. LT I can find the expected value and standard deviation of a random variable.

R2. LT I can use a binomial model to calculate probabilities

R3. LT I can check conditions and find probabilities using the standard normal curve.

S1. LT I can construct and interpret sampling distributions for proportions.

CSA: Q1-Q4, R1-R3 Chapters 14-15 Test

CFA: S1-S3: Chapter 16 Quiz

R. Random Variables
R1. Expected Value and Standard Deviation of a Random Variable
R2. Binomial Models
R3. Normal Distribution
 	
UEQ:
  ● *What is statistical inference?*
  ● *How are confidence intervals created and interpreted?*
  ● *How is a normal approximation used to solve problems involving sample proportions?*
  ● *What is hypothesis testing and how is it important in statistics?*
  ● *Why are the words "fail to reject" used when testing a claim?*
 	
S. Confidence Intervals for Proportions
	T2. Describe errors that can occur when running a hypothesis test
	
	U. Inferences About Means
	U1. Describe and apply the concepts behind the Central Limit Theorem
	U2. Compute and interpret a confidence interval for a mean
	U3. Compute and interpret a hypothesis test for a mean
	U4. Apply hypothesis test to a pairs designed experiment
	
	V. Chi-Square Testing
	V1. Verify conditions and run a chi-square goodnes of fit test
	V2. Find expected counts and run a chi-square two-way table test
	V3. Determine which component contributes most to the chi-square statistic
		S2. LT I can construct and interpret confidence intervals for proportions.
		
		S3. LT I can determine how margin of error is affected by changes in sample size.
		
		T1. LT I can run a hypothesis test about a proportion.
		
		T2. LT I can describe errors that can occur when running a hyptohesis test.
		
		U1. LT I can describe and apply the concepts behind the Central Limit Theorem
		
		U2. LT I can compute and interpret a confidence interval for means
		
		U3. LT I can compute and interpret a hypothesis test for means
		
		U4. LT I can compute and interpret a paired test for means
			CSA: S1-S3, T1-T2
			Chapters 16-17 Test	

S1. Sampling Distribution Model S2. Confidence Interval S3. Margin of Error **T. Hypothesis Testing for Proportions** T1. Hypothesis Test for Proportions T2. Type I and Type II errors *UEQ:* 　● *What is the the t-distribution and when is it appropriate to use it***?** 　● *How is a normal approximation used to solve problems involving the sample mean?* 　● *What is the significance of the Central Limit Theorem?* **U. Inferences About Means** U1. Central Limit Theorem		**V1. LT** I can check the conditions and make a conclusion for a chi-square goodnes of fit test. **V2. LT** I can find the expected counts for and make a conclusion for a chi-square two-way table test. **V3.LT** I can determine which component contributes most to the chi-square statistic.	**CSA: U1-U4** **Chapter 18 Test**	

U2. Confidence Intervals for Means
U3. Hypothesis Testing for Means
U4. Paired Testing for Means

UEQ:
- *How do we test hypotheses about categorical data?*
- *How do we better understand patterns in categorical data?*

V. Chi-Square Testing
V1. Goodness of Fit Test
V2. Two-Way Table Test
V3. Chi-Square Contributions

CSA: V1-V3
Chapter 20 Test

CSA: L-V: Part 2 Final