



STAT CHAT

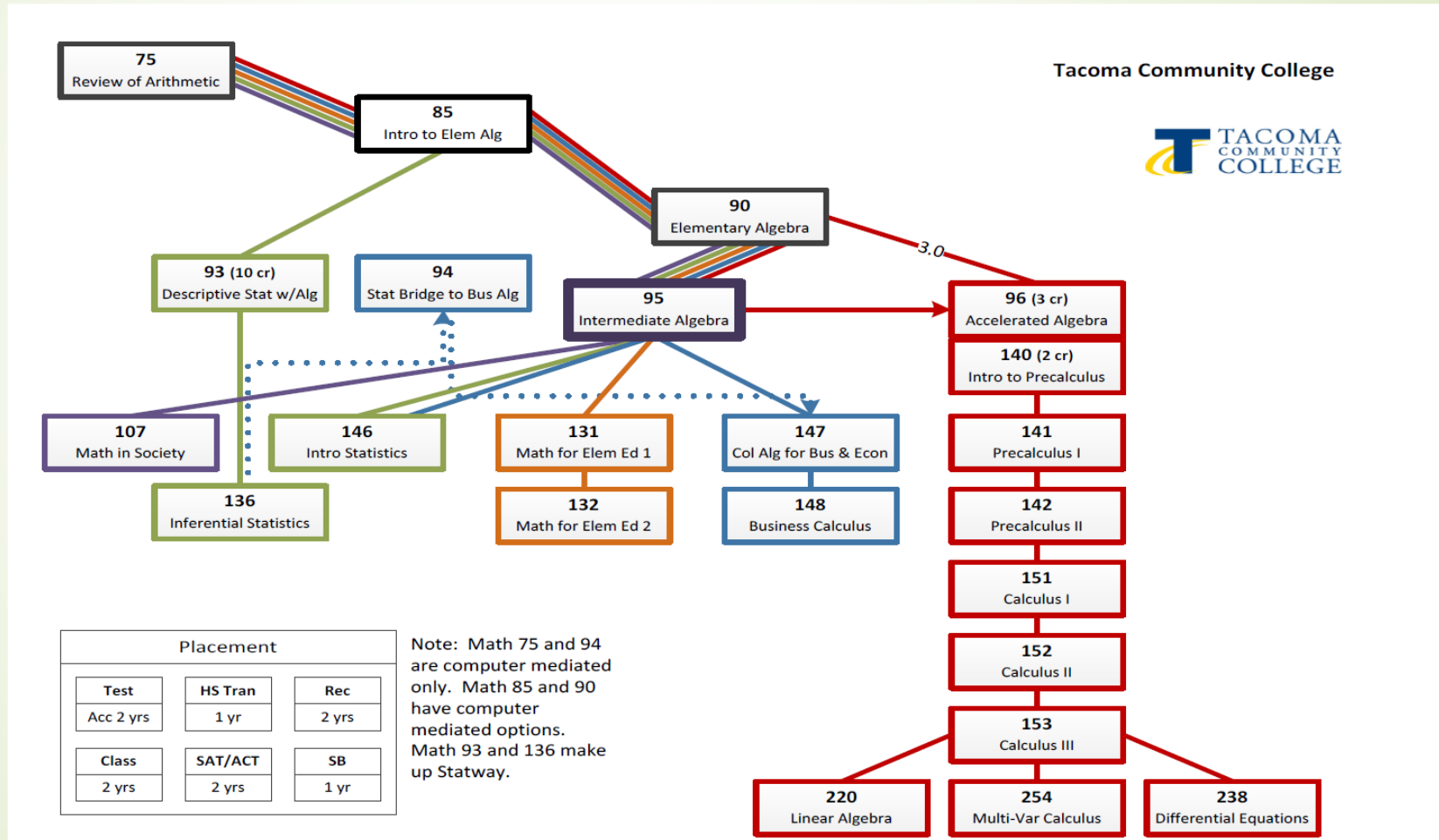
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Statistics Pathways at TCC

*taken from Math Pathways Packet/Pat Averbeck





Statistics Pathways at TCC

- Math&146 Lecture
- Math&146 Online/Hybrid
- Math93/Math136 (Statway)

Note: Not Discussed is the Business Statistics Class or the Honors Statistics Class also offered at TCC

Statistics Pathways at TCC

Objective	Math&146 Lecture	Math&146 Hybrid/Online	Statway
Prerequisite	Intermediate Algebra (Math95, Meets UW Requirement)	Intermediate Algebra (Math95, meets UW requirement)	Math 85 (Introduction to Algebra, Pre Algebra)
Book	<p>Statistics Using Technology by Kathryn Kozak (OER)</p> <p>Past Book: The Basic Practice of Statistics by David Moore</p>	<p>OLI: The text and most questions in this course were created for the Carnegie Mellon Open Learning Initiative</p> <p>Probability and Statistics course.</p>	Specific Book for Statway Designed by Carnegie
Online Platform	Optional	Wamap	Online Platform Through Statway for online Assignments
Graphing Calculator	Required	Required	Required
Time in Class	50 min/day	Online	110 min/day

Course Content Math&146 Lecture

Kozak Book

- **Ch1: Statistical Basics:** What is Statistics, Sampling Methods, Experimental Design, How not to do Statistics
- **Ch2: Graphical Descriptions of Data:** Bar Charts, Pie Charts, Histograms, Stem plots, Time Series, Ogive
- **Ch3: Numerical Descriptions of Data:** Measures of Center: Mean, Median, Mode; Measures of Spread: range, deviations, variance, standard deviation; Ranking: Median, Quartiles, Percentiles, 5# Summary, Boxplots, IQR, Outlier rule
- **Ch4: Probability:** Empirical, Theoretical, Law of Large Numbers, Probability Rules, Conditional, Testing for Independence, Multiplication Rule
- **Ch5: Discrete Probability Distributions:** Basics, Binomial (Optional)
- **Ch6: Continuous Probability Distributions:** Uniform, Normal, Finding Probabilities, Inverse Probabilities, Sampling Distribution of Means, Central Limit Theorem, Assessing Normality
- **Ch7: One-Sample Inference:** Hypothesis Testing for the Mean σ known (Z procedure), Hypothesis Testing for the Mean σ unknown (T procedure), Hypothesis Testing for Proportions
- **Ch8: Estimation:** Confidence Interval for the Mean σ known (Z procedure), Confidence Interval for the Mean σ unknown (T procedure), Confidence Interval for proportions.
- **Ch9: Two-Sample Inference:** Matched Pair T Procedures (Hyp Test and CI), Independent Samples for Two means (Hyp Test and CI), Two Proportions (Hyp Test and CI)
- **Ch10: Regression and Correlation:** Scatterplots, Regression, Correlation, Inference (Optional)
- **Ch11: Chi-Squared Tests:** Chi-Square Test for Independence, Goodness of Fit

Pacing Guidelines Math&146

*=optional

Week#	Day1	Day2	Day3	Day4	Day5
1	Intro	Sampling	Exp Designs	Bar Charts	Histograms
2	Stem&Leaf; Mean Med	Spread& Dist	Boxplots	Outliers	Catch-Up
3	Review	Test1	Prob	Prob Rules	Conditional
4	Independence	Prob Dist	Binomial*	Normal/Empirical Rule	Normal Prob
5	Inverse Probability	Assessing Normality*	Sampling	Sampling	Catch-Up
6	Review	Test2	Hyp Test, 1 Sample Z	Hyp Test, 1 Sample T	Hyp Test, 1 Sample T
7	Hyp Test, 1 Sample Prop	Conf Int, 1 Mean, Z	Conf Int, 1 Mean, T	Conf Int, 1 Prop Z	Matched Pair, Hyp Test
8	Matched Pair, Conf Int	2 Sample T, Hyp Test	2 Sample T, Conf Int	2 Sample Prop, HT and CI	Regression
9	Regression	Correlation	Inference*	Review	Test3
10	Chi Square	Chi Square	Chi Square	Review	Review

My Calendar - Fall 2018 Lecture

*=optional

Week#	Day1	Day2	Day3	Day4	Day5
1	Intro Sampling	Designs	Graphical Displays	Graphical Displays	Graphical Displays
2	Center, Spread	Boxplots	Outliers	Regression	Regression
3	Correlation	Correlation	Review	Test1	Prob
4	Prob Rules	Conditional	Binomial*	Binomial*	Dist Normal
5	Empirical Rule	Normal Prob	Inverse Norm	Sampling	Sampling
6	Review	Test2	Hyp Test, Z	Hyp Test, Z	Hyp Test, T
7	Hyp Test, T	Hyp Test, Prop	Hyp Test, Prop	Conf Int, Z	Conf Int, T
8	Conf Int, Prop	Conf Int	Matched Pair	Matched Pair	2 Sample T
9	2 Sample T	2 Sample Prop	2 Sample Prop	Review	Test3
10	Chi Square	Chi Square	Chi Square	Review	Review

Course Content Math&146

Online/Hybrid

- **Mod1: Examining Distributions:** Pie Charts, Histograms, Stemplots, Time Series, Measures of Center, Measures of Spread, boxplots, Std Deviation
- **Mod1: Examining Relationships:** Side by Side Boxplots, Two way Tables, Scatterplots, Regression, Correlation, Lurking Variables
- **Mod3: Sampling**
- **Mod4: Designing Studies:** Observational, Experimental, Surveys
- **Mod5: Probability:** Introduction, Relative Frequency
- **Mod6: Finding Probability:** Events, Equally Likely, Rules,
- **Mod7: Conditional Probability:** Conditional, Independence, Multiplication Rule, Probability Trees
- **Mod8: Random Variables:** Discrete, Continuous, Normal Distributions, Empirical, Finding Prob, Inverse Normal
- **Mod9: Sampling Distributions:** Parameters, Statistics, Sampling Dist of Sample Prop, Sampling Dist of Sample mean, Finding Prob
- **Mod10: Introduction to Inference**
- **Mod11: Estimation:** Conf Int for the Mean (Z and T), Conf Int for Prop
- **Mod12: Hypothesis Testing:** Hyp Test for 1 Prop, Hyp Test for Mean (T)
- **Mod13: Inference for Relationships:** 2 Independent Samples (T), Matched Pairs, ANOVA (optional)

Pacing Guidelines Math&146 Hybrid/Online

Week #	Monday	Thursday
0	Class Available	
1		Week 0, Mod1: Graphical Displays
2	Mod1: Center Spread Boxplots Std dev	Mod2: Linear Regression Correlation
3	Mod2: Causation, Lurking Variables Mod3: Sampling	Mod4: Design of Experiments, Surveys
4	Mod5: Probability	Mod6: Probability Rules
5	Mod7: Probability: Conditional	Mod7: Probability: Independence
6	Mod8: Random Variables	Mod8: Normal Dist, Finding Prob
7	Mod9: Sampling Distributions	Mod9: Sampling Distributions
8	Mod10/11: Confidence Intervals 1 Sample, Means	Mod11: Confidence Intervals 1 Sample, Proportions
9	Mod12: Hypothesis Testing 1 Sample, Means	Mod12: Hypothesis Testing 1 Sample, Proportions
10	Mod13: Matched Pairs	Mod13: Hyp Testing 2 Sample Means, 2 Sample Proportions

Course Content Statway (Math93/136)

- **Mod1: Type of Statistical Studies and Producing Data:** Statistical Analysis Process, Random Sampling, Experiments vs Observational Studies
- **Mod2: Summarizing Data Graphically and Numerically:** Dotplots, Histograms, Dist for Quantitative Data, Measures of Center
- **Mod3/Mod4: Examining Relationships: Quantitative Data:** Scatterplots , Correlation, Linear Regression, Patterns in Data, Exponential Regression
- **Mod5: Relationships in Categorical Data With Intro to Probability:** 2-Way Tables, Probability, Marginal Prob, Joint Prob, Conditional Prob, Testing for Independence, Building 2-Way Tables
- **Mod6: Relationships With Data, Quantitative:** Law of Large Numbers, Prob Distributions of Discrete Random Variable, Prob Dist fo Continuous Random Variable, Z-Scores, Normal Distribution, Stand Normal, Empirical Rule, Finding Probabilities
- **Mod7: Inference of One Proportion:** Sampling Distributions, Confidence Intervals, Hypothesis Testing
- **Mod8: Inference for Two Proportions:** Sampling Distribution, Confidence Intervals, Hypothesis Testing
- **Mod9: Inference for Means:** Sampling Distributions, Central Limit Theorem, T Distribution, Confidence Interval for 1 Sample Means, Confidence Interval for Paired Independent Samples, Hypothesis Testing for 1 Sample Means, Hypothesis Tests for Paired 2 Sample Means , Confidence Intervals and Hypotheses Testing for Independent Samples, Matched Pairs.
- **Mod10: Chi Square Procedures** (Optional)



Additional Information Statway (Math93/136)

- ▶ Course designed for the non stem track students
- ▶ Ability exists to take a bridge course from Statway to Business Classes
- ▶ Success rate for this class across all demographics is around **87%**
- ▶ This course uses an online platform for some assignments, and then a packet of information that the student works through in groups
- ▶ This course is based on inquiry based guided discovery method of learning

Pacing Guidelines - Statway Math93/136

Week #	1 st Half of Week	2 nd Half of Week
1	Intro, Mod1:Statistical Analysis Process, Random Sampling	Mod1: Experiments vs Observational Studies
2	Mod1 Exam, Mod2:Dotplots, Histograms	Mod2: Dist for Quantitative Data, Measures of Center
3	Mod2 Exam; Mod3: Sampling Mod4: Linear Regression and Correlation	Mod4: Linear Regression and Correlation
4	Mod3/4 Exam Mod5: 2-Way Tables, Probability, Marginal Prob, Joint Prob, Conditional Prob	Mod5: Testing for Independence, Building 2-Way Tables Mod6: Law of Large Numbers, Prob Distributions of Discrete and Continuous Random Variable
5	Mod6: Stand Normal and Normal Distributions, Empirical Rule, Finding Probabilities and Inverse Probabilities	Mod5/6 Exam Midterm Exam/Final for Math93
6	Mod7:1 Sample Proportion Sampling Distributions	Mod7: 1 Sample Proportion Confidence Intervals
7	Mod7: 1 Sample Proportion Hypothesis Testing	Mod7: 1 Sample Proportion Hypothesis Testing; Mod7 Exam
8	Mod8: 2 Sample Proportion Sampling Distributions Mod8: 2 Sample Proportion Confidence Intervals	Mod8: 2 Sample Proportion Hypothesis Testing Mod8 Exam
9	Mod9: 1 Sample Mean Sample Distribution, Confidence Interval, Hypothesis Testing	Mod9: 2 Sample Means Sampling Distribution, Confidence Intervals, Hypothesis Testing
10	Mod9: Matched Pairs, Confidence Intervals and Hypothesis Testing	Mod9 Exam Mod10: Chi Square Procedures



Topics in Recommendation 1: Broad Understanding of Statistics

Math&146	Statway
Reading Published Articles	Analyzing Real Data Data throughout the Text is all Taken from Real Data
Analyzing Data	
Gathering Data Various Projects by Instructor	Gathering Data Music and Recall Experiment Prop of Blue M7M's Toss the Pig Game Introduction to Gaming/Hyp Test

Topics Covered in Recommendation 2: Descriptive Statistics for Univariate Data

Math&146	Statway
Bar Chart Histograms Stem& Leaf	Dot Plots Histograms
Mean Median Mode Range Variance, Standard Deviation Residuals	Mean Median Mode Range Variance Standard Deviation Residuals
5 Number Summary BoxPlots Outlier Rule	5 Number Summary Boxplots Outlier Rule



Topics Covered in Recommendation 3: Descriptive Statistics for Bivariate Data

*optional

Math&146	Statway
Scatterplots Linear Regression Correlation Causation vs Association	Scatterplots Linear Regression Correlation Causation vs Association
Two Way Tables	Exponential Regression/Modeling
Inference on Regression *	Two Way Tables

Topics Covered in Recommendation 4: Study Design, Sampling

Math&146	Statway
Samples and Populations	Samples and Populations
Sampling Methods Simple Random Sample Stratified Sampling Cluster Sampling Convenience Sampling	Sampling Methods Simple Random Sample
Experiments Treatments Randomized Block Design	Experiments Treatments
Observational Studies	Observational Studies
Surveys	Surveys

Topics Covered in Recommendation 5:

Probability *optional

Math&146	Statway
Prob Basics: Events/Sample Space Probability Rules Empirical vs Theoretical Additional Rules: Conditional Probability Tests for Independence	Prob Basics: Events/Sample Space Probability Rules Empirical vs Theoretical Additional Rules: Conditional Probability Tests for Independence
Discrete Probability Distributions (most do not find expected value) Binomial Distribution*	Discrete Probability Distributions (Finding expected value $\sum xp(x)$)
Continuous Probability Distributions	Continuous Probability Distributions
Normal Distribution: Empirical Rule Zscores Finding Probabilities Inverse Probabilities	Normal Distribution: Empirical Rule Zscores Finding Probabilities Inverse Probabilities
Sampling Distributions	Sampling Distributions

Topics Covered in Recommendation 6: Statistical Inference

Math&146	Statway
<p>1 Sample: Hypothesis Testing for the Mean (Z and T) Confidence Interval for the Mean (Z and T) Hypothesis Testing for Proportion Confidence Interval for Proportion</p> <p>2 Sample: Hypothesis Testing for 2 Means Confidence Interval for 2 Means Hypothesis Testing for 2 Proportions Confidence Interval for 2 Proportions Hypothesis Testing for Matched Pairs Confidence Interval for Matched Pairs</p> <p>Others: Chi Square Inference for Regression* Anova*</p>	<p>1 Sample: Hypothesis Testing for the Mean (T) Confidence Interval for the Mean (T) Hypothesis Testing for Proportion Confidence Interval for Proportion</p> <p>2 Sample: Hypothesis Testing for 2 Means Confidence Interval for 2 Means Hypothesis Testing for 2 Proportions Confidence Interval for 2 Proportions Hypothesis Testing for Matched Pairs Confidence Interval for Matched Pairs</p> <p>Others: Chi Square</p>



Possible Probability Exam Questions

- ▶ The scores on the SAT verbal test in recent years follow approximately the $N(517, 112)$ distribution.
- ▶ What is the proportion of students scoring under 400?
- ▶ What is the proportion of students scoring between 400 and 550?
- ▶ How high must a student score to place in the top 10% of all students taking the SAT? State answer as a whole number.
- ▶ Using the empirical rule, what is the probability that a randomly SAT test will have a verbal score between 629 and 853?



Possible Probability Exam Questions

- ▶ Life times of a certain type of light bulb are normally distributed with mean 2000 hours and standard deviation 240 hours.
- ▶ If 25 light bulbs are selected randomly, what is the probability that their average lifetime is less than 1900 hours?
- ▶ If 25 light bulbs are selected randomly, what is the probability that their average lifetime is greater than 2200 hours?



Possible Probability Exam Questions

Math&146

- ▶ Amount of money customers spend at a local store has a mean of \$32.50 and a standard deviation of \$11.25. What is the approximate sampling distribution of the sample mean for a random sample of 100 customers from this local store? Explain fully.

Possible Probability Exam Questions

- ▶ A test was given to a group of students, the grades and genders of the students are summarized below. A Student is randomly chosen.
 - ▶ What is the probability that the student was a female and scored a B?
 - ▶ What is the probability that the student was a male or scored a C?
 - ▶ Given that the student is a female, what is the probability that the score on the test was an A?

	A	B	C	Total
Male	32	5	25	62
Female	16	10	6	32
Total	48	15	31	94

Possible Probability Exam Questions

► Here are the 36 possible outcomes when two dice are rolled. Add up the totals on both dice.

► $S = \{$

(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

► }

► Find $P(\text{sum is a } 6)$

► Find $P(\text{sum is a } 6 \mid \text{first die is a } 5)$

► Are the events the “sum is a 6” and the “first die is a 5” independent? Why or why not?



Possible Probability Exam Questions

- ▶ When looking at left-handedness, it turns out that approximately 12% of people in the world are left handed. Consider a group of 17 people. Use x = number of left handed people
- ▶ Find the probability that none of the 17 people have green eyes. Is this an unusual event, why or why not?
- ▶ Find the probability that at most three 3 people of the 17 are left handed.
- ▶ Find the probability that at least four 4 people of the 17 are left handed.

Possible Inference Exam Questions

- ▶ My daughter takes too long to eat her breakfast; I know that her average eating time is 26 minutes. To encourage her to eat faster, I tell her that she can watch Dora as soon as she's done eating. For the next five days her average time eating breakfast is 22.5 minutes with a standard deviation of 3.2 minutes. Is her eating time significantly faster? Test at the 0.05 level of significance.
- ▶ a) What are the H_0 and H_a ?
- ▶
- ▶ b) What is the Test Statistic and the P-Value. Draw a Diagram of the pvalue?
- ▶
- ▶ c) State the conclusion in context of this problem.



Possible Inference Exam Questions

- ▶ According to the National Institute on Alcohol Abuse and Alcoholism, 41% of college students nationwide engage in “binge drinking” behavior, having 5 or more drinks in one occasion during the past two weeks. A college president wonders if the proportion of students enrolled at her college that binge drink is actually lower than the national proportion. In a commissioned study, 348 students are selected randomly from a list of all students enrolled at the college. Of these 132 admitted to having engaged in binge drinking.
- ▶ a) What are the H_0 and H_A ?
- ▶ b) What is the Test Statistic and the P-Value? Draw a Diagram.
- ▶
- ▶ c) State the conclusion in context of this problem.



Possible Inference Exam Questions

- ▶ Suppose a student measuring the boiling temperature of a certain liquid observes the readings (in degrees Celsius) 102.5, 101.7, 103.1, 100.9, 100.5, and 102.2 on the different samples of the liquid. What is the 95% confidence interval for the population mean of boiling temperatures? State in words what this means in the context of this problem.



Possible Inference Exam Question

- ▶ The American Veterinary Medical Association conducted a survey of veterinary clinics to estimate the proportion that do not treat large animals (cows, horses, etc.). The survey was mailed to a random sample of 120 veterinary clinics throughout the country and of these, 88 responded that they do not treat large animals. Estimate the proportion of clinics that do not treat large animals using a 95% confidence interval. State in words what this means in the context of this problem.



Possible Inference Exam Questions

- ▶ A historian examining British colonial records for the Gold Coast in Africa suspects that the death rate was higher among African miners than among European miners. In the year 1936, there were 223 deaths among 33,809 African miners and 7 deaths among 1,541 European miners in the Gold Coast.
- ▶ Consider this year as a sample from the prewar era in Africa. Is there good evidence that the proportion of African miners who died during a year was higher than the proportion of European miners who died?
- ▶ State all parts of the hypotheses, including the test used and the conclusion



Possible Inference Exam Question

- ▶ Suppose the Cartoon Network conducts a nation-wide survey to assess viewer attitudes toward Superman. Using a simple random sample, they select 400 boys and 300 girls to participate in the study. 160 boys say that Superman is their favorite character, compared to 90 of the girls.
- ▶ Estimate the difference in attitudes towards Superman using a 95% confidence interval. State in words what this means in the context of the problem.