TOWNSHIP OF UNION PUBLIC SCHOOLS

Sports Statistics
Adopted: October 19, 2021

Mission Statement

The mission of the Township of Union Public Schools is to build on the foundations of honesty, excellence, integrity, strong family, and community partnerships. We promote a supportive learning environment where every student is challenged, inspired, empowered, and respected as diverse learners. Through cultivation of students' intellectual curiosity, skills and knowledge, our students can achieve academically and socially, and contribute as responsible and productive citizens of our global community.

Philosophy Statement

The Township of Union Public School District, as a societal agency, reflects democratic ideals and concepts through its educational practices. It is the belief of the Board of Education that a primary function of the Township of Union Public School System is to formulate a learning climate conducive to the needs of all students in general, providing therein for individual differences. The school operates as a partner with the home and community.

Course Description

This course teaches students how to use four-steps of the statistical process in the context of sports: ask questions, collect data, analyze data, and make conclusions. Each unit begins with a sports-related statistical question (e.g., Is there a home field advantage in the NFL?). Students will then learn how to collect appropriate data, analyze the data, and make reasonable conclusions. Although the context of the examples and exercises will be sports related, the primary focus of the class will be to teach students the basic principles of statistical reasoning. Major statistical topics include descriptive statistics, probability, probability distributions, and inferential statistics. Use of technology, including online applets and the graphing calculator will be prominent in the course. Throughout the course, students will complete investigations that require them to complete the four-step statistical process using athletes of their choice.

Recommended Textbook:

Statistical Reasoning in Sports

Authors: Josh Tabor & Chris Franklin

Pacing Guide

Unit 1	Chapter 1: Testing Claims in Sports Chapter 2: Analyzing Categorical Variables Chapter 3: Comparing Two Percentages Chapter 4: Experiments	10 weeks
Unit 2	Chapter 5: Conditional Probability and Strategy in Sports Chapter 6: Analyzing Quantitative Variables Chapter 7: Comparing Two Means or Medians	10 weeks
Unit 3	Chapter 8: Exploring Paired Data Chapter 9: More Measures of Variability Chapter 10: Standardized Scores and Normal Distributions	10 weeks
Unit 4	Chapter 11: Sampling with Confidence Chapter 12: Relationships between Two Quantitative Variables Chapter 13: Using Relationships to make Predictions	10 weeks

Unit 1

Unit Title: Testing Claims in Sports, Analyzing Categorical Values, Comparing Two Percentages, Experiments

Grade level:11th and 12th **Timeframe: MP 1 (10 weeks)**

Essential Questions

Chapter 1: Testing Claims in Sports (2 weeks)

How can students distinguish performance from ability?

Explain what it means for athletic performances to be independent?

Use the results of a simulation to determine if there is convincing evidence that an athlete is streaky?

Chapter 2: Analyzing Categorical Variables (2 weeks)

How can you identify individuals and variables in a data set and distinguish categorical and quantitative variables?

Identify what makes some graphs deceptive?

How can you determine if there is convincing evidence of a change in *ABILITY*?

How can you explain the effect of sample size?

Chapter 3: Comparing Two Percentages (3 weeks)

Explain the difference between explanatory and response variables?

How can students construct a segmented bar chart to display association between categorical variables?

How can students describe evidence for the alternative hypothesis and provide two explanations for the evidence?

How can students estimate a *p*-value using technology and results of a simulation?

Chapter 4: Experiments (3 weeks)

Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions?

Explain the purpose of comparison in an experiment?

Explain the purpose of random assignment in an experiment and how to perform the random assignment?

How can students identify variables that should be kept the same in an experiment?

Describe the placebo effect and the purpose of blinding in an experiment?

Describe a Type I and a Type II error in context?

Explain the consequences of making each type of error?

Explain how to reduce the probability of each type of error?

Standards

Standards (Taught and Assessed):

■MAJOR CLUSTERS:

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on two categorical and quantitative variables

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Making Inferences and Justifying Conclusions (S-IC)

Understand and evaluate random processes underlying statistical experiments

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin fall heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

6. Evaluate reports based on data.

Conditional Probability and the Rules of Probability (S-CP)

Understand independence and conditional probability and use them to interpret data

4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

☐SUPPORTING CLUSTERS:

Using Probability to Make Decisions (S-MD)

Calculate expected values and use them to solve problems

1. Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

3. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.

4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

Use probability to evaluate outcomes of decisions

5. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
    a. Find the expected payoff for a game of chance.
    b. Evaluate and compare strategies based on expected values.

6. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

Key: ■ Major Cluster   ☐ Supporting Cluster

Highlighted Career Ready Practices and 21st Century Themes/Skills

- 9.1.12.CFR.2: Summarize causes important to you and compare organizations you seek to support to other organizations with similar missions.
- 9.1.12.CFR.4: Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
- 9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, *Social Studies Practice*: Gathering and Evaluating Sources.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

Sports Statistics- October 2021

Social-Emotional Learning Competencies

- Self-Awareness
- Self-Management
- Social Awareness
- Relationship Skills
- Responsible Decision-Making

Instructional Plan

Pre-Assessment and Reflection

Pre-Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Standards Pre-Assessment for units 1-4	● **Tier 1 Learners:** ○ Have guided notes filled out at different levels according to ability. ○ Provide assignments that contain tasks of varying difficulty. Each task should focus on essential learning that all students should master, but the tasks will vary in difficulty. ○ Group students by similar interest when working on application problems. ○ Use mini lessons to reteach to those having difficulty. ○ Group students so that each group contains all level learners. The tier 3 learners can serve as peer helpers. ○ Assign a basic homework assignment. Require students to spend a set amount of time to work (showing effort) on the assignment rather than completing the entire assignment. ○ Allow students to choose a method for completing a project: video, PowerPoint, paper, or presentation. ● **Tier 2 Learners:** ○ Utilize foldables creating tangible products to help students digest information while incorporating several of the multiple intelligences. ● **Tier 3 Learners:**

	○ Have problems posted around the room. Have students loop to specific questions based on difficulty.

Standards, Student Learning Objectives (SLO), Formative Assessment, Activities and Resources

Standard	SLO – WALT **We are learning to/that**	Formative Assessment	Activities and Resources	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
S-ID 5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	Distinguish PERFORMANCE from ABILITY. Explain what it means for athletic PERFORMANCES to be independent. Use a spinner to simulate the number of streaks. Use the results of a simulation to determine if there is convincing evidence that an athlete is streaky. Identify individuals and variables in a data set. Distinguish categorical and quantitative variables. Graph the distribution of a categorical variable using bar charts, pie charts, and segmented bar charts. Summarize the association between two categorical variables in a two-way table.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses* *Chapter 4 Test #4*	*Activity:* *#1-Chapter 3 Page 58-73* *#2-Page 103 #45* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

<mark>S-IC 2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin fall heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?</mark>	Identify what makes some graphs deceptive. Use a spinner to simulate the distribution of the number (or proportion) of successful attempts. Use the results of a simulation to determine if there is convincing evidence of a change in *ABILITY*. Use the law of large numbers to explain the effect of sample size. Test a claim about a difference in *ABILITY* using the State-Simulate-Conclude process.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 49 example* *Page 57 #44* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC 3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	Use the law of large numbers to explain the effect of sample size. Explain how to simulate the distribution of a difference in percentages using note cards.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 31 #1 and 2* *Page 43 # 24* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

S-IC 5 Use data from a randomized experiment to compare two treatments; <mark>use simulations to decide if differences between parameters are significant.</mark>	Explain the purpose of random assignment in an experiment and how to perform the random assignment. Identify variables that should be kept the same in an experiment. Describe the placebo effect and the purpose of blinding in an experiment. Use technology to generate a distribution of simulated *PERFORMANCES*. Describe the association between two categorical variables. Distinguish observational studies from experiments. Explain the purpose of comparison in an experiment.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 125 Example* *Page 129 #9* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC 6 Evaluate reports based on data.	Distinguish explanatory and response variables. Describe evidence for the alternative hypothesis and provide two explanations for the evidence. Describe a Type I and a Type II error in context. Explain the consequences of making each type of error.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 109-110 #51 and 52* *Page 111 #53* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Sports Statistics- October 2021

	Explain how to reduce the probability of each type of error.			
S-CP 4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.	Construct a segmented bar chart to display association between categorical variables. Estimate a *p*-value using the results of a simulation. Determine if there is convincing evidence for the alternative hypothesis using a *p*-value. Estimate a *p*-value using technology.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 74 # 1-4* *Page 101 #37* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-CP 5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.	Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 153 #46* *Page 155 # 48-50* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-MD 6 Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	State the null hypothesis and the alternative hypothesis for a test about change in *ABILITY*. Describe evidence for the alternative hypothesis and provide two explanations for the evidence.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 139 #27 and 28* *Page 150 example* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment

	State hypotheses for testing a difference in percentages. State hypotheses for testing a difference in percentages for an experiment and state the evidence for the alternative hypothesis. Use simulation to estimate a p-value for an experiment and draw an appropriate conclusion.		www.espn.com	activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Benchmark Assessment 1 and 2

Benchmark Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Chapter 1 Test *Chapter 2 Test*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Benchmark Assessment 3 and 4

Benchmark Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Chapter 3 Test *Chapter 4 Test*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Summative Assessments

Summative Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections

Sports Statistics- October 2021

Chapter 1 Investigative Project: Investigate if an athlete or team (of students choosing) was in fact streaky.	
Chapter 2 Investigative Project: Investigate if the ability of an athlete increased or decreased in the postseason.	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
Chapter 3 Investigative Project: Investigate if a team or athlete has a greater ability in one context versus another context.	
Chapter 4 Investigative Project: Conduct a single subject experiment to investigate if you have a greater ability using one of two techniques.	

Interdisciplinary Connections

Interdisciplinary Connections	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Politics: Pg58 #45 and 46 Weather and meteorology: Pg 59#47 Science: Pg106 example- Does bathing in a sauna prevent heart attacks? Science and health: Pg 111 #54- Are teenagers more likely to have hearing loss in 2010 than in 1990? Health and nutrition: Pg 152 #43,44,45	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Unit 2

Unit Title: Conditional Probability, Analyzing Quantitative Variables, Comparing Two Means

Grade level:11th and 12th   **Timeframe: MP 2 (10 weeks)**

Essential Questions

Chapter 5: Conditional Probability and Strategy in Sports (3 weeks)
- Interpret the probability of an event as a long-run relative frequency?
- Can you explain and calculate the probability of events using a two-way table?
- Can you use a win probability to determine when a strategy will be effective?

Chapter 6: Analyzing Quantitative Variables (3 weeks)
- How do I visually represent quantitative data?
- How do I describe the shape of a distribution of quantitative data?
- How do I calculate measures of central tendency of a distribution of quantitative data?
- How do I calculate the range of a distribution of quantitative data?
- How do I find the quartiles & the IQR of a distribution of quantitative data?
- How do outliers and skewness affect measures of central tendency?
- How do I construct a boxplot to summarize a distribution of quantitative data?
- How do I compare two or more distributions of quantitative data using shape, outliers, center, and spread (variability)?

Chapter 7: Comparing Two Means or Medians (4 weeks)
- Explain the concept of ABILITY when analyzing quantitative data.
- How do you simulate the distribution of a difference in means using note cards?
- Estimate a p-value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis.
- Determine if a cause-and-effect conclusion is appropriate.
- Estimate a p-value using technology.
- Explain why comparing medians might be more appropriate than comparing means.
- Explain how to simulate the distribution of a difference in medians using note cards

Standards

Standards (Taught and Assessed):
🟩MAJOR CLUSTERS:

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Making Inferences and Justifying Conclusions (S-IC)

Understand and evaluate random processes underlying statistical experiments

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin fall heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
6. Evaluate reports based on data.

Conditional Probability and the Rules of Probability (S-CP)

Understand independence and conditional probability and use them to interpret data

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent.
3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

Use the rules of probability to compute probabilities of compound events in a uniform probability model

6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.
7. Apply the Addition Rule, P(A or B) = P(A) + P(B) − P(A and B), and interpret the answer in terms of the model.

◻SUPPORTING CLUSTERS:

Conditional Probability and the Rules of Probability (S-CP)

Use the rules of probability to compute probabilities of compound events in a uniform probability model

8. Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
9. Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions (S-MD)

Calculate expected values and use them to solve problems

1. Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
3. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

Use probability to evaluate outcomes of decisions

5. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
      a. Find the expected payoff for a game of chance.
      b. Evaluate and compare strategies on the basis of expected values.
6. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
7. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game)

Key: ■ Major Cluster   ☐ Supporting Cluster

Highlighted Career Ready Practices and 21st Century Themes/Skills
Refer to highlighted SLO

- 9.1.12.CFR.2: Summarize causes important to you and compare organizations you seek to support to other organizations with similar missions.
- 9.1.12.CFR.4: Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.

Sports Statistics- October 2021

- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
- 9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, *Social Studies Practice*: Gathering and Evaluating Sources.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

Social-Emotional Learning Competencies
- Self-Awareness
- Self-Management
- Social Awareness
- Relationship Skills
- Responsible Decision-Making

Instructional Plan

Pre-Assessment and Reflection

Pre-Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Standards Pre-Assessment for chapters 5-7	**Tier 1 Learners:** o Have guided notes filled out at different levels according to ability. o Provide assignments that contain tasks of varying difficulty. Each task should focus on essential learning that all students should master, but the tasks will vary in difficulty. o Group students by similar interest when working on application problems. o Use mini lessons to reteach to those having difficulty. o Group students so that each group contains all level learners. The tier 3 learners can serve as peer helpers.

Sports Statistics- October 2021

	o Assign a basic homework assignment. Require students to spend a set amount of time to work (showing effort) on the assignment rather than completing the entire assignment.
	o Allow students to choose a method for completing a project: video, PowerPoint, paper, or presentation.
	● **Tier 2 Learners:**
	○ Utilize foldables creating tangible products to help students digest information while incorporating several of the multiple intelligences.
	● **Tier 3 Learners:**
	○ Have problems posted around the room. Have students loop to specific questions based on difficulty.

Standards, Student Learning Objectives (SLO), Formative Assessment, Activities and Resources

Standards	SLO – WALT We are learning to/that	Formative Assessment	Activities and Resources	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
S-ID1: Represent data with plots on the real number line (dot plots, histograms, and box plots).	Represent quantitative data and describe the shape of a distribution Calculate measures of central tendency and the range of a distribution of quantitative data Find the quartiles & the IQR of a distribution of quantitative data Construct a boxplot to summarize a distribution of	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 235 and Page 240* *Do the Chicago Cubs allow more runs during cloudy versus sunny days?* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

	quantitative data			
S-ID2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	Explain and calculate the probability of events using a two-way table Compare two or more distributions of quantitative data using shape, outliers, center, and spread (variability)	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 250 Comparing age of skiers* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-ID3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	Describe the shape of a distribution of quantitative data Explain how outliers and skewness affect measures of central tendency	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Example on page 224* *Outliers on cloudy days example page 246-247* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin fall heads up with probability 0.5. Would a result of 5 tails	Interpret the probability of an event as a long-run relative frequency	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *CH6 Example on Page 217 Do Rested Players play better defense?* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher

				level questioning techniques in class and on assessments.
in a row cause you to question the model?				
S-IC5: Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	Determine if there is convincing evidence for the alternative hypothesis. Determine if a cause-and-effect conclusion is appropriate.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Ch7 Review Pages 310-311* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC6: Evaluate reports based on data.	Estimate a p-value using the results of a simulation and use this to determine if there is convincing evidence for the alternative hypothesis.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Investigative Projects for Chapters 5,6,7* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-CP: Understand independence and conditional probability and use them to interpret data #1-5	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions,	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips*	*Activity:* *Page 174 Conditional probability and Mike Trout*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a

| | intersections, or complements of other events ("or," "and," "not").

Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent.

Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

Recognize and explain the concepts of conditional probability and independence | *Short Constructed Responses* | *Page 179#11 Example about soccer and the association between location and outcome of game*

Page 181 #18 Tiger Woods example

Pg 204 Do High School boys prefer different superpowers than high school girls?

Resources:
Textbook: Statistical Reasoning in Sports
Simulations and Applets
www.sports-reference.com
www.espn.com | bilingual dictionary.
GT: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments. |

| S-CP6,7: Use the rules of probability to compute probabilities of compound events in a uniform probability model #6,7 | Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. | *Investigative Projects*

Chapter Assessments

Do-Nows and Exit Slips

Short Constructed Responses | *Activity:*
Pg 183 #25, 26

Resources :
Textbook: Statistical Reasoning in Sports
Simulations and Applets
www.sports-reference.com
www.espn.com | **SPED/504/at risk**: Individualized as needed
ELL: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary.
GT: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments. |

Benchmark Assessment

Benchmark Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Chapter 5 Test *Chapter 6 Test* *Chapter 7 Test*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Summative Assessments (add rows as needed)

Summative Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections

Sports Statistics- October 2021

Chapter 5 Investigative Project: Create an example or find a real-life example where a coach must make a strategic decision during a game. Using your example, determine when a particular stray is the right thing to do.	
Chapter 6 Investigative Project: Compare distributions of a quantitative variable for two or more teams, individuals, groups, or context (for 1 team or athlete)	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
Chapter 7 Investigative Project: Conduct an observational study to investigate if a team or athlete has a greater ability in one context than in another context.	

Interdisciplinary Connections

Interdisciplinary Connections	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Politics: Pg207 #57 Banking: Pg208 #58, Page 307#37 Science: Pg265#66 Health: Pg 208-209#59,61	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Unit 3

Unit Title: Exploring Paired Data, Measures of Variability, Standardized Scores

Grade level:11th and 12th   **Timeframe: MP 3 (10 weeks)**

Essential Questions

Chapter 8: Exploring Paired Data (4 weeks)

Can you identify paired data in experiments and observational studies?

Use a graph to analyze the distribution of differences in a paired data set.

Can you calculate and interpret the mean difference in a paired data set?

Identify if a cause-and-effect conclusion is appropriate.

Explain how to simulate the distribution of a mean difference using note cards.

Estimate a *p*-value using the results of a simulation and technology.

Is convincing evidence for the alternative hypothesis?

Explain the benefit of using paired data?

Chapter 9: More Measures of Variability (3 weeks)

Understand the properties of the mean absolute deviation and standard deviation, including and explain how it is affected by individual values?

Calculate and interpret the standard deviation (SD) for a distribution of quantitative data.

Distinguish the observed standard deviation from the true standard deviation.

Explain how to simulate the distribution of a difference in standard deviations using note cards.

Chapter 10: Standardized Scores and Normal distributions (3 weeks)

Calculate and interpret a *z*-score.

Compare *PERFORMANCES* on different scales using *z*-scores.

Use the 68–95–99.7 rule to estimate the percent of values between two boundaries.

Can you explain and assess normality with graphs and the 68–95–99.7 rule?

How can you use the standard normal table or technology to find the percent of values in a specified interval and to find the boundary value for a given percentile?

Standards

Standards (Taught and Assessed):

■MAJOR CLUSTERS :

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Making Inferences and Justifying Conclusions (S-IC)

Understand and evaluate random processes underlying statistical experiments

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
6. Evaluate reports based on data.

☐SUPPORTING CLUSTERS :

Conditional Probability and the Rules of Probability (S-CP)

Use the rules of probability to compute probabilities of compound events

9. Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions (S-MD)

Calculate expected values and use them to solve problems

1. Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
3. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

Use probability to evaluate outcomes of decisions

Sports Statistics- October 2021

6. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

Key:　■ Major Cluster　　□ Supporting Cluster

Highlighted Career Ready Practices and 21st Century Themes/Skills
<mark>Refer to highlighted SLO</mark>

- 9.1.12.CFR.2: Summarize causes important to you and compare organizations you seek to support to other organizations with similar missions.
- 9.1.12.CFR.4: Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
- 9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, *Social Studies Practice*: Gathering and Evaluating Sources.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

Social-Emotional Learning Competencies
- Self-Awareness
- Self-Management
- Social Awareness
- Relationship Skills
- Responsible Decision-Making

Instructional Plan

Pre-Assessment and Reflection

Pre-Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections

Standards Pre-Assessment	**Tier 1 Learners:**
	   ○ Have guided notes filled out at different levels according to ability.
	   ○ Provide assignments that contain tasks of varying difficulty. Each task should focus on essential learning that all students should master, but the tasks will vary in difficulty.
	   ○ Group students by similar interest when working on application problems.
	   ○ Use mini lessons to reteach to those having difficulty.
	   ○ Group students so that each group contains all level learners. The tier 3 learners can serve as peer helpers.
	   ○ Assign a basic homework assignment. Require students to spend a set amount of time to work (showing effort) on the assignment rather than completing the entire assignment.
	   ○ Allow students to choose a method for completing a project: video, PowerPoint, paper, or presentation.
	● **Tier 2 Learners:**
	   ○ Utilize foldables creating tangible products to help students digest information while incorporating several of the multiple intelligences.
	● **Tier 3 Learners:**
	   ○ Have problems posted around the room. Have students loop to specific questions based on difficulty.

Standards, Student Learning Objectives (SLO), Formative Assessment, Activities and Resources

Standards	SLO – WALT We are learning to/that	Formative Assessment	Activities and Resources	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
S-ID: 1. Represent data with plots on the real number line (dot plots, histograms, and box plots).	Identify paired data in experiments and observational studies? Use a graph to analyze the distribution of differences in a paired data set.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 318-319 Can students throw a baseball farther than a softball?* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-ID: 2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	Understand the properties of the mean absolute deviation and standard deviation, including and explain how it is affected by individual values? Explain how to simulate the distribution of a difference in standard deviations using note cards.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 337#11 and 12* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-ID:3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	Calculate and interpret the standard deviation (SD) for a distribution of quantitative data. Distinguish the observed standard deviation from the true standard deviation.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips*	*Activity:* *Page 332-333 Do Home teams have a greater ability to avoid fouls?* *Page 338#13* *Resources:*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a

	Calculate and interpret the mean difference in a paired data set	*Short Constructed Responses*	*Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-ID:4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	Use the 68–95–99.7 rule to estimate the percent of values between two boundaries. Explain and assess normality with graphs and the 68–95–99.7 rule	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Pg 341 #20* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC:2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*	Use the standard normal table or technology to find the percent of values in a specified interval and to find the boundary value for a given percentile?	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 343 #Did restrictions on defensive players increase teams' ability to pass?* *Pg 345 #21-25* *Pg 346 #28 Decide if there's convincing evidence that NBA teams had a greater ability to make 3-point shots in 1997 than 1998?* *Resources :* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

| S-IC:5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. | Explain the benefit of using paired data

Calculate and interpret a *z*-score. Compare *PERFORMANCES* on different scales using *z*-scores. | *Investigative Projects*

Chapter Assessments

Do-Nows and Exit Slips

Short Constructed Responses | *Activity:*
Pg 348-351 Example Does music hinder academic performance?
Resources :
Textbook: Statistical Reasoning in Sports
Simulations and Applets
www.sports-reference.com
www.espn.com | **SPED/504/at risk**:
Individualized as needed
ELL: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary.
GT: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments. |
| S-IC:6 Evaluate reports based on data. | Distinguish explanatory and response variables.

Describe evidence for the alternative hypothesis and provide two explanations for the evidence.

Describe a Type I and a Type II error in context.

Explain the consequences of making each type of error. Explain how to reduce the probability of each type of error. | *Investigative Projects*

Chapter Assessments

Do-Nows and Exit Slips

Short Constructed Responses | *Activity:*
==*Pg352#36 Does adding compost to a garden increase the yield of tomato plants?*==
Every investigative project (Ch8-10) explains in detail the evaluation process in reporting data.
Resources:
Textbook: Statistical Reasoning in Sports
Simulations and Applets
www.sports-reference.com
www.espn.com | **SPED/504/at risk**:
Individualized as needed
ELL: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary.
GT: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments. |

Benchmark Assessment

Benchmark Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Chapter 8 Test *Chapter 9 Test* *Chapter 10 Test*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Summative Assessments (add rows as needed)

Summative Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Chapter 8 Investigative Project: Students will conduct an observational study to investigate if a group of teams or athletes has a greater ability in one context than another. Chapter 9 Investigative Project: Students will conduct an observational study to investigate if an athlete, team, or group of teams is more consistent in one context than in another context. Chapter 10 Investigative Project: Students will investigate performances from different eras to see which one is best, relatively speaking.	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Interdisciplinary Connections

Interdisciplinary Connections	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Music: Page 348 Is Music Distracting Agriculture: Pg 352 #36 Marketing: Pg 352 #35,37 Weather: Pg 396 Which city has more consistent weather? Allied Health: Pg398 #45,47 Food and Nutrition: Page 452#51,52	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Unit 4

Unit Title: Sampling with Confidence, Relationship Between Two Quantitative Variables, Using Relationships

Grade level:11th and 12th   **Timeframe: MP 4**

Essential Questions

Chapter 11: Sampling with Confidence
- Can you identify the population and sample in a sample survey?
- How can you describe how convenience sampling and voluntary response sampling can lead to bias?
- Explain how random sampling can help to avoid bias.
- Describe how to obtain a random sample using note cards or technology.
- Explain how other aspects of a sample survey can lead to bias.
- Can you approximate the standard error of a sample percentage and interpret the standard error?
- Can you calculate and interpret a 95% confidence interval for a percentage?
- Can you use a confidence interval to assess a claim?
- Describe the effect of changing the sample size on the margin of error.
- Use simulation to approximate the standard error of a sample mean and interpret the standard error.

Chapter 12: Relationships between Two Quantitative Variables
- Can you distinguish explanatory and response variables?
- Can you describe the direction, form, and strength of an association displayed in a scatterplot, and identify unusual features?
- Can you interpret and distinguish correlation from causation?
- Describe how the correlation is influenced by outliers.
- Distinguish the observed correlation from the true correlation.
- Explain how to simulate the distribution of the correlation using note cards.
- Estimate a p-value using the results of a simulation.
- Determine if there is convincing evidence for the alternative hypothesis.

Chapter 13: Using Relationships to make Predictions
- How can you use a model to make predictions?
- Can you make predictions using a least-squares regression line, keeping in mind the danger of extrapolation?
- Explain technology to calculate the equation of the least-squares regression line.

Sports Statistics- October 2021

Standards

Standards (Taught and Assessed):

■MAJOR CLUSTERS :

Interpreting Categorical and Quantitative Data (S-ID)

Summarize, represent, and interpret data on two categorical and quantitative variables

6. Represent data on two quantitative variables on a scatter plot and describe how the variables are related.
    a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
    b. Informally assess the fit of a function by plotting and analyzing residuals.
    c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
8. Compute (using technology) and interpret the correlation coefficient of a linear fit.
9. Distinguish between correlation and causation.

Making Inferences and Justifying Conclusions (S-IC)

Understand and evaluate random processes underlying statistical experiments

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

6. Evaluate reports based on data.

■SUPPORTING CLUSTERS:

Conditional Probability and the Rules of Probability (S-CP)

Use the rules of probability to compute probabilities of compound events in a uniform probability model

Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions (S-MD)

Sports Statistics- October 2021

Calculate expected values and use them to solve problems

1. Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
3. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
4. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.

Use probability to evaluate outcomes of decisions

5. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
    a. Find the expected payoff for a game of chance.
    b. Evaluate and compare strategies based on expected values.

6. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

Key: ■ Major Cluster   ☐ Supporting Cluster

Highlighted Career Ready Practices and 21st Century Themes/Skills

- 9.1.12.CFR.2: Summarize causes important to you and compare organizations you seek to support to other organizations with similar missions.
- 9.1.12.CFR.4: Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors.
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
- 9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, *Social Studies Practice*: Gathering and Evaluating Sources.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

Sports Statistics- October 2021

Social-Emotional Learning Competencies
- [Self-Awareness](#)
- [Self-Management](#)
- [Social Awareness](#)
- [Relationship Skills](#)
- [Responsible Decision-Making](#)

Instructional Plan

Pre-Assessment and Reflection

Pre-Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Standards Pre-Assessment	**Tier 1 Learners:** ○ Have guided notes filled out at different levels according to ability. ○ Provide assignments that contain tasks of varying difficulty. Each task should focus on essential learning that all students should master, but the tasks will vary in difficulty. ○ Group students by similar interest when working on application problems. ○ Use mini lessons to reteach to those having difficulty. ○ Group students so that each group contains all level learners. The tier 3 learners can serve as peer helpers. ○ Assign a basic homework assignment. Require students to spend a set amount of time to work (showing effort) on the assignment rather than completing the entire assignment. ○ Allow students to choose a method for completing a project: video, PowerPoint, paper, or presentation. ● **Tier 2 Learners:** ○ Utilize foldables creating tangible products to help students digest information while incorporating several of the multiple intelligences. ● **Tier 3 Learners:**

	○ Have problems posted around the room. Have students loop to specific questions based on difficulty.	

Standards, Student Learning Objectives (SLO), Formative Assessment, Activities and Resources

Standards	SLO – WALT We are learning to/that	Formative Assessment	Activities and Resources	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
S-ID 6. a,b,c: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.	Identify the population and sample in a sample survey? Distinguish explanatory and response variables? Describe the direction, form, and strength of an association displayed in a scatterplot, and identify unusual features? Describe how the correlation is influenced by outliers.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Page 511 In each setting listed identify the type of variable and explain your reasoning.* *Pg 513 and Page 520* *Do baseball teams that spend more money on players also win more games?* *Page 521 #1-3* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-ID 7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	Predict using a least-squares regression line, keeping in mind the danger of extrapolation Explain technology to calculate the equation of the least-squares regression line.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 576 Example on predicting points in the English premier league* *Page 582 Serve speed and player height in tennis* *Pg 585 example* *Resources :* *Textbook: Statistical Reasoning in Sports*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning

Sports Statistics- October 2021

			Simulations and Applets *www.sports-reference.com* *www.espn.com*	techniques in class and on assessments.
S-ID 8. Compute (using technology) and interpret the correlation coefficient of a linear fit.	Describe how the correlation is influenced by outliers. Distinguish the observed correlation from the true correlation. Explain how to simulate the distribution of the correlation using note cards.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 526 Example titled "guess the correlation"* *Page 528 Example titled " Want to score more points?"* *Resources :* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-ID 9. Distinguish between correlation and causation.	Interpret and distinguish correlation from causation	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 533 Example "Influential Putters"* *Page 535 #19-22* *Resources :* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC 1. and 2. Understand and evaluate random processes underlying statistical experiments	Identify the population and sample in a sample survey Describe how convenience sampling and voluntary response sampling can lead to bias Explain how random sampling can help to avoid bias.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* ==*Page 625 Example about used trucks*== *Page 627 #45* *Resources :* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon

	Describe how to obtain a random sample using note cards or technology. Explain how other aspects of a sample survey can lead to bias. Describe the effect of changing the sample size on the margin of error. Use simulation to approximate the standard error of a sample mean and interpret the standard error.			the curriculum. Use higher level questioning techniques in class and on assessments.
S-IC 3,4,6: Make inferences and justify conclusions from sample surveys, experiments, and observational studies	Use a model to make predictions. Make predictions using a least-squares regression line, keeping in mind the danger of extrapolation. Explain technology to calculate the equation of the least-squares regression line.	*Investigative Projects* *Chapter Assessments* *Do-Nows and Exit Slips* *Short Constructed Responses*	*Activity:* *Page 628 #46 Does tapping on a can of soda reduce the amount of soda expelled?* *Page 636 #4* *Resources:* *Textbook: Statistical Reasoning in Sports* *Simulations and Applets* *www.sports-reference.com* *www.espn.com*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Benchmark Assessment

Benchmark Assessment	**Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections**
Chapter 11 Test *Chapter 12 Test* *Chapter 13 Test*	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.

Summative Assessments

Summative Assessment	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Chapter 11 Investigative Project: Students will research an athlete of their choice and use confidence intervals to establish his or her ability in 2 different ways.	
Chapter 12 Investigative Project: Students will investigate if there is convincing evidence that the true correlation between two quantitative variables is different then 0.	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.
Chapter 13 Investigative Project: Students choose a response variable and investigate several different explanatory variables to determine which of the explanatory variables is the best predictor of the response variable.	

Interdisciplinary Connections

Interdisciplinary Connections	Modifications (ELL, Special Education, Gifted, At-risk of Failure, 504) and Reflections
Culinary Arts: Page 629 #47 Science: Page 630 #49 Health and nutrition: Page 558 #49 Meteorology: Page 559#51	**SPED/504/at risk**: Individualized as needed **ELL**: Model and Provide Example. Establish a non-verbal cue to redirect students when not on task. Students may use a bilingual dictionary. **GT**: Provide enrichment activities to expand upon the curriculum. Use higher level questioning techniques in class and on assessments.