Randolph Township Schools
Randolph Middle School

Statistics of Sports Curriculum

"Statistical thinking will one day be necessary for effective citizenship as the ability to read or write."
--H.G. Wells, 1895

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Randolph Township Schools
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Statistics of Sports Curriculum

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Randolph Township Schools

Mission Statement

We commit to inspiring and empowering all students in Randolph schools to reach their full potential as unique, responsible and educated members of a global society.

Randolph Township Schools
Affirmative Action Statement

Equality and Equity in Curriculum

The Randolph Township School District ensures that the district's curriculum and instruction are aligned to the State's Core Curriculum Content Standards. The curriculum addresses the elimination of discrimination and the achievement gap, as identified by underperforming school-level AYP reports for State assessment. The Curriculum provides equity in instruction, educational programs and provides all students the opportunity to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

N.J.A.C. 6A:7-1.7(b): Section 504, Rehabilitation Act of 1973; N.J.S.A. 10:5; Title IX, Education Amendments of 1972

RANDOLPH TOWNSHIP BOARD OF EDUCATION
EDUCATIONAL GOALS
VALUES IN EDUCATION

The statements represent the beliefs and values regarding our educational system. Education is the key to self-actualization which is realized through achievement and self-respect. We believe our entire system must not only represent these values, but also demonstrate them in all that we do as a school system.

We believe:
• The needs of the child come first.
• Mutual respect and trust are the cornerstones of a learning community.
• The learning community consists of students, educators, parents, administrators, educational support personnel, the community and Board of Education members.
• A successful learning community communicates honestly and openly in a non-threatening environment.
• Members of our learning community have different needs at different times. There is openness to the challenge of meeting those needs in professional and supportive ways.
• Assessment of professionals (i.e., educators, administrators and educational support personnel) is a dynamic process that requires review and revision based on evolving research, practices and experiences.
• Development of desired capabilities comes in stages and is achieved through hard work, reflection and ongoing growth.

Randolph Township Schools
Department of Science, Technology, Engineering, and Math
Statistics of Sports Curriculum

Introduction

This is a marking period course offered to middle school students interested in statistics related to professional athletics. Students will gain an understanding of mathematics through scenarios of acquiring a professional athletic team, examining athlete statistics, and marketing to generate incremental revenue. Students will research, learn and use statistics, and study several financial aspects of managing a team. Hands-on projects will improve critical thinking and problem solving skills, as well as enhance students' ability to communicate through writing and speaking. At the completion of this course, students will have an understanding of real-world applications of numerous mathematics skills.

SUGGESTED TIME ALLOTMENT	UNIT NUMBER	CONTENT - UNIT OF STUDY
3 weeks	I	**Financial Aspects of a Major League Athletic Team**
3 weeks	II	**Statistics of Major League Athletes**
3 weeks	III	**Statistics Driven Marketing**

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Statistics of Sports
UNIT I: Financial Aspects of a Major League Athletic Team

STANDARDS / GOALS:	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Math **NJSLSA.8.NS.A.1.** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. **NJSLSA.8.SP.A.1.** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	Through the collection and interpretation of organized data, businessmen and entrepreneurs are able to make informed decisions.	• What challenges does one face when analyzing the purchase of a sports franchise, team, or other sports related venture?
	Analyzing relationships between financial quantities and components to describe patterns of various data.	• How do relationships between various data sets influence our decision making in sports?
	KNOWLEDGE	**SKILLS**
Mathematical Practices **MP2** Reason abstractly and quantitatively **MP4** Model with mathematics. **Technology** **NJSLSA.8.1.8.A.1.** Demonstrate knowledge of a real world problem using digital tools.	**Students will know:** Accurate research must be completed to assure the integrity of data. First-hand research versus second-hand research. Understand and use technology systems. Spreadsheets are used to analyze data.	**Students will be able to:** Present reliable research about an athletic organization and find financial information related to a specific team. Discuss whether collected data is based upon first-hand (e.g., interviews, experiments, surveys, or personal experience) or second-hand (compiled by others such as in books, periodicals, and web sites) research. Input data and formulate into a spreadsheet. Use spreadsheet to analyze data by generating graphs and organize data in meaningful ways.

NJSLSA.8.1.8.A.2. Create a document (e.g. newsletter, reports, personalized digital applications to be critiqued by professionals for usability. learning plan, business letters or flyers) using one or more. **NJSLSA.8.1.8.A.4.** Graph and calculate data within a spreadsheet and present a summary of the results Select and use applications effectively and productively.	Data analysis is one tool used to solve problems and guide decision making.	Create graphical displays for categorical data: pie chart, bar graph. Create graphical displays for quantitative data: dot plot, stem-and-leaf plot, histogram, boxplot. Analyze and interpret data for use in business decision making.
	A budget is an itemized list of income and expenditures over a specified period of time.	Estimate the cost to purchase a sports franchise based on research data. Create and present a proposed budget for a major league athletic team by inputting appropriates formulas, and assumed income and expenses to complete an analysis of profitability. Present and defend whether an investment is worthwhile by providing evidence from the interpretation of relevant data and the comparison to similar researched investments.
	Select and use applications effectively and productively.	Display data through various and appropriate graphical representations.

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| | **KEY TERMS:** Graph, Coordinate Grid, Data, Scatterplots, Association, Rational, Irrational, Linear, Nonlinear | |

ASSESSMENT EVIDENCE:
- Complete independent or collaborative performance-based assessments.
- Real-world application projects
- Formative assessments focusing on statistics in the context of sports and games.

KEY LEARNING EVENTS AND INSTRUCTION:
- Students will read and annotate articles to further their understanding of the finances of running a team.
- Students will be able to utilize reliable and appropriate research tools and technologies to analyze data as it pertains to the financial aspects of a team.

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
3 Weeks	**Unit I: Financial Aspects of a Major League Athletic Team** • Reliable Sources of Data • Conduct Research • Creating Tables and Spreadsheets • Creating Visual Displays of Data • Creating and Using a Budget	**Suggested Supplies and Activities** Computer programs such as Microsoft Excel or Google Spreadsheets Websites such as: http://www.cbssports.com/nfl/stats http://mlb.mlb.com/stats/ www.businessinsider.com/ http://www.nbclearn.com/portal/site/learn

STANDARDS / GOALS:	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Math **NJSLSA.7.SP.A.2.** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. **NJSLSA.8.NS.A.1.** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. **NJSLSA.8.SP.A.1.** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. **NJSLSA.8.SP.A.2.** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit	Data analysis often reveals patterns and enables prediction.	• How can predictions be made based on data?
	Data representations can be used to make inferences/conclusions about players.	• How can data be used by a player to negotiate their pay?
	KNOWLEDGE	**SKILLS**
	Students will know: Statistics are used to determine team rankings and player ratings, to modify the rules of competition, and in sports reporting. For each player, there are dozens of potential regression statistics.	**Students will be able to:** Discuss and interpret statistical analysis in use to report player, game, and league data. Defend their choice in players based on player ratings, team rankings and additional relevant statistical data. Calculate various statistics for players (e.g., passing, rushing, receiving, kicking, etc.) including probability and trends. Discuss and present the statistical significance of a player's published statistics to determine whether a set of data can be used to establish a trend.

(e.g. line of best fit) by judging the closeness of the data points to the line. **NJSLSA.8.SP.A.3.** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept **NJSLSA.8.SP.A.4.** Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. **Mathematical Practices** **MP2** Reason abstractly and quantitatively **MP3** Construct viable arguments and critique the reasoning of others. **MP4** Model with mathematics. **MP8** Look for and express regularity in repeated reasoning. **Technology** **NJSLSA.8.1.8.A.2.** Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.	Two-way tables can be used to represent data and study the association between two categorical data sets of a population. Bivariate data can be represented graphically in a scatterplot. Select and use applications effectively and productively. Plan strategies to guide inquiry.	Create ratios comparing an athlete's compensation to their output on the field/court to determine their worth. Create scatterplots to show the relationship between two variables. Describe the form, direction, strength and outliers of the relationship between two quantitative variables as shown in a scatterplot. Compare two similar sets of data to determine the efficiency of allotted funds. Input data and formulate into a spreadsheet. Display data through various and appropriate graphical representations. Ability to use reliable and appropriate internet sources to analyze player performance data. Evaluate and select information sources and digital tools based on the appropriateness for specific tasks. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

NJSLSA.8.1.8.A.4. Graph and calculate data within a spreadsheet and present a summary of the results **NJSLSA.8.1.8.E.1.** Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.	**KEY TERMS:** Patterns, Variables, Frequencies, Measurement, Graph, Data, Association, Rational, Irrational, Linear, Nonlinear	

ASSESSMENT EVIDENCE:
- Complete independent or collaborative performance-based assessments.
- Real-world application projects
- Formative Assessments focusing on statistics in the context of sports and games.

KEY LEARNING EVENTS AND INSTRUCTION:
- Students will read and annotate articles to further their understanding of both individual player and whole team performance.
- Students will be able to utilize reliable and appropriate research tools and technologies to analyze player performance data.

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
3 Weeks	**Unit II: Statistics of Major League Athletes** • Ratios • Two Way Tables • Scatterplots • Correlation and Trends	**Suggested Supplies and Activities** Programs such as Microsoft Excel or Google spreadsheets Websites including: http://www.mathgoodies.com/Webquests/sports/ http://www.pbs.org/teachers/mathline/concepts/sportsandmath/activity3.shtm http://msms.ehe.osu.edu/category/sports/ https://newsela.com/text-sets/96463

STANDARDS / GOALS:	ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Math **NJSLSA.7.SP.A.1.** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. **NJSLSA.7.SP.A.2.** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. **NJSLSA.8.SP.A.4.** Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	The sports and entertainment industry relies on effective marketing strategies which are based on data.	• How do sports and entertainment marketers use marketing strategies to entice consumer purchases and increase team profits?
	The reputation of athletes and teams is influenced by the relationship between statistics and marketing.	• How do the reputations of athletes affect a team's annual profit?
	KNOWLEDGE	**SKILLS**
	Students will know: Marketing can be an effective tool to generate incremental revenue. Marketers often employ strategic models and tools to make and analyze marketing decisions. When collecting data, it is important the researcher defines the population. A random sampling representing the population is selected for a study because the total population is usually too large to study.	**Students will be able to:** Identify ways the sports industry generates revenue. Provide examples of event marketing and design a promotional mix for a sports franchise. Develop a promotional strategy to be tested. Define a population based on characteristics that are relevant to the study—in this case the target audience for the promotion. Create a sample group based on the characteristics of their intended population for the promotion.

Mathematical Practices **MP2** Reason abstractly and quantitatively **MP3** Construct viable arguments and critique the reasoning of others. **MP4** Model with mathematics. **MP8** Look for and express regularity in repeated reasoning. **Technology** **NJSLSA.8.1.8.A.1.** Demonstrate knowledge of a real world problem using digital tools. **NJSLSA.8.1.8.A.2.** Create a document (e.g. newsletter, reports, personalized digital applications to be critiqued by professionals for usability. learning plan, business letters or flyers) using one or more **NJSLSA.8.1.8.A.4.** Graph and calculate data within a spreadsheet and present a summary of the results Select and use applications effectively and productively.	A survey is a gathering of a sample of data or opinions considered to be representative of a whole. Statistical Inference makes use of information from a sample to draw conclusions about the population from which the sample was taken. A budget is an estimate of income and expenditure over a period of time Understand and use technology systems. Select and use applications effectively and productively.	Create a survey using a digital tool to collect data from the selected sample related to the proposed promotion. Present and discuss inferences based on the data collected from survey results: Will the promotion generate incremental net revenue? Create, analyze, and present a budget for the cost to attend a professional sporting event for a group. Analyze the cost effectiveness of hosting a sporting event. Input data and formulate into a spreadsheet. Represent qualitative and quantitative data accurately and efficiently.

	KEY TERMS: Marketing, Relationships, Patterns, Variables, Frequencies, Measurement, Graph, Data, Association	

ASSESSMENT EVIDENCE:
- Complete independent or collaborative performance-based assessments.
- Real-world application projects
- Formative Assessments focusing on statistics in the context of sports and games.

KEY LEARNING EVENTS AND INSTRUCTION:
- Students will read and annotate articles to further their understanding of the marketing of players and teams.
- Students will be able to utilize reliable and appropriate research tools and technologies to analyze player and team performance data and its effect on marketing a team.

RANDOLPH TOWNSHIP SCHOOL DISTRICT
Statistics of Sports
UNIT III: Statistics Driven Marketing

SUGGESTED TIME ALLOTMENT	CONTENT-UNIT OF STUDY	SUPPLEMENTAL UNIT RESOURCES
3 Weeks	**UNIT III: Statistics Driven Marketing** • Introduction to Sports Marketing and Promotions • Surveys for Data Collection and Decision Making • Budgeting	**<u>Suggested Supplies and Activities</u>** Programs such as Microsoft Excel or Google Spreadsheets Programs such as Microsoft Publisher Programs such as surveymonkey.com or Google forms. Websites such as: http://financialplan.about.com/od/budgetingyourmoney/ht/createbudget.htm http://money.cnn.com/magazines/moneymag/money101/lesson2/index.htm

APPENDIX A

RESOURCES:

TEXT AND ELECTRONIC TEXT
None Required

ISBN NUMBER, NAME, COPYRIGHT
None Required

WEB ADDRESSES:
https://newsela.com/text-sets/96463
http://www.nbclearn.com/portal/site/learn
www.prezi.com
http://www.mathgoodies.com/Webquests/sports/
http://www.pbs.org/teachers/mathline/concepts/sportsandmath/activity3.shtm
http://msms.ehe.osu.edu/category/sports/
http://www.seminarsonly.com/Engineering-Projects/Marketing/Sports-Marketing-Projects-For-High-School-Students.php
http://financialplan.about.com/od/budgetingyourmoney/ht/createbudget.htm
http://money.cnn.com/magazines/moneymag/money101/lesson2/index.htm
http://www.cbssports.com/nfl/stats
http://mlb.mlb.com/stats/
www.businessinsider.com/

Technology:
Microsoft Excel
Microsoft Word
Microsoft PowerPoint
Microsoft / Google Forms
Outlook 365
Desmos Graphing Resource