

Rumson-Fair Haven Regional High School Curriculum

Course: *Statistics and Probability*

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Section I: Course Description

Statistics and Probability is an elective, full-year course that carries five credits toward graduation. The first semester of the course is a study of Statistics. It is designed to provide students with an applications-oriented investigative approach to data collection and analysis. Course content includes topics in descriptive Statistics: frequency distributions, measures of central tendency and spread, sampling distributions, and analysis of bivariate data. In the second semester, the focus is on Probability. Topics include basic Probability laws, tree diagrams, complementary and compound events, counting methods (permutations and combinations), and combinatorial probabilities. Where time allows, topics in inferential Statistics will be included: sampling techniques and the Central Limit Theorem. Graphing calculators will be used throughout the course.

Section II: NJSL: New Jersey Student Learning Standards/Learning Objectives

1. **2023 New Jersey Student Learning Standards – Mathematics:**
 - “A New Jersey education in Mathematics builds quantitatively and analytically literate citizens prepared to meet the demands of college and career, and to engage productively in an information-driven society; ...A high-quality mathematics education fosters a population that...leverages data in decision-making and as a lens for discussing, analyzing, and responding to practical questions, persists to make sense of and model problems arising in everyday life, society, and the workplace, thinks critically and strategically to assess quantitative relationships and to solutions to complex problems, employs precise reasoning and constructs viable arguments to deduce conclusions, recognize false statements and assess peers’ reasoning, interprets, evaluates and critiques the mathematics embedded in social, scientific and commercial systems, as well as the claims made in the private and public sectors, communicates precisely when conveying, representing, and justifying both qualitative and quantitative perspectives.”
2. **2023 New Jersey Student Learning Standards English Language Arts:**
 - A New Jersey education in English Language Arts builds readers, writers, and communicators prepared to meet the demands of college and career and to engage as productive American citizens with global responsibilities. ...Students will develop the necessary skills in reading, writing, speaking, and listening that are the foundations for creative and purposeful expression in language read rich, challenging texts that build their knowledge of the world, grow their confidence and identities as readers, and develop critical thinking skills and vocabulary necessary for long-term success[; e]ngage in regular, meaningful, writing authentic tasks, exploring valued topics, writing for impact and expression, and sharing their work with others (including authentic audiences) leverage complex texts and digital media to develop comprehension, active listening, and discussion skills ground daily writing and discussion in evidence, fostering an ability to read critically, build arguments, cite evidence, and communicate ideas to contribute meaningfully as productive citizens evaluate the reliability, credibility, and perspective of authors and speakers across all forms of media express ideas and knowledge through a variety of modalities and media, and serve as effective communicators who purposefully read, write, and speak across multiple disciplines [and l]earn to persist in reading complex texts, establishing lifelong habits to read voluntarily for pleasure, for further education, for information on public policy, and for advancement in the workplace.
3. **Standard 8.1 (Computer Science) and 8.2 (Design Thinking) of the 2020 NJSL:**
 - “The ‘Intent and Spirit of the Computer Science and Design Thinking Standards’ is to focus on deep understanding of concepts that enable students to think critically and systematically about leveraging technology to solve local and global issues. Authentic learning experiences that enable students to apply content knowledge, integrate concepts across disciplines, develop computational thinking skills, acquire and incorporate varied perspectives, and communicate with diverse audiences about the use and effects of computing prepares New Jersey students for college and careers.”
4. **Standard 9.4 (Life Literacies and Key Skills) of the 2020 NJSL:**
 - “This standard outlines key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.”
 - **Climate Change:** The state of New Jersey has mandated instruction in, “Climate Change across all content areas, leveraging the passion students have shown for this critical issue and providing them opportunities to develop a deep understanding of the science behind the changes and to explore the solutions our world desperately needs.”

5. ***Amistad Law: N.J.S.A. 18A 52:16A-88:**
 - The inclusion of lessons and resources/texts dealing with the African slave trade, slavery in America, the vestiges of slavery in this country, and the contributions of African Americans to our society will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.”
6. ***Holocaust Law: N.J.S.A. 18A 35-28:**
 - The inclusion of lessons and resources/texts that enable pupils to identify and analyze applicable theories concerning human nature and behavior; to understand that genocide is a consequence of prejudice and discrimination; and to understand that issues of moral dilemma and conscience have a profound impact on life will be implemented in English and Social Studies courses in accordance with state law: “Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.”
7. ***LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35:**
 - A transformative approach to the inclusion of lessons and resources/texts on the contributions and issues concerning the LGBTQ+ population and people with disabilities will be implemented across all core subjects in accordance with state law: “A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district’s implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.”
8. ***Asian American and Pacific Islanders Legislation: N.J.S.A 4021/A6100:**
 - The inclusion of lessons and resources/texts on the history and contributions of Asian Americans and Pacific Islanders will enable New Jersey’s schools to provide a curriculum that reflects the diversity of our state. In accordance with state law: “A board of education shall include instruction on the history and contributions of Asian Americans and Pacific Islanders in an appropriate place in the curriculum of students in grades kindergarten through as part of the school district’s implementation of the New Jersey Student Learning Standards in Social Studies.”
9. Acquisition/development/refinement of the higher-order critical thinking skills aligned with the *Revised Bloom’s Taxonomy of Cognitive Objectives*

Section III: Curriculum Modifications

The *Statistics and Probability* curriculum is subject to case-by-case modifications to support/advance the needs of all students, including special education students, English language learners, gifted students, and those at risk of school failure. These modifications are based on Individualized Learning Programs (IEPs), recommendations made by the district’s English Language Learners (ELL) coordinator, feedback from members of the Intervention & Referral Services Team (*I&RS*) for at-risk students, and 504 Plans.

Coursework and assessments will be modified on an individual basis for students when necessary. Modifications may include but are not limited to those outlined on the [Modifications/Accommodations for Mathematics Courses](#) chart.

Section IV: Preparation for Standardized Testing

Instruction in *Statistics and Probability* is aligned with the requirements of state and national standardized assessments, including the *NJGPA*, *NJSLA*, the *ACT*, the *PSAT*, and the *SAT*.

Section V: Curriculum Pacing Guide

Curriculum Pacing Guide	
Course Title: <i>Statistics and Probability</i>	Grade Level: 12
Unit I: Descriptive Statistics	Weeks 1-16

Unit II: Probability and Probability Statistics	Weeks 17-30
Unit III: Inferential Statistics	Weeks 31-40

Section VI: Technology Skills

Students in *Statistics and Probability* are required to complete the technology skills components of the curriculum:

- Graphing Calculator
- Desmos
- Google Docs
- Google Slides
- Google Sheets

Section VII: Primary Texts and Year-Long Instructional Resources

The following texts and instructional resources are employed in *Statistics and Probability*:

- *Common Sense Education*
- Elementary Statistics, Picturing the World, 5th Edition

Section VIII: Grading Formula and Assessment Modes

Marking period grades in *Statistics and Probability* are determined via a percentage weighting model. The specific grading categories and weightings of each will be determined before the start of each academic year and will be published in the posted/distributed course syllabi.

Assessments in *Statistics and Probability* vary greatly in format, scope/content/skills assessed, and alternative assessments, differentiation in assessments and choice will be incorporated as appropriate. Preliminary assessments of each format will be used as benchmarks and summative assessments will be created/revised collaboratively each year and planned by members of the *Statistics and Probability* instructional team to inform future learning and to measure student growth.

Section IX: Unit Templates

The following unit templates have been established for the *Statistics and Probability* curriculum by the *Statistics and Probability* instructional team:

Unit I: Descriptive Statistics
Unit Summary
Students will be introduced to data analysis. They will be able to read, understand, and communicate data, a critical step that leads them to be able to model a variety of real-world situations, draw appropriate inferences, make informed decisions, and justify those decisions. For this unit, students will end up with the knowledge to construct frequency distributions and their graphs, emphasizing histograms. From there, students can describe the histogram's shape, locate the measures of central tendency for a population and a sample, and compute the five-number summary. This will also involve being able to calculate the measures of variability using the Empirical Rule and Chebychev's Theorem to interpret standard deviation. Finally, students will be able to compute measures of relative standing for individual values in a distribution. This includes standardized values (z-scores) and percentile ranks.
Standards/Core Ideas/Performance Expectations
The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Statistics and Probability</i> : <ul style="list-style-type: none"> ● <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> ○ MP.1-8 ○ S.ID.A.1-4, B.5-6, & C.7-9 ● <i>2023 New Jersey Student Learning Standards English Language Arts</i> <ul style="list-style-type: none"> ○ RL.CT.11–12.8, L.VL.11-12.3.A, W.AW.11-12.1.A & E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6

<ul style="list-style-type: none"> ● 2020 New Jersey Student Learning Standards: <i>Computer Science and Design Thinking</i> <ul style="list-style-type: none"> ○ 8.1.12.CS.4 ● 2020 New Jersey Student Learning Standards: <i>Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> ○ 9.4.12.CT.2, 9.4.12.CI.1, 9.4.12.DC.6, 9.4.12.IML.8 		
Unit Essential Questions		Unit Enduring Understandings
<ul style="list-style-type: none"> ● What is data? ● What are the tools that statisticians use for data exploration and data analysis? ● What is the purpose of organizing and collecting data? ● Why is it important to describe patterns and departures from patterns in data? ● What measurements can be made from gathered data? ● How can statistics be used in everyday life? 		<ul style="list-style-type: none"> ● Data may be any facts, statistics, or information gathered and collected together for reference and analysis. ● Statisticians can use any number of plots, graphs, numerical tables, and infometric photos to explore and analyze data. These include: pie charts, bar graphs, line graphs, histograms, dot plots, etc. ● In organizing and collecting data, you can look at overall patterns and deviations to discover trends and other information over various sample sizes. ● Students can find the mean, median, and mode of statistical data along with identifying outliers and standard deviations. ● A solid understanding of statistics will enable you to make sound decisions based on data in your everyday life.
Evidence of Learning		
Formative & Alternative Assessments:	Benchmark & Summative Assessments:	Resources Needed:
<ul style="list-style-type: none"> ● Classwork ● Homework ● Performance activities ● Projects ● Cooperatives ● Case studies ● Technology activity ● Individual student check ins with teacher 	<ul style="list-style-type: none"> ● 1.1 Quiz (Benchmark) ● Chapter 1 Test (Benchmark) ● 2.1 Quiz ● 2.2 Quiz ● 2.3 Quiz ● 2.4 Quiz ● Chapter 2 Unit Test 	<ul style="list-style-type: none"> ● Desmos Calculator ● Textbook

Unit II: Probability and Probability Distributions	
Unit Summary	
<p>In this unit, students will be introduced to Probability, which quantifies the likelihood that something will happen and enables us to make predictions and informed decisions. Students will be able to determine the probability that an event will occur and learn how to create and use probability distributions, specifically the shape, center, and variability to make decisions in inferential statistics. Students will also learn how to recognize normal distributions and how to use their properties in real-life applications. Using this knowledge, students can understand independence and conditional probability and use them to interpret data. From there, students can use the rules of probability to compute probabilities of compound events in a uniform probability model. Students can then use probability to evaluate outcomes of decisions and calculate expected values for use in solving problems.</p>	
Standards/Core Ideas/Performance Expectations	
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Statistics and Probability</i>:</p> <ul style="list-style-type: none"> ● 2023 New Jersey Student Learning Standards: <i>Mathematics</i> <ul style="list-style-type: none"> ○ MP.1-8 ○ S.CP.A.1-5, B.6, 7 & 9, S.MD.A.1-4 & B.5-7 ● 2023 New Jersey Student Learning Standards <i>English Language Arts</i> <ul style="list-style-type: none"> ○ RL.CT.11–12.8, L.VL.11-12.3.A, W.AW.11-12.1.A & E, W.IW.11-12.2.A, W.NW.11-12.3.A-E, SL.II.11-12.2, SL.PI.11-12.4, RI.MF.11-12.6 ● 2020 New Jersey Student Learning Standards: <i>Computer Science and Design Thinking</i> <ul style="list-style-type: none"> ○ 8.1.12.CS.4 ● 2020 New Jersey Student Learning Standards: <i>Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> ○ 9.4.12.CT.2 9.4.12.CI.1 	
Unit Essential Questions	Unit Enduring Understandings
<ul style="list-style-type: none"> ● What is probability? ● What is meant by the word "random"? 	<ul style="list-style-type: none"> ● Probability is the extent to which something is probable or the likelihood of something happening.

<ul style="list-style-type: none"> • How does the number of repetitions affect the accuracy of your prediction? • How can students tell that a probability model is legitimate? • What is the importance of knowing the probability models? • Which conditions does the model satisfy? • What is the Law of Large Numbers? • What is conditional probability? 	<ul style="list-style-type: none"> • Many phenomena both natural and of human design are random. That is, they are unpredictable in the short run but have a fixed pattern in the very long run (Law of Large Numbers). • A probability model is a mathematical description of a random phenomenon. The sum of all probabilities in the model must equal one for it to be legitimate. • An important part of many probability models is the independence of events. • The Law of Large Numbers is an important concept when doing probability experiments but should always be interpreted very carefully. • Conditional probability is the probability of an event happening given that another event has already occurred.
Evidence of Learning	
Formative & Alternative Assessments: <ul style="list-style-type: none"> • Classwork • Homework • Performance activities • Projects • Cooperatives • Case studies • Individual student check ins with teacher 	Benchmark & Summative Assessments: <ul style="list-style-type: none"> • 3.1 Quiz • 3.2 Quiz • Chapter 3 Assessment • 4.1 Quiz • 4.2 Quiz • Chapter 4 Assessment • 5.1 Quiz • 5.2 Quiz • 5.3 Quiz • Chapter 5.4-5.5 Assessment
Resources Needed: <ul style="list-style-type: none"> • Desmos Calculator • Textbook 	

Unit III: Inferential Statistics	
Unit Summary	
<p>In this unit, students will be introduced to discrete mathematics, which consists of tools and strategies for representing, organizing, and interpreting non-continuous data. If time allows, they will learn how to make a more meaningful estimate by specifying an interval of values on a number line together with a statement of how confident they are that the interval contains the population parameter. Students will learn how to test a claim about a population parameter. Statistical inference provides methods for drawing conclusions about a population from sample data. Statistical inference uses the language of probability to express the strength of our conclusions. Significance tests and confidence intervals appear frequently in reports of studies from many fields. Hypothesis testing is important in many different fields because it gives a scientific procedure for assessing the validity of a claim about a population. Students will be able to understand and evaluate random processes underlying statistical experiments. From there, they can make inferences and justify conclusions from sample surveys, experiments, and observational studies.</p>	
Standards/Core Ideas/Performance Expectations	
<p>The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in <i>Statistics and Probability</i>:</p> <ul style="list-style-type: none"> • <i>2023 New Jersey Student Learning Standards: Mathematics</i> <ul style="list-style-type: none"> ○ MP.1-8 ○ S.IC.A.1-2 & B.3-4 • <i>2023 New Jersey Student Learning Standards English Language Arts</i> <ul style="list-style-type: none"> ○ RL.CT.11–12.8, L.VL.11–12.3.A, W.AW.11–12.1.A & E, W.IW.11–12.2.A, W.NW.11–12.3.A-E, SL.II.11–12.2, SL.PI.11–12.4, RI.MF.11–12.6 • <i>2020 New Jersey Student Learning Standards: Computer Science and Design Thinking</i> <ul style="list-style-type: none"> ○ 8.1.12.CS.4 • <i>2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies and Key Skills</i> <ul style="list-style-type: none"> ○ 9.4.12.CT.2, 9.4.12.CI.1 	
Unit Essential Questions	Unit Enduring Understandings
<ul style="list-style-type: none"> • How do students estimate a population parameter? • How can one verify that two variables are independent? • What are the types of errors in 	<ul style="list-style-type: none"> • When a sample statistic is used to estimate the unknown value of a population parameter we want not just the estimate but also a statement of how accurate the estimate is. • If there are two random variables and the distribution of one is not influenced by the values taken by the other they are independent.

statistical testing? <ul style="list-style-type: none"> • What procedures may be used to analyze situations? • What is linear regression? • What is a null hypothesis? • What are the two most common types of inference? • What is a significance test? 	<ul style="list-style-type: none"> • Type 1, Type 2, and power in significance may be error types. • Chi-square procedures for given situations can test and calculate relevant components and test results from computer outputs. • Linear regression can be used to show how strong the relationship is between two variables. This includes a dependent and an independent variable. • The null hypothesis is that there is no significant difference between identified populations—they can occur only due to error. • Statistical estimation and statistical hypothesis testing are the two most common types of inference. • A significance test assesses the evidence for some claim about the population. Usually, the claim to be tested states that some effect is present in the population. 	
Evidence of Learning		
Formative & Alternative Assessments: <ul style="list-style-type: none"> • Classwork • Performance activities • Population project • Cooperatives • Case studies • Individual student check ins with teacher 	Benchmark & Summative Assessments: <ul style="list-style-type: none"> • Interpreting Data Quiz • Interference Quiz • Unit 6.1 Quiz • Unit 6.2 Quiz • Chapter 6 Assessment • Unit 7.1 Quiz • Unit 7.2 Quiz • Chapter 7 Quiz • Unit 8.1 Quiz • Unit 8.2 Quiz • Chapter 8 Quiz • Case Study (Summative) 	Resources Needed: <ul style="list-style-type: none"> • Desmos Calculator • Textbook

Section X: Unit Reflection

The *Statistics and Probability* instructional team must confer upon the completion of each instructional unit in the *Statistics and Probability* curriculum and rate the degrees to which the instructional units meet performance criteria established by the New Jersey Department of Education using the Unit Reflection Form. Completed unit reflection forms must be submitted to the Department Supervisor for approval upon completion of curriculum implementation with a complementing list of suggested modifications to the *Statistics and Probability* curriculum.

Unit Reflection Form: <i>Algebra II Honors</i>			
Lesson Activities:	Strongly	Moderately	Weakly
Foster student use of technology as a tool to develop critical thinking, creativity, and innovation skills;			
Are challenging and require higher-order thinking and problem-solving skills;			
Allow for student choice;			
Provide scaffolding for acquiring targeted knowledge/skills;			
Integrate modern, global perspectives, especially those regarding diversity, genocide, global issues, and historical ones regarding racial relations;			
Integrate 21 st century skills;			
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills;			
Are varied to address different student learning styles and preferences;			

Are differentiated based on student needs;			
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process;			
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives;			
Provide opportunities for student reflection and self-assessment;			
Provide data to inform and adjust instruction to better meet the varying needs of learners.			