

Pascack Valley Regional High School District

**Pascack Hills High School, Montvale, New Jersey
Pascack Valley High School, Hillsdale, New Jersey**

Course Name: Statistics II

Born On: August, 2017
Previous Revision: August, 2020
Current Revision: August, 2023
Board Approval: 8/28/23

COURSE DESCRIPTION: Statistics II

Statistics II is a half-year, 2.5 credit course that builds on the knowledge and skills students will develop in *Statistics I*. Students will learn to compute probabilities and run simulations for situations where probability cannot be computed. Students will also be able to determine whether a finding is statistically significant through the creation of confidence intervals and hypothesis testing. 11th and 12th grade students enrolled in *Statistics I* and *Statistics II* have the option of earning college credit by registering with William Paterson University at a reduced price but at student expense. Please note that dual enrollment is not required, and that the course will have the same requirements and expectations whether or not students elect to register for college credit.

All mathematics courses in the Pascack Valley Regional High School District *are* designed to address multiple learning styles and needs, and accommodations and modifications are made for students with disabilities, multilingual students, students at risk of failure, gifted and talented students, and students with 504 plans. Students are encouraged to analyze data using tools and models to make valid and reliable claims (9.4.12.IML.3), and various technologies are integrated throughout the curriculum, including scientific calculators, graphing calculators, specialized software, and various Internet programs and subscriptions. These tools enrich the curriculum by giving students' access to additional mathematical representations, and they also help to differentiate by providing students with additional options to engage with mathematical tasks.

The Pascack Valley Regional High School Mathematics Department integrates 21st century life and career skills across its courses, with the dual goal of informing students about careers and fields of study that use mathematics (9.3.ST.5, 9.3.ST-ET.5 and 9.3.ST-SM.2), and helping students improve the quantitative, mathematical, and statistical reasoning skills they will need to be effective producers and consumers of quantitative information in their everyday lives (9.2.12.CAP.2). Mathematics courses address the *New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills*, with a particular emphasis on demonstrating the ability to reflect, analyze and use creative skills and ideas (9.4.12.CI.1), investigating new challenges and opportunities for personal growth, advancement and transition (9.4.12.CI.3), identifying problem-solving strategies used in the development of an innovative product or practice (9.4.12.CT.1), and explaining the potential benefits of collaborating to enhance critical thinking and problem solving (9.4.12.CT.2). Mathematics courses also address the *New Jersey Student Learning Standards for English Language Arts Companion Standards*, with a particular focus on following complex multistep procedures (RST.9-10.3/RST.11-12.3), determining the meaning of symbols, key terms, and other domain-specific words and phrases (RST.9-10.4/RST.11-12.3), and translating quantitative or technical information expressed in words into visual forms and translating information expressed visually or mathematically into words (RST.9-10.7). Similarly, the mathematics department seeks to support students by providing them with opportunities to use quantitative, statistical, and mathematical reasoning in interdisciplinary contexts, in contexts that are meaningful to students, and in contexts that attend to the contributions and perspectives of historically marginalized groups. Specifically, mathematics courses will look to incorporate, when appropriate,

contributions and experiences of people from the LGBTQ+ community and individuals with disabilities, and references to issues of social and cultural relevance, including climate change.

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Content/Topic:	Key Learning Items/Concepts and Pacing Guide	Observable Proficiencies and Skills:	NJSLS	Formative, Summative, Benchmark, and Alternative Assessments	Core Instructional and Supplemental Materials/ Modifications and Accommodations
<p>Unit 4 – Simulations</p> <p>Time: 2-3 weeks (See next column for specific time frames)</p> <p>Content Statement: Students will understand how to create and evaluate simulations of random events.</p> <p>Enduring Understandings: Observational studies are not always practical or available for determining numeric probabilities and expected values.</p> <p>Carefully crafted simulations can effectively determine probabilities and expected values.</p> <p>Random numbers may be</p>	<p>Key learning items/concepts:</p> <p>Design and simulations to match a variety of scenarios (2 days)</p> <p>Conduct a variety of simulations -lab replications (roll actual dice, toss actual coins) (2 days) -random number simulations with tables and technology (4 days)</p> <p>Content-specific modifications and accommodations - use multiple representations and technology to support conceptual understanding - allow calculator use to focus attention on conceptual understanding</p> <p>Interdisciplinary/additional connections</p>	<p>Proficiencies: Students will be able to design and conduct simulations to match scenarios.</p> <p>Students will be able to assess candidate simulations.</p> <p>Students will be able to properly assign random numbers.</p> <p>Skills: Design simulations</p>	<p>NJSLS Content Standards</p> <p>S-IC 2</p> <p>NJSLS SMP</p> <p>MP1. Make sense of problems and persevere in solving them MP2. Construct viable arguments and critique the reasoning of others MP3. Reason abstractly and quantitatively MP4. Model with mathematics MP5. Attend to precision MP6. Use appropriate tools strategically MP7. Look for and make use of structure MP8. Look for and express regularity in repeated reasoning</p> <p>NJSLS for ELA Companion Standards</p>	<p>Students will be assessed regularly throughout this course, with a focus on both conceptual understanding and procedural fluency. Assessment tools may include the following:</p> <ul style="list-style-type: none"> - quizzes (F) - tests (S) - performance tasks (F/S) - projects (S) - homework (F) - discussions (F) - journals (F) - Form A, B, or C benchmark (B) - alternative assessments (A) - conduct simulations (F) 	<p>Selection of primary sources <i>Suggestion(s):</i> Texts: <i>STATS Modeling The World</i> 3rd Edition Bock, Velleman, De Veaux; College Board problems (advanced); Deltamath (remediation, on grade level, and advanced)</p> <p>Resources: - Core Math Tools - Microsoft Excel - Fathom - TI-83/84 Calculator</p> <p>Modifications and Accommodations: Students with special needs: Teachers and support staff will attend to all modifications and accommodations listed in students’ IEPs and 504s. Teachers will incorporate manipulatives, extra time, alternative assessments, scaffolding, spiraling, technology, and flexible grouping to support student learning. Multilingual students: Teachers and</p>

<p>used as surrogates for lab replications of scenarios, but the assignments of the numbers must match the inherent probability of the scenario.</p>	<ul style="list-style-type: none"> - draw on contexts with applications from other fields - draw on contexts with climate change applications - draw on contexts from diverse populations 	<p>Assign random numbers</p> <p>Conduct simulations</p>	<p>RST.9-10.3 RST.9-10.4 RST.9-10.7 RST.11-12.3 RST.11-12.4</p> <p>NJSLS-CLKS - 21st Century Life and Careers 9.4.12.CI.1 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2</p> <p>- Technology 9.4.12.IML.3 9.4.12.TL.2 9.4.12.IML.4 9.4.12.IML.9 9.4.12.IML.10</p> <p>- Career Education 9.2.12.CAP.2 9.3.ST.5 9.3.ST-ET.5 9.3.ST-SM.2</p> <p>NJSLS – CSDT 8.1.12.DA.1 8.1.12.DA.5 8.1.12.DA.6 8.1.12.AP.1 8.2.12.ETW.2</p>		<p>support staff will work to support multilingual students in their first language and in English, providing materials and/or resources to support students’ understanding. Students will be given additional time, as appropriate, and translation tools will be utilized as needed.</p> <p><u>Students at risk of school failure:</u> Formative and summative data will be used to monitor student success, and students at risk of failure will receive additional supports and services, which may include parent consultation, extra help, and differentiation strategies, including small group instruction, group work, scaffolding, and spiraling.</p> <p><u>Gifted and Talented Students:</u> Students who excel in their mastery of course standards will be further challenged with more complex tasks, extensions of concepts and skills, and extended problem solving and critical thinking opportunities.</p>
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<p>Unit 5 – Probability</p> <p>Time: 6-7 weeks (See next column for specific time frames)</p> <p>Content Statement: Students will gain the skills to compute the likelihood of a variety of events.</p> <p>Enduring Understandings: The multiplication and addition rules can allow computation of a variety of likelihoods.</p> <p>Venn and tree diagrams can be used to organize information and aid computation of probability.</p>	<p>Key learning items/concepts:</p> <p>Addition and multiplication rules (5 days)</p> <p>Expected Value calculations and project (6 days)</p> <p>Geometric probability (3 days)</p> <p>Uses of permutations and combinations to compute probability plus binomial probability (7 days)</p> <p>Probability using Venn diagrams and 2-way tables with conditional probability (5 days)</p> <p>Probability trees and conditional probability (5 days)</p> <p>Content-specific modifications</p>	<p>Proficiencies: Students will be able to compute probability in a variety of situations, including conditional probability.</p> <p>Students will be able to compute the expected value of games of chance and warranties or insurance.</p> <p>Skills: Choosing when to apply the multiplication rule and the</p>	<p>NJSLS Content Standards</p> <p>S-CP 1 S-CP 2 S-CP 3 S-CP 4 S-CP 5 S-CP 6 S-CP 7</p> <p>S-MD 1 S-MD 2 S-MD 3 S-MD 4</p> <p>NJSLS SMP</p> <p>MP1. Make sense of problems and persevere in solving them MP2. Construct viable arguments and critique the reasoning of others MP3. Reason abstractly and quantitatively MP4. Model with mathematics MP5. Attend to precision MP6. Use appropriate tools strategically MP7. Look for and make use of structure MP8. Look for and express regularity in repeated reasoning</p>	<p>Students will be assessed regularly throughout this course, with a focus on both conceptual understanding and procedural fluency. Assessment tools may include the following:</p> <ul style="list-style-type: none"> - quizzes (F) - tests (S) - performance tasks (F/S) - projects (S) - homework (F) - discussions (F) - journals (F) - Form A, B, or C benchmark (B) - alternative assessments (A) - project-based expected value computations (S) 	<p>Selection of primary sources <i>Suggestion(s):</i> Texts: <i>STATS Modeling The World</i> 3rd Edition Bock, Velleman, De Veaux; College Board problems (advanced); Deltamath (remediation, on grade level, and advanced)</p> <p>Resources:</p> <ul style="list-style-type: none"> - Core Math Tools - Microsoft Excel - Fathom - TI-83/84 Calculator <p>Modifications and Accommodations: Students with special needs: Teachers and support staff will attend to all modifications and accommodations listed in students' IEPs and 504s. Teachers will incorporate manipulatives, extra time, alternative assessments, scaffolding, spiraling, technology, and flexible grouping to support</p>

<p>Expected Value can be used to give a value to games of chance, warranties and insurance contracts.</p>	<p>and accommodations - use multiple representations and technology to support conceptual understanding - allow calculator use to focus attention on conceptual understanding</p> <p>Interdisciplinary/additional connections - draw on contexts with applications from other fields - draw on contexts with climate change applications - draw on contexts from diverse populations</p>	<p>addition rules</p> <p>Choosing when to use Permutations and Combinations</p> <p>Choosing when to use Venn Diagrams and/or trees to compute probability</p> <p>Organizing information to complete expected value calculations</p>	<p>NJSLS for ELA Companion Standards RST.9-10.3 RST.9-10.4 RST.9-10.7 RST.11-12.3 RST.11-12.4</p> <p>NJSLS-CLKS - 21st Century Life and Careers 9.4.12.CI.1 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2</p> <p>- Technology 9.4.12.IML.3 9.4.12.TL.2 9.4.12.IML.4 9.4.12.IML.9 9.4.12.IML.10</p> <p>- Career Education 9.2.12.CAP.2 9.3.ST.5 9.3.ST-ET.5 9.3.ST-SM.2</p> <p>NJSLS – CSDT 8.1.12.DA.1 8.1.12.DA.5 8.1.12.DA.6 8.1.12.AP.1 8.2.12.ETW.2</p>		<p>student learning.</p> <p>Multilingual students: Teachers and support staff will work to support multilingual students in their first language and in English, providing materials and/or resources to support students’ understanding. Students will be given additional time, as appropriate, and translation tools will be utilized as needed.</p> <p>Students at risk of school failure: Formative and summative data will be used to monitor student success, and students at risk of failure will receive additional supports and services, which may include parent consultation, extra help, and differentiation strategies, including small group instruction, group work, scaffolding, and spiraling.</p> <p>Gifted and Talented Students: Students who excel in their mastery of course standards will be further challenged with more complex tasks, extensions of concepts and skills, and extended problem solving and critical thinking opportunities.</p>
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<p>Unit 6 – Confidence intervals and hypothesis testing</p> <p>Time: 9-10 weeks (See next column for specific time frames)</p> <p>Content Statement: Students will be able to evaluate findings to determine if they are statistically significant.</p> <p>Enduring Understandings: The Central Limit Theorem assures that for a large enough sample size, all sample distributions are normally distributed.</p> <p>Confidence intervals give an expression of likelihood for a stated statistic.</p>	<p>Key learning items/concepts:</p> <p>Explain and demonstrate how the CLT creates normal sampling distributions for proportions or means, predict probabilities of events using samples and the CLT for proportions only (4 days)</p> <p>Create and interpret confidence intervals for proportions (8 days)</p> <p>Conduct hypothesis testing for proportions (8 days)</p> <p>Analyze intervals and hypothesis tests for proportions, including identifying Types I and II errors (4 days)</p> <p>Use CLT to compute std dev and predict probabilities of events using means (4 days)</p>	<p>Proficiencies: Students will use the normal distribution to compute the likelihood of events occurring for proportions and means.</p> <p>Students will be able to provide and explain confidence intervals for proportions and means.</p> <p>Skills: Apply CLT for proportions and means</p>	<p>NJSLS Content Standards</p> <p>S-IC 1 S-IC 4 S-IC 5</p> <p>NJSLS SMP</p> <p>MP1. Make sense of problems and persevere in solving them MP2. Construct viable arguments and critique the reasoning of others MP3. Reason abstractly and quantitatively MP4. Model with mathematics MP5. Attend to precision MP6. Use appropriate tools strategically MP7. Look for and make use of structure MP8. Look for and express regularity in repeated reasoning</p> <p>NJSLS for ELA Companion</p>	<p>Students will be assessed regularly throughout this course, with a focus on both conceptual understanding and procedural fluency. Assessment tools may include the following:</p> <ul style="list-style-type: none"> - quizzes (F) - tests (S) - performance tasks (F/S) - projects (S) - homework (F) - discussions (F) - journals (F) - Form A, B, or C benchmark (B) - alternative assessments (A) - capstone project to tie together the concepts of the CLT, confidence intervals and hypothesis testing 	<p>Selection of primary sources <i>Suggestion(s):</i> Texts: <i>STATS Modeling The World</i> 3rd Edition Bock, Velleman, De Veaux; College Board problems (advanced); Deltamath (remediation, on grade level, and advanced)</p> <p>Resources:</p> <ul style="list-style-type: none"> - Core Math Tools - Microsoft Excel - Fathom - TI-83/84 Calculator <p>Modifications and Accommodations: Students with special needs: Teachers and support staff will attend to all modifications and accommodations listed in students' IEPs and 504s. Teachers will incorporate manipulatives, extra time, alternative assessments, scaffolding, spiraling, technology, and flexible grouping to support</p>

<p>Hypothesis testing allows educated opinions on whether conclusions can be drawn from observations.</p> <p>The t-distribution must be used for intervals and tests on means.</p>	<p>Create and interpret confidence intervals and hypothesis tests for means using the t-distribution (4 days)</p> <p>Create and interpret confidence intervals and hypothesis tests for the difference of two proportions (4 days)</p> <p>Create and interpret confidence intervals and hypothesis tests for the difference of two means (4 days)</p> <p>Content-specific modifications and accommodations</p> <ul style="list-style-type: none"> - use multiple representations and technology to support conceptual understanding - allow calculator use to focus attention on conceptual understanding <p>Interdisciplinary/additional connections</p> <ul style="list-style-type: none"> - draw on contexts with applications from other fields - draw on contexts with climate change applications - draw on contexts from diverse populations 	<p>Create and describe confidence intervals for proportions and means</p> <p>Choose sample size to support a given confidence interval</p> <p>Conduct and analyze hypothesis tests for proportions and means</p> <p>Compare two proportions</p> <p>Compare two means</p>	<p>Standards</p> <p>RST.9-10.3 RST.9-10.4 RST.9-10.7 RST.11-12.3 RST.11-12.4</p> <p>NJSLS-CLKS - 21st Century Life and Careers</p> <p>9.4.12.CI.1 9.4.12.CI.3 9.4.12.CT.1 9.4.12.CT.2</p> <p>- Technology</p> <p>9.4.12.IML.3 9.4.12.TL.2 9.4.12.IML.4 9.4.12.IML.9 9.4.12.IML.10</p> <p>- Career Education</p> <p>9.2.12.CAP.2 9.3.ST.5 9.3.ST-ET.5 9.3.ST-SM.2</p> <p>NJSLS – CSDT</p> <p>8.1.12.DA.1 8.1.12.DA.5 8.1.12.DA.6 8.1.12.AP.1 8.2.12.ETW.2</p>	<p>(S)</p>	<p>student learning.</p> <p>Multilingual students: Teachers and support staff will work to support multilingual students in their first language and in English, providing materials and/or resources to support students’ understanding. Students will be given additional time, as appropriate, and translation tools will be utilized as needed.</p> <p>Students at risk of school failure: Formative and summative data will be used to monitor student success, and students at risk of failure will receive additional supports and services, which may include parent consultation, extra help, and differentiation strategies, including small group instruction, group work, scaffolding, and spiraling.</p> <p>Gifted and Talented Students: Students who excel in their mastery of course standards will be further challenged with more complex tasks, extensions of concepts and skills, and extended problem solving and critical thinking opportunities.</p>
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