

Course: Probability and Statistics Unit 3: One - Sample Inferential Statistics	Year of Implementation: 2026-2027
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Stage One - Desired Results	
Link(s) to New Jersey Student Learning Standards for this course: https://www.state.nj.us/education/cccs/2020/	
● Unit Standards: ○ Content Standards ■ https://www.nj.gov/education/standards/math/ NJSLS - Making Inferences and Justifying Conclusions [S-IC] ● S-IC.A.1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population. ● S-IC.B.4 – Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. ● S-IC.B.5 – Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. ○ 2020 NJSLS Standards: Career Readiness, Life Literacies, and Key Skills Introduction https://www.nj.gov/education/standards/clicks/Docs/2020NJSLS-CLKS.pdf ■ 9.4.12.TL.4 - Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem. ■ 9.4.12.CI.1 – Demonstrate the ability to reflect, analyze, and use creative skills and ideas.	

- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions
- 9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.

○ ***Interdisciplinary Content Standards***

[2020 New Jersey Student Learning Standards Science Grade 9 through Grade 12](#)

- HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

Computer Science and Design Thinking Introduction

<https://www.nj.gov/education/standards/compsci/Docs/2020%20NJSLS-CSDT.pdf>

- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

- *NJ Statutes*: NJ State law mandates the inclusion of the following topics in lesson design and instruction as aligned to elementary and secondary curriculum.

Amistad Law: N.J.S.A. 18A 52:16A-88 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.

Holocaust Law: N.J.S.A. 18A:35-28 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.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 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.

Diversity and Inclusion (N.J.S.A. 18A:35-4.36a) A board of education shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards.

Asian American and Pacific Islanders (AAPI) P.L.2021, c.410 Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416)

For additional information, see

NJ Amistad Curriculum: <https://www.nj.gov/education/amistad/about/>

Diversity and Inclusion: <https://www.nj.gov/education/standards/dei/index.shtml>

- (Sample Activities/ Lessons): <https://www.nj.gov/education/standards/dei/samples/index.shtml>

Asian American and Pacific Islanders:

- [Asian American and Pacific Islander Heritage and History in the U.S.](#)

A Teacher's Guide from EDSITEment offering a collection of lessons and resources for K-12 social studies, literature and arts classrooms that center around the experiences, achievements and perspectives of Asian Americans and Pacific Islanders across U.S. history.

Transfer Goal: Students will be able to independently use their learning to evaluate claims and communicate the uncertainty of conclusions in context

As aligned with LRHSD Long Term Learning Goal(s): <https://www.lrhdsd.org/academics/curriculum>

The Lenape Regional High School District Math program, in alignment with the New Jersey Student Learning Standards for Mathematics, prepares our students for success in college and their careers. Through completing our coursework, our students will be better able to:

1. Problem-Solving: apply and transfer autonomously and collaboratively mathematical concepts and problem-solving techniques to unfamiliar, varied and real-world situations
2. Reasoning: reason abstractly and quantitatively by applying mathematical representations, symbols and estimation techniques when engaging in problem-solving
3. Critical Thinking: construct and effectively communicate valid conclusions and critique the reasoning of others
4. Modeling: demonstrate mastery of concepts by evaluating models that others have constructed or by creating appropriate models of their own
5. Tools: identify the correct tools to solve problems, if applicable
6. Precision: determine an answer's appropriateness as a means of determining its validity, while using proper mathematical notation and units
7. Structure: use multiple representations, critical thinking skills, and prior knowledge to solve problems in new situations
8. Patterns: analyze data and recognize patterns in a variety of situations
9. Habits of Mind: approach new situations with curiosity, persistence, resourcefulness, and confidence; take risks, monitor their progress, accept and learn from setbacks, make adjustments, and reflect on their performance.

Enduring Understandings

Students will understand that. . .

EU 1

confidence intervals provide a range of values that estimate an unknown population parameter and reflect the level of certainty associated with a sample-based statistic.

EU 2

hypothesis testing is a structured process used to evaluate claims about a population by analyzing sample

Essential Questions

- How do confidence intervals use sample data to estimate population values, and what affects their accuracy and usefulness?
- How does hypothesis testing help us make reliable conclusions about a population based on sample data?

data and determining the likelihood that observed results occurred by chance.	
<u>Knowledge</u> Students will know . . . EU 1 • a confidence interval estimates a population parameter using a sample statistic and a margin of error. (S-IC.B.4, 9.4.12.TL.4m S-IC.A.1) • the margin of error depends on the variability in the data, sample size, and confidence level. (S-IC.B.4) • a larger confidence level results in a wider interval, while a larger sample size narrows the interval. (S-IC.B.4, HS-LS2-7) • interpretation of confidence intervals must be in context. (S-IC.B.4, 9.4.12.IML.4, 9.4.12.Cl.1, 8.1.12.DA.5) EU 2 • hypothesis testing is used to evaluate a claim about a population based on sample data. (S-IC.B.5, S-IC.A.1) • the null hypothesis represents a default assumption about a population, while the alternative hypothesis represents a competing claim. (S-IC.B.5, 9.4.12.TL.4) • a p-value measures the strength of evidence against the null hypothesis; a small p-value indicates stronger evidence. (S-IC.B.5)	<u>Skills</u> Students will be able to. . . EU 1 • construct and interpret confidence intervals for population means and proportions using appropriate technology. (S-IC.B.4, 9.4.12.TL.4) • explain how sample size and confidence level impact the width of a confidence interval. (S-IC.B.4m S-IC.A.1) • evaluate real-world claims or reports that use confidence intervals to support conclusions. (S-IC.B.4, 9.4.12.IML.4, HS-LS2-7, 8.1.12.DA.5) • use simulations or bootstrapping to approximate confidence intervals in the absence of a normal distribution. (S-IC.B.4, 9.4.12.Cl.1) EU 2 • state appropriate null and alternative hypotheses for real-world scenarios. (S-IC.B.5) • conduct hypothesis tests for proportions and means using technology, including calculating p-values and test statistics. (S-IC.B.5, 9.4.12.TL.4) • interpret p-values in context to determine whether to reject or fail to reject the null hypothesis. (S-IC.B.5)

- the significance level (α) defines the threshold for rejecting the null hypothesis and affects the likelihood of a Type I error. (S-IC.B.5)
- interpretation of hypothesis testing results in context is essential to creating meaningful and valid conclusions. (S-IC.B.5, 9.4.12.IML.4, [9.4.12.CI.1](#), [8.1.12.DA.5](#), 9.4.12.IML.3)

- justify conclusions drawn from hypothesis tests and recognize the possibility of Type I and Type II errors. (S-IC.B.5, S-IC.A.1)
- critically evaluate how sampling design, variability, and test parameters influence the reliability of conclusions. (S-IC.B.5, 9.4.12.IML.4, [9.4.12.CI.1](#), [8.1.12.DA.5](#), 9.4.12.IML.3)

Stage Two - Assessment

Other Evidence:

- Classroom Summarizers
- Independent Practice
- Self Assessments
- Classroom Assessments

Stage Three - Instruction

Learning Plan: Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer. {place A, M and/or T along with the applicable EU number in parentheses after each statement} All knowledge and skills must be addressed in this section with a corresponding lesson/activity which teaches each concept. The following color codes are used to notate activities that correspond with interdisciplinary connections and 21st Century Life & Career Connections (which involves Technology Literacy): **Red = Interdisciplinary Connection**; **Purple = 21st Century Life & Career Connection**

For example:

- **Activity: Guess the Mystery Mean (A, EU 1)**
- **Activity: Which Way Will the Hershey Kiss Land? (A, EU 1)**
- **Activity: Should Flint Switch to Bottled Water? (M, T, EU 2)**

Suggested Sequence of Learning Activities

- **Activity: Guess the Mystery Mean (A, EU 1)**
- Understand and calculate margin of error for a population mean when the population standard deviation is known (z). (A, EU 1)
- Find and interpret a confidence interval for a population mean when the population standard deviation is known (z). (A, EU 1)
- Determine the minimum sample size required to estimate a population mean with a given margin of error (z). (M, EU 1)
- Understand and calculate margin of error for a population mean when the population standard deviation is unknown (t). (A, EU 1)
- Find and interpret a confidence interval for a population mean when the population standard deviation is unknown (t). (A, EU 1)
- Understand and calculate margin of error for a population proportion. (A, EU 1)
- **Activity: Which Way Will the Hershey Kiss Land? (A, EU 1)**
- Find and interpret a confidence interval for a population proportion. (A, EU 1)
- Determine the minimum sample size required to estimate a population proportion with a given margin of error. (M, EU 1)
- Understand the definitions and five steps of hypothesis testing. (M, EU 2)
- Conduct a hypothesis test for a population mean when the population standard deviation is known using a z-test. (T, EU 2)
- Conduct a hypothesis test for a population mean when the population standard deviation is unknown using a t-test. (T, EU 2)
- **Conduct a hypothesis test for a population mean (z-test) using both the rejection region and/or p-value methods. (T, EU 2)**

- Conduct a hypothesis test for a population mean (t-test) using both the rejection region and/or p-value methods. (T, EU 2)
- Conduct a hypothesis test for a population proportion (z-test) using both the rejection region and/or p-value methods. (T, EU 2)
- Compare and interpret results from confidence intervals and hypothesis testing to evaluate consistency and draw conclusions. (T, EU 1, EU 2)
- Activity: Should Flint Switch to Bottled Water? (M, T, EU 2)

Pacing Guide

<i>Unit #</i>	<i>Title of Unit</i>	<i>Approximate # of teaching days</i>
1	Collect, Model, and Analyze Data	48
2	Probability	53
3	One - Sample Inferential Statistics	21
4	Two - Sample Inferential Statistics	13

Instructional Materials

- TI-Nspire
- Desmos
- <https://www.amstat.org/whats-going-on-in-this-graph>
- <https://slowrevealgraphs.com/>
- [Math Medic](#)

Accommodations

Special Education: The curriculum will be modified as per the Individualized Education Plan (IEP). Students will be accommodated based on specific accommodations listed in the IEP.

Students with 504 Plans: Students will be accommodated based on specific accommodations listed in the 504 Plan.

English Language Learners: Students will be accommodated based on individual need and in consultation with the ELL teacher.

Students at Risk of School Failure: Students will be accommodated based on individual need and provided various structural supports through their school.

Gifted and Talented Students: Students will be challenged to enhance their knowledge and skills through acceleration and additional independent research on the subject matter.