

# Unit 04: Sampling Distributions

Content Area:

Course(s):

Time Period: **Year**

Length: **180**

Status: **Published**

## Unit 4

<b>Unit Title:</b>	Sampling Distributions
<b>Suggested Duration:</b>	<b>3 weeks</b>

## Interdisciplinary Connections

Interdisciplinary Connections
<b>Reading and Writing Companion Standards for History, Social Studies, Science and Technical Subjects</b> <ul style="list-style-type: none"><li>▪ <a href="#">Grades 9-10</a></li><li>▪ <a href="#">Grades 11-12</a></li></ul>
<b>Math Practices:</b> <a href="https://www.nj.gov/education/standards/math/Index.shtml">https://www.nj.gov/education/standards/math/Index.shtml</a>
<b>Science Practices:</b> <a href="https://www.nj.gov/education/standards/science/Index.shtml">https://www.nj.gov/education/standards/science/Index.shtml</a>
Find and paste appropriate <u>Companion Standards or Practices</u> here.

Real world Data will be used as part of each of the Learning Activities. Once the basic concepts and skills are Mastered, each activity and problem will use this knowledge and these skills to connect Mathematics to another discipline.

## Technology Integration

Technology Integration
Northern supports the integration of the <a href="#">SAMR Model</a> : a framework which extends learning through the use of technology. The installation of interactive boards, the purchase of softwares and subscriptions, and the investment in 1:1 laptops and various other instructional technologies are examples of Northern's commitment to enhancing students' learning and preparing the 21st century learner for college and careers.

Extensive use of TI-84, Stapplet, Google Classroom, AP Classroom, Desmos, and Khan Academy.

## **Standard(s) Addressed**

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### **Statistical Practices:**

1. Formulate Questions: Determine an investigative question for a statistical study.
2. Collect Data: Identify and justify methods for collecting data and conducting statistical inference.
3. Analyze Data: Construct representations of data and calculate numerical statistical outputs.
4. Interpret Results: Interpret results and justify conclusions and methods.

### **Course Topics:**

- 2.12 Sampling Distributions and the Central Limit Theorem
- 3.1 Estimators
- 3.2 Sampling Distributions for Sample Proportions
- 3.9 Sampling Distributions for the Difference Between Sample Proportions
- 4.1 Sampling Distributions for Sample Means
- 4.6 Sampling Distributions for the Difference Between Two Sample Means

## **STAGE I Desired Results**

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<b>STAGE I Desired Results</b>
<b><i>Objective (Transfer)</i></b>
<i>Students will be able to independently use their learning to...</i>
<i>This unit applies probabilistic reasoning to sampling, introducing students to sampling distributions of</i>

*statistics they will use when performing inference in Units 6 and 7. Students should understand that sample statistics can be used to estimate corresponding population parameters and that measures of center (mean) and variability (standard deviation) for these sampling distributions can be determined directly from the population parameters when certain sampling criteria are met. For large enough samples from any population, these sampling distributions can be approximated by a normal distribution. Simulating sampling distributions helps students to understand how the values of statistics vary in repeated random sampling from populations with known parameters.*

**Mastery**

**Big Ideas/Understandings**

*Students will understand that...*

**BIG IDEA 1: VARIATION AND DISTRIBUTION (VAR)**

The distribution of measures for individuals within a sample or population describes variation. The value of a statistic varies from sample to sample. How can we determine whether differences between measures represent random variation or meaningful distinctions? Statistical methods based on probabilistic reasoning provide the basis for shared understandings about variation and about the likelihood that variation between and among measures, samples, and populations is random or meaningful.

- VAR-1 Given that variation may be random or not, conclusions are uncertain.

- VAR-6 The normal distribution may be used to model variation.

**BIG IDEA 2: PATTERNS AND UNCERTAINTY (UNC)**

Statistical tools allow us to represent and describe patterns in data and to classify departures from patterns. Simulation and probabilistic reasoning allow us to anticipate patterns in data and to determine the likelihood of errors in inference.

**Essential Questions**

§ How likely is it to get a value this large just by chance?

§ How can we anticipate patterns in the values of a statistic from one sample to another?

<p>- UNC-3 Probabilistic reasoning allows us to anticipate patterns in data.</p>	
<b>Acquisition</b>	
<p><i>Students will know . . .</i></p> <p><a href="#">See “essential knowledge” in each topic of College Board CED for Unit 5</a></p>	<p><u><a href="#">Students will be skilled at . . .</a></u></p> <p>The probabilities associated with the normal distribution are what statisticians use to justify claims about populations they’ll never be able to measure directly. Revisiting these properties early in Unit 5 will reinforce why sampling distributions allow statisticians to approximate parameters for the population of interest. Sketching, shading, and labeling a normal distribution aids in understanding the probability being calculated.</p> <p>Students should practice creating graphical representations, labeling the mean, and marking off values 1, 2, and 3 standard deviations from the mean. Students often struggle to interpret parameters of probability distributions in context, simply describing features of the graph rather than explicitly connecting those features to the situation described in the problem.</p> <p>Teachers can remind students that context is about a variable (“tip amounts,” for example), not just the units (dollars). It’s also critical that students explicitly show that the appropriate conditions have been verified, and that they avoid using nonspecific language like “it” in their interpretations. Using an error analysis strategy with sample responses can help familiarize students with these issues before they make similar mistakes</p>

**STAGE II Assessment Evidence**

STAGE II Assessment Evidence	
Evaluation	Assessments

Chapter evaluations in the format of AP exam (free responses and multiple choice based on chapter alignment of The Practice of Statistics

Formative assessments will be based on FRQs from previous AP exams on topics at regular intervals in the chapter/unit.

Chapter 7: Sampling Distributions

### Modifications

How are the evaluations/assessments modified/accelerated? (i.e.: alternate assessment). All courses follow a [balanced assessment system](#) with Practice, Assessments, Evaluations.

Modifications on 504 plans may be submitted at ([SSD](#)), prior to testing. Both exclusion **statements** and **extensions** exist for each standard to accommodate different paces.

## STAGE III Learning Plan

### STAGE III Learning Plan

#### Organize plan by weeks

[Day 1: What is a Sampling Distribution? \(TPS Lesson 7.1 Day 1\)](#)

[Day 2: What is a Sampling Distribution? cont'd \(TPS Lesson 7.1 Day 2\)](#)

Day 3: Quiz 7.1

[Day 4: Sampling Distribution of a Sample Proportion \(TPS Lesson 7.2 Day 1\)](#)

[Day 5: Sampling Distribution of a Difference between Two Proportions \(TPS Lesson 7.2 Day 2\)](#)

Day 6: Quiz 7.2

[Day 7: Sampling Distribution of a Sample Mean \(TPS Lesson 7.3 Day 1\)](#)

[Day 8: The Central Limit Theorem \(TPS Lesson 7.3 Day 2\)](#)

[Day 9: Sampling Distribution of a Difference between Two Means \(TPS Lesson 7.3 Day 3\)](#)

Day 10: Quiz 7.3

Day 11: Review

Day 12: Chapter 7 Test

### Modifications

How are the activities modified/differentiated? (i.e.: abridged text)

Modifications on 504 plans may be submitted at ([SSD](#)), prior to testing. Both exclusion **statements** and **extensions** exist for each standard to accommodate different paces.

## Specific Resources for Unit

<b>Specific Resources for Unit</b>
<b>Attached Affirmative Action Compliance Checklist</b>

[LP: AP Chapter 7 | StatsMedic](#)

[Lesson Plans for CED Unit 5: Sampling Distributions](#)

[Sampling distributions | AP® Statistics | Math](#)

AP Classroom

## Diversity, Equity, & Inclusion

<b><a href="#">Diversity, Equity &amp; Inclusion</a></b>
Provide a brief description of how this unit addresses DE&I.

## Career Readiness (9.2), Life Literacies and Key Skills (9.4) Standards

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.2	Attend to financial well-being.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

## Climate Change Education

<b><a href="#">ClimateChange Education</a></b>
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Enduring Understandings/Core Ideas	Performance Expectations
Math and ELA- Provide a brief description of a lesson or activity that relates to Climate Change. All other Content Team copy and paste the <u>Core Idea and Performance Expectation</u> from NJDOE link above.	