Unit 07: Exploring Two-variable Data

Content Area:
Course(s):
Time Period: **Year**
Length: **180**
Status: **Published**

Unit 7

Unit Title:	Exploring Two-variable Data
Suggested Duration:	**Two weeks**

Interdisciplinary Connections

Interdisciplinary Connections
Reading and Writing Companion Standards for History, Social Studies, Science and Technical Subjects ▪ Grades 9-10 ▪ Grades 11-12 **Math Practices**: https://www.nj.gov/education/standards/math/Index.shtml **Science Practices**: https://www.nj.gov/education/standards/science/Index.shtml Find and paste appropriate Companion Standards or Practices 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 SAMR Model: 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

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:

5.1 Graphical Representations Between Two Quantitative Variables

5.2 Correlation

5.3 Linear Regression Models

5.4 Residuals

5.5 Least-Squares Regression

STAGE I Desired Results

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Objective (Transfer)
Students will be able to independently use their learning to… *Building on Unit 1, students will explore relationships in two-variable categorical or quantitative data sets. They will use graphical and numerical methods to investigate an association between two categorical variables. Skills learned while working with two-way tables will transfer to calculating probabilities in Unit 4. Students will describe form, direction, strength, and unusual features for an association between two quantitative variables. They will assess correlation and, if appropriate, use a linear model to predict values of the response variable from values of the explanatory variable. Students will interpret the least-squares*

regression line in context, analyze prediction errors (residuals), and explore departures from a linear pattern.

Mastery	
Big Ideas/Understandings *Students will understand that…*	Essential Questions
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.	§ Does the fact that the number of shark attacks increases with ice cream sales necessarily mean that ice cream sales cause shark attacks? § How might you represent incomes of individuals with and without a college degree to help describe similarities and/or differences between the two groups?
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.	
BIG IDEA 3: DATA-BASED PREDICTIONS, DECISIONS, AND CONCLUSIONS (DAT) Data-based regression models describe	

relationships between variables and are a tool for making predictions for values of a response variable. Collecting data using random sampling or randomized experimental design means that findings may be generalized to the part of the population from which the selection was made. Statistical inference allows us to make data-based decisions.	
Acquisition	
Students will know . . . See "essential knowledge" in each topic of College Board CED for Unit 2	*Students will be skilled at . . .* In Unit 2, students are looking at the relationship between variables. The ability to calculate and describe statistical values, such as a conditional relative frequency or the slope of a regression line, is critical for data analysis because students must be able to analyze patterns before drawing conclusions about the data. Students should be allowed to perform their calculations using technology to help them become more aware of procedural errors. Students will also need practice translating output from technology ("calculator speak") into appropriate statistical language. As any statistician will assert, a numerical calculation is only as good as one's ability to interpret what it means in the real world. Rather than just reporting values from their calculations, students must be able to connect their numerical results to the scenario's context and formulate a verbal response that makes that connection clear. Teachers can model good communication and provide high-quality feedback to help students use accurate statistical language when comparing side-by-side bar graphs, for example, and to avoid common errors in reasoning, such as using the word "line" to explain why a relationship is linear.

STAGE II Assessment Evidence

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Evaluation	Assessments

Chapter evaluations in the format of AP exam (free responses and multiple choice based on chapter alignment of The Practice of Statistics Chapter 3: Describing Relationships	Formative assessments will be based on FRQs from previous AP exams on topics at regular intervals in the chapter/unit.

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: Lesson 3.1 - Scatterplots Day 2: Lesson 3.1 - Correlation Day 3: Quiz 3.1 Day 4: Lesson 3.2 - Regression Line, Prediction, & Residuals Day 5: Lesson 3.2 - Least Squares Regression & Residual Plots Day 6: Lesson 3.2 - Standard Deviation of Residuals & r-squared Day 7: Lesson 3.2 - Outliers for Scatterplots Day 8: Quiz 3.2 Day 9: Chapter 3 Review & Barbie Bungee Finale Day 10: Chapter 3 Review Day 11: Chapter 3 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

Specific Resources for Unit
Attached Affirmative Action Compliance Checklist

LP: AP Chapter 3 | StatsMedic
Exploring bivariate numerical data | AP®□ Statistics | Math
AP Classroom

Diversity, Equity, & Inclusion

Diversity, Equity &Inclusion
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

ClimateChange Education	
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 Core Idea and Performance Expectation from NJDOE link above.