Abington Heights School District
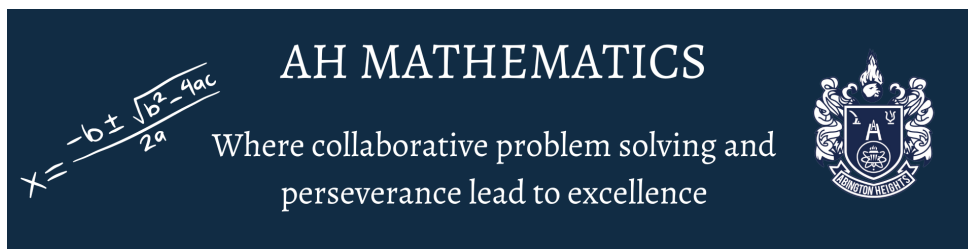# Statistics AP Curriculum

In Statistics AP, students develop their numeracy skills through the following areas of study:

1. Exploring One-Variable Data
2. Exploring Two-Variable Data
3. Collecting Data
4. Probability, Random Variables, and Probability Distributions
5. Sampling Distributions
6. Inference for Categorical Data: Proportions
7. Inference for Quantitative Data: Means
8. Inference for Categorical Data: Chi-Square
9. Inference for Quantitative Data: Slopes

Board Approval Date: June 7, 2023
Adoption: 2023 - 2024 SY
Review Date:

AH MATHEMATICS

Where collaborative problem solving and perseverance lead to excellence

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Abington Heights Math Framework

Stakeholders	Actions
Students	★ Engage in mathematical discussions, share their ideas openly, be inquisitive, seek to understand and learn more about mathematical concepts, and try their best daily. ★ Exhibit creativity and curiosity in problem solving individually and collaboratively. ★ Persevere in engaging and challenging daily mathematical practice. ★ Come prepared to learn every day.
Teachers	★ Create a safe and collaborative classroom environment where students feel vested in a shared vision for mathematical excellence. ★ Develop high quality instruction that meets the needs of all learners through differentiation. ★ Use a variety of 21st century methodologies to advance learning. ★ Partner with parents and guardians to support student success. ★ Establish a collaborative community within the building and amongst grade levels to ensure a cohesive level of instruction.
Building Leaders	★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores ○ Knowledgeable about program and grade level standards ○ Ensure consistent and equal access to high-quality instructional materials and resources, building. ★ Be partners with teachers, students and families: ○ Provide guidance and support to the mathematical community. ○ Understand needs of teachers, students and families. ★ Trust the educators to make professional decisions based on program, student, and district needs.
Central Admin	★ Effectively communicate to the school board and community specific areas of need and how to support teachers and building leaders in a quest for mathematical excellence ★ Deeply understand the needs of teachers, students, the instructional materials being used, programs being implemented, and the expectations for state-level assessment scores ○ Have a common metric for mathematical excellence. ○ Ensure consistent and equal access to high-quality instructional materials and resources, district. ○ Re-examine best practices/curriculum routinely (6 years). ★ Support a culture of collaboration between the other stakeholder groups to maintain the standard of excellence of the Abington Heights ★ Trust the educators to make professional decisions based on program, student, and district needs.
Parents/ Community	★ Be a strong support system and contribute by building a positive math community for students. ★ Encourage a positive math mindset. ★ Have conversations with their children about school and ask what they are learning about in school. ★ Be open, receptive to the district's ideas about student learning and reach out to teachers/school to learn more about how they can support. ★ Trust the educators to make professional decisions based on program, student, and district needs.
School Board	★ Provide the fiscal resources to support: ○ Highly qualified professionals for mathematics ○ High-quality instructional materials ○ Effective and efficient math interventions for remediation ○ Professional development for math content and instructional practices ★ Trust the educators to make professional decisions based on program, student, and district needs.

Statistics AP Scope and Sequence

Month	Unit	Estimated Number of Weeks
September	Exploring & Understanding Data	4
October	Exploring Relationships Between Variables	4
November	Exploring Relationships Between Variables	1
	Gathering Data	3
December	Gathering Data	2
	Randomness & Probability	2
January	Randomness & Probability	3
February	From The Data At Hand To The World At Large	4
March	From The Data At Hand To The World At Large	2
	Learning About The World	2
April	Learning About The World	1
	Inferences When Variables Are Related	2
	AP Exam Prep	1
May	AP Exam Prep	1
	Post-AP Exam Summary Activities	3
June	Post-AP Exam Summary Activities	1

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
EXPLORING & UNDERSTANDING DATA	What is statistics, and why should we study it? What are the best methods to display and describe categorical data? What are the best methods to display and describe quantitative data? How do we use and interpret statistical summaries to describe data sets? What measures of center and spread are most appropriate to use when describing a distribution? Why is the normal distribution essential to the study of statistics?	Stats Starts Here Displaying & Describing Categorical Data Displaying & Summarizing Quantitative Data Understanding & Comparing Distributions The Standard Deviation as a Ruler & the Normal Model	Categorize types of variables Construct, evaluate, and interpret categorical data displays Evaluate and compare distributions using shape, center, spread, unusual features, and context Construct, evaluate, and interpret quantitative data displays Compare distributions using histograms and boxplots Compare data points in different distributions using standardized z-scores	CC.2.4.HS.B.1 CC.2.4.HS.B.2 CC.2.4.HS.B.4 CC.2.4.HS.B.5	5 W's Review Worksheet Categorical Data Review Worksheet Quantitative Data Review Worksheet Comparing Distributions Worksheet Comparing ACT & SAT Scores Worksheet Normal Distribution Calculator Functions Review Worksheet Unit I review exercises AP Classroom Multiple Choice assignment Unit I Free Response Question Assignment	Chapter homework assignments Classwork review exercises Unit I review exercises AP Classroom Multiple Choice assignment Unit I Free Response Question Assignment Chapters 1 & 2 Quiz Chapter 3 Quiz Chapter 4 Quiz Chapter 5 Quiz Unit I Test

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
EXPLORING & UNDERSTANDING DATA (continued)	Does the data always lead to the truth? Is all data created equal?		Shift and rescale data, and evaluate the properties of such with measures of center and variation Calculate and interpret area under a Normal model (probability) using technology Calculate and interpret Normal model cut points using technology		Chapter PowerPoints Chapter homework assignments	
EXPLORING RELATIONSHIPS BETWEEN VARIABLES	How can we describe the relationship between two quantitative variables? How is linear regression useful in describing a relationship between two quantitative variables?	Scatterplots, Association, and Correlation Linear Regression Regression Wisdom Re-expressing Data: Get It Straight!	Describe associations through scatterplots (direction, form, strength, outliers) Calculate and interpret the correlation coefficient and R^2 Differentiate between correlation and causation	CC.2.1.HS.F.3 CC.2.4.HS.B.3	Correlation, Regression, Prediction Review Worksheet NBA & MLB Association Activity Distance & Ticket Price Scatterplot Worksheet Height & Shoe Size Correlation Activity	Chapter homework assignments Classwork review exercises Unit II review exercises AP Classroom multiple choice assignment

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
EXPLORING RELATIONSHIPS BETWEEN VARIABLES (continued)	When is re-expression useful, and why do we use it?		Compute and interpret a least squares regression line by hand and using technology Determine leverage and influential points on a scatterplot Re-express data to fit a more linear pattern using the Ladder of Powers		Outliers, Influence, Leverage Review Re-expressing Data Review Worksheet Re-expressing Data Predictions Worksheet Unit II review exercises AP Classroom Multiple Choice assignment Unit II Free Response Question Assignment Chapter PowerPoints Chapter homework assignments	Unit II Free Response Question Assignment Height & Shoe Size Correlation Activity Chapter 6 Quiz Chapter 7 Quiz Chapter 8 Quiz Chapter 9 Quiz Unit II Test

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
GATHERING DATA	How can we use simulations to model ideas of randomness? What makes a sampling method unbiased? What characteristics compose a well designed experiment and observational studies? How does the data produced in an experiment or observational study determine the different conclusions that can be made? Is all data created equal?	Understanding Randomness Sample Surveys Experiments & Observational Studies	Build a simulation to represent the outcomes of real events Construct sample surveys using a variety of sampling frames to reduce or eliminate bias (simple random sample, stratified, cluster, multistage, systematic) Evaluate sampling frames for bias, classify bias by type (voluntary response, convenience sample, undercoverage, nonresponse, response), and suggest methods to correct the bias		Randomness Simulation (Pick a Number) Basketball Shot Simulation Activity Simulation Review Worksheet Stratified vs. Cluster Sampling Worksheet Identifying Sampling Methods Worksheet Farming Simple Random Sample & Stratification Worksheet Experimental Design Worksheet Unit III review exercises AP Classroom Multiple Choice assignment	Chapter homework assignments Classwork review exercises Unit III review exercises AP Classroom multiple choice assignment Unit III Free Response Question Assignment Chapter 10 Quiz Chapter 11 Quiz Chapter 12 Quiz Unit III Test Randomness Simulation (Pick a Number) Basketball Shot Simulation Farming Simple Random Sample & Stratification Simulation

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
GATHERING DATA (continued)			Construct useful observational studies and experiments, including the random assignment of subjects, control groups, replication, blocking, and blinding Evaluate observational studies and experiments for poor experimental design and suggest methods to correct the poor design		Unit III Free Response Question Assignment Chapter PowerPoints Chapter homework assignments	
RANDOMNESS & PROBABILITY	How can we use simulations to model ideas of randomness? How can we use probability to model real-life scenarios? How can we base decisions on chance?	From Randomness to Probability Probability Rules! Random Variables Probability Models	Differentiate between the types of probability (theoretical, statistical, subjective)	CC.2.4.HS.B.6 CC.2.4.HS.B.7	Probability Concepts Worksheet #1 Probability Concepts Worksheet #2 Conditional Probability Practice Worksheet	Chapter homework assignments Classwork review exercises Unit IV review exercises AP Classroom multiple choice assignment

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
RANDOMNESS & PROBABILITY (continued)	Is anything in nature truly random?		Apply basic concepts of probability (range of probabilities, compliments) to compute probabilities Compute probabilities using the addition and multiplication rules Differentiate between disjoint and join events (addition rule), and independent and dependent events (multiplication rule) Determine if two events are disjoint or not, and independent or not Compute conditional probabilities		Social Media Probability Activity Practice with Tree Diagrams Worksheet Discrete Random Variables Worksheet #1 Discrete Random Variables Worksheet #2 Binomial Distribution Worksheet Binomial & Geometric Distribution Worksheet Flipping Coin Simulation Flipping Tack Simulation (Part I) Unit IV review exercises AP Classroom Multiple Choice assignment	Unit IV Free Response Question Assignment Chapter 13 Quiz Chapter 14 Quiz Chapter 15 Quiz Chapter 16 Quiz Unit IV Test Flipping Coin Simulation Flipping Tack Simulation (Part I)

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
RANDOMNESS & PROBABILITY (continued)			Evaluate the expected value and standard deviation of discrete random variables Compute probabilities, mean, and standard deviation with the geometric probability model by hand and using technology Compute probabilities, mean, and standard deviation with the binomial probability model by hand and using technology		Unit IV Free Response Question Assignment Chapter PowerPoints Chapter homework assignments	
FROM THE DATA AT HAND TO THE WORLD AT LARGE	What is the difference between a statistic and a parameter? How can modeling predict the future?	Sampling Distribution Models Confidence Intervals for Proportions Testing Hypotheses About Proportions	Understand the appropriate times to use sampling distribution models, and compute corresponding probabilities and standard deviations with accuracy by		Central Limit Theorem Practice Worksheet 1-Proportion CI Practice Worksheet 1-Proportion HT Practice Worksheet	Chapter homework assignments Classwork review exercises Unit V review exercises

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
FROM THE DATA AT HAND TO THE WORLD AT LARGE (continued)	How does the normal distribution apply to the real world? Is it reasonable to think that different people require different amounts of convincing? How is statistical inference used to draw conclusions from data? How is probability used to express the strength of our conclusions? To what extent should decisions be made based on chance? What does it mean to make an inference? What makes an argument statistically convincing?	More About Tests and Intervals Comparing Two Proportions	applying the Central Limit Theorem Compute and interpret a confidence interval for one proportion with varied levels of confidence State appropriate null and alternative hypotheses in conducting a hypothesis test Compute and interpret the result of a hypothesis test for one proportion with varied alpha values Accurately state and interpret Type I and Type II errors in hypothesis testing		More About Testing Worksheet Working with 2-Proportions Worksheet Flipping Tack Simulation (Part II) Unit V review exercises AP Classroom Multiple Choice assignment Unit V Free Response Question Assignment Chapter PowerPoints Chapter homework assignments	AP Classroom multiple choice assignment Unit V Free Response Question assignment Chapter 17 Quiz Chapter 18 Quiz Chapter 19 Quiz Chapter 20 Quiz Chapter 21 Quiz Unit V Test Flipping Tack Simulation (Part II)

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
FROM THE DATA AT HAND TO THE WORLD AT LARGE (continued)	Is all data created equal?		Compute and interpret a confidence interval comparing two proportions with varied levels of confidence Compute and interpret the result of a hypothesis test comparing two proportions with varied alpha values			
LEARNING ABOUT THE WORLD	Is it reasonable to think that different people require different amounts of convincing? How is statistical inference used to draw conclusions from data? How is probability used to express the strength of our conclusions? To what extent should decisions be made based on chance?	Inferences About Means Comparing Means Paired Samples & Blocks	Compute and interpret a confidence interval for a mean with varied levels of confidence Compute and interpret the result of a hypothesis test for a mean with varied alpha values		1-Mean CI & HT Practice Worksheet Student Ages Simulation Activity (Part I) Student Ages Simulation Activity (Part II) 2-Mean CI & HT Practice Worksheet Paired Mean CI & HT Practice Worksheet	Chapter homework assignments Classwork review exercises Unit VI review exercises AP Classroom multiple choice assignment Unit VI Free Response Question Assignment

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
LEARNING ABOUT THE WORLD (continued)	What does it mean to make an inference? What makes an argument statistically convincing? Is all data created equal?		Compute and interpret a confidence interval comparing two means with varied levels of confidence Compute and interpret the result of a hypothesis test comparing two means with varied alpha values Compute and interpret a confidence interval comparing paired samples with varied levels of confidence Compute and interpret the result of a hypothesis test comparing paired samples with varied alpha values		Unit VI review exercises AP Classroom Multiple Choice assignment Unit VI Free Response Question Assignment Chapter PowerPoints Chapter homework assignments	Chapter 22 Quiz Chapter 23 Quiz Chapter 24 Quiz Unit VI Test Student Ages Simulation (Part I) Student Ages Simulation (Part II)

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
INFERENCES WHEN VARIABLES ARE RELATED	How can we verify that two variables are Independent? What does it mean to make an inference? What makes an argument statistically convincing? Is all data created equal?	Comparing Counts Inferences for Regression	Differentiate between the three types of chi-square tests (goodness-of-fit, homogeneity, independence) and choose the appropriate test to conduct Compute and interpret a chi-square goodness-of-fit test Compute and interpret a chi-square test of homogeneity Compute and interpret a chi-square test of independence Examine and interpret the standardized residuals of each cell in the chi-square matrix Compute and interpret the result		Chi-Square Tests Worksheet #1 Chi-Square Tests Worksheet #2 Correlation & Regression Review Worksheet Linear Regression Worksheet Hypothesis Testing Review Unit VII review exercises AP Classroom Multiple Choice assignment Unit VII Free Response Question Assignment Chapter PowerPoints Chapter homework assignments	Chapter homework assignments Classwork review exercises Unit VII review exercises AP Classroom multiple choice assignment Unit VII Free Response Question Assignment Chapter 25 Quiz Chapter 26 Quiz Unit VII Test Hypothesis Testing review

	Essential Questions	Content	Skills	[PA Core Standards](#)	Activities	Assessment/ Evidence of Learning
INFERENCES WHEN VARIABLES ARE RELATED (continued)			of a hypothesis test with a least squares regression line			
AP EXAM PREP	All essential questions from throughout the year	AP Exam Review	Successfully interpret and complete applicable practice AP Statistics exam problems Review knowledge gained throughout the year		AP Exam review packet AP Practice Exam	AP Exam review packet AP Practice Exam
POST-AP EXAM SUMMARY ACTIVITIES	All essential questions from throughout the year	All content areas from throughout the year	Design an appropriate study or experiment, completed with a solid sampling frame and free of bias Summarize study or experiment data using appropriate graphical displays, summary statistics, and verbal descriptions		Course Summary Project	Course Summary Project

	Essential Questions	Content	Skills	PA Core Standards	Activities	Assessment/ Evidence of Learning
POST-AP EXAM SUMMARY ACTIVITIES (continued)			Make inferences on real-world data using confidence intervals and hypothesis tests Reach appropriate mathematical conclusions Write a professional, mathematical report on their findings Present their findings to the class			