Chagrin Falls Schools
Curriculum Map
Grade Level/Subject:
AP Statistics

Date Range	Unit	Standards College Board Standards Ohio Statistics and Probability Standards	Key Vocabulary	Assessment	Resources	Student Learning Objectives (SLO)
Mid August till first week of September	4	2A. Overview of methods of data collection 2B. Planning and conducting surveys 2C. Planning and conducting experiments 2D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments and surveys **S.IC.3** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **S.IC.6** Evaluate reports based on data.	Population Census Sample Convenience Sample Bias Voluntary Response Sample Random Sampling Simple Random Sample Stratified Random Sample Cluster Sample Undercoverage Nonresponse Observational Study Experiment Confounding Treatment Experimental Units Subjects Random Assignment Completely Randomized Design Double Blind Statistically Significant Randomized Block Design Matched Pairs Design	Formal: 4.1 Quiz 4.2 Quiz Chapter 4 Team Test Chapter 4 Individual Test Informal: Khan Assignments Suggested Book Assignments FRAPPY's Group Activities: Sampling Sunflowers Sampling the Federalist Papers	The Practice of Statistics 5E Khan Academy	1. Identify characteristics of a well-designed and well-conducted survey 2. Define populations, samples and random selection 3. Identify sources of bias in sampling and surveys 4. Identify sampling methods, including simple random sampling, stratified random sampling and cluster sampling 5. Identify characteristics of a well-designed and well-conducted experiment 6. Identify treatments, control groups, experimental units, random assignments and replication 7. Identify sources of bias and confounding, including placebo effect and blinding 8. Conduct a completely randomized design 9. Conduct a randomized block design, including matched pairs design
September 7-September 25	1	1A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot) 1B. Summarizing distributions of univariate data 1C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)	Individuals Variables Categorical Variables Quantitative Variables Distribution Pie Chart Bar Graph	1.1 Quiz 1.2 Quiz Chapter 1 Team Test Chapter 1 Individual Test	The Practice of Statistics 5E Khan Academy	1. Identify center and spread 2. Identify clusters and gaps 3. Identify outliers and other unusual features 4. Identify shape 5. Measuring center: median, mean 6. Measuring spread: range, interquartile range, standard deviation

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		S.ID.1 Represent data with plots on the real number line (dot plotsG, histograms, and box plots) in the context of real-world applications using the GAISE model **S.ID.2** In the context of real-world applications by using the GAISE model, use statistics appropriate to the shape of the data distribution to compare center (median and mean) and spread (mean absolute deviationG, interquartile rangeG, and standard deviation) of two or more different data sets. **S.ID.3** In the context of real-world applications by using the GAISE model, interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). **S.ID.4** Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	Marginal Distribution Conditional Distribution Segmented Bar Graph Association Dotplot Symmetric Skewed Stemplot Histogram Mean Median Standard Deviation Range IQR Outlier Rule 5 Number Summary Variance	Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities		7. Measuring position: quartiles, percentiles, standardized scores (z-scores) 8. Using boxplots 9. The effect of changing units on summary measures 10. Comparing center and spread: within group, between group variation 11. Comparing clusters and gaps 12. Comparing outliers and other unusual features 13. Comparing shapes
September 26-October 12	2	3C. The normal distribution **S.MD.4** Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.	Percentile Cumulative Relative Frequency Graph Standardized Score (Z-Score) Density Curve Normal Distribution Empirical Rule The Standard Normal Table Normal Probability Plot	Formal: 2.1 Quiz Chapter 2 Team Test Chapter 2 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Khan Academy	1. Identify and utilize properties of the normal distribution 2. Use tables of the normal distribution 3. Use the normal distribution as a model for measurements

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October 15-October 31	5	3A. Probability **S.IC.2** Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. **S.CP.1** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). **S.CP.2** Understand that two events A and B are independent if and only if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. **S.CP.3** Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **S.CP.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. **S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. ***S.CP.6*** *Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.* ***S.CP.7*** *Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.* ***S.CP.8*** *Apply the general Multiplication Rule in a uniform probability modelG, P(A and B) = P(A)·P(B|A) =*	Probability Simulation Sample Space Probability Model Event Mutually Exclusive Venn Diagram Conditional Probability General Multiplication Rule Independent Events Multiplication Rule for Independent Events	Formal: 5.1 Quiz Chapter 5 Team Test Chapter 5 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Khan Academy	1. Interpreting probability, including long-run relative frequency interpretation 2. Articulate "Law of Large Numbers" concept 3. Apply the addition rule, multiplication rule, conditional probability and independence 4. Compute discrete random variables and their probability distributions, including binomial and geometric 5. Simulate random behavior and probability distributions 6. Compute and interpret mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable

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		P(B)·P(A|B), and interpret the answer in terms of the model. ***S.CP.9*** *Use permutations and combinations to compute probabilities of compound events and solve problems.* **S.MD.5** Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. **a.** Find the expected payoff for a game of chance. **b.** Evaluate and compare strategies on the basis of expected values. **S.MD.6** Use probabilities to make fair decisions, e.g., drawing by lots, using a random number generator. **S.MD.7** Analyze decisions and strategies using probability concepts, e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.				
November 1 - November 14	7	3D. Sampling distributions	Parameter Statistic Sampling Variability Sampling Distribution Unbiased Estimator Variability of a Statistic Normal Approximation Central Limit Theorem	Formal: 7.1 Quiz Chapter 7 Team Test Chapter 7 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Khan Academy	1. Describe attributes of sampling distribution of a sample proportion 2. Describe attributes of sampling distribution of a sample mean 3. Central Limit Theorem 4. Describe attributes of sampling distribution of a difference between two independent sample proportions 5. Describe attributes of sampling distribution of a difference between two independent sample means 6. Simulate of sampling distributions 7. Describe attributes of t-distribution 8. Describe attributes of chi-square distribution
November 15-December 6	8	4A. Estimation (point estimators and confidence intervals) **S.IC.4** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error	Point Estimator Point Estimate % Confidence Level	Formal: 8.1 Quiz	The Practice of Statistics 5E Khan Academy	1. Estimating population parameters and margins of error

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		through the use of simulation models for random sampling.	% Confidence Interval Standard Error Critical Value t-Distribution Degrees of Freedom Standard Error of the Sample Mean One-Sample t-Interval Margin of Error	Chapter 8 Team Test Chapter 8 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities		2. Properties of point estimators, including unbiasedness and variability 3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals 4. Large sample confidence interval for a proportion 5. Large sample confidence interval for a difference between two proportionn 6. Confidence interval for a mean 7. Confidence interval for a difference between two means (unpaired and paired) 8. Confidence interval for the slope of a least-squares regression line
December 7-December 20	9	4B. Tests of significance **S.IC.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	Null Hypothesis Alternative Hypothesis One Sided Alternative Hypothesis Two Sided Alternative Hypothesis P-Value Statistically Significant Type 1 Error Type 2 Error Test Statistic Power One-Sample t-Test for a Mean Paired Data	Formal: 9.1 Quiz Chapter 9 Team Test Chapter 9 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Khan Academy	1. Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power 2. Large sample test for a proportion 3. Large sample test for a difference between two proportions 4. Test for a mean 5. Test for a difference between two means (unpaired and paired) 6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables) 7. Test for the slope of a least-squares regression line
Early to Mid January	10	4A. Estimation (point estimators and confidence intervals) 4B. Tests of significance **S.IC.1** Understand statistics as a process for making inferences	2 Sample z-Interval for p1-p2 Pooled Sample Proportion	Formal: 10.1 Quiz 10.2 Quiz Chapter 10 Team Test	The Practice of Statistics 5E Khan Academy	1. Describe the shape, center, and spread of the sampling distribution of $\hat{p}_1 - \hat{p}_2$. 2. Determine whether the conditions are met for doing inference about $p_1 - p_2$.

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Mid January to Late January		about population parameters based on a random sample from that population. **S.IC.5** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between sample statistics are statistically significant.	2 Sample z-Test for p1-p2 2 Sample t Statistic 2 Sample t-Interval for mu1-mu2 2 Sample t-Test for mu1-mu2	Chapter 10 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities		3. Construct and interpret a confidence interval to compare two proportions. 4. Perform a significance test to compare two proportions. 5. Describe the shape, center, and spread of the sampling distribution of $\bar{x}_1 - \bar{x}_2$. 6. Determine whether the conditions are met for doing inference about $\mu_1 - \mu_2$. 7. Construct and interpret a confidence interval to compare two means. 8. Perform a significance test to compare two means. 9. Determine when it is appropriate to use two-sample t procedures versus paired t procedures.
Early February to Mid February	11	4B. Tests of significance	One Way Table Chi Square Test for Goodness of Fit Observed Expected Chi Square Test Statistic Chi Square Distribution Chi Square for Homogeneity Chi Square Test for Independence	Formal: 11.1 Quiz 11.2 Quiz Chapter 11 Team Test Chapter 11 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Kahn Academy	1. State appropriate hypotheses and compute expected counts for a chi-square test for goodness of fit. 2. Calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test for goodness of fit. 3. Perform a chi-square test for goodness of fit. 4. Conduct a follow-up analysis when the results of a chi-square test are statistically significant. 5. Compare conditional distributions for data in a two-way table. 6. State appropriate hypotheses and compute expected counts for a chi-square test based on data in a two-way table. 7. Calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test based on data in a two-way table. 8. Perform a chi-square test for homogeneity. 9. Perform a chi-square test for independence.

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						10. Choose the appropriate chi-square test.
Mid February to End of February	3	D . Exploring bivariate data 1D . Analyzing patterns in scatterplots 2D . Correlation and linearity 3D. Least-squares regression line 4D. Residual plots, outliers and influential points **S.ID.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. **S.ID.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. **a.** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions, or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* (A2, M3) **b.** Informally assess the fit of a function by discussing residuals. (A2, M3) **c.** Fit a linear function for a scatterplot that suggests a linear association. (A1, M1) **S.ID.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **S.ID.8** Compute (using technology) and interpret the correlation coefficient of a linear fit. **S.ID.9** Distinguish between correlation and causation.	Response Variable Explanatory Variable Scatterplot Positive Association Negative Association Correlation,r Regression Line Predicted Value Slope y-intercept Extrapolation Residuals Least Squares Regression Line Residual Plot Standard Deviation of Residuals Coefficient of Determination, r^2 Outlier Influential	Formal: 3.1 Quiz 3.2 Quiz Chapter 3 Team Test Chapter 3 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Kahn Academy	1. Identify explanatory and response variables in situations where one variable helps to explain or influences the other. 2. Make a scatterplot to display the relationship between two quantitative variables. 3. Describe the direction, form, and strength of a relationship displayed in a scatterplot and identify outliers in a scatterplot. 4. Interpret the correlation. 5. Understand the basic properties of correlation, including how the correlation is influenced by outliers. 6. Use technology to calculate correlation. 7. Explain why association does not imply causation. 8. Interpret the slope and y intercept of a least-squares regression line. 9. Use the least-squares regression line to predict y for a given x. Explain the dangers of extrapolation. 10. Calculate and interpret residuals. 11. Explain the concept of least squares. 12. Determine the equation of a least-squares regression line using technology or computer output. 13. Construct and interpret residual plots to assess whether a linear model is appropriate. 14. Interpret the standard deviation of the residuals and r^2 and use these values to assess how well the least-squares regression line models the relationship between two variables. 15. Describe how the slope, y intercept, standard deviation of the residuals, and r^2 are influenced by outliers.

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						16. Find the slope and y intercept of the least-squares regression line from the means and standard deviations of x and y and their correlation.
Early March to Mid March	12	4A. Estimation (point estimators and confidence intervals) 4B. Tests of significance 5D. Transformations to achieve linearity: logarithmic and power transformations	Population Regression Line Sample Regression Line Mean of Sampling Distribution of b SD of Sampling Distribution of b Conditions for Regression Inference t-Interval for Slope t-Test for Slope Power Model Exponential Model Transformation Logarithm	Formal: 12.1 Quiz 12.2 Quiz Chapter 12 Team Test Chapter 12 Individual Test Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities	The Practice of Statistics 5E Kahn Academy	1. Check the conditions for performing inference about the slope β of the population (true) regression line. 2. Interpret the values of a, b, s, SE_b, and r^2 in context, and determine these values from computer output. 3. Construct and interpret a confidence interval for the slope β of the population (true) regression line. 4. Perform a significance test about the slope β of the population (true) regression line. 5. Use transformations involving powers and roots to find a power model that describes the relationship between two variables, and use the model to make predictions. 6. Use transformations involving logarithms to find a power model or an exponential model that describes the relationship between two variables, and use the model to make predictions. 7. Determine which of several transformations does a better job of producing a linear relationship.
March 15-April 1	6	3B. Combining independent random variables **S.MD.1** Define a random variableG for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution G using the same graphical displays as for data distributions.	Random Variable Probability Distribution Discrete Random Variable Mean (Expected Value) Variance Standard Deviation	Formal: 6.1 Quiz Chapter 6 Team Test Chapter 6 Individual Test	The Practice of Statistics 5E Kahn Academy	1. Notion of independence versus dependence 2. Compute mean and standard deviation for sums and differences of independent random variables

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		S.MD.2 Calculate the expected valueG of a random variable; interpret it as the mean of the probability distribution. **S.MD.3** Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.	Continuous Random Variable Independent Random Variable Binomial Setting Binomial Random Variable Binomial Distribution Binomial Coefficient Geometric Setting Geometric Random Variable Geometric Distribution	Informal: Kahn Assignments Suggested Book Assignments FRAPPY's Group Activities		

Link to Ohio Standards: https://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/MATH-Standards-2017.pdf.aspx

College Board AP Stats Topic Outline

Following is an outline of the major topics covered by the AP Statistics Exam . The ordering here is intended to define the scope of the course but not necessarily the sequence . The percentages in parentheses for each content area indicate the coverage for that content area in the exam .

I . Exploring Data: Describing patterns and departures from patterns (20%–30%)

Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

A . Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)

1 . Center and spread

2 . Clusters and gaps

3 . Outliers and other unusual features

4 . Shape

B . Summarizing distributions of univariate data

1 . Measuring center: median, mean

2 . Measuring spread: range, interquartile range, standard deviation

3 . Measuring position: quartiles, percentiles, standardized scores (z-scores)

4 . Using boxplots

5 . The effect of changing units on summary measures

C . Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)

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1 . Comparing center and spread: within group, between group variation
2 . Comparing clusters and gaps
3 . Comparing outliers and other unusual features
4 . Comparing shapes
D . Exploring bivariate data
1 . Analyzing patterns in scatterplots
2 . Correlation and linearity
3 . Least-squares regression line
4 . Residual plots, outliers and influential points
5 . Transformations to achieve linearity: logarithmic and
power transformations
E . Exploring categorical data
1 . Frequency tables and bar charts
2 . Marginal and joint frequencies for two-way tables 3 . Conditional relative frequencies and association 4 . Comparing distributions using bar charts
II . Sampling and Experimentation: Planning and conducting a study (10%–15%)
Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.
A . Overview of methods of data collection 1 . Census
2 . Sample survey
3 . Experiment
4 . Observational study
B . Planning and conducting surveys
1 . Characteristics of a well-designed and well-conducted survey
2 . Populations, samples and random selection
3 . Sources of bias in sampling and surveys
4 . Sampling methods, including simple random sampling, stratified random
sampling and cluster sampling
C . Planning and conducting experiments
1 . Characteristics of a well-designed and well-conducted experiment
2 . Treatments, control groups, experimental units, random assignments
and replication
3 . Sources of bias and confounding, including placebo effect and blinding
4 . Completely randomized design

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5 . Randomized block design, including matched pairs design
D . Generalizability of results and types of conclusions that can be drawn from observational studies, experiments and surveys
III . Anticipating Patterns: Exploring random phenomena using probability and simulation (20%–30%)
Probability is the tool used for anticipating what the distribution of data should look like under a given model.

A . Probability
1 . Interpreting probability, including long-run relative frequency interpretation
2 . "Law of Large Numbers" concept
3 . Addition rule, multiplication rule, conditional probability and independence
4 . Discrete random variables and their probability distributions, including binomial and geometric
5 . Simulation of random behavior and probability distributions
6 . Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable

B . Combining independent random variables
1 . Notion of independence versus dependence
2 . Mean and standard deviation for sums and differences of independent random variables

C . The normal distribution
1 . Properties of the normal distribution
2 . Using tables of the normal distribution
3 . The normal distribution as a model for measurements

D . Sampling distributions
1 . Sampling distribution of a sample proportion
2 . Sampling distribution of a sample mean
3 . Central Limit Theorem
4 . Sampling distribution of a difference between two independent sample proportions
5 . Sampling distribution of a difference between two independent sample means
6 . Simulation of sampling distributions 7 . t-distribution
8 . Chi-square distribution

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IV . Statistical Inference: Estimating population parameters and testing hypotheses (30%–40%)
Statistical inference guides the selection of appropriate models.
A . Estimation (point estimators and confidence intervals)
1 . Estimating population parameters and margins of error
2 . Properties of point estimators, including unbiasedness and variability
3 . Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
4 . Large sample confidence interval for a proportion
5 . Large sample confidence interval for a difference between two proportions
6 . Confidence interval for a mean
7 . Confidence interval for a difference between two means (unpaired and paired)
8 . Confidence interval for the slope of a least-squares regression line
B . Tests of significance
1 . Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power
2 . Large sample test for a proportion
3 . Large sample test for a difference between two proportions
4 . Test for a mean
5 . Test for a difference between two means (unpaired and paired)
6 . Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)
7 . Test for the slope of a least-squares regression line