Unit One: Exploring Data (4 weeks)

Big Ideas:

- Analyzing Categorical Data
- Displaying Categorical Data
- Displaying Quantitative Data

Topics	Assessments/Activities	Standards
The definition of statistics How to distinguish between categorical and quantitative data How to create and interpret pie and bar charts How to create and interpret dot plots, stem plots and histograms Understand measures of central tendency: median, mean and mode Understand measures of spread: range, IQR and standard deviation. Determine if a data set has outliers. Find 5 number summary and create box plots Use TI84 to create histograms, boxplots, and find 5 number summary Choose the most appropriate numerical summary data for a data set	Homework for each section Quizzes Collect data from students in class – categorical and quantitative M&M's activity for graphs, m&m's activity for standard deviation Create graphs using Excel Review and Practice quizzes Unit 1 Test	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).

Unit Two: Modeling Distributions of Data (3 weeks)

Big Ideas:

- Describing locations in a distribution: percentiles and z-scores
- Normal distributions
- Empirical Rule
- Normal Distribution calculations

Topics	Assessments/Activities	Standards
Measuring Position: Percentiles, Cumulative Relative Frequency Graphs Measuring Position: z-scores Normal Distributions, The 68-95-99.7 Rule, The Standard Normal Distribution Normal Distribution Calculations Use TI-84 to find areas under normal curve Assessing Normality – examining graphs and Normal probability plots	Homework and classwork for each section. Khan academy practice sets Against All Odds – Video about Normal Distributions and z-scores Quiz Review and Practice quizzes. Unit 2 Test	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.

Unit Three: Describing Relationships: (2-3 weeks)

Big Ideas:

- Scatterplots and Correlation
- Least-Squares Regression

Topics	Assessments/Activities	Standards
Explanatory and response variables Displaying relationships: scatterplots and interpreting Measuring linear association: correlation Least-squares regression Interpreting a regression line and predicting values Residuals and the least-squares regression line How well the line fits the data: residual plots Use TI-84 to find regression line, correlation coefficient and graph scatterplots	Guessing Ages activity Videos – Scatterplots; Linear Regression Unit Activity – forearm length and foot length Activity – relationship between parent and student heights Homework for each section Quizzes as needed Review and Practice Unit Test	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

Unit Four: Designing Studies: (3 weeks)

Big Ideas:

- Sampling and Surveys
- Experiments
- Inference and Ethics

Topics	Assessments/Activities	Standards
Introduction, Sampling and Surveys, How to Sample Badly, How to Sample Well: Random Samples Other Sampling Methods Observational Studies vs. Experiments Three Principles of Experimental Design Experiments: What Can Go Wrong? Inference for Experiments Blocking, Matched Pairs Design Scope of Inference, the Challenges of Establishing Causation	Homework for each section 2 Quizzes (mid and end of unit) Group project – design an experiment to evaluate how a treatment affects stress levels Activity – Experiments in the News Group project – Response Bias project	S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population S.IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

Unit Five: Probability: (3-4 weeks)

Big Ideas:

- Probability and Simulation
- Probability Rules
- Conditional Probability and Independence

Topics	Assessments/Activities	Standards
Introduction, The Idea of Probability Probability Models, Basic Rules of Probability, Experimental versus theoretical Two-Way Tables and Probability, Venn Diagrams and Probability, Tree Diagrams Conditional Probability and Independence, Multiplication Rule, Addition Rule Counting methods – combinations and permutation	Pass the Pigs game design activity Homework for each section (Larson book and Ready, Set, Go module) Quiz mid-unit Unit 5 Test	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 model, P(A and B) = P(A)·P(B|A) = 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

Also: Learning Cards for each chapter, share research or news articles each unit that use statistics; and end of semester poster project

Unit Six: Random Variables: (3 weeks)

Big Ideas:

- Discrete and Continuous Random Variables
- Binomial and Geometric random variables

Topics	Assessments/Activities	Standards
Probability Distributions: Discrete random Variables, Mean (Expected Value) of a Discrete Random Variable Standard Deviation (and Variance) of a Discrete Random Variable Binomial Random Variables, Binomial Probabilities Mean and Standard Deviation of a Binomial Distribution Geometric Distributions	Homework for each section (Larson book) Candy family activity for Binomials Applying Binomials: Is it Smart to Foul activity Quiz	S.MD.1 Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. S.MD.2 Calculate the expected value 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

Unit Seven: Sampling Distributions: (3-4 Weeks)

Big Ideas: Sampling Dist., Central Limit Theorem, Confidence intervals, proportion and mean

Topics	Assessments/Activities	Standards
Parameters and Statistics Sampling Variability, Describing Sampling Distributions The Central Limit Theorem The Idea of a Confidence Interval, Interpreting Confidence Levels and Confidence Intervals, Constructing a Confidence Interval When σ Is Known: The One-Sample *z* Interval for a Population Mean Determine minimum sample size for a given precision When σ Is Unknown: The *t* Distributions, Constructing a Confidence Interval for μ Estimating *p*, Constructing a Confidence Interval for *p*	Resource: Picturing the World Textbook (Larson) Red, White and Blue Chips Activity for sampling distributions m&m's activity for finding confidence interval Homework for each section 8.1 A and 8.2A practice AP quizzes Quiz Review and practice using old FRP questions Unit test	Sampling Distribution a) Sampling distribution of a sample proportion b) Sampling distribution of a sample mean c) Central limit theorem d) t distribution Estimation e) Estimating population parameters and margins of error f) Logic of confidence intervals, meaning of conf. level and conf. intervals, properties of conf. intervals g) Interpreting CI correctly

Unit Eight: Hypothesis Testing (4 weeks)

Big Ideas: Significance tests, test about population proportion , test for population mean

Topics	Assessments/Activities	Standards
The Reasoning of Significance Tests, Stating Hypotheses and identifying the claim Left, Right and Two-tailed tests Type I and Type II Errors, level of significance Carrying Out a Significance Test, The One-Sample *z* Test for a Proportion Carrying Out a Significance Test for μ (large samples) the z-test and (small samples) the one Sample *t* Test Hypothesis test for proportions – using reject regions and the p-value method Interpreting hypothesis tests in context	Resource: Picturing the World textbook Coin flipping simulation to discuss type I and II errors Homework for each section, worksheet for practicing writing hypotheses Quiz Review and Practice test from text Unit test	Tests of significance a) 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 b) Large sample test for proportion c) Test for a mean, large and small samples

Unit Nine: Hypothesis Testing – Two Samples (2 weeks)
Big Ideas: Two-sample hypothesis tests for proportion, and for mean

Topics	Assessments/Activities	Standards
Testing the difference between means (large samples) Dependent and Independent samples 2 Sample test for difference in means (small samples) – Independent samples 2 Sample test for means, with dependent samples Hypothesis test for difference between proportions Interpreting hypothesis tests in context	Resource: Picturing the World textbook (Larson) Homework for each section Quiz Review Test	Tests of significance a) Logic of significance testing, null and alternative hypotheses, P-values b) Large sample and small sample tests for difference in means. c) Test for difference in proportions

Unit Ten: Inference for Distributions of Categorical Data (1-2 weeks)
Big Ideas: Chi-Square Goodness of Fit Tests, Inference for Relationships

Topics	Assessments	Standards
Comparing Observed and Expected Counts The Chi-Square Goodness-of-Fit Test Testing for independence using chi-square (review checking for independence using conditional probabilities)	Candy activity – m&m's Goodness of Fit Homework from section 10.1 and 10.2, Larson textbook	Sampling Distributions a) Chi-square Distributions Tests of significance a) Chi-square test for goodness of fit, homogeneity of proportions, and independence (one and two-way tables)

Unit Eleven: Inference for Regression (1 week)

Big Ideas:

Topics	Assessments	Standards
Review correlation of two variables, scatterplots, regression lines and correlation coefficents. Review residual plots, and other ways to determine if a relationship is linear Inference for linear regression - Sampling distribution for slope - Checking conditions for inference Constructing confidence interval for the slope Performing a significance test for the slope	Review assignments for regression Helicopter Activity	S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Informally assess the fit of a function by discussing residuals. (A2, M3) b. 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.★

Other end-of-year activities:

End Of Year Project (Display on poster and present to class)
Research a famous statistician, create a Powerpoint, and share with class