INDIANA AREA SCHOOL DISTRICT
INDIANA, PA

Course Title: Statistics

Grade Level:10-12

Course Number:

Core or Elective: Elective

Periods Per Week: 5

Length of Time: 39 minutes

Length of Course: Full Year

Units of Credit: 1.0

Revision Date: 10/30/18

Course Description

The purpose of the statistics course is to introduce students to the major concepts and tools for collecting, analyzing and drawing conclusions from data . Students are exposed to four broad conceptual themes:

1 . Exploring Data: Describing patterns and departures from patterns
2 . Sampling and Experimentation: Planning and conducting a study
3 . Anticipating Patterns: Exploring random phenomena using probability and simulation
4 . Statistical Inference: Estimating population parameters and testing hypotheses

Prerequisite: Students taking the course must have successfully completed Algebra II

Expected Level of Achievements (District Grading Scale)

A (4):	**93% - 100%**
B (3):	**85% - 92%**
C (2):	**77% - 84%**
D (1):	**69% - 76%**
F (0):	**68% and below**

Subject Area: Mathematics **Course Title: Statistics**

Grade: Secondary **Strand: I Exploring data: describing patterns and departures from patterns**

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
2.1.11F 2.3.11.E 2.2.11.C 2.5.11A 2.5.11B 2.6.11 A 2.6.11 C 2.6.11 E	**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 unusual features 4. Shape **B. Summarizing distributions of univariate data** 1. Measuring center; median and mean 2. Measuring spread; range, interquartile range, standard deviation 3. Measuring position; quartiles percentiles, 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)** 1. Comparing Center and spread 2. Comparing clusters and gaps	Class discussion Calculator use and exploration Web based software use and exploration Guided questioning Teacher modeling Group work	Active Daily Participation Homework Assignments Student Self-reflection Informal Classroom Assessments Test/Quiz

	3. Comparing outliers and unusual features 4. Comparing Shape **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 distributions 3. Conditional relative frequencies and association 4. Comparing distributions using bar charts		

Materials/Resources	Reteaching	Enrichment
• TI 83 Calculators • Online Statistical Software (https://www.stapplet.com/) • Promethean Board and Active Inspire Software • Google Classroom • Text: Ninth Edition ©2017 **Introduction to the Practice of Statistics** David S. Moore (*Purdue University*) , George P. McCabe (*Purdue University*) , Bruce A. Craig (*Purdue University*) ISBN-10: 1-319-01338-4; ISBN-13: 978-1-319-01338-7; Format: Cloth Text • Text Supplement: https://www.macmillanlearning.com/catalog/studentresources/ips9e#	Individualized instruction Online resources	Complete Teacher directed project Compete in PA Math League, ASHME contest, IUP math contest, etc.

Subject Area: Mathematics **Course Title: Statistics**
Grade: Secondary **Strand: II Sampling and experimentation: planning and conducting a study**

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
2.5.11A 2.5.11B 2.6.11A	**A. Overview of methods of collecting data** 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 SRS, stratified and clustering sampling methods **C. Planning and conducting experiments** 1. Characteristics of a well-designed and well-conducted experiment	Class discussion Calculator use and exploration Web based software use and exploration Guided questioning Teacher modeling Group work	Active Daily Participation Homework Assignments Student Self-reflection Informal Classroom Assessments Test/Quiz

	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 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**		

Materials/Resources	Reteaching	Enrichment
• TI 83 Calculators • Online Statistical Software (https://www.stapplet.com/) • Promethean Board and Active Inspire Software • Google Classroom • Text: Ninth Edition ©2017 **Introduction to the Practice of Statistics**	Individualized instruction Online resources	Complete Teacher directed project Compete in PA Math League, ASHME contest, IUP math contest, etc.

David S. Moore (*Purdue University*) , George P. McCabe (*Purdue University*) , Bruce A. Craig (*Purdue University*) ISBN-10: 1-319-01338-4; ISBN-13: 978-1-319-01338-7; Format: Cloth Text • Text Supplement: https://www.macmillanlearning.com/catalog/studentresour		

Subject Area: Mathematics **Course Title: Statistics**

Grade: Secondary **Strand: III Anticipating patterns; exploring random phenomena using probability simulation**

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
2.2.11C 2.5.11.A 2.5.11.B 2.6.11.A 2.6.11.C 2.7.11A 2.7.11.E	**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 variables and probability distributions 6. Mean and standard deviation of a random variable, and linear transformation of a random variable **B. Combining independent**	Class discussion Calculator use and exploration Web based software use and exploration Guided questioning Teacher modeling Group work	Active Daily Participation Homework Assignments Student Self-reflection Informal Classroom Assessments Test/Quiz

	random variables 1. Notion of independence vs 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 mean 2. Sampling distribution of sample proportion 3. Sampling distribution of difference between two independent sample means 4. Sampling distribution of a difference of two independent sample proportions 5. Central limit theorem 6. Simulation of sampling distributions 7. T distributions 8. Chi Square distribution		

Materials/Resources	Reteaching	Enrichment
• TI 83 Calculators • Online Statistical Software (https://www.stapplet.com/) • Promethean Board and Active Inspire Software • Google Classroom • Text: Ninth Edition ©2017 **Introduction to the Practice of Statistics** David S. Moore (*Purdue University*) , George P. McCabe (*Purdue University*) , Bruce A. Craig (*Purdue University*) ISBN-10: 1-319-01338-4; ISBN-13: 978-1-319-01338-7; Format: Cloth Text	Individualized instruction Online resources	Complete Teacher directed project Compete in PA Math League, ASHME contest, IUP math contest, etc.

• Text Supplement: https://www.macmillanlearning.com/catalog/studentresour		

Subject Area: Mathematics **Course Title:Statistics**

Grade: Secondary **Strand: IV Statistical Inference: estimation parameters and testing hypotheses**

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
2.5.11A 2.5.11B 2.6.11A 2.6.11C 2.6.11E 2.7.11A 2.7.11E	**A. Estimation (point estimators and confidence intervals)** 1. Estimation population parameters and margins of error 2. Properties of point estimators, including unbiasedness and variability 3. Logic of Confidence intervals, meaning of confidence intervals and confidence levels, and properties of confidence intervals 4. Large Sample confidence intervals for a proportion 5. Large Sample confidence intervals for a difference	Class discussion Calculator use and exploration Web based software use and exploration Guided questioning Teacher modeling Group work	Active Daily Participation Homework Assignments Student Self-reflection Informal Classroom Assessments Test/Quiz

	between two proportions. 6. Confidence intervals for a mean 7. Confidence intervals for a difference between two means 8. Confidence intervals for the slope of the least -squares regression line **D. Test 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 (paired and unpaired) 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		

Materials/Resources	Reteaching	Enrichment
• TI 83 Calculators • Online Statistical Software (https://www.stapplet.com/) • Promethean Board and Active Inspire Software • Google Classroom • Text: Ninth Edition ©2017 **Introduction to the Practice of Statistics** David S. Moore (*Purdue University*) , George P. McCabe (*Purdue University*) , Bruce A. Craig (*Purdue University*) ISBN-10: 1-319-01338-4; ISBN-13: 978-1-319-01338-7; Format: Cloth Text	Individualized instruction Online resources	Complete Teacher directed project Compete in PA Math League, ASHME contest, IUP math contest, etc.

• Text Supplement: https://www.macmillanlearning.com/catalog/studentresour		