

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: Statistics is the science of data. We begin our study of statistics by mastering the art of examining data. Data is explored with a focus on displaying, finding, and interpreting quantitative measures. Data is also analyzed for general shape and patterns.
Grade Level(s): 11-12	
Essential Question(s): How do you display and analyze categorical data? How do you display and analyze quantitative data? How do you describe measures of center and spread? How do you compare multiple distributions? How do you perform linear transformations? What are the effects of linear transformations on measures of center and spread? How do you compare multiple distributions graphically?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Understand the difference between categorical and quantitative data • Construct and interpret bar graphs • Construct and interpret pie charts • Construct and interpret dot plots • Construct and interpret stem plots • Construct and interpret histograms – frequency and percentage • Construct and interpret ogives and percentiles • Construct and interpret time plots • Describe distributions with shape, center, spread and possible outliers • Compare two or more distributions (shape, center, spread, and possible outliers) • Understand the nature of measures of center and spread • Find and interpret mean, median • Understand changes to mean and median when data points are added or subtracted • Find and interpret standard deviation and variance • Find and interpret the five number summary including quartiles • Find and interpret inter-quartile range • Construct and interpret box plots • Perform linear transformations on measures of center and spread • Describe the overall shape and pattern of a distribution including skewness and outliers • Use side by side bar graphs and box plots to compare distributions

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students discuss real-world problems where the effect of linear transformation on measures of center and spread are seen. They will apply the rules for impacts on measures of center (mean and median) and measures of spread (standard deviation and IQR). Basketball player salaries are used as a basis for this analysis. Students will also use the definition and formula for variance and mean to find and interpret quantitative data.

MPAC 2 – Connecting concepts:

Students will work through a problem with a Presidential age histogram which makes the connection between histograms and percentiles. This leads into a discovery of the ogive graph which students will then analyze to locate individuals within the distribution.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this unit students realize the importance of algebraic procedures, such as finding the mean or standard deviation. Students also must recall to write slope intercept form of lines for linear transformation analysis.

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach, a numerical approach, an algebraic approach and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to apply and use the formula for mean and variance which include capital Greek sigma notation, and how to use this notation to help solve problems.

MPAC 6 – Communicating:

Students learn how to clearly interpret graphical displays of data and communicate their results into meaningful answers.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions
- Microsoft Excel
- Various applets on the Internet

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- **An interpretation narrative analyzing measures of center and spread**
- **Narrative comparisons of the shape, center, spread, and outliers for two or more quantitative distributions**
- **A justification analysis for defining outliers**

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 1.1 – Displaying Distributions with Graphs

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Complete Activity 1 in text on Page 4 (How Fast Is Your Heart Beating?) to help recall of tables, basic data collection, and calculation of average.
Teaching Objectives	<ul style="list-style-type: none"> • Understand the difference between categorical and quantitative data • Construct and interpret bar graphs • Construct and interpret pie charts • Construct and interpret dot plots • Construct and interpret stem plots • Construct and interpret histograms – frequency and percentage • Construct and interpret ogives • Construct and interpret time plots • Describe distributions with shape, center, spread and possible outliers • Compare two or more distributions (shape, center, spread, and possible outliers)
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 1,2,6,8,11,12,16,19,21 AP Exam Practice: 2001 (1), 2017 (4), 2016 (1), 2014 (4)

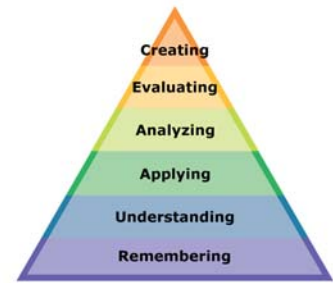
Section:1.2 – Describing Distributions with Numbers

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Complete “Who’s baseball’s greatest home run hitter...?” problem on Page 37 to help recall of stem plot and guide student’s interest toward quantifying summary data.

<p>Teaching Objectives</p>	<ul style="list-style-type: none"> • Understand the nature of measures of center and spread • Find and interpret mean, median • Understand changes to mean and median when data points are added or subtracted • Find and interpret standard deviation and variance • Find and interpret the five number summary including quartiles • Find and interpret inter-quartile range • Construct and interpret box plots • Perform linear transformations on measures of center and spread • Compare two or more distributions (shape, center, spread, and possible outliers) • Describe the overall shape and pattern of a distribution including skewness and outliers • Use side by side bar graphs and box plots to compare distributions
<p>Checking for Understanding</p>	<p><i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment</p>
<p>Practice and Apply Assigning Homework</p>	<p>Text: 31,35,36,40,44,45,48,49 AP Exam Practice: #5 2002(B)</p>

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this unit, students develop an understanding of density curve, a mathematical model for distributions. Students learn the basic tenets of the normal distribution and the standard normal distribution. Students find proportions or probabilities using standardized value, z score, and the standard normal table and a TI 84 calculator. They will also calculate the point having a stated proportion of all values below or above it. Finally, students will assess the normality of data using multiple graphical and quantitative methods.
Grade Level(s): 11-12	
Essential Question(s): How do you recognize and interpret density curves? How do you find the proportion of values that fall between values using the empirical rule or the standard normal distribution? How do you use the standard normal distribution using Table A and on the calculator? How do you assess the normality of a distribution?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Understand the characteristics of density curves. • Locate the median and mean for density curves. • Recognize shape of normal curves and be able to estimate both the mean and standard deviation of a normal curve. • Use the empirical rule to state what percent of the observations from a normal distribution fall between two points when both points lie at the mean or one, two, or three standard deviations one either side of the mean. • Recognize the shape of normal curves and be able to estimate both the mean and standard deviation from such a curve. • Find the z score of an observation. Interpret z scores and understand that any normal distribution becomes standard normal $N(0,1)$ when standardized. • Use Table A and your calculator to calculate the proportion of values above a stated number, below a stated number, or between stated numbers. • Calculate the point having a stated proportion of all values above it or below it. • Determine graphically if a distribution is approximately normal. • Using an empirical rule process, determine if a distribution is approximately normal. • Construct and interpret normal probability plots.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students discuss real-world problems where students taking the SAT verbal or math sections want to obtain a certain top percentile to be accepted into a college. The students will work within the standard normal process using the z score formula and knowledge of Table A to determine the score needed to achieve the 90th percentile for example.

MPAC 2 – Connecting concepts:

Students will first be presented with a histogram at the beginning of Chapter 2. Then students will make the connection between percentiles and percentages of a histogram and the rough process of the empirical rule. Finally, students will be presented with the normal and standard normal distribution which also provide proportions for being within specified sections of the normal curve. All these methods provide ways to find areas within specified values.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this unit students realize the importance of algebraic procedures, such as a finding value given a z score, mean, and standard deviation.

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach, numerical approaches, and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to apply and use the z score formula which includes Greek μ and σ notation and how to use this notation to help solve problems.

MPAC 6 – Communicating:

Students learn how to clearly interpret graphical displays of data (normal distribution density curve) and communicate their results into meaningful answers.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions
- Microsoft Excel
- Various applets on the Internet

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- Explain why relatively one value is better than another value assuming both values are approximately normally distributed.
- Explain how a normal probability plot can justify that a distribution is approximately normal.
- Interpret the meaning of z scores relative to the mean and standard deviation of a distribution.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 2.1 – Density Curves and the Normal Distribution	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Complete Activity 2A (A Fined Grained Distribution) on Page 76
Teaching Objectives	<ul style="list-style-type: none"> • Understand the characteristics of density curves • Locate the median and mean for density curves • Recognize shape of normal curves and be able to estimate both the mean and standard deviation of a normal curve • Use the empirical rule to state what percent of the observations from a normal distribution fall between two points when both points lie at the mean or one, two, or three standard deviations one either side of the mean. • Recognize the shape of normal curves and be able to estimate both the mean and standard deviation from such a curve.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 2,3,4,7,8,9 AP Exam: 2011 Free Response #1

Section: 2.2 Standard Normal Calculations

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> • Using Example 2.3 on Page 87, have students explain the Empirical Rule to the class. • Show multiple illustrations of approximately normal histograms. Ask students, “How could you standardize this normal curve?” • Complete Activity 2B (Roll a Normal Distribution) on Page 76

Teaching Objectives	<ul style="list-style-type: none"> • Find the z score of an observation. Interpret z scores and understand that any normal distribution becomes standard normal $N(0,1)$ when standardized. • Use Table A and your calculator to calculate the proportion of values above a stated number, below a stated number, or between stated numbers. • Calculate the point having a stated proportion of all values above it or below it. • Determine graphically if a distribution is approximately normal. • Using an empirical rule process, determine if a distribution is approximately normal. • Construct and interpret normal probability plots.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 21,22,23,24,27 AP Exam: 2011 (1), 2017 (3), 2009 (2)

PART IV: EVIDENCE OF LEARNING

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Formative Assessments:

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Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

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- Chapter Tests
- Projects
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Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

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- Homework
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Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this Chapter 3, we study the relations between two quantitative variables. Scatterplots show the relationship, whether or not there is an explanatory-response distinction. Correlation describes the strength of the relationship, and least squares regression fits a line to data that have an explanatory-response relation. Using least squares regression lines, correlation, coefficient of determination, and residuals, a model fit can be assessed and future predictions can be made if the model is appropriate.
Grade Level(s): 11-12	
Essential Question(s): What is an explanatory vs response variable? What is the strength, direction, and form of an explanatory-response relationship? What is positive vs negative correlation? What is correlation and how does it illustrate the strength and direction of a relationship? What is a least squares regression line and how can it be found? What is the coefficient of determination and how is it used to assess the fit of the regression line? What are residuals and how can they be plotted to assess the fit for a regression line? How can influential points be identified?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Identify variables as explanatory or response, independent or dependent. • Identify variables as quantitative or categorical. • Understand that quantitative vs categorical variables are graphed using different types of graphical displays. • Graph and analyze scatterplots for patterns and potential outliers and clusters. • Understand and Identify strength, direction, and form for a scatterplot. • Using the scatterplot, identify whether the two variables are associated, and if so, whether they are positively or negatively associated. • Create scatterplots with categorical data used to delineate between data points. • Create scatterplots using a calculator. • Understand correlation is a measure of strength and direction. • Identify an approximate correlation given a scatterplot. • Understand the process for creating a Least Squares Regression Line (LSRL). • Understand that all LSRL go through the mean of the x's and the mean of the y's. • Understand that there is a relationship between the slope, the standard deviation of the x and y's. This relationship can be used to find the LSRL. • Interpret the slope and y-intercept in the LSRL in context of the situation. • Find the LSRL, correlation, and coefficient of determination using a calculator. • Understand that the coefficient of determination is the measure of variability in the y variable that can be explained by the LSRL. • Find predictions using the LSRL. • Find residuals and make residual plots in the calculator. • Find and interpret residuals and residual plots.

- Assess the fit of a LSRL using residual plots and coefficient of determination.
- Identify influential points by finding the LSRL, correlation, and coefficient of determination before and after the point is eliminated.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students discuss real-world problems where state average SAT scores versus percentage of students taking the SAT is analyzed. The relationship is explored, and definition of correlation is discussed in context of the problem. The definition of the coefficient of variation is also explored in the context of multiple real life scenarios.

MPAC 2 – Connecting concepts:

Students will explore the basic line of best fit method discussed in Algebra 1 versus the more complex process of using the least squares regression process to find the line of best fit. The difference between these methods is explored along with strengths and weaknesses of each.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this unit students realize the importance of algebraic procedures, such as a finding the slope using the correlation, the standard deviation of the x 's, and the standard deviation of the y 's. The least squares regression formula is also manipulated to solve for various variables.

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach, numerical approaches, and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to apply and use the least squares regression formula which includes \hat{y} notation. This notation is used to indicate that the y values found using the least square regression line are predicted y values.

MPAC 6 – Communicating:

Students learn how to clearly interpret graphical displays of data (scatterplots) and communicate their results into meaningful answers.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

Online Resources incorporated through the year, include but not limited to:

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Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- Explain why a LSRL is an acceptable fit for the given scatterplot.
- Explain how the residual plot indicates an acceptable for unacceptable fit.
- Interpret the meaning of coefficient of variation in the context of the problem.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section 3.1: Scatterplots

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> With the help of partners have students measure your height and arm span. Record each pair of observations on the board. Each pair should do this. Then each student should plot the pair of points on a scatterplot. The class should then discuss and record observations. Complete Activity 3 (SAT/ACT Scores)
Teaching Objectives	<ul style="list-style-type: none"> Identify variables as explanatory or response, independent or dependent. Identify variables as quantitative or categorical. Understand that quantitative vs categorical variables are graphed using different types of graphical displays. Graph and analyze scatterplots for patterns and potential outliers and clusters. Understand and Identify strength, direction, and form for a scatterplot. Using the scatterplot, identify whether the two variables are associated, and if so, whether they are positively or negatively associated. Create scatterplots with categorical data used to delineate between data points. Create scatterplots using a calculator.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 1, 6, 9, 12

Section 3.2: Correlation

	Advanced Placement
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Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Using the height and arm span from 3.1 have students pair up and discuss a quantitative value (from 0 to 1) for the strength of the relationship. This will be used as a prediction value to compare to once students calculate the actual correlation value.
Teaching Objectives	<ul style="list-style-type: none"> Understand correlation is a measure of strength and direction. Identify the acceptable range of values for correlation. Understand characteristics of correlation including its unit less nature and that it is not impacted by adding or subtracting constants. Identify an approximate correlation given a scatterplot. Find the correlation by hand and with the calculator.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 24, 25, 26

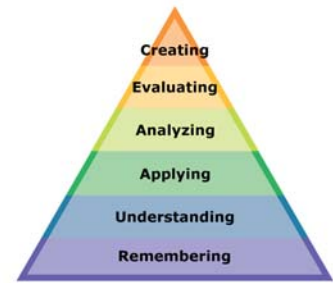
Section 3.3: Least Squares Regression

Advanced Placement	
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Using the height and arm span from 3.1 have students pair up and determine a line of best fit using two points close to a center line through the data. Discuss how this line varies amongst the groups. Compare and contrast these lines to the LSRL found later.
Teaching Objectives	<ul style="list-style-type: none"> Understand the process for creating a Least Squares Regression Line (LSRL). Understand that all LSRL go through the mean of the x's and the mean of the y's. Understand that there is a relationship between the slope, the standard deviation of the x and y's. This relationship can be used to find the LSRL. Interpret the slope and y-intercept in the LSRL in context of the situation. Find the LSRL and coefficient of determination using a calculator. Understand that the coefficient of determination is the measure of variability in the y variable that can be explained by the LSRL. Find predictions using the LSRL. Find residuals and make residual plots in the calculator. Find and interpret residuals and residual plots.

	<ul style="list-style-type: none"> Assess the fit of a LSRL using residual plots and coefficient of determination. Identify influential points by finding the LSRL, correlation, and coefficient of determination before and after the point is eliminated.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 41,42,44,45,46 Practice AP Questions: 1999 (1), 2000 (1), 2012 (1), 2007B (4)

PART IV: EVIDENCE OF LEARNING

**IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.**



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

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Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this Chapter 4, we learn how to construct a mathematical model for data that fit a curve, such as an exponential function or power function. The validity of these models are evaluated through the use of residuals, and predictions are made for x values using inverse logarithmic operations. We also learn that although correlation and regression are powerful tools for understanding two-variable data when both variables are quantitative, both correlation and regression have their limitations. In particular, we are cautioned that a strong observed association between two variables may exist without a cause-and-effect link between them.
Grade Level(s): 11-12	
Essential Question(s): How do you determine whether data or graphs are approximately exponential or powered? How do you transform exponential or powered data using logs? How do you find a LSRL for transformed data? How do you evaluate the fit of a transformed data model for exponential or powered data? How can extreme observations and lurking variables impact regression analysis? Why does correlation not imply causation? Why should x values too far outside the given x range not be used to predict y values?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Recognize that when a variable is multiplied by a fixed number greater than 1 in each equal time period, exponential growth results; when the ratio is a positive number less than 1, it's called exponential decay. • Recognize that when one variable is proportional to a power of a second variable, the result is a power function. • Perform logarithmic transformation and obtain points that lie in a linear pattern. • Find least squares regression lines (LSRL) for the transformed points. • Perform an inverse transformation that produces a curve that is a model for the original points. • Use inverse transformation process to predict x values. • Know that the deviations from the overall pattern are easily examined by fitting a line to the transformed points and plotting the residuals from this line against the explanatory variable (or fitted values). • Perform logarithmic transformations, scatterplots with original data, scatterplots with transformed data, least squares regression analysis on transformed data, and residuals plot in the calculator. • Understand that an evenly scattered pattern for residuals indicates an acceptable least squares regression model fit for the data. • Understand that both r, correlation, and the least squares regression line can be strongly influenced by a few extreme observations. • Recognize possible lurking variables that may explain the observed association between two variables x and y. • Understand that two variables are confounded when their effects on a response variable cannot be distinguished from each other.

- Draw a circle, line, and dotted line diagram to illustrate explanatory, response, and lurking variables.
- Understand that even a strong correlation does not mean that there is a cause-and-effect relationship between x and y .
- Recognize that attempting to predict using x values too far beyond the range of the given x values is called extrapolation.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students use the algebraic properties of logarithms to perform inverse logarithmic transformations. The definition of extrapolation and lurking variables are explored and discussed in the context of real world problems.

MPAC 2 – Connecting concepts:

Students will use their knowledge of basic least squares regression analysis as a starting point for this chapter. They observe basic Chapter 3 LSRL's are not appropriate for non-linear data.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this unit students realize the importance of algebraic procedures, such using logarithmic algebraic rules to perform inverse operations. Students also use the transformed models to solve for predicted values of y .

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach (scatterplot), numerical approaches (logarithmic equations), and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to apply logarithmic notation once data is transformed. \hat{y} notation is also used to indicate that y values are predicted values.

MPAC 6 – Communicating:

Students learn how to clearly interpret graphical displays of data (scatterplots) and communicate their results into meaningful answers.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions
- Microsoft Excel
- Various applets on the Internet

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- An explanation of why the model appears to be either exponential or powered data.
- An explanation of why a LSRL is an acceptable fit for the given scatterplot.
- An explanation of how the residual plot indicates an acceptable or unacceptable fit.
- A description of the relationship between variables which explains why it is common cause, causation, or confounding.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section 4.1 Transforming Relationships

	Advanced Placement
<p>Focus and Motivate Starting Options (Lesson Warm Up)</p>	<p><i>Suggestions include but not limited to:</i></p> <ul style="list-style-type: none"> • Activity 4 (Modelling the Spread of Cancer in the Body) on page 194 • Have students observe Figure 4.1 and then Figure 4.2 (before and after the outliers are removed). Have a class discussion about the shape of the curve and note student’s experience with log functions.
<p>Teaching Objectives</p>	<ul style="list-style-type: none"> • Recognize that when a variable is multiplied by a fixed number greater than 1 in each equal time period, exponential growth results; when the ratio is a positive number less than 1, it’s called exponential decay. • Recognize that when one variable is proportional to a power of a second variable, the result is a power function. • Perform logarithmic transformation and obtain points that lie in a linear pattern. • Find least squares regression lines (LSRL) for the transformed points. • Perform an inverse transformation that produces a curve that is a model for the original points. • Use inverse transformation process to predict x values. • Know that the deviations from the overall pattern are easily examined by fitting a line to the transformed points and plotting the residuals from this line against the explanatory variable (or fitted values). • Perform logarithmic transformations, scatterplots with original data, scatterplots with transformed data, least squares regression analysis on transformed data, and residuals plot in the calculator.

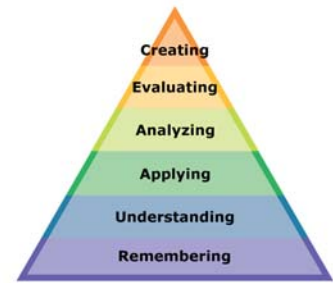
	<ul style="list-style-type: none"> Understand that an evenly scattered pattern for residuals indicates an acceptable least squares regression model fit for the data.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 1,6,11,13,15,27

Section 4.2: Cautions about Correlation and Regression

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Students are presented with a classic Causation versus Correlation scatterplot which illustrates a relationship that is not cause and effect (Ice Cream Sales versus Murders). Students pair up and record their thoughts about this relationship. The class discusses the observations as a group.
Teaching Objectives	<ul style="list-style-type: none"> Understand that both r, correlation, and the least squares regression line can be strongly influenced by a few extreme observations. Recognize possible lurking variables that may explain the observed association between two variables x and y. Understand that two variables are confounded when their effects on a response variable cannot be distinguished from each other. Draw a circle, line, and dotted line diagram to illustrate explanatory, response, and lurking variables. Understand that even a strong correlation does not mean that there is a cause-and-effect relationship between x and y. Recognize that attempting to predict using x values too far beyond the range of the given x values is called extrapolation.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 28,30,31,33-37,53,54,59,60,61 Practice AP Questions: 1999 (3), 2014 (1)

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: This chapter demonstrates good techniques for producing data and also explains why bad techniques often produce worthless data. Different methods for creating samples are introduced; some simple, some complex.
Grade Level(s): 11-12	Observational studies and experiments are compared. Completely randomized experimental design is defined and modelled. Finally, simulations are introduced as a method to imitate real life scenarios.
Essential Question(s): How do you design an unbiased study? How do you distinguish between an observational study and an experiment? How can you design a sample using various techniques – SRS, comparative, block, stratified, clustered, systematic? How can you design a sound completely randomized experiment? What are the principles of experimental design? How can you randomly choose and assign subjects? How can you simulate an experiment?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Identify the population in a sampling situation. • Recognize bias due to voluntary response samples and other inferior sampling methods. • Use Table B of random digits to select a simple random sample (SRS) from a population. • Recognize the presence of under-coverage and nonresponse as sources of error in a sample survey. • Recognize the effect of wording of questions on the response. • Use random digits to select a stratified random sample from a population when the strata are identified. • Understand whether a sample is stratified versus clustered. • Recognize whether a study is an observational study or an experiment. • Recognize bias due to confounding of explanatory variables with lurking variables in either an observational study or an experiment. • Identify the factors (explanatory variables), treatments, response variables, and experimental units or subjects in an experiment. • Outline the design of a completely randomized experiment using a diagram with sizes of groups, specific treatments, and response variables. • Use Table B of random digits to carry out the random assignment of subjects to groups in a completely randomized experiment. • Understand the principles of experimental design. • Recognize the placebo effect. • Recognize when the double-blind technique should be used. • Recognize a block design and when it would be appropriate. • Know when a matched pair design would be appropriate and how to design a match pairs experiment. • Explain why a randomized comparative experiment can give good evidence for cause-and-effect relationships.

- Recognize that many random phenomena can be investigated by means of a carefully designed simulation.
- Use multiple techniques to imitate chance behavior using a simulation technique using on-line applications or the calculator.
- Analyze the validity of using one simulation technique over another.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Given the definition of both, students will identify studies as either experiments or observational studies. Sampling methods are defined and explored using real world scenarios. Students discuss the scenarios and determine which sampling method is best.

MPAC 2 – Connecting concepts:

In previous chapters, students work with data which has already been obtained. In Chapter 5, we open the chapter by asking “Where did the data come from? How was it obtained in a sound manner?” This connection leads to the introduction of sampling methods.

MPAC 3 – Implementing algebraic/computational processes:

Students use on-line tools or the calculator in this chapter to randomly generate numbers for the purposes of sampling or simulation of an experimental design.

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach (diagram of an experimental design), numerical approaches (sample sizes are determined given industry standards), and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to illustrate a completely randomized design using standard flowchart methods. Understanding how to be fluent in this graphical approach is critical to real world application of this chapter.

MPAC 6 – Communicating:

Students learn how to clearly communicate their preferred sampling method with reasons. This reasoning is critical to explain why the study will be unbiased. |

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

Online Resources incorporated through the year, include but not limited to:

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- Microsoft Excel
- Various applets on the Internet

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- TI – 84 Plus
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21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- **Defend using a particular experimental design for a given scenario.**
- **An explanation for why patients should not be told which treatment they are receiving.**
- **An explanation as to why a given study is biased including the type of biasedness.**

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section 5.1 – Designing Samples

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Activity 5A (A Class Survey) on Page 268.
Teaching Objectives	<ul style="list-style-type: none"> Identify the population in a sampling situation. Recognize bias due to voluntary response samples and other inferior sampling methods. Use Table B of random digits to select a simple random sample (SRS) from a population. Recognize the presence of under-coverage and nonresponse as sources of error in a sample survey. Recognize the effect of wording of questions on the response. Use random digits to select a stratified random sample from a population when the strata are identified. Understand whether a sample is stratified versus clustered.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 2,4,6,8,10,11,14,15,18

Section 5.2: Designing Experiments

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Introduce Example 5.9. Have students read the problem and record their observations and any questions. Discuss the problem as a group and use it as a jumping off point for experimental design. Activity 5B (A Class Survey) on Page 289.
Teaching Objectives	<ul style="list-style-type: none"> Recognize whether a study is an observational study or an experiment.

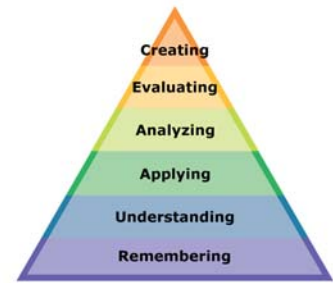
	<ul style="list-style-type: none"> Recognize bias due to confounding of explanatory variables with lurking variables in either an observational study or an experiment. Identify the factors (explanatory variables), treatments, response variables, and experimental units or subjects in an experiment. Outline the design of a completely randomized experiment using a diagram with sizes of groups, specific treatments, and response variables. Use Table B of random digits to carry out the random assignment of subjects to groups in a completely randomized experiment. Understand the principles of experimental design. Recognize the placebo effect. Recognize when the double-blind technique should be used. Recognize a block design and when it would be appropriate. Know when a matched pair design would be appropriate and how to design a match pairs experiment. Explain why a randomized comparative experiment can give good evidence for cause-and-effect relationships.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 32,35,36,38,39,43,45,46 Practice AP Questions: 2000(5), 2002(2), 2011(3), 2009(5)

Section 5.3: Simulating Experiments

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Have students pair and read Example 5.20. Have them discuss, "How could you imitate this real life scenario using a coin flip?" Have them record their ideas, and then discuss each groups ideas as a group.
Teaching Objectives	<ul style="list-style-type: none"> Recognize that many random phenomena can be investigated by means of a carefully designed simulation. Use multiple techniques to imitate chance behavior using a simulation technique using on-line applications or the calculator. Analyze the validity of using one simulation technique over another.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 61, 69, 71

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
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As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: Chapter 6 presents the fundamental concepts of probability. Probability calculations are the basis for inference. The tools acquired in the chapter help the student to describe the behavior of statistics from random samples. Probability is used to describe the long term regularity that results from many repetitions of the same random phenomenon. Probability rules and visual methods to displays probabilities are introduced. More complex probabilities are calculated using multiple probability rules in the sample problem.
Grade Level(s): 11-12	
Essential Question(s): How do you describe sample space? How do you find the number of possible outcomes of a probability experiment? How do you find the probability for equally likely outcomes? What are the characteristics of density curves and how can you find probabilities of areas under a density curve? How do you find probabilities for complementary, disjoint, and independent events? How do you find probabilities using addition, multiplication, general addition, and general multiplication rules? How do you use conditional probability for dependent events?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Learn the definition of probability and randomness. • Learn the definition of independent trials and their importance when determining probabilities. • Understand the origins and uses of probability. • Describe the sample space of a random phenomenon. • Use the multiplication principle to determine the number of outcomes. • Use counting principles, Venn Diagrams, and tree diagrams to determine simple probabilities. • For the continuous case, use geometric areas to find probabilities (areas under simple density curves) of events (intervals on the horizontal axis). • Know the probability rules and be able to apply them to determine probabilities of defined events. • Determine if two events are disjoint, complementary, or independent. • Find unions and intersections of two or more events. • Use Venn diagrams to picture relationships among several events. • Use the general addition rule to find probabilities that involve overlapping events. • Understand the idea of independence. Judge when it is reasonable to assume independence as part of a probability model. • Use the multiplication rule for independent events to find the probability that all of several independent events occur. • Use the multiplication rule for independent events in combination with other probability rules to find the probabilities of complex events. • Understand the idea of conditional probability. Find conditional probabilities for individuals chosen at random from table of counts of possible outcomes. • Use the general multiplication rule to find the joint probability $P(A \text{ and } B)$ from $P(A)$ and the conditional probability of $P(B A)$.

How do you find probability for problems with several stages?

- Construct tree diagrams to organize the use of multiplication and addition rules to solve problems with several stages.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students use the probability rules to determine probabilities given different real world scenarios. Additionally, students use the theorem of conditional probability in cases where two events are dependent. Using reasoning, students can express the independence of events formally using conditional probability, $P(B|A) = P(B)$.

MPAC 2 – Connecting concepts:

Students will combine basic probability rules like the complementary rule with more complex rules like multiplication and addition rules to find the probability for the intersection of multiple events.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this unit students realize the importance of algebraic procedures. When using the definition of conditional probabilities, students will use inverse operations to solve for the $P(A)$ given $P(A \text{ and } B)$ and $P(B|A)$.

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach (density curves), numerical approaches (probability rules), and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to apply conditional probability notation. Students learn that $P(B|A)$ means “the probability of B given A.”

MPAC 6 – Communicating:

Students learn how to clearly interpret graphical displays of data (tree diagrams) and communicate their results into meaningful answers.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises. |

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

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- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- An explanation as to why two events are independent or disjoint.
- A description of the probability found using conditional probability of $P(A|B)$ versus $P(B|A)$.
- A lessons learned summary after finding probabilities using a tree diagram in a multi-stage problem.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section 6.1: The Idea of Probability

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Activity 6 (Page 328) The Spinning Wheel
Teaching Objectives	<ul style="list-style-type: none"> Learn the definition of probability and randomness. Learn the definition of independent trials and their importance when determining probabilities. Understand the origins and uses of probability.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Page 334-335 (4,8,9)

Section 6.2: Probability Models

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Using Example 6.3 as a guideline, distribute two dice to each student. Have the students write down a list of all possible solutions for each dice and then two dices together. Use this as a starting point for sample space discussions.
Teaching Objectives	<ul style="list-style-type: none"> Describe the sample space of a random phenomenon. Use the multiplication principle to determine the number of outcomes. Use counting principles, Venn Diagrams, and tree diagrams to determine simple probabilities. For the continuous case, use geometric areas to find probabilities (areas under simple density curves) of events (intervals on the horizontal axis). Know the probability rules and be able to apply them to determine probabilities of defined events. Determine if two events are disjoint, complementary, or independent.

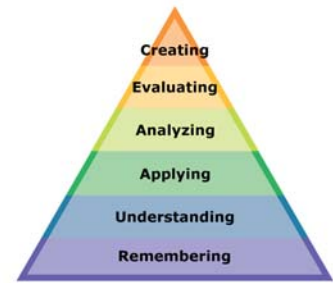
	<ul style="list-style-type: none"> • Find unions and intersections of two or more events. • Use Venn diagrams to picture relationships among several events. • Use the general addition rule to find probabilities that involve overlapping events. • Understand the idea of independence. Judge when it is reasonable to assume independence as part of a probability model. • Use the multiplication rule for independent events to find the probability that all of several independent events occur.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 11,14,15,18,19,20,22,23,26,27,28,31,33 Practice AP Questions: 2006B (3), 2006 (3), 2016 (4)

Section 6.3: General Probability Rules

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> • Introduce the real world problem Example 6.17, a promotion example, to illustrate joint probability. • Using Example 6.16 as a guideline, model how to generate a random number on the calculator or on an online application. Discuss the probability of getting an even or odd number (to a single digit).
Teaching Objectives	<ul style="list-style-type: none"> • Understand the idea of conditional probability. Find conditional probabilities for individuals chosen at random from table of counts of possible outcomes. • Use the general multiplication rule to find the joint probability $P(A \text{ and } B)$ from $P(A)$ and the conditional probability of $P(B A)$. • Construct tree diagrams to organize the use of multiplication and addition rules to solve problems with several stages.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 46,51,52,54,57,58,61,64 Practice AP Questions: #3 2006(B) and #3 2006

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this Chapter 7, students learn how to find measures for discrete versus continuous random variables. First students are taught to distinguish between discrete versus continuous variables. Then the mean and variance of a random variable are calculated, and rules for the sum or difference of two random variables are developed.
Grade Level(s): 11-12	
Essential Question(s): How do you recognize a discrete versus continuous variable? How do you construct a probability distribution table and histogram for a discrete variable? How do you find probabilities of continuous variables for events as areas under density curves including the standard normal distribution? How do you find the mean and variance of a discrete variable? How do you approximate the mean of a distribution using simulation? How do you solve probability problems using the means and variances rules?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Recognize and define a discrete random variable, and construct a probability distribution table and a probability histogram for the random variable. • Recognize and define a continuous random variable, and determine probabilities of events as areas under density curves. • Given a normal random variable, use the stand normal table or a graphing calculator to find probabilities of events as areas under the standard normal distribution curve. • Calculate the mean and variance of a discrete random variable. • Find the expected payout in a raffle or similar game of chance. • Use simulation methods and the law of large numbers to approximate the mean of a distribution. • Use rules for means and rules for variances to solve problems involving sums, differences, and linear combinations of random variables.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students identify random variables as either discrete or continuous using definitions. Using the definition for the expected mean for a discrete variable, students calculate the mean.

MPAC 2 – Connecting concepts:

Students will re-visit their knowledge of finding probabilities using the standard normal distribution from Chapter 2.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this unit students will use their knowledge of basic expression simplification to find the variance of a discrete random variable $\sum(x_i - \mu_x)^2 p_i$.

MPAC 4 – Connecting multiple representations:

Throughout this unit students solve problems using a graphical approach (probability histograms), numerical approaches, and a verbal or written approach, communicating what their final answer means in the context of the problem.

MPAC 5 – Building notational fluency:

Throughout this unit students learn how to use and apply sigma notation to find the expected mean and variance for a discrete random variable. $\mu_x = \sum x_i p_i$ and $\sigma_x^2 = \sum(x_i - \mu_x)^2 p_i$.

MPAC 6 – Communicating:

Students learn how to clearly interpret graphical displays of data (probability histograms) and communicate their results into meaningful answers.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates: All example problems are based on real world scenarios and can be found in each chapter section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts: Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics*, 2nd edition. New York: W.H. Freeman, 2003.

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions
- Microsoft Excel

- Various applets on the Internet

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

- An explanation as to why $P(30 < x < 50)$ differs from $P(30 \leq x \leq 50)$.
- An interpretation of the meaning of the probability found for a continuous random variable.
- An explanation as to why it is important to plan, using expected values, what to charge for a raffle ticket.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section 7.1 Discrete and Continuous Random Variables

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Activity 7 The Game of Craps
Teaching Objectives	<ul style="list-style-type: none"> Recognize and define a discrete random variable, and construct a probability distribution table and a probability histogram for the random variable. Recognize and define a continuous random variable, and determine probabilities of events as areas under density curves. Given a normal random variable, use the stand normal table or a graphing calculator to find probabilities of events as areas under the standard normal distribution curve.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 2,3,4,6,8 AP Exam: 2012 Free Response #2

Section 7.2: Means and Variances of Random Variables

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <ul style="list-style-type: none"> Introduce Example 7.5 Tri-State Pick 3 Lottery problem. Pose the question (while showing students table on Page 407): What is the expected average payoff from many tickets? Have the students turn & discuss with their partner. Use this as an introduction to the mean of a discrete random variable.
Teaching Objectives	<ul style="list-style-type: none"> Calculate the mean and variance of a discrete random variable. Find the expected payout in a raffle or similar game of chance.

	<ul style="list-style-type: none"> • Use simulation methods and the law of large numbers to approximate the mean of a distribution. • Use rules for means and rules for variances to solve problems involving sums, differences, and linear combinations of random variables.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: 22,26,29,33,34,36,39 Practice AP Questions: 2013 (3), 2005B (2), 2015 (3)

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this chapter, students will begin by understanding a binomial setting and how it relates to the random variables defined in Chapter 7. As we progress through this chapter, students will be able to calculate probabilities, means and standard deviations within a binomial setting. Finally, they will use all of these calculations to give a normal approximation to a binomial distribution.
Grade Level(s): 11-12	
Essential Question(s): What is a binomial setting? What are the properties of a binomial distribution? How do you calculate a binomial probability? How do you find the mean and standard deviation of a binomial random variable? How do you perform a normal approximation to a binomial distribution?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Recognize a binomial setting • Define a binomial distribution • Find binomial probabilities using technology and the binomial formula • Calculate mean and standard deviation of a binomial random variable • Calculate a normal approximation to a binomial distribution

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

At the beginning of the chapter, students will define a binomial setting. Using this definition, students will be able to use reasoning skills to determine if a situation exemplifies a binomial setting. If it does not, they will need to explain why; if it does, then they will need identify key components of the setting.

MPAC 2 – Connecting concepts:

Throughout this chapter, students will be able to realize the importance of probability and random variables, and how they relate to real-world types of problems that involve binomial distributions.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas, properties of exponents, combinations and factorials.

MPAC 4 – Connecting multiple representations:

Throughout this chapter students will solve problems using formulas and technology to find binomial probabilities. They will be able to see how different approaches can help solve the same types of problems.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with binomial distributions and the connections that these symbols have to previous chapters/formulas. They will use this notation to develop the formula for using a normal approximation.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve binomial distributions. |

Inter-Disciplinary Connections:**| Real World and Inter-disciplinary problems:**

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises. |

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions

Calculators:

- TI – 83/84 Plus

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will explain why an example either does or does not meet the requirements of a binomial setting.
Students will explain whether or not a normal approximation to a binomial distribution is satisfactory.
Students will explain how the standard deviation behaves as the probability of a success gets closer to 1.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 8.1 – The Binomial Distributions

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Activity 8: A Gaggle of Girls Recall properties of a discrete random variable. Recall properties of a normal distribution.
Teaching Objectives	<ul style="list-style-type: none"> • Identify a random variable as binomial by verifying four conditions. • Use a graphing calculator or the formula to determine binomial probabilities. • Calculate cumulative distribution functions for binomial random variables. • Calculate mean (expected values) and standard deviations of binomial random variables. • Use a normal approximation to the binomial distribution to compute probabilities.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: problems 1, 4, 5, 7, 9, 13, 15, 37, 40, 44, 45 Practice AP question: 2004 #3, 2007B #2, 2009 #2, 2010B #3, 2010 #4, 2011B #3,

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the AP Statistics curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: The purpose of this chapter is to prepare for the study of statistical inference by looking at the probability distributions of some very common statistics: sample proportions and sample means.
Grade Level(s): 11-12	Unit Summary: The purpose of this chapter is to prepare for the study of statistical inference by looking at the probability distributions of some very common statistics: sample proportions and sample means.
Essential Question(s): What is the difference between a parameter and a statistic? What is a sampling distribution? What does it mean for a statistic to be unbiased? What is the variability of a statistic? What is the sampling distribution of sample proportions? What is the sampling distribution of sample means? What is the Central Limit Theorem?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Identify a parameter and a statistic • Describe sampling distributions • Define and identify unbiased statistics • Understand the variability of a statistic • Understand the sampling distribution of a sample proportion with mean and standard deviation • Understand the sampling distribution of sample mean with mean and standard deviation • Normal approximation for sample means • The Central Limit Theorem

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

At the beginning of the chapter, students will define a sampling distribution. From here, students will use the definition to identify the type of sampling distribution that exists in each problem and how to calculate the appropriate probability.

MPAC 2 – Connecting concepts:

Throughout this chapter, students will be able to realize the importance of z-scores, probability and random variables, and how they relate to real-world types of problems that involve sampling distributions.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas and square roots.

MPAC 4 – Connecting multiple representations:

Throughout this chapter, students will solve problems about probability that use sampling distributions for means and proportions. Through these calculations, students will be able to recognize the similarities and differences between when we used z-scores in Chapter 2 and how we need to use z-scores now.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with sampling distributions and the connections that these symbols have to previous chapters/formulas. They will use this notation to develop the formulas for using a normal approximation for means and proportions.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve sampling distributions for mean and proportions. |

Inter-Disciplinary Connections:**Real World and Inter-disciplinary problems:**

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises. |

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions

Calculators:

- TI – 83/84 Plus

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will write the appropriate notation for a sampling distribution of means and proportions.
Students will explain how answers for problems related to a sampling distribution of means would be affected if they were told that the distribution was non-normal.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 9.1 – Sampling Distributions

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Activity using baseball player salaries to show how a non-normal distribution can become normal with a sampling distribution Recall properties of a normal distribution.
Teaching Objectives	<ul style="list-style-type: none"> Identify parameters and statistics in a sample or an experiment. Recognize the facts of sampling variability Interpret a sampling distribution as describing the values taken by a statistic in all possible repetitions of a sample or experiment under the same conditions. Describe the bias and variability of a statistic in terms of the mean and spread of its sampling distribution. Understand that the variability of a statistic is controlled by the size of the sample.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: problems 1, 3, 9, 10

Section: 9.2 – Sample Proportions

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Recall properties of a normal distribution. Recall notation for sample proportion and population proportion.
Teaching Objectives	<ul style="list-style-type: none"> Recognize when a problem involves a sample proportion. Find the mean and standard deviation of the sampling distribution of a sample proportion for an SRS of size n from a population having population proportion p.

	<ul style="list-style-type: none"> • Know that the standard deviation of the sampling distribution gets smaller as n gets bigger. • Recognize when you can use the normal approximation to the sampling distribution of \hat{p}. • Use the normal approximation to calculate probabilities that concern \hat{p}.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: problems 19, 20, 21,

Section: 9.3 – Sample Means

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Recall properties of a normal distribution. Recall notation for sample mean and population mean.
Teaching Objectives	<ul style="list-style-type: none"> • Recognize when a problem involves a sample mean. • Find the mean and standard deviation of the sampling distribution of a sample mean from an SRS of size n when the mean and standard deviation of the population are known. • Know that the standard deviation of the sampling distribution of sample means gets smaller as the sample size gets bigger. • Understand that the sample mean has an approximately normal distribution when the sample is large (central limit theorem). • Use the normal distribution to calculate probabilities that concern sample means.
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: problems 31, 34, 35, 37 AP Problems: 2006B #3, 2006 #3, 2007B #2, 2007 #3, 2008B #2, 2009 #2, 2010 #2, 2014 #3

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the AP Statistics curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

<p>Course/Unit Title: AP Statistics</p>	<p>Unit Summary: In this chapter, students begin by understanding the process of inference and how it related to the sampling distribution of a mean. As we progress through the chapter, students will be able to calculate a confidence interval for a mean, find the necessary sample size needed to estimate a mean, and construct a one-sample hypothesis test for a mean. Finally, in conjunction with the hypothesis tests, they will be able to identify Type I and Type II errors and understand power.</p>
<p>Grade Level(s): 11-12</p>	
<p>Essential Question(s): How do you construct a confidence interval for a mean when the population standard deviation is known? How do you choose the correct sample size when trying to estimate a mean? How do you perform a one-sample z test for a mean? What is a Type I error? What is a Type II error? What is the probability of a Type I error? What is the probability of Type II error? What is power? How can you increase power?</p>	<p>Enduring Understanding(s): Students will be able to:</p> <ul style="list-style-type: none"> • Estimate with confidence • Choose a correct sample size • Perform a one-sample z test for a mean • Identify Type I and Type II errors • Understand power

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

At the beginning of the chapter, students will define one-sample z procedures and then be able to correctly identify and use these procedures with given word problems. As the chapter continues, students will also define power, Type I and Type II errors and be able to understand how we can make a hypothesis test as trustworthy/accurate as possible.

MPAC 2 – Connecting concepts:

Throughout this chapter, students will be able to realize the importance of z-scores, probability and random variables, and how they relate to real-world types of problems that involve sampling distributions for means.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas and square roots.

MPAC 4 – Connecting multiple representations:

Throughout this chapter, students will solve problems about probability that use sampling distributions for means. Through these calculations, students will be able to recognize the similarities and differences between when we used z-scores in Chapters 2 and 9, and how we need to use z-scores now.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with sampling distributions and the connections that these symbols have to previous chapters/formulas. They will use this notation to develop the formulas for z intervals and z tests.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve z distributions.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises. |

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes |

Online Resources incorporated through the year, include but not limited to:

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- AP Central - Previously published and released AP questions

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

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- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will interpret a confidence interval in context of the problem.

Students will interpret the decision of a hypothesis test in context of the problem.

Students will write what Type I and Type II error would be, in context of the problem.

Students will explain ways to increase power. |

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 10.1 – Estimating with Confidence

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Activity 10: A little tacky! Recall properties for a sampling distribution of means
Teaching Objectives	<ul style="list-style-type: none"> • Define statistical inference • Define margin of error • Conditions for constructing a confidence interval for a population mean • Procedure for constructing a confidence interval for a population mean • Explaining how confidence intervals behave • Choosing the sample size for estimating a population mean
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 1,3,5,7,8,12,14,16,18

Section: 10.2 – Tests of Significance

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Example 10.8 – I'm a great free-throw shooter
Teaching Objectives	<ul style="list-style-type: none"> • Define a test of significance • Null and alternative hypotheses • Define P-value • Outline of a z test for a population mean • Confidence intervals and two-sided tests

Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: problems 29 – 32, 38,39,40,43

Section:10.3 – Making Sense of Statistical Significance

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Explain how a level of significance can change the decision of a hypothesis test.
Teaching Objectives	<ul style="list-style-type: none"> Decide how to choose an appropriate level of significance. Statistical significance vs. practical significance
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 58, 61

Section:10.4 – Inference as a Decision

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Class discussion about how the decision of a hypothesis test could be wrong and what causes a wrong decision.
Teaching Objectives	<ul style="list-style-type: none"> Type I and Type II errors Error probabilities Define power Ways to increase power
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 67,68,69,70,72,73

PART IV: EVIDENCE OF LEARNING

**IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.**



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this chapter, students begin with examining a t-distribution and its similarities and differences to the z-distribution. As we progress through the chapter, students will learn inference procedures, such as confidence intervals and hypothesis tests, relative to t-distributions. We conclude by looking at two-sample inference procedures and how they connect to one-sample problems.
Grade Level(s): 11-12	
Essential Question(s): What is a t-distribution? How do you construct a one-sample t interval? How do you perform a one-sample t test? How do you use matched pairs procedures? What is a two-sample t distribution? How do you construct a two-sample t interval? How do you perform a two-sample t test?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Define a t-distribution • Calculate standard error for a mean • Construct a one-sample t interval • Perform a one-sample t test • Use matched pairs procedures • Define a two sample t-distribution • Construct a two-sample t interval • Perform a two-sample t test

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

At the beginning of the chapter, students will define one-sample t procedures and then be able to correctly identify and use these procedures with given word problems. As the chapter continues, students will also define two-sample t procedures and will need to correctly identify and use these procedures with given word problems.

MPAC 2 – Connecting concepts:

Throughout this chapter, students will be able to realize the importance of t-scores, probability and random variables, and how they relate to real-world types of problems that involve sampling distributions.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas and square roots.

MPAC 4 – Connecting multiple representations:

Throughout this chapter, students will solve problems about probability that use sampling distributions for means. Through these calculations, students will be able to recognize the similarities and differences between when we used z-scores in Chapter 10 and how we need to use t-scores now.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with sampling distributions and the connections that these symbols have to previous chapters/formulas. They will use this notation to develop the formulas for t intervals and t tests.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve t distributions.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will be able to interpret confidence intervals in context of the problem.

Students will be able to interpret the decision of hypothesis tests in context of the problem.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 11.1 – Inference for a Mean of a Population

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <i>Paper Airplane Experiment</i> <i>Recall properties of a normal distribution</i> <i>Recall properties of a matched pairs experimental design</i>
Teaching Objectives	<ul style="list-style-type: none"> • Conditions for inference about a mean • Standard error • The one-sample t-statistic and the t distributions • Degrees of freedom • Procedure for a one-sample t confidence interval • Procedure for a one-sample t test • Matched pairs t procedures • Robust procedures • Know when to use t procedures • Power of a t test
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 2,3,4,9,10,12,13,25,16,17,19,22,23

Section:11.2 – Comparing Two Means

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Recall the difference between independent events and dependent events
Teaching Objectives	<ul style="list-style-type: none"> • Define two-sample problems • Conditions for comparing two means • Procedure for a two-sample t confidence interval • Procedure for a two-sample t test • Degrees of freedom • Pooled vs not pooled

Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 37,39,40,43,44,49 AP Problems: #4 2000, #5 2001, #5 2002, #4 2004(B) 2005B #4, 2006B #4, 2006 #4, 2007B #5, 2007 #1&4, 2008B #1,3&4, 2009B #5, 2009 #4, 2010 #5, 2011 #4, 2012 #3, 2013 #1, 2014 #5,

PART IV: EVIDENCE OF LEARNING

**IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.**



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this chapter, students begin with examining a z-distribution for proportions and its similarities and differences to the z-distribution for means. As we progress through the chapter, students will learn inference procedures, such as confidence intervals and hypothesis tests, relative to z-distributions for proportions. We conclude by looking at two-sample inference procedures and how they connect to one-sample problems.
Grade Level(s): 11-12	
Essential Question(s): How do you calculate a one-sample confidence interval for a proportion? How do you perform a one-sample hypothesis test for a proportion? How do you find the sample size for a desired margin of error? How do you construct a confidence interval to compare two proportions? How do you perform a hypothesis test to compare two proportions?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Understand conditions for inference about a proportion. • Construct a one-sample confidence interval for a population proportion • Perform a one-sample hypothesis test for a proportion • Find the sample size for a desired margin of error • Construct a confidence interval for comparing two proportions • Perform a significance test for comparing two proportions

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target MPAC 1 – Reasoning with definitions and theorems:

At the beginning of the chapter, students will define one-sample z procedures for proportions and then be able to correctly identify and use these procedures with given word problems. As the chapter continues, students will also define two-sample z procedures for comparing two proportions and will need to correctly identify and use these procedures with given word problems.

MPAC 2 – Connecting concepts:

Throughout this chapter, students will be able to realize the importance of z -scores, probability and random variables, and how they relate to real-world types of problems that involve sampling distributions for proportions.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas and square roots.

MPAC 4 – Connecting multiple representations:

Throughout this chapter, students will solve problems about probability that use sampling distributions for proportions. Through these calculations, students will be able to recognize the similarities and differences between when we used proportions in Chapter 9 and how we need to use z -scores now.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with sampling distributions and the connections that these symbols have to previous chapters/formulas. They will use this notation to develop the formulas for z intervals and z tests for proportions.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve z distributions for proportions.]

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises.]

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will be able to interpret confidence intervals in context of the problem.

Students will be able to interpret the decision of hypothesis tests in context of the problem. |

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 12.1 – Inference for a Population Proportion

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <i>Activity: Is One Side of a Coin Heavier?</i> <i>Recall properties of sampling distributions of proportions from Chapter 9</i>
Teaching Objectives	<ul style="list-style-type: none"> • Define sample proportion • Conditions for inference about a proportion • Standard error of a sample proportion • Procedure for constructing a confidence interval for p • Procedure for performing a hypothesis test for p • How to find sample size for a desired margin of error
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 1,2,3,5,6,7,9,10,11

Section:12.2 – Comparing Two Proportions

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> <i>Recall conditions for two-sample problems in Chapter 11</i>
Teaching Objectives	<ul style="list-style-type: none"> • Standard error for two sample proportions • Confidence intervals for comparing two proportions • Significance test for comparing two proportions
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: Problems 23,24,26,27

AP Problems: 2005 #4&5, 2006B #2, 2007 #5, 2009B #3, 2009 #5, 2010B #4, 2010 #4, 2011B #5, 2012 #4&5, 2013 #5, 2015 #2&4, 2016 #5, 2017 #2

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.

IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this chapter, students begin by
Grade Level(s): 11-12	
Essential Question(s): What are the properties of a chi-square distribution? How do you test the distribution of a population? What is a two-way table? How do you test for homogeneity of populations? How do you test for independent variables?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Understand a chi-square distribution • Define degrees of freedom for chi-square distributions • Calculate expected counts • Perform a goodness-of-fit hypothesis test • Define a two-way table • Calculate expected counts for two-way tables • Perform a chi-square test for homogeneity of populations • Perform a chi-square test for independence • Compare a chi-square test to a z-test for proportions

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

Students will begin by defining a chi-square distribution and will continue to verify these properties as they work on problems throughout the chapter.

MPAC 2 – Connecting concepts:

Throughout this chapter students will be able to recognize categorical variables and how to find probability when data is not quantitative.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas and square roots.

MPAC 4 – Connecting multiple representations:

Throughout this chapter, students will solve problems regarding categorical variables. Through these calculations, students will be able to recognize the similarities and differences between when we use procedures for quantitative data (Chapters 10 – 12) and when we use categorical data.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with chi-square distributions and the connections that these symbols have to previous chapters/formulas. They will use this notation to develop the formulas and procedures used in chi-square hypothesis tests.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve chi-square distributions.

Inter-Disciplinary Connections:

Real World and Inter-disciplinary problems:

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises.

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions

Calculators:

- TI – 84 Plus
- TI - 89 Titanium

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will interpret the decision of a hypothesis test in context of the problem.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

-
- Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.
- Suggested warm-up activities, instructional strategies/activities, and assignments:

- **Section: 13.1 – Test for Goodness of Fit**

•	• Advanced Placement
• Focus and Motivate • Starting Options (Lesson Warm Up)	• <i>Suggestions include but not limited to:</i> • Activity 13 “I Didn’t Get Enough Blues”
• Teaching Objectives	• Define a chi-square distribution • Procedure for a goodness-of-fit test
• Checking for Understanding	• <i>Suggestions include but not limited to:</i> • Exit Tickets (teacher made supplement) • Inquiry • Formative Assessment
• Practice and Apply • Assigning Homework	• Text: Problems 2,4

- **Section:13.2 – Inference for Two-Way Tables**

•	• Advanced Placement
• Focus and Motivate • Starting Options (Lesson Warm Up)	• <i>Suggestions include but not limited to:</i> • Recall properties of a z-test for two proportions
• Teaching Objectives	• Define a two-way table • Define expected counts for two-way tables • Define the chi-square statistic • Procedure for chi-square test for homogeneity of populations • Cell counts required for the chi-square test • Procedure for the chi-square test of association/independence • Chi-square test vs z test
• Checking for Understanding	• <i>Suggestions include but not limited to:</i> • Exit Tickets (teacher made supplement) • Inquiry • Formative Assessment
• Practice and Apply • Assigning Homework	Text: problems 14,16,18,19,20,22,23,24

AP Problems: 2008 #5, 2009 #1, 2010B #5, 2011B #4,
2013 #4, 2014 #1, 2016 #2, 2017 #5

- **PART IV: EVIDENCE OF LEARNING**

**IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.**



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the Algebra 1 curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Course Name: AP Statistics

Course Number: 034600

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: AP Statistics	Unit Summary: In this chapter, students will begin by understanding the regression model and the necessary conditions for regression inference. As the section continues, students will be able to perform inference procedures for the slope.
Grade Level(s): 11-12	
Essential Question(s): What is a regression model? What are the conditions for regression inference? What is the standard error for the LSRL? What are the degrees of freedom for paired data? How do you construct a confidence interval for slope? How do you perform a significance test for slope? How do you read computer output for regression inference?	Enduring Understanding(s): Students will be able to: <ul style="list-style-type: none"> • Understand the regression model • Understand conditions for regression inference • Find the standard error about the LSRL • Understand degrees of freedom for paired data • Construct a confidence interval for slope • Perform a significance test for slope

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

Applications of the Mathematical Practices for AP Statistics:

Learning Target

MPAC 1 – Reasoning with definitions and theorems:

At the beginning of the chapter, students will define the regression model. Using this definition, students will be able to use reasoning skills to determine if a situation meets the conditions for regression inference. If it does, then they will perform the appropriate inference procedures.

MPAC 2 – Connecting concepts:

Throughout this chapter, students will be able to realize the importance of regression procedures, and how they relate to real-world types of problems.

MPAC 3 – Implementing algebraic/computational processes:

Throughout this chapter, students will realize the importance of basic calculations: solving formulas, properties of exponents, and square roots.

MPAC 4 – Connecting multiple representations:

Throughout this chapter students will solve problems using formulas and technology to perform regression inference. They will be able to see how different approaches can help solve the same types of problems.

MPAC 5 – Building notational fluency:

Students are able to understand the notation associated with regression inference and the connections that these symbols have to previous chapters/formulas (especially Chapter 3). They will use this notation to develop the formula for using linear regression.

MPAC 6 – Communicating:

Students are able to make connections, apply, discuss and justify their final answers to problems that involve linear regression. |

Inter-Disciplinary Connections:**Real World and Inter-disciplinary problems:**

Yates, Moore and Starnes: All example problems are based on real-world scenarios. They can be found in each chapter's section exercises and in the chapter review exercises. |

Students will engage with the following text, resources and tools:

Texts:

- The Practice of Statistics by Yates, Moore and Starnes

Online Resources incorporated through the year, include but not limited to:

- Albert io – online AP exam practice resource
- AP Central - Previously published and released AP questions

Calculators:

- TI – 83/84 Plus

The following 21st century skills and the 8 mathematical practices are embedded throughout the course and are evident in daily lessons, assignments, activities, assessments and projects:

21st Century skills:

- Critical thinking
- Creativity
- Collaboration
- Communication
- Information literacy
- Technology literacy
- Media literacy
- Flexibility
- Leadership
- Initiative
- Productivity
- Social skills

Mathematical Practices:

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Students will write:

Students will interpret the value of the correlation in context of the problem.

Students will interpret the coefficient of determination in context of the problem.

Students will interpret the y-intercept and the slope in context of the problem.

Students will interpret a confidence interval for slope.

Students will interpret the decision of a hypothesis test for slope.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

Students will uncover and build skills through various classroom learning activities. Investigating algebra activities, modeling examples, using real-life application, using note-taking strategies, and using Smart Board technologies will all be explored as a blend of learning strategies to promote critical thinking, problem solving and performance skills of all learners. Other learning experiences could include alternative lesson openers, math and history applications, problem-solving workshops, interdisciplinary applications and projects.

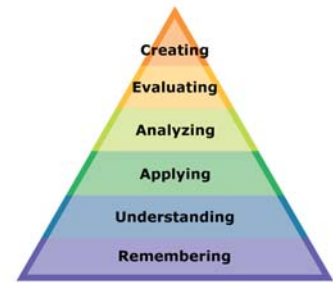
Suggested warm-up activities, instructional strategies/activities, and assignments:

Section: 14.1 – Inference About the Model

	Advanced Placement
Focus and Motivate Starting Options (Lesson Warm Up)	<i>Suggestions include but not limited to:</i> Recall properties and calculations about linear regression from Chapter 3. Activity 14 – arm span data
Teaching Objectives	<ul style="list-style-type: none"> • Conditions for regression inference • Define the true regression line • Standard error about the LSRL • Degrees of freedom for paired data • How to construct a confidence interval for regression slope • How to perform a hypothesis test for regression slope • Understand how to use and interpret computer output
Checking for Understanding	<i>Suggestions include but not limited to:</i> Exit Tickets (teacher made supplement) Inquiry Formative Assessment
Practice and Apply Assigning Homework	Text: problems 1,2,4,7,9,11,13,14,16,17 Practice AP questions #5 2005(B), #2 2006, 2011 #5,

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.



Formative Assessments:

The effectiveness of the instructional program will be based on numerous activities and strategies including the following: teacher observations, students collaborating with peers, questioning strategies, student record-keeping, quizzes, exit/admit assignments, peer/self-assessments, learning/response logs, discussions and practice presentations.

Accommodations/Modifications:

As per individual student's IEP or 504 plan.

Summative Assessments:

The following assessments will be used to evaluate student learning, skill acquisition and academic achievement of the Standards of Mathematical Practice and the New Jersey Learning Standards for Mathematics listed under each chapter in the AP Statistics curriculum/syllabus at the conclusion of an instructional time period.

- Diagnostic Pre-Test
- Chapter Tests
- Projects
- End-Of –Course Assessment

Accommodations/Modifications:

As per individual students' IEP or 504 plan.

Performance Assessments:

The following assessments require students to utilize various strands of mathematics.

- Projects
- Practice AP Exam Questions
- Homework
- Classwork

Accommodations/Modifications:

As per individual student's IEP or 504 plan.