

# Statistics Math Curriculum



## Egg Harbor Township School District

State Board Adoption Date of Standards: 5/2016

## Unit Overview (Standards Coverage)

Unit	Standards	Unit Focus	Standards for Mathematical Practice	Open Educational Resources
<b>Unit 1</b> <i>Collecting and Exploring Univariate Data</i> (3 weeks)	<ul style="list-style-type: none"> <li>Summarize, represent, and interpret data on a single count or measurement variable</li> <li>Summarize, represent, and interpret data on two categorical and quantitative variables</li> </ul>	Understanding variability, data types, basic data displays, sampling methods, biases, and experimental design.	<p>MP1. Select methods for collecting and/or analyzing data for statistical inference.</p> <p>MP2. Describe patterns, trends, associations, and relationships in data.</p>	<a href="http://www.studyisland.com">www.studyisland.com</a> <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a> <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a> <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a> <a href="http://www.mvap.collegeboard.org">www.mvap.collegeboard.org</a>
<b>Unit 2</b> <i>Describing Univariate Data</i> (4 weeks)	<ul style="list-style-type: none"> <li>Summarize, represent, and interpret data on a single count or measurement variable</li> </ul>	Reading and creating the data displays used to summarize categorical, discrete numeric, and continuous numeric data.	<p>MP3. Explore random phenomena.</p> <p>MP4. Develop an explanation or justify a conclusion using evidence from data, definitions, or statistical inference.</p>	<a href="http://www.studyisland.com">www.studyisland.com</a> <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a> <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a> <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a> <a href="http://www.mvap.collegeboard.org">www.mvap.collegeboard.org</a>
<b>Unit 3</b> <i>Exploring Bivariate Data</i> (4 weeks)	<ul style="list-style-type: none"> <li>Summarize, represent, and interpret data on two categorical and quantitative variables</li> <li>Interpret linear models</li> </ul>	Constructing and interpreting bivariate data displays, correlation, least squares regression, standard error, residuals, coefficient of determination, and power transformations.		<a href="http://www.studyisland.com">www.studyisland.com</a> <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a> <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a> <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a> <a href="http://www.mvap.collegeboard.org">www.mvap.collegeboard.org</a>
<b>Unit 4</b> <i>Probability, Random Variables, and Probability Distributions</i> (8 weeks)	<ul style="list-style-type: none"> <li>Understand independence and conditional probability and use them to interpret data</li> <li>Use the rules of probability to compute probabilities of compound events in a uniform probability model</li> <li>Calculate expected values and use them to solve problems</li> <li>Use probability to evaluate outcomes of decisions</li> </ul>	Applying basic principles of probability to solve various problems involving chance experiments including combinations, permutations, counting principle, tree and venn diagrams, conditional probability, general addition and multiplication rules, law of total probability, expected value, discrete and continuous probability distributions, binomial, and geometric distributions.		<a href="http://www.studyisland.com">www.studyisland.com</a> <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a> <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a> <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a> <a href="http://www.mvap.collegeboard.org">www.mvap.collegeboard.org</a>

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<p><b>Unit 5</b> <i>Sampling Distributions (2 weeks)</i></p>	<ul style="list-style-type: none"> <li>• Understand and evaluate random processes underlying statistical experiments</li> <li>• Make inferences and justify conclusions from sample surveys, experiments and observational studies</li> </ul>	<p>Exploring and discovering the patterns that form in sampling distributions of the sample mean and the sample proportion and using these patterns to develop rules for describing/measuring center, shape, and spread based on the Central Limit Theorem.</p>		<p><a href="http://www.studyisland.com">www.studyisland.com</a>  <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a>  <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a>  <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a>  <a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></p>
<p><b>Unit 6</b> <i>Confidence Interval Estimates (3 weeks)</i></p>	<ul style="list-style-type: none"> <li>• Understand and evaluate random processes underlying statistical experiments</li> <li>• Make inferences and justify conclusions from sample surveys, experiments and observational studies</li> </ul>	<p>Understanding and applying the concepts learned about inferential statistics to construct estimates of the population mean and proportion using margin of error based on a particular sample sizes.</p>		<p><a href="http://www.studyisland.com">www.studyisland.com</a>  <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a>  <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a>  <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a>  <a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></p>
<p><b>Unit 7</b> <i>Hypothesis Testing (6 weeks)</i></p>	<ul style="list-style-type: none"> <li>• Understand and evaluate random processes underlying statistical experiments</li> <li>• Make inferences and justify conclusions from sample surveys, experiments and observational studies</li> </ul>	<p>Using inferential statistical processes to conduct hypothesis tests on population means and proportions for one, two, or three or more populations.</p>		<p><a href="http://www.studyisland.com">www.studyisland.com</a>  <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a>  <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a>  <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a>  <a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></p>

**This document outlines in detail the answers to following four questions:**

- 1. What do we want our students to know?**
- 2. How do we know if they learned it?**
- 3. What do we do if they did not learn it?**
- 4. What do we do when they did learn it?**

**Curricular Framework MATH-Statistics**

<b>Unit 1 STATISTICS</b>		
<b>Content &amp; Practice Standards</b>	<b>Interdisciplinary Standards</b>	<b>Critical Knowledge &amp; Skills</b>
<ul style="list-style-type: none"> <li>Summarize, represent, and interpret data on a single count or measurement variable</li> <li>Summarize, represent, and interpret data on two categorical and quantitative variables</li> </ul>	<ul style="list-style-type: none"> <li>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Understanding variability, data types, basic data displays, sampling methods, biases, and experimental design.</li> </ul>
<b>Unit 1 STATISTICS</b>		
<b>Stage 1 – Desired Results</b>		
<b>UNIT SUMMARY</b>	<b>CORE AND SUPPLEMENTAL MATERIALS/RESOURCES</b>	
The Data Collection Unit will cover the nature of variability in statistics, the various designs used to do research, the primary differences between observational and experimental studies, the various biases that can occur during data collection, and the sampling methods used to avoid such biases.	<ul style="list-style-type: none"> <li>Introduction to Statistics textbook</li> <li><a href="http://www.studyisland.com">www.studyisland.com</a></li> <li><a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li><a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li><a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li><a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>	
<b>UNDERSTANDINGS</b>		
<p>Students will understand that...</p> <ul style="list-style-type: none"> <li>variability is an important aspect of statistical analysis.</li> <li>there is a difference between a census and a sample.</li> <li>data collection can be utilized to make summative statements or inferences about a population.</li> <li>observational studies can be used to demonstrate correlation or association.</li> <li>designed experiments can be used to prove causation.</li> </ul>		
<b>Students will know...</b>	<b>Students will be able to...</b>	
<ul style="list-style-type: none"> <li>key concepts- population, sample, census, descriptive statistics, inferential statistics, categorical data, numeric data, discrete data,</li> </ul>	<ul style="list-style-type: none"> <li>conduct simple experimental and observational studies using sampling methods and design elements to reduce bias and confounding variables.</li> </ul>	

## Curricular Framework MATH-Statistics

<p>continuous data, relative frequency, selection bias, measurement/response bias, nonresponse bias, simple random sample, stratified sampling, cluster sampling, sampling with replacement, sampling without replacement, extraneous factors, blocking, direct control, randomization, replication, control, and blind.</p> <ul style="list-style-type: none"> <li>● what variability looks like and why it is essential to the discipline of statistics.</li> <li>● what conclusions can be drawn from an observational versus an experimental study.</li> </ul>	<ul style="list-style-type: none"> <li>● identify different types of data sets.</li> <li>● calculate relative frequency.</li> </ul>
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### Stage 2 – Assessment Evidence

<p>Performance Tasks: <i>What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?</i></p> <p><b><u>Performance Tasks/Use of Technology</u></b></p> <ul style="list-style-type: none"> <li>● Summer assignment</li> <li>● Homework/classwork</li> <li>● Exit questions</li> <li>● Bingo cage and marbles for sampling methods</li> <li>● Experimental design with all design elements</li> <li>● Model experimentation</li> </ul>	<p>Other Evidence: <i>What other means of assessment will be used throughout this unit?</i></p> <p><b><u>Formative</u></b></p> <ul style="list-style-type: none"> <li>● Modelling experiment activity</li> <li>● Free response AP practice questions</li> </ul> <p><b><u>Summative</u></b></p> <ul style="list-style-type: none"> <li>● Vocabulary quiz</li> <li>● True/False quiz</li> </ul>
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### Stage 3 – Learning Plan

•This unit is the foundation for statistical analysis. Students need to understand and put into practice the process of gathering a sample that is representative of the desired population of interest using the appropriate random sampling methods. Additionally, students need to understand what type of data can be collected and how to quickly and easily organize that data into simple tables/graphs. Students will need to understand and identify sources of biased data and the significance and influence that bias has over the resulting statistics. Students often excel at identifying the sampling methods but struggle with higher tasks in the Bloom’s taxonomy. Various ‘labs’ are designed to direct students through the process of designing well thought out experiments using random mechanisms. One example of such labs is dealing with the scenario of surveying the student body as it sits in the auditorium for a school assembly. How might the student council obtain a representative sample in the most functional way using the sampling methods learned? Students, working in groups, must effectively communicate and collaborate to develop a plan.

### Planned Differentiation & Interventions for Tiers I, II, III, ELL, SPED, and Gift & Talented Students

- *Rethink and revise. Dig deeper into ideas at issue (through the faces of understanding). Revise, rehearse, and refine, as needed. Guide students in self-assessment and self-adjustment, based on feedback from inquiry, results, and discussion.*
- *Evaluate understandings. Reveal what has been understood through final performances and products. Involve students in a final self-assessment to identify remaining questions, set future goals, and point toward new units and lessons.*
- *Tailor (personalize) the work to ensure maximum interest and achievement. Differentiate the approaches used and provide sufficient options and variety (without compromising goals) to make it most likely that all students will be engaged and effective.*

#### Gifted & Talented:

- “Differentiating the Lesson” in Big Ideas online resources for all sections
- “Additional Topics” in Big Ideas online resources to extend and enhance instruction
- Big Ideas Game Closet
- Big Ideas Differentiated Instruction options
- Big Ideas Mini-Assessments
- Design Challenges
- Student Choice/Driven Activities
- Group Projects
- MobyMax
- LinkIt!
- Rocket Math
- [Intervention Central](#)
- [Do to Learn](#)
- [Differentiation Strategies for Math](#)
- [Discovery Education Math](#)
- [Everyday Mathematics](#)
- [Homework Spot](#)
- [Math Fact Fluency](#)

#### Tier I:

- “Differentiating the Lesson” in Big Ideas online resources for all sections
- Big Ideas MATH Pyramid of Tiered Interventions for additional resources
- Record and Practice Journal

- Differentiated Instruction options
- Fair Game Review
- Vocabulary Support Glossary resources
- Mini-Assessments
- Game Closet
- Lesson Tutorials
- Flash Cards
- Extended Time
- Flexible Grouping
- Small Group Instruction
- Peer Buddies
- Math Tutoring Center (HS only)
- Math Lab/Tutorial
- MobyMax
- LinkIt!
- Rocket Math
- [Intervention Central](#)
- [Do to Learn](#)
- [Learning Ally](#)
- [Differentiation Strategies for Math](#)
- [Discovery Education Math](#)
- [Everyday Mathematics](#)
- [Homework Spot](#)
- [Flash Card Math](#)
- [Math Fact Fluency](#)

**Tier II:**

- Lesson Tutorials
- Basic Skills Handbook
- Skills Review Handbook
- Differentiated Instruction Big Ideas resources
- Game Closet
- Centers/Small Group Instruction
- Math Tutoring Center (HS only)
- Math Lab/Tutorial
- MobyMax
- LinkIt!

- Math Fact Fluency/Rocket Math

**Tier III:**

- Customized Learning Intervention Activities resources
- Intensive Intervention resource
- Systematic Assessments to focus on specific deficits

**ELL:**

- Big Ideas Math Student Editions are available online in Spanish
- Letters to Parents are available in the Resources by Chapter book to assist in guiding parents through each chapter and offer helpful suggestions they can use to demonstrate mathematical concepts for their child in daily activities. These letters are editable so teachers can customize them.
- Student Dynamic eBook Audio has the option to be read in English or Spanish
- Multi-Language Glossary for new Math vocabulary is available in 14 different languages.
- Audio version is available in English or Spanish.
- Game Closet can be accessed in English or Spanish, while also allowing for all students to play and understand these educational games.
- ELL Notes included in Teacher Edition to help teachers overcome obstacles.
- Record & Practice Journal available in Spanish.
- Student Journal available in Spanish.
- Chapter Reviews available in English and Spanish.
- Vocabulary Flash Cards
- Chunking Information
- Math Word Wall/Word Bank
- Multi-Sensory Instruction
- Use of Translation software
- Gradual Release Model
- [TODOS: Mathematics for ALL](#) - Excellence and Equity in Mathematics
- [FABRIC - A Learning Paradigm for ELLs](#) (NJDOE resource)

**SPED:**

- Menu Math (mostly for very low functioning students)
- Math Labs/Tutorial
- MobyMax
- LinkIt!
- IXL
- Learning Ally (audio version for textbooks and other published materials) – Also available for 504 students
- Apex Online Learning – Bridge students only
- Use of specialized equipment such as beeping balls, text to speech and speech to text software, special seats or desks



- Use of hands-on materials for problem solving
- Visual supports and Use of Manipulatives
- Extended time to complete tests and assignments
- Graphic Organizers/Study Guides
- Mnemonic tricks to improve memory
- Reducing workload
- Centers/Small Group Instruction
- Adjusting accountability for standards by focusing only on essential standards
- Use of iPads or laptops for students with motor issues that make writing difficult
- Use of tangible rewards (certificates, small toys, etc. per behavior plan)
- Use prompts and model directions
- Use task analysis to break down activities and lessons into each individual step needed to complete the task
- Use concrete examples to teach concepts
- Have student repeat/rephrase written directions
- Provide multi-sensory, hands-on materials for instruction
- Chunking Information
- Modify all fine motor tasks for example: (fat crayons, pencil grip, adaptive scissors)
- Functional or practical emphasis

**504:**

- Learning Ally (audio version for textbooks and other published materials)
- Extra help opportunities
- Reduce workload
- Partial credit
- Allow use of calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed ( use interactive notebook)
- Preferential Seating
- Extra Practice
- Directions repeated, clarified and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

**Curricular Framework MATH-Statistics**

<b>Unit 2 STATISTICS</b>		
<b>Content &amp; Practice Standards</b>	<b>Interdisciplinary Standards</b>	<b>Critical Knowledge &amp; Skills</b>
<ul style="list-style-type: none"> <li>Summarize, represent, and interpret data on a single count or measurement variable</li> <li>Summarize, represent, and interpret data on two categorical and quantitative variables</li> </ul>	<ul style="list-style-type: none"> <li>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Reading and creating the data displays used to summarize categorical, discrete numeric, and continuous numeric data.</li> <li>Analyzing all of the data displays used to summarize categorical, discrete numeric, and continuous numeric data in order to summarize the center, shape, and spread of data. It also combines these measures using contextual statistics (z- scores) and basic Rules for data analysis.</li> </ul>
<b>Unit 2 STATISTICS</b>		
<b>Stage 1 – Desired Results</b>		
<b>UNIT SUMMARY</b>	<b>CORE AND SUPPLEMENTAL MATERIALS/RESOURCES</b>	
<p>The Graphical Methods for Describing Data Unit covers all of the data displays used to summarize categorical, discrete numeric, and continuous numeric data. This unit also covers all of the data displays used to summarize categorical, discrete numeric, and continuous numeric data in order to summarize the center, shape, and spread of data. It also combines these measures using contextual statistics (z- scores) and basic Rules for data analysis.</p>	<ul style="list-style-type: none"> <li>Introduction to Statistics textbook</li> <li><a href="http://www.studyisland.com">www.studyisland.com</a></li> <li><a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li><a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li><a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li><a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>	
<b>UNDERSTANDINGS</b>		
<p>Students will understand that...</p> <ul style="list-style-type: none"> <li>there are certain characteristics to look for in a display of quantitative data: center, variability, clumps &amp; gaps, unusual data values.</li> <li>different displays are used for the various types of data.</li> <li>there is a difference between sample statistics and population parameters.</li> <li>the distribution of data is important to determine how to analyze the data.</li> <li>describing the variation of data is as important as defining the center of a data set.</li> <li>standard deviation is essential to every statistically analysis.</li> </ul>		
<b>Students will know...</b>	<b>Students will be able to...</b>	

## Curricular Framework MATH-Statistics

- key concepts/vocabulary- discrete, continuous, qualitative data, quantitative data, frequency, relative frequency, frequency distribution, cumulative relative frequency.
- when to use the different types of data displays given different types of data.
- which displays are best for data sets with particular characteristics.
- key concepts/vocabulary- sample statistic, population parameter, mean, trimmed mean, median, range, deviation, variance, standard deviation, interquartile range, outliers (extreme and mild), modality (unimodal, bimodal, multimodal), skewedness (positively and negatively skewed), normal distribution, uniform distribution, tails (heavy and light), mode, quartiles, z-score, percentile
- when to use the different types of data displays given different types of data.
- use ANOVA technique to determine if there is a significant difference among three or more means.
- which displays are best for data sets with particular characteristics

- construct comparative bar charts, pie charts, segmented bar charts, stem-and-leaf plots, histograms, and cumulative relative frequency plots.
- interpret comparative bar charts, pie charts, segmented bar charts, stem-and-leaf plots, histograms, and cumulative relative frequency plots.
- calculate various measures of center- mean, trimmed mean, median.
- calculate various measures of spread- range, standard deviation, interquartile range.
- identify various shapes including skewedness, modality (mode), and tail length.
- construct both skeletal and modified boxplots.
- calculate and identify outliers.

### Stage 2 – Assessment Evidence

**Performance Tasks:**

*What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?*

**Performance Tasks/Use of Technology**

- Homework/classwork
  - Exit questions
  - Data display activity- baseball stats
  - Random Number Generator- graphing calculator

**Other Evidence:**

*What other means of assessment will be used throughout this unit?*

**Formative**

- graph of the week activities
- Free Response AP Practice questions

**Summative**

- Chapter project
- Chapter Assessment

### Stage 3 – Learning Plan

• This unit answers the question, “Now that we collected the data, now what?” It is difficult to find the signal in the noise that is data. One must first visualize it before he or she can find patterns and trends. This unit requires the students to both convert data into various data displays and draw conclusions from these displays. They are required to compare two data sets through a specific guidelines of items such as shape, gaps, variability, and center. Specifically, students are assessed on their ability to sift through baseball statistics to design meaningful data displays to summarize their performance of the selected team. The last part of the unit requires the students to contextualize the performance of their selected team using methods for both individual and group contextualization.

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- Visual supports and Use of Manipulatives
- Extended time to complete tests and assignments

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- Directions repeated, clarified and reworded
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Unit 3 STATISTICS		
Content & Practice Standards	Interdisciplinary Standards	Critical Knowledge & Skills
<ul style="list-style-type: none"> <li>Summarize, represent, and interpret data on two categorical and quantitative variables</li> <li>Interpret linear models</li> </ul>	<ul style="list-style-type: none"> <li>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Constructing and interpreting bivariate data displays, correlation, least squares regression, standard error, residuals, coefficient of determination, and power transformations.</li> </ul>
Unit 3 STATISTICS		
Stage 1 – Desired Results		
UNIT SUMMARY	CORE AND SUPPLEMENTAL MATERIALS/RESOURCES	
<ul style="list-style-type: none"> <li>The Summarizing Bivariate Data Unit covers all of the basic data display and data summary used in bivariate data. This unit includes scatter plots, correlation, lines of best fit for making predictions, assessing those lines of best fit, and using nonlinear models to make predictions.</li> </ul>	<ul style="list-style-type: none"> <li>Introduction to Statistics textbook</li> <li><a href="http://www.studyisland.com">www.studyisland.com</a></li> <li><a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li><a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li><a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li><a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>	
UNDERSTANDINGS		
Students will understand that...		
<ul style="list-style-type: none"> <li>correlation and causation are different things.</li> <li>The different strengths of the correlation coefficient match up with varying strengths of linear relationships.</li> <li>not all data uses a linear model as the best means for prediction.</li> </ul>		
Students will know...	Students will be able to...	
<ul style="list-style-type: none"> <li>key concepts/vocabulary- Pearson's correlation coefficient, dependent variable, independent variable, slope, y intercept, linear regression, line of best fit, principle of least squares, extrapolation, residuals, predicted values, residual plot, coefficient of determination, total sum of squares, residual sum of squares, transformation,</li> </ul>	<ul style="list-style-type: none"> <li>Calculate and interpret correlation coefficients.</li> <li>Calculate the equation of a line of best fit.</li> <li>Use of a linear regression to make predictions about a population.</li> <li>Analyze a residual plot to determine if a line of best fit is an appropriate model.</li> <li>Perform a power transformation.</li> </ul>	



## Curricular Framework MATH-Statistics

- the properties of correlation measurement and why correlation does not mean causation.
- the meaning of the principle of least squares.
- how to identify when a linear regression is not a good fit for making predictions.
- The dangers of extrapolation.

### Stage 2 – Assessment Evidence

**Performance Tasks:**

*What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?*

**Performance Tasks/Use of Technology**

- Homework/classwork
  - Exit questions
  - Linear regression activity
  - Minitab program output

**Other Evidence:**

*What other means of assessment will be used throughout this unit?*

**Formative**

- Free Response AP Practice questions
- Regression activities

**Summative**

- Unit quiz
- Unit assessment
- Unit project

### Stage 3 – Learning Plan

• This unit introduces the students to probability and predictions. Students will begin to see how data combined with some statistical techniques can be used to make predictions. Students also learn the pitfalls of using data to make predictions and how variability plays a role in our confidence level. Students conduct a reflective study to see if they can find patterns in their own lives that are strongly correlated. Students learn the various methods to assess the strength of their predictions and learn how to compare various prediction models.

### Planned Differentiation & Interventions for Tiers I, II, III, ELL, SPED, and Gift & Talented Students

- *Rethink and revise. Dig deeper into ideas at issue (through the faces of understanding). Revise, rehearse, and refine, as needed. Guide students in self-assessment and self-adjustment, based on feedback from inquiry, results, and discussion.*
- *Evaluate understandings. Reveal what has been understood through final performances and products. Involve students in a final self-assessment to identify remaining questions, set future goals, and point toward new units and lessons.*
- *Tailor (personalize) the work to ensure maximum interest and achievement. Differentiate the approaches used and provide sufficient options and variety (without compromising goals) to make it most likely that all students will be engaged and effective.*

**Gifted & Talented:**

- “Differentiating the Lesson” in Big Ideas online resources for all sections
- “Additional Topics” in Big Ideas online resources to extend and enhance instruction
- Big Ideas Game Closet
- Big Ideas Differentiated Instruction options
- Big Ideas Mini-Assessments
- Design Challenges
- Student Choice/Driven Activities
- Group Projects
- MobyMax
- LinkIt!
- Rocket Math
- [Intervention Central](#)
- [Do to Learn](#)
- [Differentiation Strategies for Math](#)
- [Discovery Education Math](#)
- [Everyday Mathematics](#)
- [Homework Spot](#)
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**Tier I:**

- “Differentiating the Lesson” in Big Ideas online resources for all sections
- Big Ideas MATH Pyramid of Tiered Interventions for additional resources
- Record and Practice Journal
- Differentiated Instruction options
- Fair Game Review
- Vocabulary Support Glossary resources
- Mini-Assessments
- Game Closet
- Lesson Tutorials
- Flash Cards
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**Tier II:**

- Lesson Tutorials
- Basic Skills Handbook
- Skills Review Handbook
- Differentiated Instruction Big Ideas resources
- Game Closet
- Centers/Small Group Instruction
- Math Tutoring Center (HS only)
- Math Lab/Tutorial
- MobyMax
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**Tier III:**

- Customized Learning Intervention Activities resources
- Intensive Intervention resource
- Systematic Assessments to focus on specific deficits

**ELL:**

- Big Ideas Math Student Editions are available online in Spanish
- Letters to Parents are available in the Resources by Chapter book to assist in guiding parents through each chapter and offer helpful suggestions they can use to demonstrate mathematical concepts for their child in daily activities. These letters are editable so teachers can customize them.
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- Math Word Wall/Word Bank
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- Use of Translation software
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- [TODOS: Mathematics for ALL](#) - Excellence and Equity in Mathematics
- [FABRIC - A Learning Paradigm for ELLs](#) (NJDOE resource)

**SPED:**

- Menu Math (mostly for very low functioning students)
- Math Labs/Tutorial
- MobyMax
- LinkIt!
- IXL
- Learning Ally (audio version for textbooks and other published materials) – Also available for 504 students
- Apex Online Learning – Bridge students only
- Use of specialized equipment such as beeping balls, text to speech and speech to text software, special seats or desks
- Use of hands-on materials for problem solving
- Visual supports and Use of Manipulatives
- Extended time to complete tests and assignments
- Graphic Organizers/Study Guides
- Mnemonic tricks to improve memory
- Reducing workload
- Centers/Small Group Instruction
- Adjusting accountability for standards by focusing only on essential standards
- Use of iPads or laptops for students with motor issues that make writing difficult
- Use of tangible rewards (certificates, small toys, etc. per behavior plan)
- Use prompts and model directions
- Use task analysis to break down activities and lessons into each individual step needed to complete the task
- Use concrete examples to teach concepts
- Have student repeat/rephrase written directions
- Provide multi-sensory, hands-on materials for instruction

- Chunking Information
- Modify all fine motor tasks for example: (fat crayons, pencil grip, adaptive scissors)
- Functional or practical emphasis

**504:**

- Learning Ally (audio version for textbooks and other published materials)
- Extra help opportunities
- Reduce workload
- Partial credit
- Allow use of calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed ( use interactive notebook)
- Preferential Seating
- Extra Practice
- Directions repeated, clarified and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

**Unit 4 STATISTICS**

Content & Practice Standards	Interdisciplinary Standards	Critical Knowledge & Skills
<ul style="list-style-type: none"> <li>• Understand independence and conditional probability and use them to interpret data</li> <li>• Use the rules of probability to compute probabilities of compound events in a uniform probability model</li> <li>• Calculate expected values and use them to solve problems</li> <li>• Use probability to evaluate outcomes of decisions</li> </ul>	<ul style="list-style-type: none"> <li>• Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>• Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>• Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>• Applying basic principles of probability to solve various problems involving chance experiments including combinations, permutations, counting principle, tree and venn diagrams, conditional probability, general addition and multiplication rules, law of total probability, expected value, discrete and continuous probability distributions, binomial, and geometric distributions.</li> </ul>

Unit 4 STATISTICS	
Stage 1 – Desired Results	
UNIT SUMMARY	CORE AND SUPPLEMENTAL MATERIALS/RESOURCES
<p>The probability unit covers all of the basic calculations for permutations, combinations, compound events, independent events, and conditional probability. Additionally, the Random Variables and Probability Distributions unit covers the principle concepts of random variable assignment and special types of distributions.</p>	<ul style="list-style-type: none"> <li>● Introduction to Statistics textbook</li> <li>● <a href="http://www.studyisland.com">www.studyisland.com</a></li> <li>● <a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li>● <a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li>● <a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li>● <a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>
UNDERSTANDINGS	
<p>Students will understand that...</p> <ul style="list-style-type: none"> <li>● relative frequency of occurrence is probability.</li> <li>● the Law of Large Numbers allows for accurate estimations when sample size is large enough</li> <li>● tree diagrams are an excellent method of displaying sample space and calculating probability</li> <li>● probability distribution of a discrete variable becomes more normal as the sample size increases.</li> <li>● the mean of the distribution is the expected average value in a large number of trials.</li> </ul>	
Students will know...	Students will be able to...
<ul style="list-style-type: none"> <li>● key concepts/vocabulary- combinations, permutations, sample space, event, simple event, compound event, union, intersection, compliment, disjoint (mutually exclusive), independent events, conditional probability</li> <li>● that probability is a long running mechanism.</li> <li>● how to use probability to make informed decisions.</li>   <li>● how sampling with replacement and without replacement effect probabilities.</li> <li>● key concepts/vocabulary- random variable (discrete and continuous), probability distribution, expected value, binomial distribution, geometric distribution, normal distribution, z-score</li> <li>● how to use probability to make informed decisions.</li> <li>● how linear combinations of random variables can be used to make predictions.</li> </ul>	<ul style="list-style-type: none"> <li>● create sample spaces for chance events.</li> <li>● use Venn Diagrams to represent outcomes.</li> <li>● use tree diagrams to map out probabilities.</li> <li>● identify mutually exclusive events.</li> <li>● distinguish between experimental and theoretical probabilities.</li> <li>● calculate probabilities for compound events and conditional events.</li> <li>● establish rules for Independence of events.</li> <li>● assign random variables to a chance experiment.</li> <li>● construct probability distributions for discrete random variables.</li> <li>● use probability distributions to make predictions.</li> <li>● Calculate expected value and standard deviation for random variables.</li> <li>● Calculate expected value and standard deviation for linear combinations.</li> <li>● Construct probability distributions for geometric and binomial distributions.</li> <li>● Identity probabilities associated with standardized values (z-scores) of random variables with normal distributions.</li> </ul>
Stage 2 – Assessment Evidence	

## Curricular Framework MATH-Statistics

<p>Performance Tasks: <i>What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?</i></p> <p><b><u>Performance Tasks/Use of Technology</u></b></p> <ul style="list-style-type: none"> <li>● Homework/classwork             <ul style="list-style-type: none"> <li>● Exit questions</li> <li>● Random variables activity</li> </ul> </li> <li>●</li> </ul>	<p>Other Evidence: <i>What other means of assessment will be used throughout this unit?</i></p> <p><b><u>Formative</u></b></p> <ul style="list-style-type: none"> <li>● Probability game board analysis</li> <li>● Free Response AP Practice questions</li> </ul> <p><b><u>Summative</u></b></p> <ul style="list-style-type: none"> <li>● Unit quizzes</li> <li>● Unit Assessments</li> </ul>
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### Stage 3 – Learning Plan

This unit develops an understanding of basic principles of probability and how to apply them. Students are presented with both a classical and relative frequency approach to probability learning about the law of large numbers. Many students struggle to identify the proper techniques for solving the vast variety of problems, so visualizations and practice are imperative in this unit. The students do a number of activities with M&M's, marbles, dice, and cards used as tangibles. This is the densest unit in the course, so a lot of time is given to it.

### Planned Differentiation & Interventions for Tiers I, II, III, ELL, SPED, and Gift & Talented Students

- *Rethink and revise. Dig deeper into ideas at issue (through the faces of understanding). Revise, rehearse, and refine, as needed. Guide students in self-assessment and self-adjustment, based on feedback from inquiry, results, and discussion.*
- *Evaluate understandings. Reveal what has been understood through final performances and products. Involve students in a final self-assessment to identify remaining questions, set future goals, and point toward new units and lessons.*
- *Tailor (personalize) the work to ensure maximum interest and achievement. Differentiate the approaches used and provide sufficient options and variety (without compromising goals) to make it most likely that all students will be engaged and effective.*

### **Gifted & Talented:**

- “Differentiating the Lesson” in Big Ideas online resources for all sections
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- Big Ideas Game Closet
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- [Everyday Mathematics](#)
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**Tier I:**

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- [Discovery Education Math](#)
- [Everyday Mathematics](#)
- [Homework Spot](#)
- [Flash Card Math](#)
- [Math Fact Fluency](#)

**Tier II:**

- Lesson Tutorials
- Basic Skills Handbook
- Skills Review Handbook
- Differentiated Instruction Big Ideas resources
- Game Closet
- Centers/Small Group Instruction
- Math Tutoring Center (HS only)
- Math Lab/Tutorial
- MobyMax
- LinkIt!
- Math Fact Fluency/Rocket Math

**Tier III:**

- Customized Learning Intervention Activities resources
- Intensive Intervention resource
- Systematic Assessments to focus on specific deficits

**ELL:**

- Big Ideas Math Student Editions are available online in Spanish
- Letters to Parents are available in the Resources by Chapter book to assist in guiding parents through each chapter and offer helpful suggestions they can use to demonstrate mathematical concepts for their child in daily activities. These letters are editable so teachers can customize them.
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**SPED:**

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- Use of specialized equipment such as beeping balls, text to speech and speech to text software, special seats or desks
- Use of hands-on materials for problem solving
- Visual supports and Use of Manipulatives
- Extended time to complete tests and assignments
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- Use of iPads or laptops for students with motor issues that make writing difficult
- Use of tangible rewards (certificates, small toys, etc. per behavior plan)
- Use prompts and model directions
- Use task analysis to break down activities and lessons into each individual step needed to complete the task
- Use concrete examples to teach concepts
- Have student repeat/rephrase written directions
- Provide multi-sensory, hands-on materials for instruction
- Chunking Information
- Modify all fine motor tasks for example: (fat crayons, pencil grip, adaptive scissors)
- Functional or practical emphasis

**504:**

- Learning Ally (audio version for textbooks and other published materials)
- Extra help opportunities

- Reduce workload
- Partial credit
- Allow use of calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed ( use interactive notebook)
- Preferential Seating
- Extra Practice
- Directions repeated, clarified and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

**Curricular Framework MATH-Statistics**

<b>Unit 5 STATISTICS</b>		
<b>Content &amp; Practice Standards</b>	<b>Interdisciplinary Standards</b>	<b>Critical Knowledge &amp; Skills</b>
<ul style="list-style-type: none"> <li>Understand and evaluate random processes underlying statistical experiments</li> <li>Make inferences and justify conclusions from sample surveys, experiments and observational studies</li> </ul>	<ul style="list-style-type: none"> <li>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Exploring and discovering the patterns that form in sampling distributions of the sample mean and the sample proportion and using these patterns to develop rules for describing/measuring center, shape, and spread based on the Central Limit Theorem.</li> </ul>
<b>Unit 5 STATISTICS</b>		
<b>Stage 1 – Desired Results</b>		
<b>UNIT SUMMARY</b>	<b>CORE AND SUPPLEMENTAL MATERIALS/RESOURCES</b>	
<p>The Sampling Distributions Unit covers the principle concepts of center, shape, and spread of qualitative and quantitative sampling distributions. These characteristics make up the foundation for inferential statistics.</p>	<ul style="list-style-type: none"> <li>Introduction to Statistics textbook</li> <li><a href="http://www.studyisland.com">www.studyisland.com</a></li> <li><a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li><a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li><a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li><a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>	
<b>UNDERSTANDINGS</b>		
<p>Students will understand that...</p> <ul style="list-style-type: none"> <li>probability distributions of a discrete variable become more normal as the sample size increases.</li> <li>the mean of the distribution is the expected average value in a large number of trials.</li> </ul>		
<b>Students will know...</b>	<b>Students will be able to...</b>	
<ul style="list-style-type: none"> <li>key concepts/vocabulary- sample statistic, population parameter, sampling variability, sampling distribution, Central Limit Theorem, sample size</li> <li>the basic characteristics of center, shape, and spread both qualitative and quantitative data take on given a particular sample size.</li> <li>the nature of sampling variability and how sampling distributions help to filter out some of its effects.</li> </ul>	<ul style="list-style-type: none"> <li>calculate the mean and standard deviation of both categorical and numeric sampling distributions.</li> <li>reasonably predict the shape of both categorical and numeric sampling distributions for a given sample size.</li> <li>identity probabilities associated with standardized values (z-scores) of normal distributions.</li> </ul>	

<b>Stage 2 – Assessment Evidence</b>	
<p>Performance Tasks: <i>What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?</i></p> <p><b><u>Performance Tasks/Use of Technology</u></b></p> <ul style="list-style-type: none"> <li>● Homework/classwork <ul style="list-style-type: none"> <li>● Exit questions</li> <li>● Sampling distribution activity</li> </ul> </li>   <li>● Graphing Calculator Random Number Generator</li> </ul>	<p>Other Evidence: <i>What other means of assessment will be used throughout this unit?</i></p> <p><b><u>Formative</u></b></p> <ul style="list-style-type: none"> <li>● Baseball salary activity</li> <li>● IQ activity</li> <li>● Review Stations</li> <li>● Free Response AP Practice questions</li> </ul> <p><b><u>Summative</u></b></p> <ul style="list-style-type: none"> <li>● Unit Assessment</li> </ul>
<b>Stage 3 – Learning Plan</b>	
<p>This unit is the foundation of inferential statistics. The activities at the beginning of the unit uncover the patterns that form in all sampling distributions. Students learn about the implications of the Central Limit Theorem and the relationship between sample size and the amount of measurable variability. The concepts are a bit abstract so the activities and video clips are vital to the understanding of the students.</p>	
<b>Planned Differentiation &amp; Interventions for Tiers I, II, III, ELL, SPED, and Gift &amp; Talented Students</b>	
<ul style="list-style-type: none"> <li>• <i>Rethink and revise. Dig deeper into ideas at issue (through the faces of understanding). Revise, rehearse, and refine, as needed. Guide students in self-assessment and self-adjustment, based on feedback from inquiry, results, and discussion.</i></li>   <li>• <i>Evaluate understandings. Reveal what has been understood through final performances and products. Involve students in a final self-assessment to identify remaining questions, set future goals, and point toward new units and lessons.</i></li>   <li>• <i>Tailor (personalize) the work to ensure maximum interest and achievement. Differentiate the approaches used and provide sufficient options and variety (without compromising goals) to make it most likely that all students will be engaged and effective.</i></li> </ul>	
<p><b>Gifted &amp; Talented:</b></p> <ul style="list-style-type: none"> <li>● “Differentiating the Lesson” in Big Ideas online resources for all sections</li> <li>● “Additional Topics” in Big Ideas online resources to extend and enhance instruction</li> <li>● Big Ideas Game Closet</li> <li>● Big Ideas Differentiated Instruction options</li> </ul>	

- Big Ideas Mini-Assessments
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**Tier I:**

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- Gradual Release Model
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- [FABRIC - A Learning Paradigm for ELLs](#) (NJDOE resource)

**SPED:**

- Menu Math (mostly for very low functioning students)
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- MobyMax
- LinkIt!
- IXL
- Learning Ally (audio version for textbooks and other published materials) – Also available for 504 students
- Apex Online Learning – Bridge students only
- Use of specialized equipment such as beeping balls, text to speech and speech to text software, special seats or desks
- Use of hands-on materials for problem solving
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- Extended time to complete tests and assignments
- Graphic Organizers/Study Guides
- Mnemonic tricks to improve memory
- Reducing workload
- Centers/Small Group Instruction
- Adjusting accountability for standards by focusing only on essential standards
- Use of iPads or laptops for students with motor issues that make writing difficult
- Use of tangible rewards (certificates, small toys, etc. per behavior plan)
- Use prompts and model directions
- Use task analysis to break down activities and lessons into each individual step needed to complete the task
- Use concrete examples to teach concepts
- Have students repeat/rephrase written directions
- Provide multi-sensory, hands-on materials for instruction
- Chunking Information
- Modify all fine motor tasks for example: (fat crayons, pencil grip, adaptive scissors)
- Functional or practical emphasis



**504:**

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- Extra help opportunities
- Reduce workload
- Partial credit
- Allow use of calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed ( use interactive notebook)
- Preferential Seating
- Extra Practice
- Directions repeated, clarified and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

Unit 6 STATISTICS		
Content & Practice Standards	Interdisciplinary Standards	Critical Knowledge & Skills
<ul style="list-style-type: none"> <li>Understand and evaluate random processes underlying statistical experiments</li> <li>Make inferences and justify conclusions from sample surveys, experiments and observational studies</li> </ul>	<ul style="list-style-type: none"> <li>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Understanding and applying the concepts learned about inferential statistics to construct estimates of the population mean and proportion using margin of error based on a particular sample sizes.</li> </ul>
Unit 6 STATISTICS		
Stage 1 – Desired Results		
UNIT SUMMARY	CORE AND SUPPLEMENTAL MATERIALS/RESOURCES	
The Confidence Intervals Unit covers the basic procedures for constructing confidence intervals as predictors of population parameters.	<ul style="list-style-type: none"> <li>Introduction to Statistics textbook</li> <li><a href="http://www.studyisland.com">www.studyisland.com</a></li> <li><a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li><a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li><a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li><a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>	
UNDERSTANDINGS		
<p>Students will understand that...</p> <ul style="list-style-type: none"> <li>a point estimate is used to establish a value for a population parameter.</li> <li>a confidence interval is a range of plausible values for a characteristic of a population.</li> <li>confidence intervals are always two tailed and the confidence level relates to the area under the curve between the interval.</li> <li>standard error is the estimated standard deviation of the statistic.</li> <li>Confidence level and confidence intervals are related.</li> </ul>		
Students will know...	Students will be able to...	
<ul style="list-style-type: none"> <li>key concepts/vocabulary- point estimation, confidence interval, confidence level, biased statistic, unbiased statistic, true value of a parameter, standard error, bound (margin of error), sample size, sampling distribution, z-score (critical value), t-distribution (t-scores).</li> </ul>	<ul style="list-style-type: none"> <li>construct confidence intervals for one sample and two sample statistics.</li> <li>understand the relationship between the interval and a normal curve.</li> <li>summarize calculations in context.</li> <li>identity probabilities associated with standardized values (z and t-scores) of normal distributions.</li> </ul>	

## Curricular Framework MATH-Statistics

<ul style="list-style-type: none"> <li>● the basic characteristics of center, shape, and spread both qualitative and quantitative data take on given a particular sample size.</li> <li>● the nature of sampling variability and how sampling distributions help to filter out some of its effects.</li> <li>● The basic principles behind inferential statistics.</li> </ul>	<ul style="list-style-type: none"> <li>● find a confidence interval for a variance and a standard deviation.</li> <li>● work backwards to find sample size needed for a given study.</li> </ul>
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### Stage 2 – Assessment Evidence

<p>Performance Tasks: <i>What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?</i></p> <p><b><u>Performance Tasks/Use of Technology</u></b></p> <ul style="list-style-type: none"> <li>● Homework/classwork             <ul style="list-style-type: none"> <li>● Exit questions</li> <li>● Confidence Interval Flipbook</li> </ul> </li> </ul>	<p>Other Evidence: <i>What other means of assessment will be used throughout this unit?</i></p> <p><b><u>Formative</u></b></p> <ul style="list-style-type: none"> <li>● Unit quiz</li> <li>● Exit tickets</li> <li>● Review Stations</li> <li>● Free Response AP Practice questions</li> </ul> <p><b><u>Summative</u></b></p> <ul style="list-style-type: none"> <li>● Unit Assessment</li> </ul>
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### Stage 3 – Learning Plan

This unit is an application of the inferential statistics principles learned in the last unit. Many students want to focus just on the calculations, but demonstrating an understanding of the inferential conditions that must be met as well as interpreting the results are equally as important. Students sometimes have a difficult time with the concept of margin of error, so again visualizations can help solidify such concepts. The bean bag activity at the beginning of the unit help students understand the difference between accuracy and precision.

### Planned Differentiation & Interventions for Tiers I, II, III, ELL, SPED, and Gift & Talented Students

- *Rethink and revise. Dig deeper into ideas at issue (through the faces of understanding). Revise, rehearse, and refine, as needed. Guide students in self-assessment and self-adjustment, based on feedback from inquiry, results, and discussion.*
- *Evaluate understandings. Reveal what has been understood through final performances and products. Involve students in a final self-assessment to identify remaining questions, set future goals, and point toward new units and lessons.*
- *Tailor (personalize) the work to ensure maximum interest and achievement. Differentiate the approaches used and provide sufficient options and variety (without compromising goals) to make it most likely that all students will be engaged and effective.*

<p><b>Gifted &amp; Talented:</b></p> <ul style="list-style-type: none"> <li>● “Differentiating the Lesson” in Big Ideas online resources for all sections</li> <li>● “Additional Topics” in Big Ideas online resources to extend and enhance instruction</li> </ul>
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- Big Ideas Game Closet
- Big Ideas Differentiated Instruction options
- Big Ideas Mini-Assessments
- Design Challenges
- Student Choice/Driven Activities
- Group Projects
- MobyMax
- LinkIt!
- Rocket Math
- [Intervention Central](#)
- [Do to Learn](#)
- [Differentiation Strategies for Math](#)
- [Discovery Education Math](#)
- [Everyday Mathematics](#)
- [Homework Spot](#)
- [Math Fact Fluency](#)

**Tier I:**

- “Differentiating the Lesson” in Big Ideas online resources for all sections
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- Record and Practice Journal
- Differentiated Instruction options
- Fair Game Review
- Vocabulary Support Glossary resources
- Mini-Assessments
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- Flash Cards
- Extended Time
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- [Discovery Education Math](#)
- [Everyday Mathematics](#)
- [Homework Spot](#)
- [Flash Card Math](#)
- [Math Fact Fluency](#)

**Tier II:**

- Lesson Tutorials
- Basic Skills Handbook
- Skills Review Handbook
- Differentiated Instruction Big Ideas resources
- Game Closet
- Centers/Small Group Instruction
- Math Tutoring Center (HS only)
- Math Lab/Tutorial
- MobyMax
- LinkIt!
- Math Fact Fluency/Rocket Math

**Tier III:**

- Customized Learning Intervention Activities resources
- Intensive Intervention resource
- Systematic Assessments to focus on specific deficits

**ELL:**

- Big Ideas Math Student Editions are available online in Spanish
- Letters to Parents are available in the Resources by Chapter book to assist in guiding parents through each chapter and offer helpful suggestions they can use to demonstrate mathematical concepts for their child in daily activities. These letters are editable so teachers can customize them.
- Student Dynamic eBook Audio has the option to be read in English or Spanish
- Multi-Language Glossary for new Math vocabulary is available in 14 different languages.
- Audio version is available in English or Spanish.
- Game Closet can be accessed in English or Spanish, while also allowing for all students to play and understand these educational games.
- ELL Notes included in Teacher Edition to help teachers overcome obstacles.
- Record & Practice Journal available in Spanish.

- Student Journal available in Spanish.
- Chapter Reviews available in English and Spanish.
- Vocabulary Flash Cards
- Chunking Information
- Math Word Wall/Word Bank
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- Partial credit
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- Preferential Seating
- Extra Practice
- Directions repeated, clarified and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

**Curricular Framework MATH-Statistics**

<b>Unit 7 STATISTICS</b>		
<b>Content &amp; Practice Standards</b>	<b>Interdisciplinary Standards</b>	<b>Critical Knowledge &amp; Skills</b>
<ul style="list-style-type: none"> <li>Understand and evaluate random processes underlying statistical experiments</li> <li>Make inferences and justify conclusions from sample surveys, experiments and observational studies</li> </ul>	<ul style="list-style-type: none"> <li>Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.</li> <li>Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.</li> <li>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	<ul style="list-style-type: none"> <li>Using inferential statistical processes to conduct hypothesis tests on population means and proportions for one, two, or three or more populations.</li> </ul>

**Unit 7 STATISTICS**

**Stage 1 – Desired Results**

<b>UNIT SUMMARY</b>	<b>CORE AND SUPPLEMENTAL MATERIALS/RESOURCES</b>
<p>The Hypothesis Testing Unit covers the procedures for conducting hypothesis testing for one and two sample population parameters as well as procedures for conducting significance tests for categorical data with three or more categories.</p>	<ul style="list-style-type: none"> <li>Introduction to Statistics textbook</li> <li><a href="http://www.studyisland.com">www.studyisland.com</a></li> <li><a href="http://www.seeingstatistics.com">www.seeingstatistics.com</a></li> <li><a href="http://illuminations.nctm.org/">http://illuminations.nctm.org/</a></li> <li><a href="https://www.turnersgraphoftheweek.com/">https://www.turnersgraphoftheweek.com/</a></li> <li><a href="http://www.myap.collegeboard.org">www.myap.collegeboard.org</a></li> </ul>

**UNDERSTANDINGS**

<p>Students will understand that...</p> <ul style="list-style-type: none"> <li>hypothesis testing uses sample data to decide between two competing claims about a population characteristic.</li> <li>there is a possibility of making a Type I or Type II error when conducting a hypothesis test.</li> <li>tests can be performed using the critical value approach or the p-value approach.</li> <li>the level of significance is the total area in the rejection region.</li> <li>hypothesis testing for two samples involves the difference between the means or proportions.</li> <li>identifying and labeling each population allows for a more accurate and clearer conclusion.</li> <li>procedures vary for samples that are dependent as opposed to independent.</li> <li>matched pair tests are an important analysis tool when analyzing the results of an experiment.</li> <li>bivariate quantitative data can be tested using linear regression hypothesis testing procedures.</li> <li>bivariate qualitative data can be tested for association or independence using Chi Square tests.</li> <li>a contingency table is a way of organizing bivariate qualitative data.</li> </ul>
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- chi square curve is a right skewed non-normal curve.

Students will know...	Students will be able to...
<ul style="list-style-type: none"> <li>• key concepts/vocabulary- hypothesis testing, significance level, null hypothesis, alternative hypothesis, type 1 error, type 2 error, test statistic, P-value, upper tail test, lower tail test, biased statistic, unbiased statistic, true value of a parameter, sample size, sampling distribution, z-score (critical value), t-distribution (t-scores), degrees of freedom, two sample hypothesis testing, paired sample hypothesis testing, independent sample hypothesis testing, mean difference, common proportion</li> <li>• the basic characteristics of center, shape, and spread both qualitative and quantitative data take on given a particular sample size.</li> <li>• the nature of sampling variability and how sampling distributions help to filter out some of its effects.</li> <li>• The basic principles behind inferential statistics.</li> <li>• key concepts/vocabulary- hypothesis testing, significance level, null hypothesis, alternative hypothesis, test statistic, P-value, upper tail test, biased statistic, unbiased statistic, sample size, sampling distribution, degrees of freedom, Chi squared test, one way frequency table, expected cell count, observed cell count, Goodness-of-fit Test, Homogeneity Test, contingency table, Independence Test.</li> <li>• The conditions that must be met to properly conduct a chi squared test</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct hypothesis tests.</li> <li>• determine the null and alternate hypotheses for a given scenario.</li> <li>• understand difference between one tailed and two tailed test and draw curve.</li> <li>• identify and interpret Type I and Type II errors in context of problem.</li> <li>• follow procedure and conduct hypothesis test on one sample mean.</li> <li>• understand and use p-value approach as well as critical value approach.</li> <li>• analyze results of test in context of the problem.</li> <li>• perform hypothesis tests on one sample proportion.</li> <li>• establish and interpret the power of the test.</li> <li>• find and analyze the differences between two variances and two standard deviations.</li> <li>• conduct two sample t-test for pooled or non-pooled data.</li> <li>• distinguish between independent and dependent samples.</li> <li>• perform matched pair t-test and interpret results.</li> <li>• calculate expected values for a multiple proportion study.</li> <li>• perform a Chi Square Goodness of Fit test and interpret results.</li> <li>• create contingency table from data collected.</li> <li>• calculate expected for each cell and the Chi Square test statistic.</li> <li>• perform the Chi Square test for Association or Independence.</li> </ul>

**Stage 2 – Assessment Evidence**

<p>Performance Tasks: <i>What projects, hands-on lessons, use of manipulatives, active participation in new situations, etc. will reveal evidence of meaning-making and transfer (true understanding)?</i></p> <p><b><u>Performance Tasks/Use of Technology</u></b></p> <ul style="list-style-type: none"> <li>• Homework/classwork               <ul style="list-style-type: none"> <li>• Exit questions</li> <li>• Hypothesis testing mapping</li> </ul> </li> </ul>	<p>Other Evidence: <i>What other means of assessment will be used throughout this unit?</i></p> <p><b><u>Formative</u></b></p> <ul style="list-style-type: none"> <li>• Unit quiz</li> <li>• Unit activity</li> <li>• Free Response AP Practice questions</li> </ul> <p><b><u>Summative</u></b></p> <ul style="list-style-type: none"> <li>• Unit Assessment</li> </ul>
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**Stage 3 – Learning Plan**

## Curricular Framework MATH-Statistics

This unit is the culmination of the last three units combining probability with inferential processes. Hypothesis testing is the fundamental process used in many scientific fields, so students need an understanding of test statistics and p-values. Sketching the normal curve and labelling rejection zones and other aspects of the curve can help the learning process.

### Planned Differentiation & Interventions for Tiers I, II, III, ELL, SPED, and Gift & Talented Students

- *Rethink and revise. Dig deeper into ideas at issue (through the faces of understanding). Revise, rehearse, and refine, as needed. Guide students in self-assessment and self-adjustment, based on feedback from inquiry, results, and discussion.*
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- *Tailor (personalize) the work to ensure maximum interest and achievement. Differentiate the approaches used and provide sufficient options and variety (without compromising goals) to make it most likely that all students will be engaged and effective.*

### Gifted & Talented:

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