**Unit Abstract:**

Brief paragraph overview: In this unit students will learn to draw inferences about populations based on samples and be able to discuss the extent of the validity. Students will use measures of central tendency to support their inferences about one population or more.

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| **Overarching Question:**  How is sampling used in the real-world to create and justify predictions about populations?  **How does sampling of populations affect our decision-making process?** | | | | | | |
|  | | **This Unit:** Random sampling, representative sample, random variable, and populations, measures of central tendency | | | |  |
| **Questions to Focus Assessment and Instruction:**   * Focus questions   Why would we use a random sample to represent a population?  What characteristics of a sample affect the validity of any conclusions you make about populations?  What determines whether a sample is biased?  How do measures of central tendency help us make conclusions/inferences about one or more populations?  How do people use data to influence others? | | | | **Standards for Mathematical Practice**  1.Make sense of problems and persevere in solving them.  **2.Reason abstractly and quantitatively.**  **3.Construct viable arguments and critique the reasoning of others.**  4.Model with mathematics.  5.Use appropriate tools strategically.  6.Attend to precision.  7.Look for and make use of structure.  8.Look for and express regularity in repeated reasoning. | | |
| **Academic Vocabulary**  *(5-8 most important content specific vocabulary words)* | Statistics  Population  Random sample vs biased sample (6th grade)  Representative sample (6th grade)  Population characteristic  Valid predictions/inferences  Measures of central tendency | |  | |  | |

| **Standards** | **Learning Targets** *(including relevant practice standards)* | **Explanations and Examples\*** | **Assured Experiences**  *(common assessments and learning activities)* |
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| List number and text of the content standard; priority standards are bold-faced  **7.SP.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.**  7.SP.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*  **7.SP.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.**  *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*  7.SP.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability.  *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on*  *a dot plot, the separation between the two distributions of heights is noticeable.* | Students will….  Describe random sampling  Describe what statistics means and how they are used  Identify samples and populations in given scenario  Explain why we would use representative samples.  Explain characteristics that make a representative sample valid.  Describe how the characteristics of a sample affect the validity of any conclusions you make about populations.  Describe what determines whether a sample is biased.  Use data from a random sample to draw inferences about a population.  Gauge the variation in estimates or predictions.  Use measures of central tendency to draw comparative inferences about two populations. | **7.SP.1.**  • The school food service wants to increase the number of students who eat hot lunch in the cafeteria. The student council has been asked to conduct a survey of the student body to determine the students’ preferences for hot lunch. They have determined two ways to do the survey. The two methods are listed below. Identify the type of sampling used in each survey option. Which survey option should the student council use and why?  1. Write all of the students’ names on cards and pull them out in a draw to determine who will complete the survey.  2. Survey the first 20 students that enter the lunch room.  7.SP.2. Example:  Below is the data collected from two random samples of 100 students regarding student’s school lunch preference. Make at least two inferences based on the results.    **7.SP.4.**  Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range.  Example:  • The two data sets below depict random samples of the housing prices sold in the King River and Toby Ranch areas of Arizona. Based on the prices below which measure of center will provide the most accurate estimation of housing prices in Arizona? Explain your reasoning.  o King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000}  o Toby Ranch homes {5million, 154000, 250000, 250000, 200000, 160000, 190000}  7.SP.3. Students can readily find data as described in the example on sports team or college websites. Other sources for data include American Fact Finder (Census Bureau), Fed Stats, Ecology Explorers, USGS, or CIA World Factbook. Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations.  Example:  Jason wanted to compare the mean height of the players on his favorite basketball and soccer teams. He thinks the mean height of the players on the basketball team will be greater but doesn’t know how much greater. He also wonders if the variability of heights of the athletes is related to the sport they play. He thinks that there will be a greater variability in the heights of soccer players as compared to basketball players. He used the rosters and player statistics from the team websites to generate the following lists.  Basketball Team – Height of Players in inches for 2010-2011 Season  75, 73, 76, 78, 79, 78, 79, 81, 80, 82, 81, 84, 82, 84, 80, 84  Soccer Team – Height of Players in inches for 2010  73, 73, 73, 72, 69, 76, 72, 73, 74, 70, 65, 71, 74, 76, 70, 72, 71, 74, 71, 74, 73, 67, 70, 72, 69, 78, 73, 76, 69  To compare the data sets, Jason creates a two dot plots on the same scale. The shortest player is 65 inches and the tallest players are 84 inches.      In looking at the distribution of the data, Jason observes that there is some overlap between the two data sets. Some players on both teams have players between 73 and 78 inches tall. Jason decides to use the mean and mean absolute deviation to compare the data sets. Jason sets up a table for each data set to help him with the calculations.  The mean height of the basketball players is 79.75 inches as compared to the mean height of the soccer players at 72.07 inches, a difference of 7.68 inches. (Continued on next page)  The mean absolute deviation (MAD) is calculated by taking the mean of the absolute deviations for each data point. The difference between each data point and the mean is recorded in the second column of the table. Jason used rounded values (80 inches for the mean height of basketball players and 72 inches for the mean height of soccer players) to find the differences. The absolute deviation, absolute value of the deviation, is recorded in the third column. The absolute deviations are summed and divided by the number of data points in the set.  The mean absolute deviation is 2.14 inches for the basketball players and 2.53 for the soccer players. These values indicate moderate variation in both data sets. There is slightly more variability in the height of the soccer players. The difference between the heights of the teams is approximately 3 times the variability of the data sets (7.68 ÷ 2.53 = 3.04). | * Unit # common summative assessment * Learning activity:   Create activity using pictures describing what statistics means  Engage NY weblink  <file:///C:/Users/jderose/Downloads/math-g7-m5-topic-c-lesson-16-student.pdf>  [Engage NY hyperlink](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Grade%207\Unit%207%20Inferences%20about%20Population\resources\math-g7-m5-topic-c-lesson-16-student.pdf)  Starbursts weblink  <http://threeacts.mrmeyer.com/yellowstarbursts/>  [Starbursts hyperlink](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Grade%207\Unit%207%20Inferences%20about%20Population\resources\yellowstarbursts)  Weblink to ducklings  <http://rda.aps.edu/RDA/Performance_Task_Bank/Documents/7th_Grade/Ducklings%20-%20Tasks.pdf>  [Hyperlink to ducklings](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Grade%207\Unit%207%20Inferences%20about%20Population\resources\Ducklings%20-%20Tasks%20SP.1%20SP.4.pdf)  [Hyperlink to birthdays](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Grade%207\Unit%207%20Inferences%20about%20Population\resources\Birthday%20thing.docx)  [Hyperlink to pick a pocket](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Grade%207\Unit%207%20Inferences%20about%20Population\resources\Pick%20a%20pocket%20compare%20populations%20%20SP.4.docx)  <https://www.illustrativemathematics.org/content-standards/7/SP/B/4/tasks/1340>  Present this example for SP.3 as a class activity with no assessement. |

**Instructional resources** (including manipulatives, literature connections, professional resources)

Standard #1

Standard #2

Standard #3

Standard #4

Standard #5