Unit E - *Statistics and Probability*

Overview

Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

21st Century Capacities: Analyzing and Presentation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP2 Reason abstractly and quantitatively
MP3 Construct viable arguments and critique the reasoning of others
MP5 Use appropriate tools strategically
MP6 Attend to precision
MP7 Look for and make use of structure

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.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, 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.
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

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs and/or data (Analyzing)
2. Justify reasoning using clear and appropriate mathematical language. (Presentation)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians select and use appropriate statistical methods and tools to analyze data, show trends, and describe or make predictions.
2. Mathematicians are able to make assumptions and approximations to simplify a complicated situation.
3. Mathematicians create or use models to examine, describe, solve and/or make predictions.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. Does this solution make sense?
B. How can statistics help me describe what I see?
C. How can chance inform choice?
D. How can presentation change interpretation?

seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book. **CC.8.EE.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. **CC.7.RP.2a** Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin **CC.7.RP.2b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships **CC.7.RP.2** Analyze proportional relationships and use them to solve real-world and mathematical problems. Recognize and represent proportional relationships between quantities. **CC.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. **CC.7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **CC.7.SP.6** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. **CC.7.SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.	***Acquisition:***	
	Students will know… 1. Probabilities are expressed as numbers between 0 (unlikely) and 1(likely) 2. Random sampling characteristics 3. Vocabulary: mean, median, mode, range, box and whiskers, outliers, interquartile range, central tendency, variability, random, probability, theoretical, experimental, tree diagram, frequency table, compound event	*Students will be skilled at…* 1. Finding the mean, median, mode and range of a set of data 2. Determining if a set of data has outliers 3. Finding the interquartile range of a set of data 4. Creating and reading a box and whisker plot 5. Comparing and contrasting two sets of data in terms of central tendency and spread 6. Finding experimental probabilities by collecting data 7. Using theoretical probability to predict 8. Displaying compound events with diagrams or organized lists and then finding probabilities

CC.7.SP.7a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. **CC.7.SP.7b.** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies? **CC.7.SP.8** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **CC.7.SP.8a** Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. **CC.7.SP.8b** Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event **CC.7.SP.8c** Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: if 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood? **CC.7.MP.4** In grade 7, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students explore covariance and represent two quantities simultaneously. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences, make comparisons and formulate predictions. Students use experiments or simulations to generate data sets and create probability models. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.		