

SAMPLES AND POPULATIONS Making Comparisons and Predictions

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| <p>Instructional Time and Investigations</p> | <p>18 days</p> | <ul style="list-style-type: none"> • Inv. 1: Making Sense of Samples (4 Problems) • Inv. 2: Choosing a Sample From a Population (4 Problems) • Inv. 3: Using Samples to Draw Conclusions (4 Problems) | | |
| <p>Goals</p> | <p>The Process of Statistical Investigation: Deepen the understanding of the process of investigation and apply this to samples.</p> <ul style="list-style-type: none"> • A survey allows you to gather data using a sample of a population and use that data to represent the population. Tables and graphs, as well as measures of center and variability enable you to compare data from different samples and draw conclusions about the samples and the populations. | <p>Analysis of Samples: Understand that data values in a sample vary and that summary statistics of samples taken from the same population also vary</p> <ul style="list-style-type: none"> • You can compare two samples with approximately the same measure of variability by using that measure to determine the distance between the centers of the samples. | <p>Design and Use of Simulations: Understand that simulations can model real world situations.</p> <ul style="list-style-type: none"> • Random samples are without bias, and therefore are useful for predicting population characteristics. | <p>Predictions and Conclusions about Populations: Understand that summary statistics of a representative sample can be used to gain information about a population.</p> <ul style="list-style-type: none"> • Probability models allow you to select a random sample from a population. Random samples, even of the same size, vary from each other and from the underlying population. Random samples allow you to make inferences about a population. |
| <p>Common Core Standards</p> | <p>Common Core Standards for Mathematical Practice</p> <p>MP.1: Make sense of problems and persevere in solving them.</p> <p>MP.2: Reason abstractly and quantitatively.</p> <p>MP.3: Construct viable arguments and critique the reasoning of others.</p> <p>MP.4: Model with mathematics.</p> <p>MP.5: Use appropriate tools strategically.</p> <p>MP.6: Attend to precision.</p> <p>MP.7: Look for and make use of structure.</p> <p>MP.8: Look for and express regularity in repeated reasoning.</p> | <p>Common Core Content Standards</p> <p>7.SP.A.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.</p> <p>7.SP.A.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.</p> <p>7.SP.B.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.</p> <p>7.SP.B.4: Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.</p> <p>Also 7.RP.A.2, 7.RP.A.3, 7.NS.A.1, 7.NS.A.1b, 7.SPC.5, 7.SPC.7, 7.SPC.7a</p> | | |

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Content Connections to Other Units

| Goals of the Unit | Prior Work | Future Work |
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| <p>The Process of Statistical Investigation: Deepen the understanding of the process of investigation and apply this to samples.</p> | <ul style="list-style-type: none"> Collecting and organizing data in different contexts (<i>Data About Us; What Do You Expect?</i>) Representing data using tables, line plots, dot plots, value or frequency bar graphs, histograms, and box-and-whisker plots (<i>Data About Us</i>) | <ul style="list-style-type: none"> Continuing to frame exploration of statistical concepts within the process of statistical investigation (<i>Thinking With Mathematical Models; Growing, Growing, Growing; Frogs, Fleas, and Painted Cubes</i>) Interpreting categorical and quantitative data, making inferences and justifying conclusions (<i>Thinking With Mathematical Models; High School</i>) |
| <p>Analysis of Samples: Understand that data values in a sample vary and that summary statistics of samples taken from the same population also vary.</p> | <ul style="list-style-type: none"> For numerical data: Finding measures of center and variability (range, IQR, MAD) and using these measures to make inferences and predictions (<i>Data About Us</i>) Examining the behavior of the mean and median and shapes of distributions (<i>Data About Us</i>) For categorical data: Analyzing frequencies as counts or percents (<i>Data About Us</i>) Understanding units of measure and counts (<i>Comparing Bits and Pieces; Covering and Surrounding; Variables and Patterns; Data About Us; Shapes and Designs; Accentuate the Negative; Comparing and Scaling; Moving Straight Ahead</i>) | <ul style="list-style-type: none"> Working with graphs, particularly extending to include coordinate graphs representing bivariate data, correlation, and standard deviation (<i>Thinking With Mathematical Models; High School</i>) Interpreting categorical and quantitative data (<i>Thinking With Mathematical Models; High School</i>) Reasoning about quantities and using units to solve problems (<i>Thinking With Mathematical Models; Looking for Pythagoras; Growing, Growing, Growing; Frogs, Fleas, and Painted Cubes; Say It With Symbols; It's In the System</i>) |
| <p>Design and Use of Simulations: Understand that variables can represent unknown values and equations to represent relationships.</p> | <ul style="list-style-type: none"> Gathering and organizing data collected from conducting experiments or trials of games (<i>Moving Straight Ahead; What Do You Expect?</i>) | <ul style="list-style-type: none"> Deciding if a simulation model produces desired results (<i>High School</i>) |
| <p>Predictions and Conclusions about Populations: Understand that summary statistics of a representative sample can be used to gain information about a population.</p> | <ul style="list-style-type: none"> Using counts or percents to report frequencies of data (<i>Data About Us; Comparing Bits and Pieces; Decimal Ops; Comparing and Scaling</i>) Comparing data sets using ratios, proportions, rates, or percents (<i>Comparing Bits and Pieces; Decimal Ops; Data About Us; Comparing and Scaling; What Do You Expect?</i>) | <ul style="list-style-type: none"> Using linear, inverse, exponential, and quadratic relationships to model data (<i>Thinking With Mathematical Models; Growing, Growing, Growing; Frogs, Fleas, and Painted Cubes</i>) Making inferences and justifying conclusions (<i>Thinking With Mathematical Models; High School</i>) |