# UbD Algebra 2 - Statistical Inferences

| Time Frame: 16 Lessons | Unit 7: Statistical Inferences | Course Name: Algebra 2 |
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## Stage 1: Desired Results

### Established Goal(s)

**Standards Addressed:**

**HSG-GPE.B.7**
Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

**HSS-IC.A.1**
Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

**HSS-IC.A.2**
Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

**HSS-IC.B.3**
Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

**HSS-IC.B.4**
Use data from a sample survey to estimate a population mean or proportion; develop a margin of

### Transferable Skills

*Students will be able to independently use their learning to...*

- **apply statistical inferences, mathematical knowledge, skill, and reasoning to solve real-world problems.**
- **apply statistics to make predictions based on data from prior events.**
- develop clear and effective communication.
- increase self-direction.
- develop creative and practical problem-solving.
- become responsible and involved citizens.
- develop informed and integrative thinking.

### Meaning

#### Understandings

*Students will understand that...*

- (in spoken and written language) what it means to be random in the context of statistics.
- (orally and in writing) what it means to select at random.
- they can apply statistics as a process for making inferences about population parameters based on data from a statistical study.
- probabilities from simulations may differ from expected probabilities.
- they can use data to critique (orally and in writing) mathematical claims based on a model in different cases.
- they can use data from a random sample to determine an estimate for a population proportion.

#### Essential Questions

- How can we use advanced algebraic techniques to model and solve real-world problems?
- How do we use algebraic concepts to model and solve problems related to data analysis and statistics, including regression analysis and hypothesis testing?
- How has algebra developed over time, and how has it contributed to our understanding of mathematics and the natural world?

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| error through the use of simulation models for random sampling.<br>**HSS-IC.B.5**<br>Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.<br>**HSS-IC.B.6**<br>Evaluate reports based on data.<br>**HSS-ID.A.1**<br>Represent data with plots on the real number line (dot plots, histograms, and box plots).<br>**HSS-ID.A.2**<br>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.<br>**HSS-ID.A.4**<br>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. | • they an generalize that a greater sample size usually leads to a smaller margin of error. | |
| | **Acquisition** | |
| | *Students will know...*<br><br>• how to describe the different purposes for each type of study design (survey, observational study, or experimental study)..<br>• that the way I choose a sample matters, and that random samples have less bias.<br>• how to calculate a relative frequency and create a relative frequency histogram.<br>• that a normal curve is defined using the mean and standard deviation.<br>• how to calculate a proportion of a set of data that matches a shaded area in a histogram.<br>• how to use the mean and standard deviation of a normally distributed data set to estimate intervals when given a proportion.<br>• how to use the mean and standard deviation of a normally distributed data set to estimate proportions.<br>• how to estimate the margin of error using the mean and standard deviation.<br>• how to estimate the margin of error using standard deviation.<br>• that a larger margin of error means more variability, and one should be less confident in their estimate of the population mean.<br>• that a smaller margin of error means more variability, and I can be more confident in my estimate of the population mean. | *Students will be able to...*<br><br>• decide if a study is good or bad based on evidence.<br>• understand that different samples from the same population can still have different statistics.<br>• recognize the difference between a survey, observational study, or experimental study.<br>• understand why randomization is important in the design of a study.<br>• understand that sample means and proportions can be representative of the overall population.<br>• understand that sample means and proportions vary.<br>• understand why it's important to be skeptical of data that seems unfair.<br>• use mathematical evidence to find the difference between when outcomes are unfair or due to random chance.<br>• justify a mathematical claim using evidence<br>• recognize the patterns of proportions that occur in distributions that are approximately normal in shape.<br>• use the standard deviation to describe the variability in a distribution.<br>• describe a distribution using the characteristics of its shape, center, and spread.<br>• understand that my choice of the design for a study will impact what questions I can answer.<br>• recognize the difference between a survey, observational study, or experimental study<br><br>Mathematical Practices:<br>• make sense of problems and persevere in solving them.<br>• reason abstractly and quantitatively. |

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| | | • construct viable arguments and critique the reasoning of others.<br>• model with mathematics.<br>• use appropriate tools strategically.<br>• attend to precision.<br>• look for and make use of structure.<br>• look for and express regularity in repeated reasoning. |