# Finite: Statistics

ESTABLISHED GOALS: *Competencies:*

- *Students will demonstrate the ability to decontextualize (represent symbols) and contextualize (understand the meaning of quantities) by converting real-world situations into mathematical symbols for manipulation, and interpreting symbolic results back into practical contexts.*
- *Students will demonstrate logical thinking and communication skills by building justified mathematical arguments, comprehending the justification of others, and critiquing their reasoning.*
- *Students will demonstrate application skills by using mathematical concepts and symbols to represent, analyze, and solve problems arising in everyday life, society, and the workplace.*
- *Students will demonstrate resourcefulness by evaluating and selecting the most effective tools to solve mathematical problems and deepen their understanding of concepts.*
- *Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.*
- *Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.*
- *Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.*

*Content Standards:*

• HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

• HSS.ID.A.2 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.

• HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

• HSS.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

• HSS.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

• 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?

## *Transfer*

*Students will be able to independently use their learning* ***to analyze and interpret data.***

## *Meaning*

ENDURING UNDERSTANDINGS

*Students will understand that…*

- statistics provides the tools for organizing, analyzing, and interpreting numerical data.
- data analysis can reveal interesting facts about data and be used to make predictions about future events.

ESSENTIAL QUESTIONS

- Is statistics a more valuable tool in the interpretation or explanation of data?

## *Acquisition*

*Students will know…*

- *that the first step in studying data is to organize it in the form of tables or graphs.*
- *that the second step in studying data is to apply mathematical tools for analyzing the data.*
- *that "success" and "failure" are simply the customary names for the two possible outcomes and often do not indicate actual success or failure at anything.*
- *that sample means are necessary because determining a population mean is often impossible.*

*vocabulary: random variable; discrete, continuous, and finite random variables; probability distribution, histogram, frequency tables, Bernoulli trial, binomial random variable, measures of central tendency, variance, standard deviation, normal distribution*

*Students will be skilled at…*

- *classifying random variables.*
- *determining appropriate sample spaces.*
- *creating histograms.*
- *creating probability distributions.*
- *using technology to automate the calculations for frequency tables.*
- *calculating the probability distribution of binomial random variables.*
- *calculating measures of central tendency*
- *reading sigma notation*
- *determining the expected value of a finite random variable.*
- *determining the expected value of a binomial random variable.*
- *estimating the expected value from a sample.*
- *applying Chebyschev's Rule*
- *finding probabilities for normal distributions.*

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| • HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.<br>• HSS.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.<br>• HSS.IC.B.5 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 Evaluate reports based on data.<br>• HSS.CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").<br>• MP2 Reason abstractly and quantitatively.<br>• MP3 Construct viable arguments and critique the reasoning of others.<br>• MP5 Use appropriate tools strategically.<br>• MP6 Attend to precision.<br>• MP7 Look for and make use of structure.<br>• MP8 Look for and express regularity in repeated reasoning. | | |

| ***Content Area Literacy Standards*** | ***21st Century Skills*** |
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| ● RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>● RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*.<br>● RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. | ● *reason effectively*<br>● *use systems thinking*<br>● *solve problems*<br>● *access and evaluate information*<br>● *use and manage information*<br>● *be self-directed learners* |

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| ***Evaluative Criteria*** | ***Assessment Evidence*** |
| | PERFORMANCE TASK(S): |
| | OTHER EVIDENCE: |

*Summary of Key Learning Events and Instruction*

| ***Science Integration*** | ***College, Career, and Civic Life Integration*** | ***Technology Integration*** |
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| ***District Materials*** | ***Distance Learning/Field Trips*** | ***Technology Resources*** |
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