

# Probability, Statistics & Trigonometry: Statistics

| Stage 1 Desired Results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <p><b>ESTABLISHED GOALS: Competencies:</b></p> <ul style="list-style-type: none"> <li>Students will demonstrate perseverance and strategic thinking by identifying the underlying meaning of a problem, planning a logical solution pathway, working through challenges, and verifying the reasonableness of their answers.</li> <li>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.</li> <li>Students will demonstrate logical thinking and communication skills by building justified mathematical arguments, comprehending the justification of others, and critiquing their reasoning.</li> <li>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.</li> <li>Students will demonstrate resourcefulness by evaluating and selecting the most effective tools to solve mathematical problems and deepen their understanding of concepts.</li> <li>Students will demonstrate accuracy and clarity using correct mathematical terminology, specifying units of measure, and calculating with the degree of precision appropriate for the problem context.</li> <li>Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.</li> <li>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.</li> <li>Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.</li> </ul> <p><b>Content Standards:</b></p> <ul style="list-style-type: none"> <li>HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).</li> <li>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.</li> <li>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).</li> <li>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.</li> <li>HSS.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</li> <li>HSS.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.</li> <li>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?</li> <li>HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.</li> <li>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.</li> <li>HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between</li> </ul> | <b>Transfer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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influencing certain interpretations of the data.</li> <li>just because there is a correlation between two things, that there is causation between them.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p><b>ESSENTIAL QUESTIONS</b></p> <ul style="list-style-type: none"> <li>Can you ever be sure that a conclusion is correct?</li> <li>How can we determine if our understandings of a relationship are correct?</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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an important feature of any empirical study in which the goal is to make inferences about a population from a sample.</li> <li>that frequency distribution tables can be used for both categorical and numeric variables.</li> <li>a line of best fit can be used to determine the linear relationship between two quantities.</li> <li>a linear correlation does not mean that there is a causation between the two sets of data.</li> </ul> <p><u>vocabulary:</u> statistics, population, census, sample, data, parameter, statistic, quantitative data, qualitative data, discrete data, continuous data, nominal level of measure, ordinal level of measure, interval level of measure, ratio level of measure, self-selected survey, loaded question, observational study, experiment, placebo effect, blinding, double blind, confounding, random sample, systematic sampling, convenience sampling, stratified sampling, cluster sampling, frequency table, lower class limits, upper class limits,</p> | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> <li>identifying a value as a statistic or parameter.</li> <li>identifying abuses of statistics.</li> <li>identifying observational study/experiment.</li> <li>identifying sampling method.</li> <li>identifying class width/midpoint/boundary.</li> <li>constructing a cumulative frequency table.</li> <li>constructing a frequency table given data.</li> <li>analyzing histograms.</li> <li>constructing histograms.</li> <li>constructing scatter diagrams.</li> <li>constructing pie charts.</li> <li>constructing dot plots.</li> <li>constructing Pareto charts.</li> <li>constructing stem and leaf plots.</li> <li>finding mean, median, mode, and midrange.</li> <li>finding mean of a frequency table.</li> <li>finding range, standard deviation, and variance.</li> <li>finding standard deviation of a frequency table.</li> <li>finding the value of a percentile/decile/quartile</li> <li>constructing a box plot.</li> <li>testing for linear correlation.</li> <li>constructing and interpreting a scatter diagram.</li> </ul> |

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| <ul style="list-style-type: none"> <li>parameters are significant.</li> <li>HSS.IC.B.6 Evaluate reports based on data.</li> <li>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").</li> <li>MP2 Reason abstractly and quantitatively.</li> <li>MP3 Construct viable arguments and critique the reasoning of others.</li> <li>MP4 Model with mathematics</li> <li>MP5 Use appropriate tools strategically.</li> <li>MP6 Attend to precision.</li> <li>MP7 Look for and make use of structure.</li> <li>MP8 Look for and express regularity in repeated reasoning.</li> </ul> | <i>class boundaries, class midpoints, class width, relative frequency table, cumulative frequency table, histogram, relative frequency histogram, dotplot, stem and leaf plot, pareto chart, pie chart, scatter diagram, measure of center, mean, median, mode, bimodal, multimodal, midrange, range, standard deviation, variance, range rule of thumb, empirical rule, Chebyshev's theorem, z-score, quartiles, deciles, percentiles, exploratory data analysis, outlier, 5-number summary, boxplot, correlation, scatterplot, linear correlation, coefficient, regression equation/line</i> | <ul style="list-style-type: none"> <li>finding the value of the linear correlation coefficient.</li> <li>identifying correlation errors.</li> <li>finding the equation of a regression line.</li> <li>finding the best predicted value.</li> </ul>                                        |
| <b>Content Area Literacy Standards</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>21<sup>st</sup> Century Skills</b>                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>RST.11-12.4 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 <i>grades 11-12 texts and topics</i>.</li> <li>RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</li> <li>RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</li> </ul>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>reason effectively</li> <li>use systems thinking</li> <li>make judgments and decisions</li> <li>solve problems</li> <li>implement innovations</li> <li>communicate clearly</li> <li>analyze media</li> <li>apply technology effectively</li> </ul> |

| Stage 2 - Evidence  |                      |
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| Evaluative Criteria | Assessment Evidence  |
|                     | PERFORMANCE TASK(S): |
|                     | OTHER EVIDENCE:      |

| Stage 3 – Learning Plan                        |
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| Summary of Key Learning Events and Instruction |

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|--------------------------------------------------------------|--------------------------------------------------------------|
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| <b><i>Language Arts Integration</i></b>                      | <b><i>Mathematics Integration</i></b>                        |
| <ul style="list-style-type: none"><li>• 1.OA.1 Use</li></ul> | <ul style="list-style-type: none"><li>• 1.OA.1 Use</li></ul> |
| <b><i>Technology Integration</i></b>                         | <b><i>District Materials</i></b>                             |
| <ul style="list-style-type: none"><li>• 1.OA.1 Use</li></ul> |                                                              |