

Statistics

Adopted 2015

Mathematical process standards

1. The student uses mathematical processes to acquire and demonstrate mathematical understanding [S.9-12.1](#)

(A) apply mathematics to problems arising in everyday life, society, and the workplace [S.9-12.1.A](#)

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution [S.9-12.1.B](#)

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems [S.9-12.1.C](#)

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate [S.9-12.1.D](#)

(E) create and use representations to organize, record, and communicate mathematical ideas [S.9-12.1.E](#)

(F) analyze mathematical relationships to connect and communicate mathematical ideas [S.9-12.1.F](#)

(G) display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication [S.9-12.1.G](#)

Statistical process sampling and experimentation

2. The student applies mathematical processes to apply understandings about statistical studies, surveys, and experiments to design and conduct a study and use graphical, numerical, and analytical techniques to communicate the results of the study [S.9-12.2](#)

(A) compare and contrast the benefits of different sampling techniques, including random sampling and convenience sampling methods [S.9-12.2.A](#)

(B) distinguish among observational studies, surveys, and experiments [S.9-12.2.B](#)

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- (C) analyze generalizations made from observational studies, surveys, and experiments** S.9-12.2.C

 - (D) distinguish between sample statistics and population parameters** S.9-12.2.D

 - (E) formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions** S.9-12.2.E

 - (F) communicate methods used, analyses conducted, and conclusions drawn for a data-analysis project through the use of one or more of the following: a written report, a visual display, an oral report, or a multi-media presentation** S.9-12.2.F

 - (G) critically analyze published findings for appropriateness of study design implemented, sampling methods used, or the statistics applied** S.9-12.2.G
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Variability

- 3. The student applies the mathematical process standards when describing and modeling variability** S.9-12.3

 - (A) distinguish between mathematical models and statistical models** S.9-12.3.A

 - (B) construct a statistical model to describe variability around the structure of a mathematical model for a given situation** S.9-12.3.B

 - (C) distinguish among different sources of variability, including measurement, natural, induced, and sampling variability** S.9-12.3.C

 - (D) describe and model variability using population and sampling distributions** S.9-12.3.D
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Categorical and quantitative data

- 4. The student applies the mathematical process standards to represent and analyze both categorical and quantitative data** S.9-12.4

 - (A) distinguish between categorical and quantitative data** S.9-12.4.A

 - (B) represent and summarize data and justify the representation** S.9-12.4.B

 - (C) analyze the distribution characteristics of quantitative data, including determining the possible existence and impact of outliers** S.9-12.4.C

 - (D) compare and contrast different graphical or visual representations given the same data set** S.9-12.4.D

 - (E) compare and contrast meaningful information derived from summary statistics given a data set** S.9-12.4.E

 - (F) analyze categorical data, including determining marginal and conditional distributions, using two-way tables** S.9-12.4.F
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Probability and random variables

5. The student applies the mathematical process standards to connect probability and statistics S.9-12.5

(A) determine probabilities, including the use of a two-way table S.9-12.5.A

(B) describe the relationship between theoretical and empirical probabilities using the Law of Large Numbers S.9-12.5.B

(C) construct a distribution based on a technology-generated simulation or collected samples for a discrete random variable S.9-12.5.C

(D) compare statistical measures such as sample mean and standard deviation from a technology-simulated sampling distribution to the theoretical sampling distribution S.9-12.5.D

Inference

6. The student applies the mathematical process standards to make inferences and justify conclusions from statistical studies S.9-12.6

(A) explain how a sample statistic and a confidence level are used in the construction of a confidence interval S.9-12.6.A

(B) explain how changes in the sample size, confidence level, and standard deviation affect the margin of error of a confidence interval S.9-12.6.B

(C) calculate a confidence interval for the mean of a normally distributed population with a known standard deviation S.9-12.6.C

(D) calculate a confidence interval for a population proportion S.9-12.6.D

(E) interpret confidence intervals for a population parameter, including confidence intervals from media or statistical reports S.9-12.6.E

(F) explain how a sample statistic provides evidence against a claim about a population parameter when using a hypothesis test S.9-12.6.F

(G) construct null and alternative hypothesis statements about a population parameter S.9-12.6.G

(H) explain the meaning of the p-value in relation to the significance level in providing evidence to reject or fail to reject the null hypothesis in the context of the situation S.9-12.6.H

(I) interpret the results of a hypothesis test using technology-generated results such as large sample tests for proportion, mean, difference between two proportions, and difference between two independent means S.9-12.6.I

(J) describe the potential impact of Type I and Type II Errors S.9-12.6.J

Bivariate data

- 7. The student applies the mathematical process standards to analyze relationships among bivariate quantitative data** S.9-12.7
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- (A) analyze scatterplots for patterns, linearity, outliers, and influential points** S.9-12.7.A
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- (B) transform a linear parent function to determine a line of best fit** S.9-12.7.B
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- (C) compare different linear models for the same set of data to determine best fit, including discussions about error** S.9-12.7.C
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- (D) compare different methods for determining best fit, including median-median and absolute value** S.9-12.7.D
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- (E) describe the relationship between influential points and lines of best fit using dynamic graphing technology** S.9-12.7.E
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- (F) identify and interpret the reasonableness of attributes of lines of best fit within the context, including slope and y-intercept** S.9-12.7.F