

# Statistics

Adopted 2015

## Mathematical process standards

**1. The student uses mathematical processes to acquire and demonstrate mathematical understanding** S.9-12.1

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

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**(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

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**(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

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

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

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

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

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## 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

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

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**(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

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

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  - (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

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  - (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

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  - (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

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

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

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

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  - (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

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

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

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

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

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

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  - (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

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

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

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

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**(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

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**Inference**

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

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

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**(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

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

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

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

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**(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

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

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**(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

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**(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

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

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## 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