

# Statistical Reasoning

## Mathematical Practices

**0 Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.** [SR.MP](#)

**0.1** Make sense of problems and persevere in solving them. [SR.MP.1](#)

**0.2** Reason abstractly and quantitatively. [SR.MP.2](#)

**0.3** Construct viable arguments and critique the reasoning of others. [SR.MP.3](#)

**0.4** Model with mathematics. [SR.MP.4](#)

**0.5** Use appropriate tools strategically. [SR.MP.5](#)

**0.6** Attend to precision. [SR.MP.6](#)

**0.7** Look for and make use of structure. [SR.MP.7](#)

**0.8** Look for and express regularity in repeated reasoning. [SR.MP.8](#)

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## Mathematical Modeling

**1 Apply mathematics to real-life situations; model real-life phenomena using mathematics.** [SR.MM.1](#)

**1.1** Explain contextual, mathematical problems using a mathematical model. [SR.MM.1.1](#)

**1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or the humanities. [SR.MM.1.2](#)

**1.3** Using abstract and quantitative reasoning, make decisions about information and data from a real-life situation. [SR.MM.1.3](#)

**1.4** Use various mathematical representations and structures with this information to represent and solve real-life problems. [SR.MM.1.4](#)

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## Data & Statistical Reasoning

### 2 Formulate statistical investigative questions of interest to students that can be answered with data. [SR.DSR.2](#)

- 2.1 Formulate statistical investigative questions about a population using samples taken from the population. [SR.DSR.2.1](#)
  - 2.2 Formulate comparative and associative statistical investigative questions for surveys, observational studies, and experiments to compare two or more groups or to investigate the association of two or more variables. [SR.DSR.2.2](#)
  - 2.3 Formulate multivariable statistical investigative questions. [SR.DSR.2.3](#)
  - 2.4 Formulate inferential statistical investigative questions regarding association and prediction. [SR.DSR.2.4](#)
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### 3 Collect data by designing and implementing a plan to address the formulated statistical investigative question. [SR.DSR.3](#)

- 3.1 Apply an appropriate data-collection plan when collecting primary or secondary data for the statistical investigative question of interest. [SR.DSR.3.1](#)
  - 3.2 Distinguish between surveys, observational studies, and experiments. [SR.DSR.3.2](#)
  - 3.3 Design sample surveys, experiments, and observational studies using accepted practices. [SR.DSR.3.3](#)
  - 3.4 Distinguish between random selection and random assignment and identify their impact on conclusions. [SR.DSR.3.4](#)
  - 3.5 Describe potential sources and effects of bias and confounding variables. [SR.DSR.3.5](#)
  - 3.6 Describe and adhere to the ethical use of data (e.g., sensitive information, privacy, and living subjects). [SR.DSR.3.6](#)
  - 3.7 Identify when data can be generalized to a target population. [SR.DSR.3.7](#)
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### 4 Analyze data by selecting and using appropriate graphical and numerical methods. [SR.DSR.4](#)

- 4.1 Summarize quantitative or categorical data using tables, graphical displays, and numerical summary statistics. [SR.DSR.4.1](#)
- 4.2 Summarize and describe relationships among multiple variables. [SR.DSR.4.2](#)
- 4.3 Use sampling distributions developed through simulation to describe the sample-to-sample variability of sample statistics. [SR.DSR.4.3](#)
- 4.4 Use sampling distributions to compute simulated p-values. [SR.DSR.4.4](#)
- 4.5 Describe the relationship between two quantitative variables by interpreting correlation ( $r$ ) and a least-square regression line (using technology). [SR.DSR.4.5](#)
- 4.6 Use simulations to investigate associations between two categorical variables and to compare groups. [SR.DSR.4.6](#)

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**5 Interpret the results of the analysis, making connections to the formulated statistical investigative question.** [SR.DSR.5](#)

- 5.1 Use statistical evidence from analyses to answer the formulated statistical investigative questions. [SR.DSR.5.1](#)
- 5.2 Interpret the impact of outliers, missing values, or erroneous values on the results. [SR.DSR.5.2](#)
- 5.3 Use and interpret the p-value to determine whether the estimate for a population characteristic is plausible. [SR.DSR.5.3](#)
- 5.4 Interpret a given margin of error associated with an estimate of a population characteristic. [SR.DSR.5.4](#)
- 5.5 Explain the impact of multiple variables on one another. [SR.DSR.5.5](#)