

Data Analysis and Probability

STANDARD

for Grades

3–5

Instructional programs from prekindergarten through grade 12 should enable all students to—

Expectations

In grades 3–5 all students should—

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

- design investigations to address a question and consider how data-collection methods affect the nature of the data set;
- collect data using observations, surveys, and experiments;
- represent data using tables and graphs such as line plots, bar graphs, and line graphs;
- recognize the differences in representing categorical and numerical data.

Select and use appropriate statistical methods to analyze data

- describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed;
- use measures of center, focusing on the median, and understand what each does and does not indicate about the data set;
- compare different representations of the same data and evaluate how well each representation shows important aspects of the data.

Develop and evaluate inferences and predictions that are based on data

- propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.

Understand and apply basic concepts of probability

- describe events as likely or unlikely and discuss the degree of likelihood using such words as *certain*, *equally likely*, and *impossible*;
- predict the probability of outcomes of simple experiments and test the predictions;
- understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

Data Analysis and Probability

In prekindergarten through grade 2, students will have learned that data can give them information about aspects of their world. They should know how to organize and represent data sets and be able to notice individual aspects of the data—where their own data are on the graph, for instance, or what value occurs most frequently in the data set. In grades 3–5, students should move toward seeing a set of data as a whole, describing its shape, and using statistical characteristics of the data such as range and measures of center to compare data sets. Much of this work emphasizes the comparison of related data sets. As students learn to describe the similarities and differences between data sets, they will have an opportunity to develop clear descriptions of the data and to formulate conclusions and arguments based on the data. They should consider how the data sets they collect are samples from larger populations and should learn how to use language and symbols to describe simple situations involving probability.

Investigations involving data should happen frequently during grades 3–5. These can range from quick class surveys to projects that take several days. Frequent work with brief surveys (How many brothers and sisters do people in our class have? What’s the farthest you have ever been from home?) can acquaint students with particular aspects of collecting, representing, summarizing, comparing, and interpreting data. More extended projects can engage students in a cycle of data analysis—formulating questions, collecting and representing the data, and considering whether their data are giving them the information they need to answer their question. Students in these grades are also becoming more aware of the world beyond themselves and are ready to address some questions that have the potential to influence decisions. For example, one class that studied playground injuries at their school gathered evidence that led to the conclusion that the bars on one piece of playground equipment were too large for the hands of most students below third grade. This finding resulted in a new policy for playground safety.

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

At these grade levels, students should pose questions about themselves and their environment, issues in their school or community, and content they are studying in different subject areas: How do fourth graders spend their time after school? Do automobiles stop at the stop signs in our neighborhood? How can the amount of water used for common daily activities be decreased? Once a question is posed, students can develop a plan to collect information to address the question. They may collect their own data, use data already collected by their school or town, or use other existing data sets such as the census or weather data accessible on the Internet to examine particular questions. If students collect their own data, they need to decide whether it is appropriate to conduct a survey or to use observations or measurements. As part of their plan, they often need to refine their question and to consider aspects of data collection such as how to word questions, whom to ask, what and when

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