

# Databases / SDSS

## Novice

- Scientists need to gather a lot of information to draw their conclusions.
- Find patterns by eye in small groups of numbers.
- Create graphs by hand.
- Databases allow us to find outliers and special cases.
- Larger sets of data allow us to better describe the overall properties of the dataset (e.g., mean, median, mode, ratios, percentages).

## Intermediate

- Manipulate databases in Excel or other spreadsheet tools.
- Graph and fit lines in Excel or other spreadsheet tools.
- Use large datasets to actually find interesting outliers and special cases.
- Calculate statistics such as the mean, median, mode, ratios, percentages.

## Expert

- Write programs to analyze data (e.g., IDL, Python).
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses.
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe.

## Related NGSS

Grade Level	Student Performance Expectations
3-5	4-PS4-3 <b>Generate and compare multiple solutions that use patterns to transfer information.</b>
MS	MS-PS4-3 <b>Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.</b>
HS	HS-PS4-5 <b>Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.</b>

## Related CCSSM

Grade Level	Student Performance Expectations
3-5	<p><b>CCSS.MATH.PRACTICE.MP4 Model with mathematics.</b> Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.</p> <p><b>CCSS.MATH.CONTENT.4.G.A.1</b> Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.</p>
MS	<p><b>CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.</b> Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to <i>decontextualize</i>—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to <i>contextualize</i>, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</p>
HS	<p><b>CCSS.MATH.CONTENT.HSA.SSE.A.1</b> Interpret expressions that represent a quantity in terms of its context.</p>