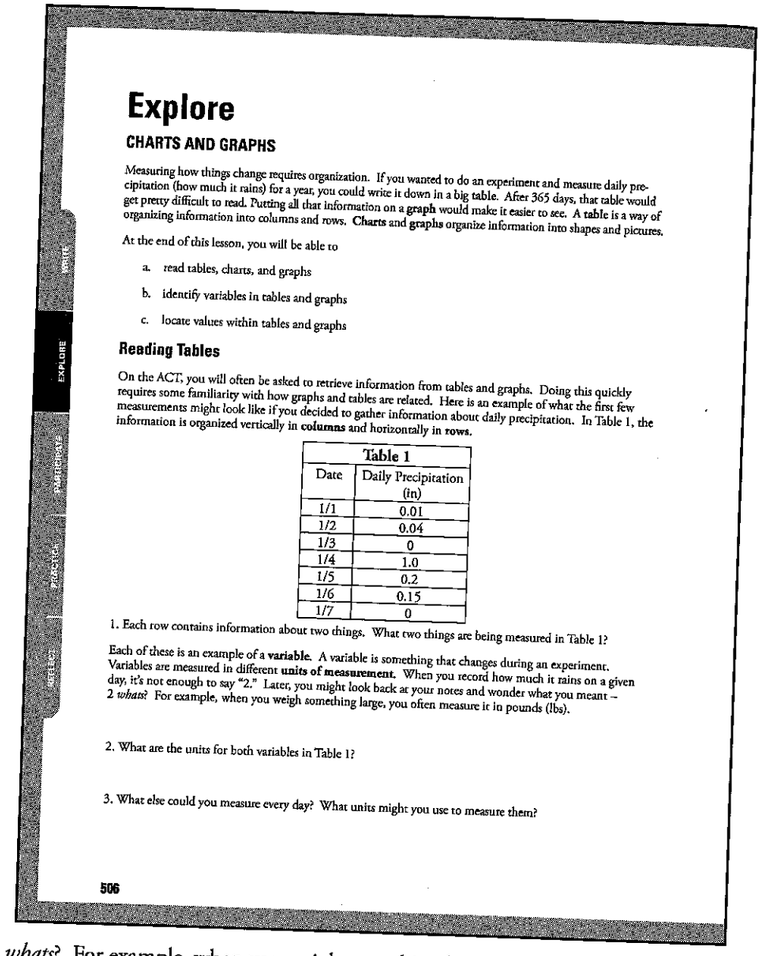
Reading Tables

The Science section of the ACT can be intimidating to many students. The purpose of these lessons is to build familiarity with the components of the Science test.

In this lesson in particular, students will learn how to read tables and charts. Since this is a very visual skill, it may be a good idea to project the charts and graphs onto the board, either through a projector or by writing down a simple version.



Explore

CHARTS AND GRAPHS

Measuring how things change requires organization. If you wanted to do an experiment and measure daily precipitation (how much it rains) for a year, you could write it down in a big table. After 365 days, that table would get pretty difficult to read. Putting all that information on a **graph** would make it easier to see. A **table** is a way of organizing information into columns and rows. **Charts** and **graphs** organize information into shapes and pictures.

At the end of this lesson, you will be able to

a. read tables, charts, and graphs

b. identify variables in tables and graphs

c. locate values within tables and graphs

Reading Tables

On the ACT, you will often be asked to retrieve information from tables and graphs. Doing this quickly requires some familiarity with how graphs and tables are related. Here is an example of what the first few measurements might look like if you decided to gather information about daily precipitation. In Table 1, the information is organized vertically in **columns** and horizontally in **rows**.

Table 1

Date	Daily Precipitation (in)
1/1	0.01
1/2	0.04
1/3	0
1/4	1.0
1/5	0.2
1/6	0.15
1/7	0

1. Each row contains information about two things. What two things are being measured in Table 1?

Each of these is an example of a **variable**. A variable is something that changes during an experiment. Variables are measured in different **units of measurement**. When you record how much it rains on a given day, it's not enough to say "2." Later, you might look back at your notes and wonder what you meant – 2 *whats*? For example, when you weigh something large, you often measure it in pounds (lbs).

2. What are the units for both variables in Table 1?

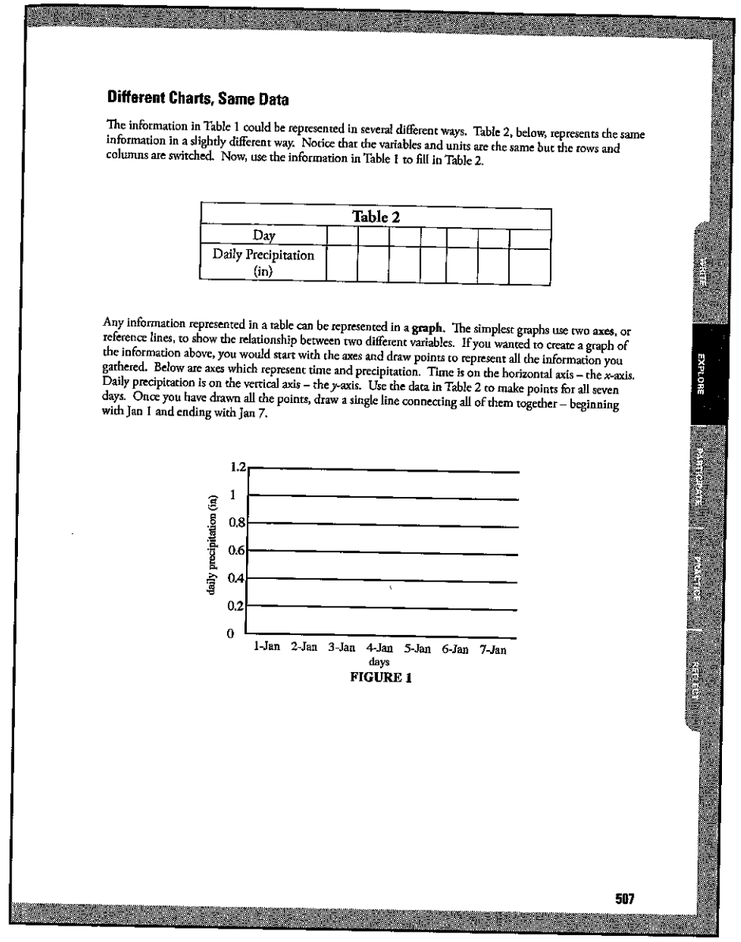
3. What else could you measure every day? What units might you use to measure them?

1. Answer: Time and precipitation are being measured in table one. Students may not recognize that time is being measured in the chart, or they may say "days". This is okay. Question 2 about variables will give you a chance to help them sort this out.

Each of these is an example of a **variable**. A variable is something that changes during an experiment. Variables are measured in different **units of measurement**. When you record how much it rains on a given day, it's not enough to say "2". Later, you might look back at your notes and wonder what you meant – 2 *whats*? For example, when you weigh something large, you often measure it in pounds (lbs).

2. Answer: Days and inches are the units in the table. If students have trouble with the first column, you can ask questions like 'what are days a measure of?' Ask them to name several other units that they could use to measure time.

3. Answer: Temperature (°C or °F) is the easiest variable to add. If students get stuck, ask them to think about which variables are often discussed in weather forecasts. As long as students can explain what they want to measure and how they would measure it, almost anything is fine. Keep one or two of their suggestions on hand for the exercises that follow. Examples of variables (units): Wind Speed (mph), Dew Point (°C or °F), Sunrise or Sunset (Time of day), Relative Humidity (%), etc.



Different Charts, Same Data

The information in Table 1 could be represented in several different ways. Table 2, below, represents the same information in a slightly different way. Notice that the variables and units are the same but the rows and columns are switched. Now, use the information in Table 1 to fill in Table 2.

Table 2

Day							
Daily Precipitation (in)							

Any information represented in a table can be represented in a **graph**. The simplest graphs use two **axes**, or reference lines, to show the relationship between two different variables. If you wanted to create a graph of the information above, you would start with the axes and draw points to represent all the information you gathered. Below are axes which represent time and precipitation. Time is on the horizontal axis – the *x*-axis. Daily precipitation is on the vertical axis – the *y*-axis. Use the data in Table 2 to make points for all seven days. Once you have drawn all the points, draw a single line connecting all of them together – beginning with Jan 1 and ending with Jan 7.

FIGURE 1

Answer:

Table 2

Day	**1/1**	**1/2**	**1/3**	**1/4**	**1/5**	**1/6**	**1/7**
Daily Precipitation (in)	**0.01**	**0.04**	**0**	**1**	**0.2**	**0.15**	**0**

Answers:

1. 0 in
2. 2.6 in

Adding More Variables

The addition of multiple variables to charts and graphs is one of the ways in which the ACT creates more difficult passages. Even students with strong chart reading skills will occasionally be overwhelmed by the additional variables. It is important for the students to stay focused on the process.

Now that you've built a graph, try to look up information from a similar graph that represents the precipitation from another week of measuring.

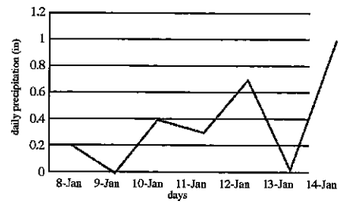


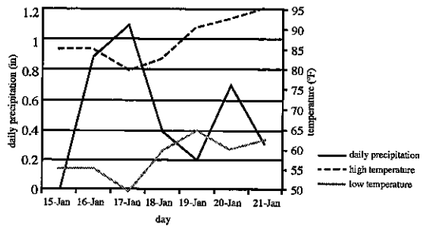
FIGURE 2

1. According to Figure 2, how much precipitation was there on January 10? To be sure, place your pencil right above the mark for 10 and draw a line straight up to the point. Next, draw a line to the axes labeled for precipitation.

2. What was the total amount of precipitation from the 8th to 14th? You'll need to repeat the process above for all seven days. Make sure to write down the values as you go. Don't try memorizing them.

Adding More Variables

In order to make the ACT Science Section more challenging, the tables and graphs often contain more than two variables. This can be visually confusing, so paying careful attention to variables and units is extremely important. In Figure 3, there are new variables and units. Now, answer the questions below.



1. What are the new variables? What units are they measured in?

2. What was the high temperature on January 19th? Start by placing your pencil above January 19th. Draw a line straight up until you hit the line for high temperature (the red line with a diamond). Draw a line toward the axis that notes temperature. What value have you reached?

3. How many inches did it rain on the day in which the high temperature was highest? First, locate the line for high temperature. Where is it highest? Draw a line down to find the day. Where does that line cross the graph for daily precipitation? Draw a line from that point to the axis that measures precipitation.

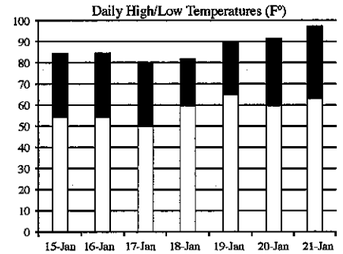
4. On the day with the most rain, what was the difference between the high and low temperatures?

Other Ways to Graph

Line graphs aren't the only kinds of graphs that you're likely to encounter on the ACT, but the essential function of all graphs is the same – to transform data from a table into some kind of picture. Here are a few common types of graphs you're likely to run in to.

Bar & Column Graphs

Horizontal or vertical bars are common ways to represent individual data points on graphs. The result – bar graphs – are not much different from line graphs once you take a closer look. The data represented below should look familiar.



1. On which day was the difference between the high and low temperature the greatest?

Answers:

1. High and low temperature, °F
2. About 90°F (Make sure the students note the units.)
3. The high temperature was highest on January 21st. It rained 0.3 in.
4. It rained the most on January 17th. The low temperature was 50°F and the high temperature was 80°F. The difference is 30°F.

Bar & Column Graphs

Answer: January 21st, 35 °F

Circle Graphs aka Pie Charts

Answers:

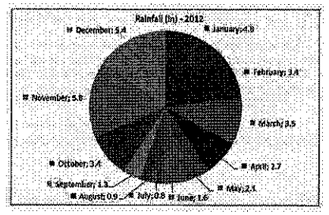
2. 35.7 inches
3. 2.7 in = 7.5%

Diagrams

4. Answer: Several answers are possible. Generally, the water will need to precipitate or sublimate into run-off or groundwater discharge.

Circle Graphs aka Pie Charts

Circle graphs are useful when you're analyzing the parts of some whole. For instance, what if you carried out your rain measurements for an entire year and wanted to show how the various months compared to one another? In a circle graph, the size of the slice represents the percentage of the whole taken up by that category.

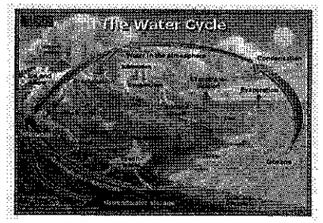


2. How much did it rain in the year measured?

3. What percentage of the total yearly rainfall occurred in the month of April?

Diagrams

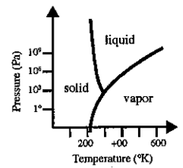
Some information can't be easily summed up into a nice neat graph. Occasionally, the ACT will just show you a picture of a machine, an experiment, or some broader concept. For instance, what if you wanted to show where all this rain was actually coming from. Below is a picture of what scientists call "the water cycle." Read the various labels and follow the arrows. What kind of story is being told here?



Credit: U.S. Geological Survey, Department of the Interior/USGS, U.S. Geological Survey/by John Evans and Howard Perlman

4. How might water that evaporated from the ocean end up back in the ocean?

Sneak Peek



Substances commonly occur in three different *phases of matter* – solid, liquid, or gas – depending on the atmospheric pressure and temperature. For example, at room temperature (273°K) water (H_2O) at sea level (10^5Pa) is a liquid. When raised to 373°K at the same pressure, water boils and becomes vapor. The figure above shows water's phase behavior.

1. Based on Figure 1, water heated to 300°K is most likely to be in which phase at 10^5Pa?

   A. Solid

   B. Liquid

   C. Gas

   D. Water could be in more than one phase at that temperature and pressure.

SNEAK PEEK

Answer: C.