Food Lab Graphs and Charts

SCIENCE AND TECHNOLOGY are used in a wide variety of occupations, and they are critical to the future of our nation. It is important for you to have an understanding of the STEM curriculum. STEM is the acronym for the integrated study of science, technology, engineering, and mathematics. In this unit, you will learn about the importance of STEM studies and how the areas apply to numerous jobs related to Family and Consumer Science.



Objectives:

1. Review methods to organize charts and graphs.
2. Manipulate recipe volume.
3. Evaluate flow chart design.

Key Terms:

area graph
bar graph
charts
dependent variable
flow charts
graphs
independent variable
legend
line graph
pie chart
recipe conversion factor
variables
x-axis
y-axis
yield factor

Methods to Organize Charts and Graphs

Charts and **graphs** are used to display data (gathered information), such as measurements, facts, or statistics in a compact design. Charts and graphs illustrate data in a visual form. Common graphs display data using bars, lines, or parts of a circle.

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COMMON PARTS OF CHARTS AND GRAPHS

Common parts of charts and graphs include:

- Titles explain the information contained in the chart or graph and are usually shown at the top of the chart or graph.
- **Legends** are keys that explain what the data represents. If more than one item is analyzed, different colors may be used in the graph.
- Source lines indicate where the information was obtained.
- The **x-axis** is an axis that runs horizontally and represents data fields (e.g., years and amounts).
- The **y-axis** is an axis that runs vertically and represents frequency (usually shown in numbers).

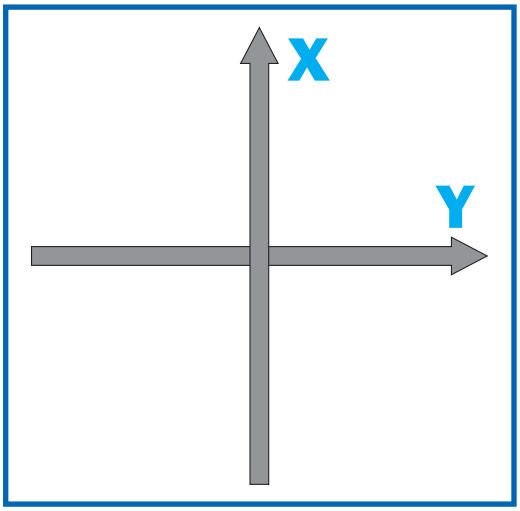


FIGURE 1. The x-axis runs horizontally and the y-axis runs vertically.

Variables

Variables are also a common part of charts and graphs. **Variables** are changeable and constant items that can be measured in an experiment. Objects, events, ideas, feelings, and time periods are examples of variables.

- An **independent variable** is a variable that stands alone and that is not changed by the other variables being measured. For example, a person's age, gender, and home state are examples of independent variables.
- A **dependent variable** is a variable that relies on other factors and may change during the study or experiment. For instance, in a study on sleep and test scores, sleep (independent variable) causes changes in test scores (dependent variable). It is not possible that test scores (dependent variable) cause a change in sleep (independent variable).

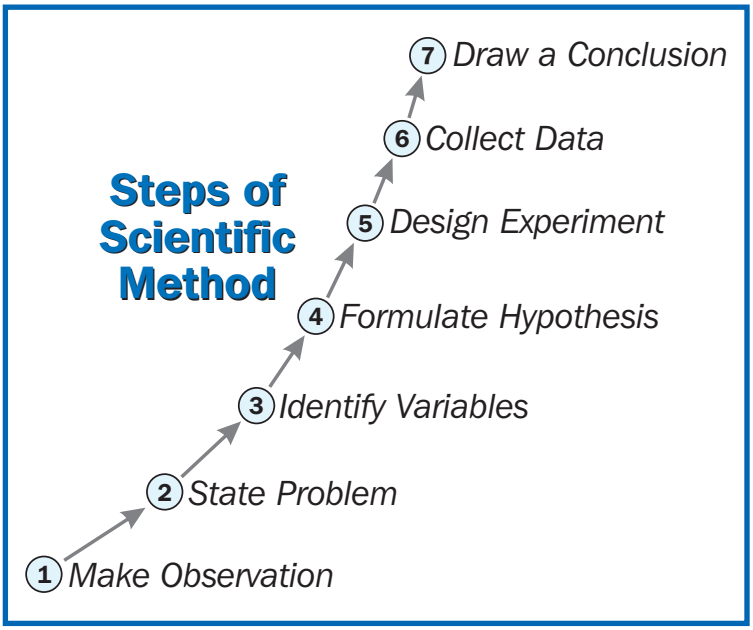


FIGURE 2. Identifying variables is part of the scientific method.

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TYPES OF GRAPHS AND CHARTS

Bar Graph

A **bar graph** is a visual display of rectangular blocks used to compare amounts and frequency. Bar graphs help us make quick generalizations about the data. Bar graphs are rectangular and may have their base on the vertical or the horizontal axis. Bar graphs may be stacked (built with two or more items shown in different colors).

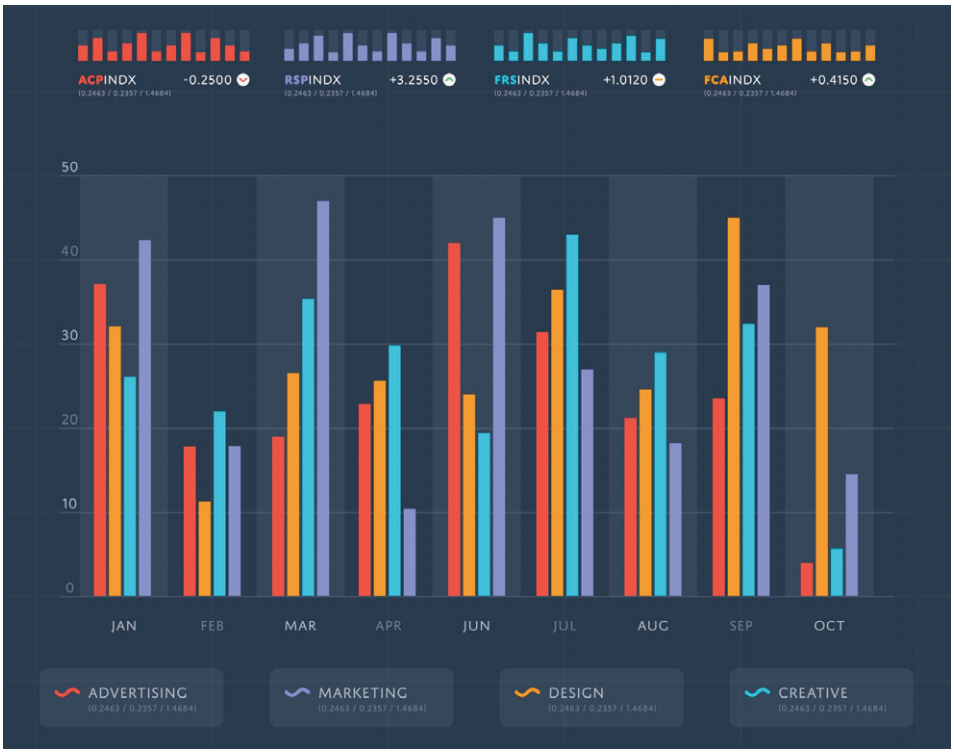


FIGURE 3. This bar graph is color coded by business categories.

Line Graph

A **line graph** is a graphic way to show how two variables compare. Each variable is plotted along an axis. Line graphs are an excellent choice when a person wants to display data that changes over time. For example, temperature or Web site logins are well described in a line graph format. Line graphs are shown in more than one color line when comparing different variables on the same

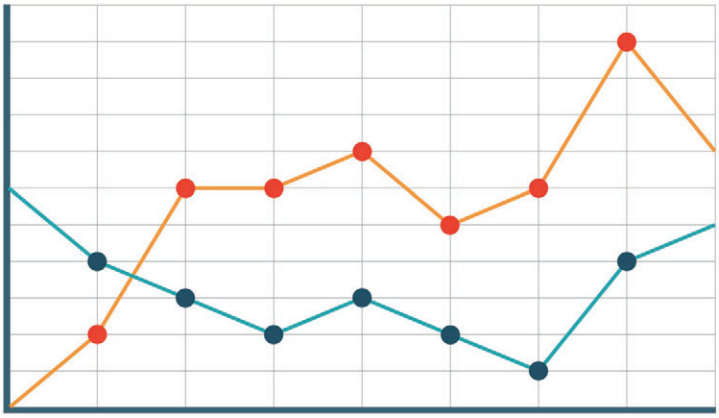


FIGURE 4. Line graphs connect the dots of data. This line graph shows two different variables.

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graph. Line graphs are an excellent way to compare manufacturing production (x-axis) and actual sales figures (y-axis) for different periods of time. Line graphs are an easy way to map dependent and independent variables that are both quantitative (measurable).

Pie Chart

A **pie chart** is a graphic representation of proportions. These proportions are often shown as percentages and as wedges from a whole circle. Pie charts show changes at a certain point in time, not changes over a period of time. Pie charts are good choices to show a:

- Family budget
- Election results
- Sales figures for different cost centers in a restaurant

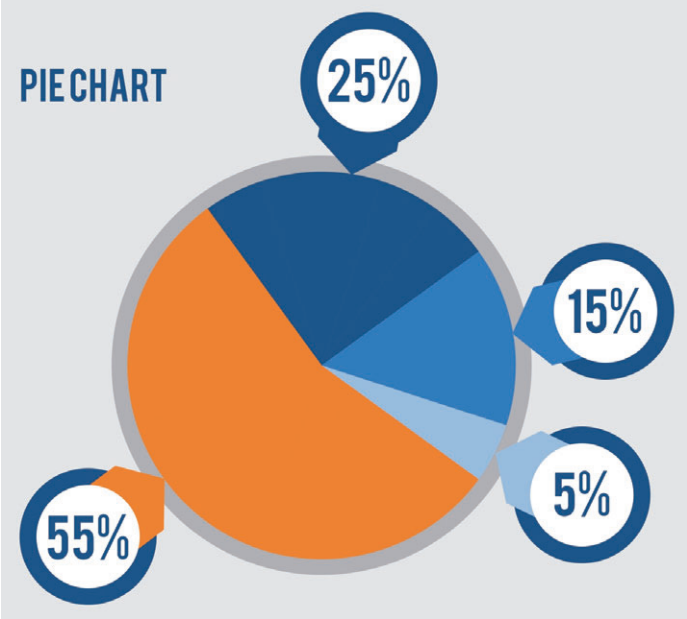


FIGURE 5. Pie charts should have a legend explaining the variables indicated by each color.

Area Chart

An **area graph** is a graphic representation designed similarly to line graphs. Like a line graph, an area graph is a graphic representation that is able to show changes over time, but it uses shading or color to represent the comparison. Area graphs may be used to show peaks and valleys over short or long time periods. Area graphs may represent sets of data with each set in a different color.

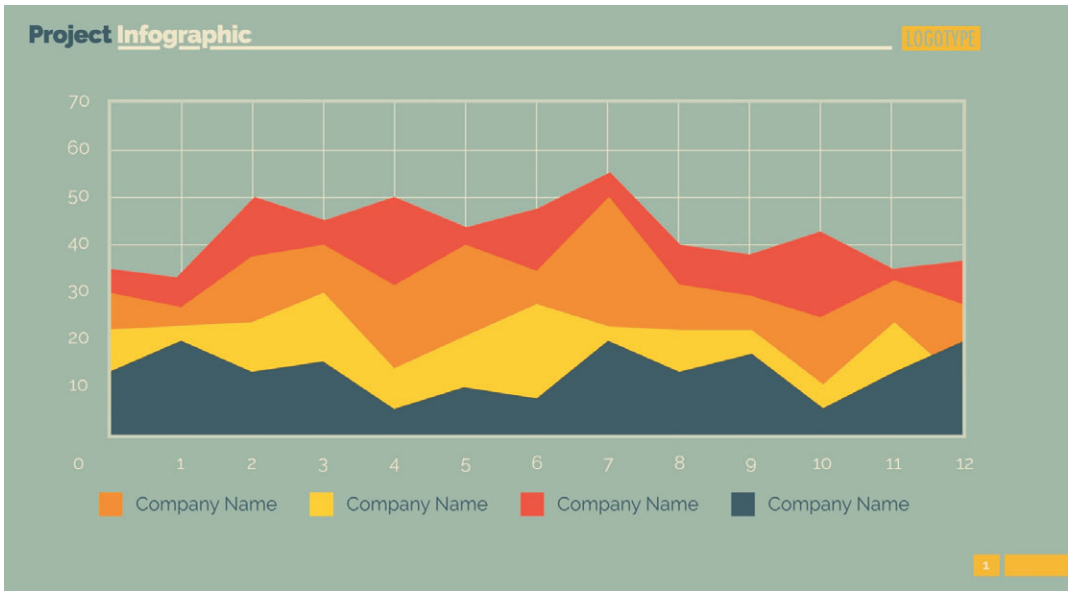


FIGURE 6. Pictured is a stacked area chart or graph. A legend would be included to name the different colored variables.

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Manipulating Recipes

RECIPE VOLUME ADJUSTMENTS

- Recipe volume may be increased or decreased.
- Most recipe volume adjustments require working with fractions.
- Basic arithmetic skills of addition, subtraction, multiplication, and division of whole numbers and fractions are necessary to adjust recipe volume.
- Procedures for mixing are not normally changed.
- Cooking and baking times may be increased or decreased but not in incremental amounts.

Recipe Conversion Factor or Yield Factor

A **recipe conversion factor** (RCF) or **yield factor** (YF) is a number that represents a ratio or a percentage of an original recipe. It is used to convert each ingredient in the original recipe to provide a new yield (the resulting quantity or amount). A conversion factor can be used to increase or decrease the size of the original recipe's yield. To calculate RCF or YF, use the following steps:

Step 1: Divide the desired yield (new yield) by the original yield (old yield). For instance, when 20 cupcakes are needed and an original recipe makes 12, the applied formula is 20 ÷ 12 = 1.67, so 1.67 is the conversion factor. Similarly, a recipe that makes 50 cupcakes where only 12 are needed would be solved by 12 ÷ 50 = 0.24, providing a yield factor of 0.24.

Step 2: Multiply each ingredient by the RCF. For example, in the problem in which the yield RCF was 1.67 to make 20 cupcakes, if the original recipe called for:

a. 10 oz milk, one applies the RCF as 1.67 × 10 oz = 16.7 oz of milk needed for the new increased recipe
b. 3 c flour, one applies the RCF as 1.67×3c= 5.01

An easy way to remember the RCF formula is the acronym "NO"—New recipe over Old recipe or New recipe over Original recipe.

Calculating RCF When Units Are Different

To calculate RCF when the units are different:

Step 1: Convert the different units to a common unit, such as:

- Old recipe = quarts

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- New recipe = gallons
- Convert both recipes to a common unit (e.g., cups).

Step 2: Divide the desired yield by the original yield to determine the RCF.

Step 3: Multiply each ingredient by the RCF.

CAUTIONS WHEN MANIPULATING RECIPE VOLUME

Chemical Leavening Agents

Formulas/recipes that indicate chemical leavening agents by volume (e.g., t, T, and c) should not use the RCF to increase or decrease the amount. Instead consult a reliable conversion chart (e.g., the one in Food for Fifty) to determine the amount needed.



FIGURE 7. When do you leaven a recipe with baking soda?

Potent Ingredients

Spices, salt, hot peppers, saffron, and other potent ingredients do not require increasing. Many potent ingredients do not require any alternation from the original amount. For instance, when doubling a chili recipe, the amount of salt and/or hot chili powder required may not change from the original recipe. The ingredient is potent enough to accommodate the larger yield.



FIGURE 8. Which ingredients in the picture are considered potent ingredients?

Large Shifts in Yield

The more one alters a formula/recipe, the more likely a problem (in taste or quality) may occur. It is necessary to test the recipe prior to serving or to find a formula closer in volume to the yield required.

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EXPLORING OUR WORLD...

SCIENCE CONNECTION:
Manipulate Recipe Volume

Follow the instructions for reducing in half and doubling the recipe for lemon stir-up. Place the answers in the data table. Estimate the serving size for half and doubled recipes.

Lemon Stir-Up: Reducing and Doubling Recipe

Steps	Ingredient	Original Recipe	Half Original Recipe	Doubled Original Recipe
In a pitcher, stir:	Sugar	1/2 cup		
	Hot water	1/2 cup		
Add to pitcher:	Juice from lemon	2		
	Very thin lemon slices	1/2 of whole lemon		
	Cold water	1 quart		
	Ice Cubes	12		
Serves		4-5 people		

Stir vigorously with plastic spoon. Pour into tall glasses. (Adapted from Betty Crocker's Cookbook for Boys and Girls.)

Flow Chart Design

Flow charts are graphic representations of a sequential process and use various box shapes and arrows to direct a process or a standard operating procedure (SOP). Flow charts are commonly used by industrial engineers and computer programmers to show the thought process and the step-by-step elements of a procedure, assembly, and "if, then" directives. They show a process and demonstrate how the steps of the process fit together. The graphic representation affords people the opportunity to "see," analyze, and troubleshoot an entire process on one sheet of paper.

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DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: Graphs Speak for Themselves

Graphs provide a visual representation of data. While some words are necessary, such as the title, legend, and variable listings, most information is given through the picture. Take a minute to consider how much easier it is to convey data with a graph rather than with words alone. You've heard the saying, "a picture is worth a thousand words." Now conduct a simple experiment to learn if it is true. Find an example of a graph. It can be one you created as a lab experiment, or you can find one in a book or on the Internet. Count the number of words on the graph. Now write a paragraph or two that would fully explain the data contained in the graph. Make sure you explain all the variables and how the dependent variable changed over time. Ask a friend to read what you wrote and to determine whether you have adequately explained all the data. Is the information as clear when it is presented in graph form? When you are finished, count the total number of words used. How does it compare to the number of words on the graph?

SHAPES IN FLOW CHARTS

Flow charts use a variety of shaped boxes, including:

- Elongated circles representing the beginning and end of the process
- Rectangles representing an action
- Diamond shapes representing a decision point

Arrows connect the various box shapes in a flow chart.

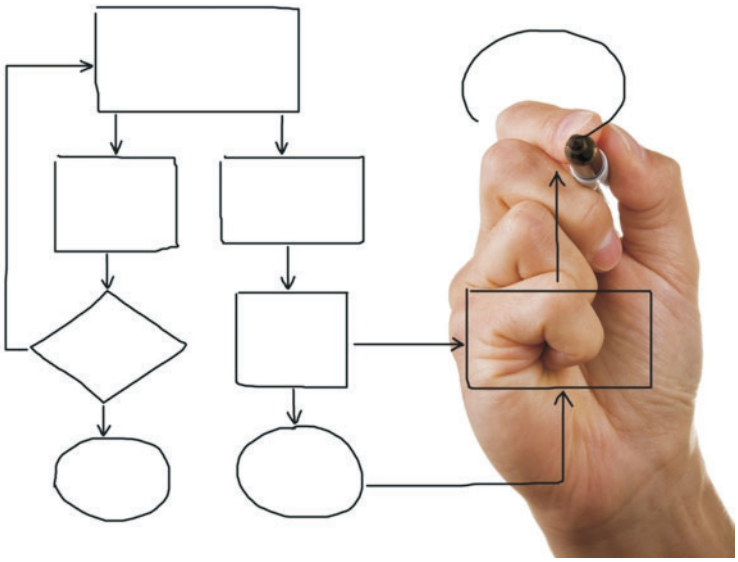


FIGURE 9. Can you identify the purpose of each shape in the flow chart?

Summary:



Charts and graphs illustrate data in a visual form, using bars, lines, or parts of a circle. You can present the variables in different ways, using bar graphs, line graphs, pie charts, and area graphs. An independent variable is a variable that stands alone

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and that is not changed by the other variables being measured. In contrast, a dependent variable is a variable that relies on other factors and may change during the study or experiment. Flow charts are graphic representations of a sequential process and use various box shapes and arrows to direct a process or a standard operating procedure. Flow charts use elongated circles to represent the beginning and end of the process, rectangles to represent an action, diamond shapes to represent a decision point, and arrows to connect the various box shapes.

Checking Your Knowledge:



1. What does the acronym STEM mean?
2. What is the difference between dependent and independent variables?
3. Explain the different types of graphs.
4. What are three ways to manipulate recipes?
5. How are shapes used in a flow chart?

Expanding Your Knowledge:



Advancing technology is constantly changing how business people create and use charts and graphs. Interview a person who routinely creates charts, patterns, or floor plans for his or her job. Find out what technology he or she currently uses to create the graphics. How has this changed over the length of this individual's employment? Ask how often the software changes and how those changes have made his or her job easier or more difficult. For more information, see the web links below.

Web Links:



Charts and Graphs
http://42explore.com/graphs.htm

Chart and Graph Tools
http://www.onlinecharttool.com/

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