



THE MAGIC OF GRAPHS AND STATISTICS

It's hard to get through a day without seeing a graph or chart somewhere, whether you're reading a newspaper or a magazine, watching an ad on television, or looking at a display in the grocery store. Graphs and charts are used everywhere because they make data easy to understand.

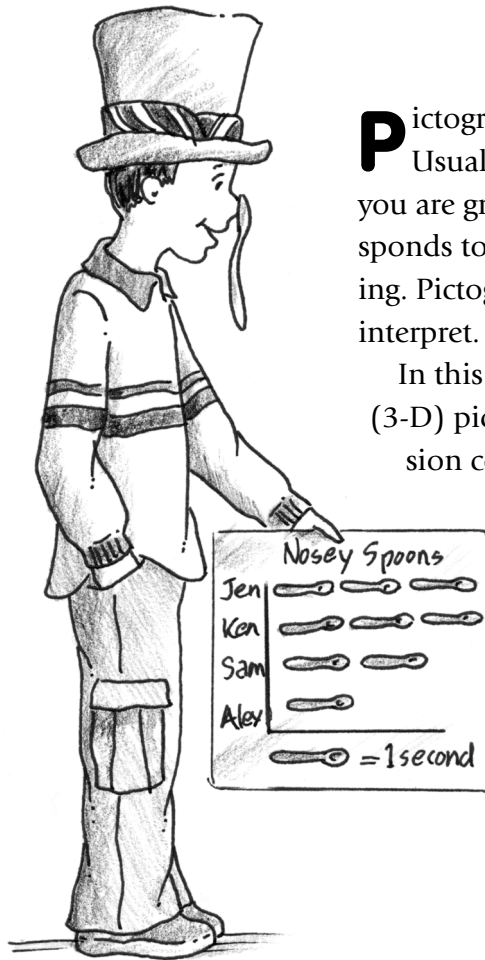
In this book, you are going to learn about five types of charts and graphs: pictographs, bar graphs, pie charts, line graphs, and map charts. Different types of graphs are often used to show different types of data. Pictographs are made out of pictures and have instant visual impact. Bar graphs are made up of either vertical or horizontal bars and are often used to show performance. Pie charts use sectioned circles to emphasize comparisons. Line graphs use horizontal, vertical, and diagonal lines and are especially good for tracking changes over time. Map charts use maps of a state, a country, the world, or any part of the world to make geographical comparisons.

You'll also learn a lot about statistics, which is the science of representing or grouping data so that they are easily understood. It can sound complicated, but really it's not. When you find your average test score on your spelling tests, you have computed a statistic. Instead of calling it the average,

you'll call it the mean. You'll learn how to compute other statistics, too, such as the mode, median, and range. You'll learn what the normal curve is, how to tell the difference between percent and percentile, and how to rank order a group of numbers.

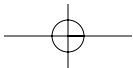
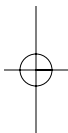
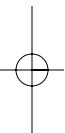
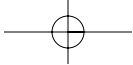
Most of all, learning about graphing and statistics is fun! In the activities in this book, you'll dangle a spoon on your nose, bounce different-size balls, roll dice, organize shoes, grow grass, track the mail, test the memory of your friends, do a sleep study, and much more. Why not get started? You'll be surprised how graphing and statistics will help you understand the world around you.

PICTOGRAPHS



Pictographs are graphs using picture-symbols. Usually, the symbol looks like the thing that you are graphing, and the number of symbols corresponds to the number of whatever you are graphing. Pictographs are fun to look at and easy to interpret.

In this part, you will make a 3-dimensional (3-D) pictograph using hard candies, track television commercials, shoot free throws with your friends, dangle a spoon from your nose, and interpret the amount of TV watched.



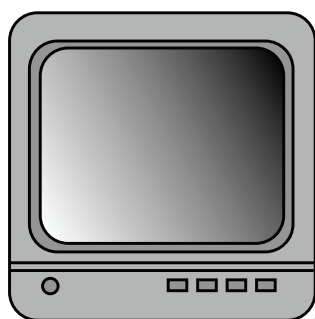
1

But First... A Brief Commercial Break

Before you start graphing data, you have to collect them and organize them. Try this activity to practice gathering data.

Procedure

1. Gather your materials and watch a 30-minute television show. As soon as the show starts, use the stopwatch to time the length of each commercial that you see. Make a list of the type of product each commercial advertises and the commercial's length in seconds.



MATERIALS

TV
stopwatch
pencil
paper
calculator



EXAMPLE

soda commercial	30 seconds
credit-card commercial	60 seconds

2. Now reorganize the data by type of product. Make a list of all of the different products you recorded in the left-hand column of the chart. Use slash marks to represent the number of commercials you recorded for each product.

EXAMPLE

Product	Slash Marks	Tally	Total Time
Soda	/	1	
Cars	///	3	
Fast Foods	//	2	
Toys	/// /// ///	8	
TV Shows	//	2	
Clothes and Shoes	////	4	
Total Commercials		20	

3. Count the number of slash marks next to each product. Enter these numbers in the “Tally” column.

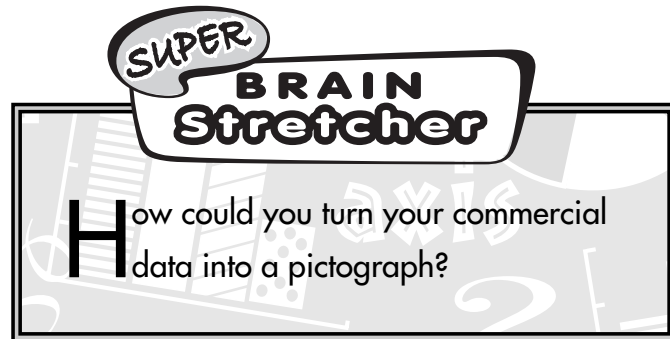
BRAIN Stretcher

Record the number of commercials in three different half-hour television programs. What is the total airtime devoted to commercials over all three shows? What percentage of the airtime was devoted to commercials in each of the shows?

Now record the length in seconds of each commercial in three different hour-long television programs. What is the total time devoted to commercials? What percentage of airtime was devoted to commercials in each of the shows?

Is the same percentage of airtime devoted to commercials in both half-hour and 1-hour television programs?

4. Compute the total time of the commercials for each type of product and enter it in the last column. Add up the times in this column to get the total commercial time during the show. How many minutes of commercials were in the half hour of TV that you watched? Which type of product had the most commercial time?



Tips and Tricks

To compute percentage of airtime devoted to commercials:

1. Find the total number of seconds used for commercials.
2. Find the total number of seconds in the program including commercials by multiplying the length of the show in minutes by 60.
3. To find the percentage, divide step 1 by step 2 and multiply the answer by 100.

Example

The total time of commercials during a 30-minute program is 600 seconds. The total time of the program (including the commercials) is 30 minutes, or 1,800 seconds. The percentage of the show devoted to commercials is $600/1,800$, or $1/3$ (expressed as a decimal = .333). Now we multiply this by 100 to get 33.3%.

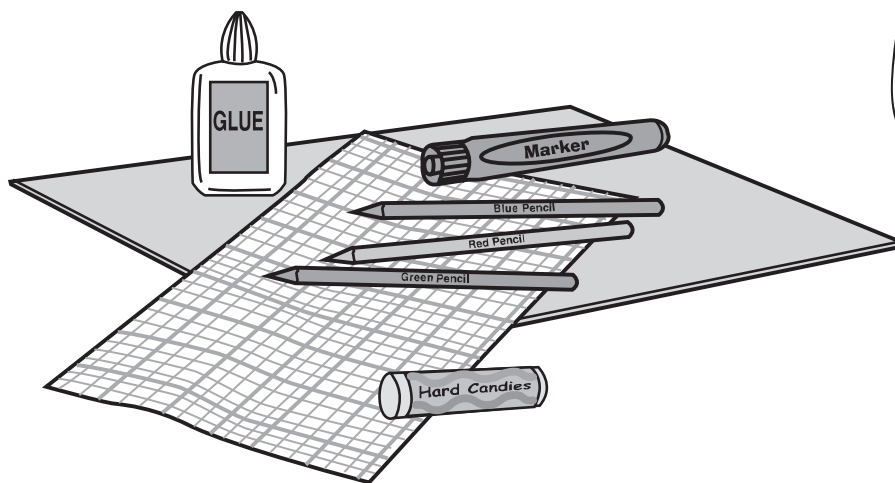
2

3-D Candy Pictograph

*A pictograph uses pictures to represent objects.
In this activity, you're going to use candies to make a
3-dimensional (3-D) pictograph, then copy it on graph
paper to make a 2-dimensional pictograph.*












MATERIALS

a roll of hard
candies of
different colors
cardboard
glue
marker
graph paper
colored pencils









Procedure

1. Open a roll of hard candies.
2. Sort the candy pieces by color. How many candies are there of each color?
3. Line up the candies on the piece of cardboard in horizontal rows by color. Glue each row onto the cardboard. At the top of the graph, use the marker to write the title of your graph, such as "Candy Colors."

	CANDY COLORS
Red	  
Green	   
Yellow	
Purple	
Orange	 



4. Copy the pictograph on a sheet of graph paper using the colored pencils. Place your title at the top of the graph. At the bottom of the graph, indicate the scale for the graph. For example, one red circle = one red candy.

CANDY COLORS	
Red	  
Green	   
Yellow	
Purple	
Orange	 
 = one red candy  = one green candy  = one yellow candy  = one purple candy  = one orange candy	

BRAIN Stretcher

Open another roll of hard candies. Write the number of candies of each color on a sheet of paper. Put all the candies in a paper lunch bag. What is the chance of picking a red candy from the bag? Pick one candy out of the bag. What color is it? Eat it. Now that you have eaten one candy, what is the chance of picking a red candy? Pick a second candy out of the bag. Eat it. Now what is the chance of picking a red candy out of the bag?

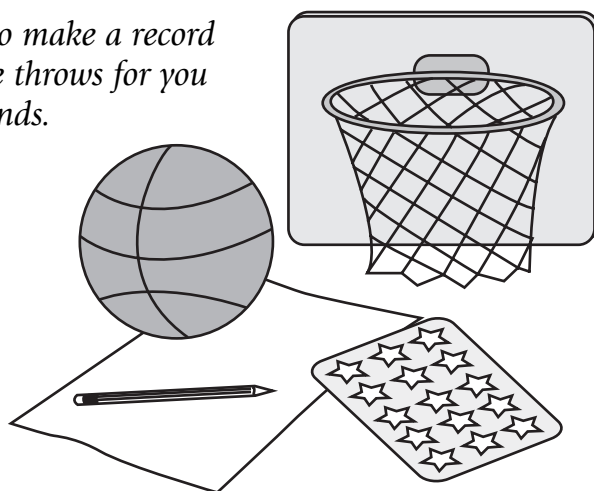
Tips and Tricks

To figure out the chance of picking a red candy from the bag, count the number of red candies in the bag. Now count the total number of candies in the bag, including red candies. Divide the number of red candies by the total number of candies in the bag. Multiply the answer by 100. This is the chance of picking a red candy out of the bag.

3

Basketball Pictograph

Try this activity to make a record of basketball free throws for you and your friends.



MATERIALS

paper
pencil
basketball
basketball hoop
basketball
stickers or star
stickers
group of friends












Procedure

1. Copy the chart below on a sheet of paper.

Player	Free Throws

2. Go to a basketball court with a group of friends. Take a basketball, the chart, and the stickers with you.

3. Have the players take turns shooting free throws. Give each player a chance to shoot 10 free throws. Each time a player makes a free throw, he or she should place a sticker on the row that is marked with his or her name.
4. When everyone has finished putting on their stickers, you will have a pictograph of the group's free throws. Put a title at the top of the graph and the date at the bottom.

Player	Free Throws
Brian	 
John	 
Alice	   
Gwen	  

BRAIN Stretcher

WHAT'S YOUR FAVORITE SPORT?

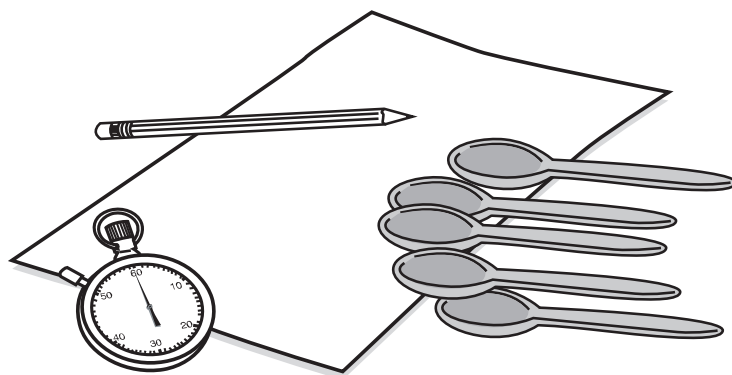
Try making a pictograph of something you do in that sport, such as

- number of types of hits you make during a baseball game (singles, doubles, triples, and home runs)
- soccer goals scored by members of your team over a single season
- laps you do during swimming practice

4

Dangling Spoons

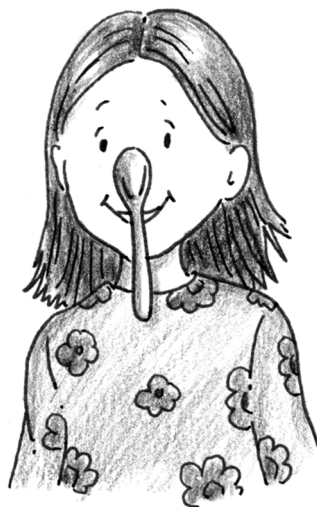
Learn to create and interpret pictographs by playing a silly spoon game and graphing the results.

**MATERIALS**

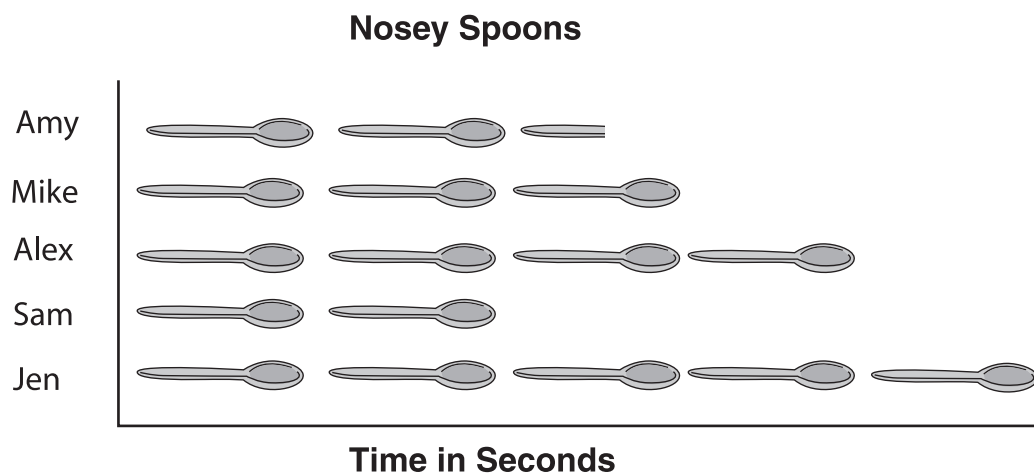
5 spoons
stopwatch
paper
pencil
5 volunteers


Procedure

1. Give a clean, dry spoon to each volunteer. Have the volunteers breathe hot air on the inside of their spoons and dangle the spoons from the tips of their noses.
2. As soon as a spoon is dangling, time how long it stays on the person's nose. Give each volunteer three attempts and record his or her longest score.
3. Graph each of your five volunteers' scores using a pictograph. Use a picture of one spoon to represent 2 seconds and



a picture of half a spoon to represent 1 second. Your graph should look something like this:



 = 2 Seconds

4. Look at the finished graph and answer the following questions: Who had the longest time according to your graph? Who had the shortest? What was the difference between the longest time and the second longest time? How would this difference be represented in spoons?

BRAIN Stretcher

Average the three trials of each of your five volunteers and graph the results using a pictograph. To compute the average, add the three trials and divide by 3. Did your results change from your previous graph? Does the graph show a different person having the longest time?

5

Television Pictograph

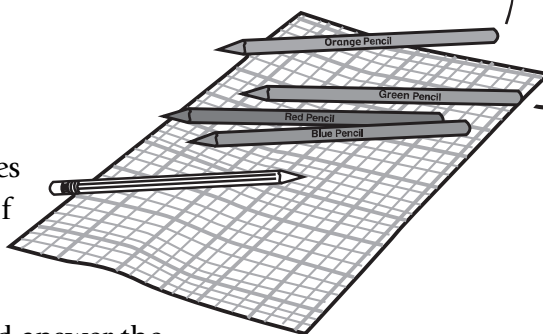
Read a pictograph and answer questions about the data it represents. Then have a contest with the people in your family to see who can watch the least TV.












MATERIALS


graph paper
colored pencils
pencil

Procedure

1. This pictograph uses pictures to show how many hours of TV one student watches per day over the course of 1 week. Look at the graph and answer the following questions on a piece of paper:



	Hours of Television Watched
Monday	
Tuesday	
Wednesday	 
Thursday	
Friday	 
Saturday	  
Sunday	 

 = 1 hour

On which day did the student watch the most TV?

On which day did the student watch the least TV?

What was the average amount of TV that the student watched during a single day of the week? What was the average amount of TV that the student watched on a single weekend day?

If the student had a TV curfew of 2 hours a day, on how many days did the student go over the curfew?

How many total hours of television did the student watch during the week?

2. Have a contest with the members of your family. See who can watch the least television in a single week. Make a pictograph of each person's television viewing. Use a different-colored pencil for each person's graph. Add to the graphs each day. Who won the contest at the end of the week?

BRAIN Stretcher

What if each picture of a television in the above graph represented 2 hours of TV watched? Answer the same questions from the exercise and see how this affects your answers.