Lesson 1: Posing Statistical Questions

Classwork

Example 1: Using Data to Answer Questions

Honeybees are important because they produce honey and pollinate plants. Since 2007, there has been a decline in the honeybee population in the United States. Honeybees live in hives, and a beekeeper in Wisconsin notices that this year, he has 5 fewer hives of bees than last year. He wonders if other beekeepers in Wisconsin are also losing hives. He decides to survey other beekeepers and ask them if they have fewer hives this year than last year, and if so, how many fewer. He then uses the data to conclude that most beekeepers have fewer hives this year than last and that a typical decrease is about 4 hives.

Statistics is about using data to answer questions. In this module, you will use the following four steps in your work with data:

Step 1: Pose a question that can be answered by data.
Step 2: Determine a plan to collect the data.
Step 3: Summarize the data with graphs and numerical summaries.
Step 4: Answer the question posed in Step 1 using the data and summaries.

You will be guided through this process as you study these lessons. This first lesson is about the first step: What is a statistical question, and what does it mean that a question can be answered by data?

Example 2: What Is a Statistical Question?

Jerome, a sixth grader at Roosevelt Middle School, is a huge baseball fan. He loves to collect baseball cards. He has cards of current players and of players from past baseball seasons. With his teacher’s permission, Jerome brought his baseball card collection to school. Each card has a picture of a current or past major league baseball player, along with information about the player. When he placed his cards out for the other students to see, they asked Jerome all sorts of questions about his cards. Some asked:

- What is Jerome’s favorite card?
- What is the typical cost of a card in Jerome’s collection? For example, what is the average cost of a card?
- Are more of Jerome’s cards for current players or for past players?
- Which card is the newest card in Jerome’s collection?
Exercises 1–5

1. For each of the following, determine whether or not the question is a statistical question. Give a reason for your answer.
   a. Who is my favorite movie star?
   b. What are the favorite colors of sixth graders in my school?
   c. How many years have students in my school’s band or orchestra played an instrument?
   d. What is the favorite subject of sixth graders at my school?
   e. How many brothers and sisters does my best friend have?

2. Explain why each of the following questions is not a statistical question.
   a. How old am I?
   b. What’s my favorite color?
   c. How old is the principal at our school?
3. Ronnie, a sixth grader, wanted to find out if he lived the farthest from school. Write a statistical question that would help Ronnie find the answer.

4. Write a statistical question that can be answered by collecting data from students in your class.

5. Change the following question to make it a statistical question: How old is my math teacher?

**Example 3: Types of Data**

We use two types of data to answer statistical questions: numerical data and categorical data. If you recorded the ages of 25 baseball cards, we would have numerical data. Each value in a numerical data set is a number. If we recorded the team of the featured player for each of 25 baseball cards, you would have categorical data. Although you still have 25 data values, the data values are not numbers. They would be team names, which you can think of as categories.

**Exercises 6–7**

6. Identify each of the following data sets as categorical (C) or numerical (N).
   
   a. Heights of 20 sixth graders _______
   
   b. Favorite flavor of ice cream for each of 10 sixth graders _______
   
   c. Hours of sleep on a school night for each of 30 sixth graders _______
   
   d. Type of beverage drunk at lunch for each of 15 sixth graders _______
   
   e. Eye color for each of 30 sixth graders _______
   
   f. Number of pencils in the desk of each of 15 sixth graders _______
7. For each of the following statistical questions, identify whether the data Jerome would collect to answer the question would be numerical or categorical. Explain your answer, and list four possible data values.

   a. How old are the cards in the collection?

   b. How much did the cards in the collection cost?

   c. Where did Jerome get the cards in the collection?
Lesson Summary

Statistics is about using data to answer questions. In this module, the following four steps summarize your work with data:

Step 1: Pose a question that can be answered by data.
Step 2: Determine a plan to collect the data.
Step 3: Summarize the data with graphs and numerical summaries.
Step 4: Answer the question posed in Step 1 using the data and summaries.

A statistical question is one that can be answered by collecting data and where there will be variability in the data.

Two types of data are used to answer statistical questions: numerical and categorical.

Problem Set

1. For each of the following, determine whether the question is a statistical question. Give a reason for your answer.
   a. How many letters are in my last name?
   b. How many letters are in the last names of the students in my sixth-grade class?
   c. What are the colors of the shoes worn by students in my school?
   d. What is the maximum number of feet that roller coasters drop during a ride?
   e. What are the heart rates of students in a sixth-grade class?
   f. How many hours of sleep per night do sixth graders usually get when they have school the next day?
   g. How many miles per gallon do compact cars get?

2. Identify each of the following data sets as categorical (C) or numerical (N). Explain your answer.
   a. Arm spans of 12 sixth graders
   b. Number of languages spoken by each of 20 adults
   c. Favorite sport of each person in a group of 20 adults
   d. Number of pets for each of 40 third graders
   e. Number of hours a week spent reading a book for a group of middle school students

3. Rewrite each of the following questions as a statistical question.
   a. How many pets does your teacher have?
   b. How many points did the high school soccer team score in its last game?
   c. How many pages are in our math book?
   d. Can I do a handstand?
4. Write a statistical question that would be answered by collecting data from the sixth graders in your classroom.

5. Are the data you would collect to answer the question you wrote in Problem 2 categorical or numerical? Explain your answer.