Investigation 3

What Do We Mean by *Mean?*

The main use of the United States Census is to find out how many people live in the United States. The census provides useful information about household size. In the census, the term *household* means all the people who live in a "housing unit" (such as a house, an apartment, or a room of a boarding house).

In earlier investigations, you used median and mode to describe a set of data. Another measure of center is the *mean*. It is the most commonly used measure of center for numerical data. Another word often used to indicate the mean of a set of data is *average*.

3.1 Finding the Mean

Six students in a middle-school class use the United States Census guidelines to find the number of people in their household. Each student then makes a stack of cubes to show the number of people in his or her household.
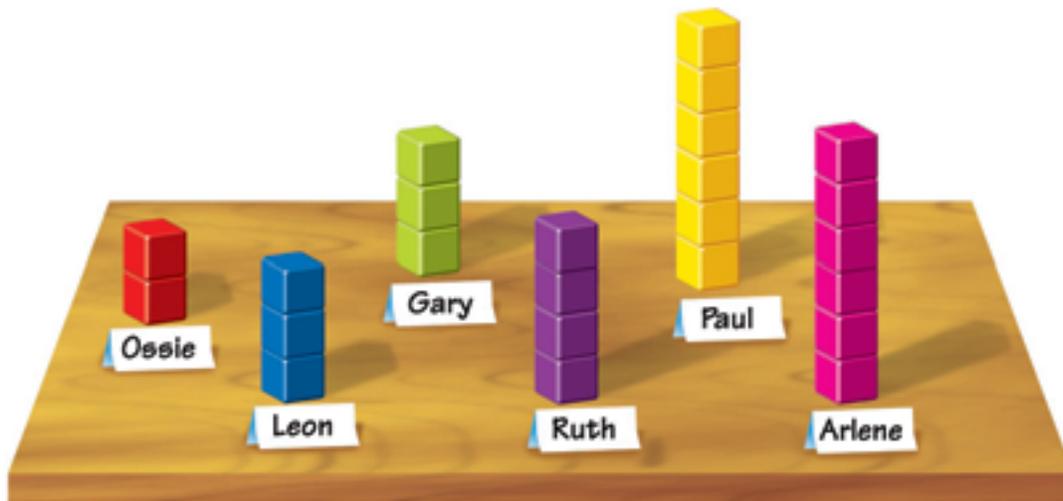
You can see from the stacks that the six households vary in size.

Getting Ready for Problem 3.1

Use cubes and make stacks like the ones shown above. Use the stacks to answer these questions:

- What is the median of these data?
- What is the mode of these data?

Make the stacks all the same height by moving cubes.

- How many cubes are in each stack?
- The average stack height you found represents the mean number of people in a household. What is the mean number of people in a household?

Problem 3.1 Finding the Mean

Another group of students made the table below.

Household Size

| Name	Number of People
Reggie	6
Tara	4
Brendan	3
Felix	4
Hector	3
Tonisha	4

A. Make stacks of cubes to show the size of each household.

  1. How many people are in the six households altogether? Explain.

  2. What is the mean number of people per household? Explain.

  3. How does the mean for these data compare to the mean for the data in the Getting Ready?

B. What are some ways to determine the mean number of a set of data other than using cubes?

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The line plots below show two different distributions with the same mean.
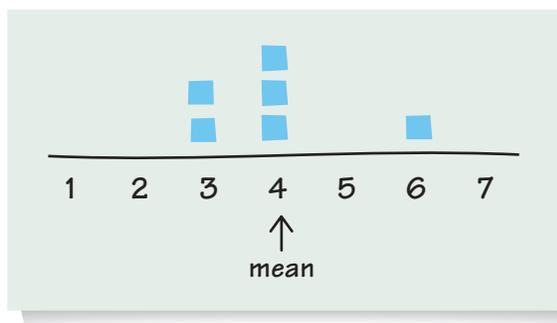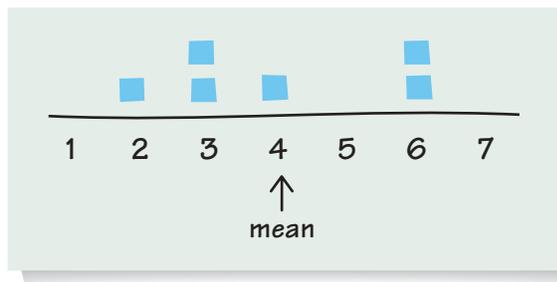
Getting Ready for Problem 3.2

- How many households are there in each situation?
- What is the total number of people in each situation?
- How do these facts relate to the mean in each case?

Data With the Same Mean

A. Find two new data sets for six households that each has a mean of 4 people per household. Use cubes to show each data set. Then make line plots from the cubes.

B. Find two different data sets for seven households that each has a mean of 4 people per household. Use cubes to show each set. Then make line plots from the cubes.

C. A group of seven students find they have a mean of 3 people per household. Find a data set that fits this description. Then make a line plot for this data.

D. 1. A group of six students has a mean of $3\frac{1}{2}$ people per household. Find a data set that fits this description. Then make a line plot for this data.

   2. How can the mean be $3\frac{1}{2}$ people when "half" a person does not exist?

   3. How can you predict when the mean number of people per household will not be a whole number?

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A group of middle-school students answered the question: How many movies did you watch last month? The table and stem plot show their data.

Movies Watched

Student	Number
Joel	15
Tonya	16
Rachel	5
Swanson	18
Jerome	3
Leah	6
Beth	7
Mickey	6
Bhavana	3
Josh	11

Movies Watched

```
0 | 3 3 5 6 6 7
1 | 1 5 6 8
2 |
```
Key: 1 | 5 means 15 movies

You have found the mean using cubes to represent the data. You may know the following procedure to find the mean: The **mean** of a set of data is the sum of the values divided by the number of values in the set.

Problem 3.3 Using the Mean

A. Use the movie data to find each number.

1. the total number of students

2. the total number of movies watched

3. the mean number of movies watched

B. A new value is added for Carlos, who was home last month with a broken leg. He watched 31 movies.

1. How does the new value change the distribution on the stem plot?

2. Is this new value an outlier? Explain.

3. What is the mean of the data now?

4. Compare the mean from Question A to the new mean. What do you notice? Explain.

C. Data for eight more students are added:

Tommy	5	Robbie	4
Alexandra	5	Ana	4
Trevor	5	Alicia	2
Kirsten	4	Brian	2

   1. How do these values change the distribution on the stem plot?

   2. Are any of these new data values outliers? Explain.

   3. What is the mean of the data now?

   4. Compare the means you found in Questions A and B with this new mean. What do you notice? Explain.

D. 1. What happens to the mean of a data set when you add one or more data values that are outliers? Explain.

   2. What happens to the mean of a data set when you add data values that cluster near one end of the original data set? Explain.

   3. Explain why you think these changes might occur.

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