Using Mean, Median, and Mode

Whether you use mean, median, or mode depends both

- on the type of data and
- on the shape of distribution.

Example. This distribution of science quiz scores is heavily skewed (asymmetrical), and its “peak” is at 6. Which of the three measures of center would best describe this distribution?

Let’s calculate the mean, median, and mode.

Mode: We can see from the graph that the mode is 6.

Median: There are 24 students. The students’ actual scores are 1, 2, 3, 3, 3, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6.

The median is the average of the 12th and 13th scores, which is 5.

The mean is \( \frac{1 + 2 + 3 + 3 + 3 + 4 + 4 + 7 \times 5 + 10 \times 6}{24} = 4.79167 \approx 4.79. \)

Notice that the mean is less than 5, but the two highest bars on the graph are at 5 and 6. In this case, the mean does not describe the peak of the distribution very well because it actually falls outside the peak! Both the median and the mode do describe it well.

1. a. Find the mean, median, and mode of this data set: 3, 4, 4, 5, 5, 5, 5, 6, 8, 25.

   mean _______ median _______ mode _______

b. Which of the three, mean, median, or mode, best describes the center of this data?

   Clearly, either the _______ or the _______ , but not the _______ !

   The _______ is off from the central peak of the distribution.

   The reason for this is that the data item “25” throws it off. This 25 is very different from the other data items in the set, and could even be a typing error! Such an item is called an outlier.

2. The graph shows the response to a certain question in a survey.

   It was measured as a yes/no question. Which of the below are possible to determine? (Mark with an “x”).

   ____ mean ____ median ____ mode

   Hint: Imagine what the original data that was used to create the graph looks like.
3. Judith asked 55 teenagers about how much money they spent to purchase Mother's Day gifts.

a. Which of the numbers $11 and $9 is the mean? Which is the median?

b. Would mean or median better describe this data? Why?

c. Approximately what percentage of these teenagers spent $10 or less on a Mother's Day gift?

4. Name what is being studied (usually the title of the graph tells you this).

- Describe how the data was measured and in what units. For example, the respondents have given numerical answers in dollars. Or perhaps they chose either “yes” or “no.”

- Indicate whether the mean, median, or mode can be calculated. You do not have to find the mean, even when it is possible.

*Hint: Think what kind of data was used to create the graph (the original data).*

a. What is being measured or studied? ______________________

   How is it measured?

   Which are possible? (Mark with an “x”).
   ___ mean  ___ median  ___ mode

   The mode is: _____________  The median is: _____________

b. What is being measured or studied? ______________________

   How is it measured?

   Which are possible? (Mark with an “x”).
   ___ mean  ___ median  ___ mode

   The mode is: _____________  The median is: _____________
For the following data sets:

- Create a dot plot or a bar graph.
- Name your graph.
- Describe the shape of the distribution.
- Indicate how many observations there are.
- Choose measure(s) of center that describe the peak of the distribution, and calculate them.

5. a. The length of words on three pages in a certain children’s story book:

```
7 5 6 8 3 6 2 4 2 2 3 4 4 3 5 5 4
5 4 3 2 5 2 1 4 4 7 5 4 8 3 3 3 3 3 5
5 3 4 2 3 1 6 2 5 4 4 3 4 3 2 8
```

Here is the same data sorted:

```
1 1 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 4 4 4
4 4 4 4 4 4 4 4 5 5 5 5 5 5 6 6 6 7 7 8 8 8
```

b. A restaurant asked its customers some questions about their food and service. One question was, “How would you rate the meal you ate today?” There were five possible answers: “excellent,” “good,” “normal,” “not so good,” and “poor.” The customers’ responses are listed below:

```
normal  poor  excellent  good  good
normal  not so good  excellent  good  good
normal  normal  good  excellent  good  good
not so good  not so good  excellent  good  good  good
```

Can you find a quick, mental math method for calculating the mean for this data set? 102, 94, 99, 105, 96, 107, 101, 104 (the weights of a litter of kittens at birth, in grams)