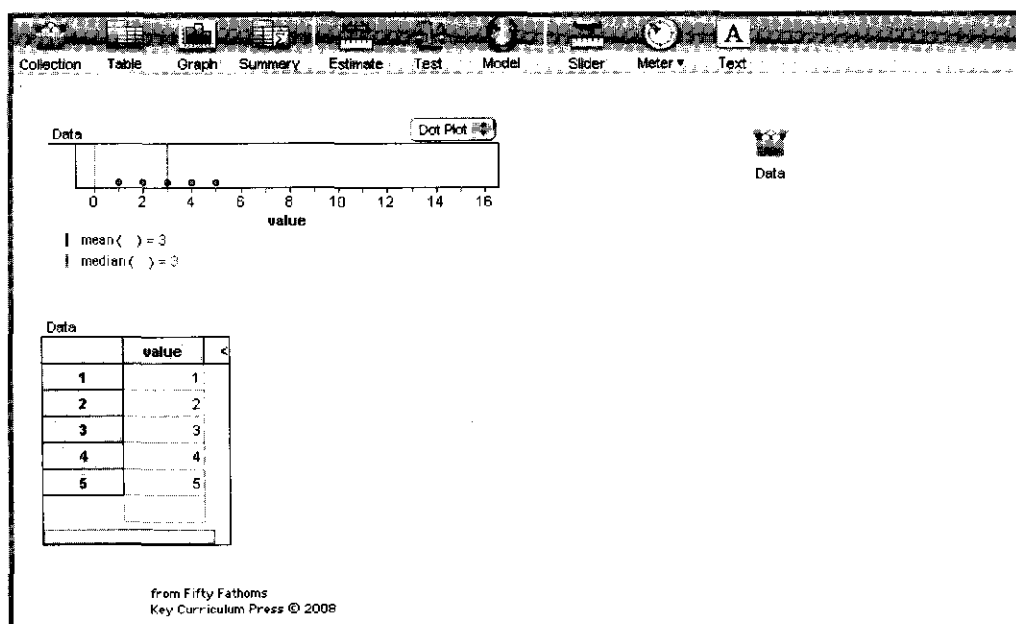


Demo 2: Mean and Median

Measures of center: mean, median, and midrange • Resistance: what happens to the measures when you move one point

This demo explores the properties of these two measures of center—the mean and the median. In particular, it's about how they are or are not resistant to changes in the data. It's important not to be judgmental here; being resistant is not good or bad—but the resistance of the measure is one factor that helps you figure out which measure you want to use. The point is to come up with a number that represents the entire data set fairly. You might think of this as a “typical” value.

As with Demo 1, “The Meaning of Mean,” the main idea here is to drag points and see what happens.



What To Do

- ▷ Open **Mean and Median.ftm**. It should look like the illustration.

Here you see a graph showing data **values** and, below it, a case table. The lines for the mean and median are in the same place (at **value = 3**) right now.

- ▷ Predict what will happen before you move the point!

- ▷ Grab the right-hand point with the mouse and move it to the right. See how the line for the mean moves and the median does not. Also see how the numerical value for the mean (just below the graph) changes and how the data value for the point changes in the table.
- ▷ Move the right-hand point (originally the one with value 5) to the left, past the median. Watch how (and for how long) the median sticks to the point you're moving.

Questions

- How far do you have to move the right-hand point to get the mean to increase by one (that is, from 3 to 4)?
- Why doesn't the median change when you wiggle the point off to the right?
- Why does the median stick to the moving point when you move it past the median? **Sol**
- Over what range of values does the median stick to the point you're dragging?
- How is all of that different (or the same) if you drag a different point?

Challenges

- Explain (in a few sentences or a short paragraph; or in a lively discussion) why you have to move the point as far as you do to get the mean to change by one.
- Explain why it doesn't make a difference which point you move.
- Statisticians say that the median is "resistant to changes in outliers" while the mean is not. Discuss whether *resistant* is a good word to use for this.
- Aloysius says, "The median is a better measure of center because it doesn't go all wacko if you get one crazy point." Hildegard says, "The mean is better because it takes all the data into account; the median really only depends on one or two points." Discuss the ways in which both are right.
- Give examples where you would prefer to use the mean to determine a "typical" value for a data set; give other examples where you would prefer the median.

More To Do

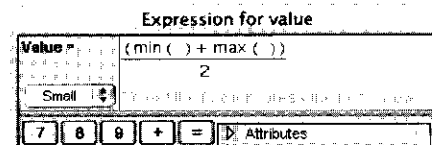
- Put the collection back the way it was. (Re-**Open** it or choose **Undo** from the **Edit** menu repeatedly until you get back to the original state.)
 - ⇒ The shortcut for **Undo** is **⌘+Z** (Mac) or **Control+Z** (Windows).

- In the case table, click in the empty box at the bottom of the **value** column. Type **6** and press **Enter** or **Return**. You have just created a new case (and a new point on the graph; you may have to change the scale to see it).
- Now drag the (new) right-hand point. What's different when you drag to the right? What's different when you drag to the left?

Extension: Plotting the Midrange

Mean and median are not the only measures of center. Another one is called the *midrange*. Let's plot it and see how it behaves.

- Put the collection back so that you have five or six points, values {1, 2, 3, 4, 5, and maybe 6}.
- Click on the graph to select it.
- Choose **Plot Value** from the **Graph** menu. The formula editor opens.
- Enter this formula: **(min() + max()) / 2**, as shown. (You can type those characters exactly; notice how typing the ")" works.)



- Close the formula editor by pressing **OK**.
- Drag a point around. See what happens.

Questions About the Midrange

- How far do you have to move the right-hand point to increase the midrange by one?
- Explain why it's that far.
- Over what range of values for the maximum point (the one on the right—with a value of 5 or 6) does the midrange not change? Explain why.
- How would you characterize how "resistant" the midrange is to changes in outliers—especially compared with the mean and median? **Sol**
- What are advantages and disadvantages of using the midrange as a measure of center?