Use Dotplots (Line Plots) to Determine Mean, Median, Mode, and Range

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Objective:
Students will use a dotplot (a line plot) to determine mean, median, mode and range.

Connections to Previous Learning:
Students should be able to determine the mean, median, mode, and range for a set of data.

Connections to AP*:
AP Statistics Topic: Distributions – Measures of Center, Shape, and Variability

Materials:
Student Activity page, a sticky note for each student, butcher paper or chalk/white board

Teacher Notes:
Often one of the responsibilities of a Pre-AP Algebra I teacher is to search for students who have been “missed” in order to open the gate to a wider number of students. This lesson, along with “Analyzing Mean, Median, Mode, and Range”, is designed to provide meaningful statistical connections during the first few days of algebra before moving on to more typical algebra activities. While students should be able to determine measures of central tendency of data, few have used a dotplot (line plot) to aid in determining that information. The first activity in this lesson is teacher directed and requires a sticky note for each student. Have the student write the number of letters in her/his last (or first) name. Have the chalk board or a piece of butcher paper pre-marked with numbers from 3 to 12 as the number line for a dotplot. Note: A dotplot is frequently referred to as a line plot; however, the term used AP* Statistics is always dotplot. Leave enough space between marks for the width of the sticky plus a little. Have students come up one group (or row) at a time to place their sticky notes in the correct column. Take some time here to let them review the arithmetic necessary to find each measure. This activity can be done very quickly, but resist that temptation. Take the time to discuss questions such as which of these four measures can be most quickly found from the dotplot. Show students how to work to the middle to find the median. Investigate what happens if there are two pieces of data in the middle. Be especially careful calculating the mean. Some students will divide by the number of points on the horizontal axis, not by the number of pieces of data. Also, if students are using a calculator, a common calculator mistake made here is to add, then divide without either using parentheses or first finding the sum. Let them make the mistake and then take the opportunity to talk about reasonableness of an answer.
Question 1 of the student activity page is intended to be done as a small group activity; however, it can also be used as an individual homework assignment. Have students collect and organize a set of data (20 to 30 points), create a dotplot of the data, determine the mode, the median, the mean and the range of the data, and write an explanation of how they used the dotplot to determine the values for the mode, the median, and the range. The topic for the data may be selected by the teacher, or, if time permits, allow the students to collect data of their own choosing. Suggest topics such as the height of each student, the number of letters in each student’s first name, the number of pets in their homes, etc.

Question 2 should be used as an individual assignment.
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1. Collect and organize a set of data with between 20 and 30 values. Draw a dotplot of the data; then determine the mode, the median, the mean and the range using the dotplot. Write an explanation of how you used the dotplot to determine each value.

   a) Mode

   b) Median

   c) Mean

   d) Range

2. As of September 2, 2002, the top 10 home run leaders in the American League had hit 48, 42, 38, 34, 32, 31, 31, 28, 27, and 27 home runs. The top 10 home run leaders in the National League had hit 43, 40, 38, 37, 35, 33, 33, 32, 32, and 28 home runs. Make ONE dotplot from this information. Use it to determine mean, median, mode, and range. Be sure to explain how you used the dotplot as you determine each measure.
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Answers:
Check to see that students have made an accurate line plot from the data they collected.

1. Mode - The student should give the mode and explain that it is the “tallest” column on the line plot.

2. Median - The student should give the answer and explain how to get to the middle of a line plot in order to find the median.

3. Mean—The student should give the answer and explain that they added all the data and divided by the number of data points. The majority of points here should go to checking to see if the students actually used the information from the line plot to find the mean. It is important in mathematics to value the new information in a lesson when grading; therefore, don’t count a problem totally wrong for an arithmetic error.

4. Check for an accurate range, but more importantly make sure that the student can explain how to check the line plot for the smallest and largest pieces of data and that he(she) knows to find the difference between these two values.

5. As of September 2, 2002, the top 10 home run leaders in the American League had hit 48, 42, 38, 34, 32, 31, 31, 28, 27, and 27 home runs. The top 10 home run leaders in the National League had hit 43, 40, 38, 37, 35, 33, 33, 32, 32, and 28 home runs. Make ONE line plot from this information. Use it to determine mean, median, mode, and range. Be sure to explain how you used the line plot as you find each measure.

![Line Plot]

The mean is determined by \((27 \times 2 + 28 \times 2 + 31 \times 2 + 32 \times 3 + 33 \times 2 + 34 + 35 + 37 + 38 \times 2 + 40 + 42 + 43 + 48) \div 20\). This results in 34.45 or 34.5 rounded to the nearest tenth. The median is 33. The student can either show getting to the middle on the line plot or explain it in words. The mode is 32 as it has the highest column. The range is 48 – 27, or 11.