

The Inch Boy and Yao Ming

Outliers can influence the measures of central tendency. This activity is designed to help students see what can happen to a set of data that has outliers added to the data set. Students will calculate the mean, median, mode, range and create a box and whisker plot. After the calculations are completed an outlier, “the Inch Boy” is added to the group. The measures are recalculated. The Inch Boy leaves the group and Yao Ming, the tallest player in the NBA is added. A final set of calculations is completed with both Yao Ming and the Inch Boy as members of the group.

This activity is based in part from an article in Mathematics Teaching in the Middle School, May 2008, p 538-542, “Literature in the Mathematics Classroom: Introducing The Inch Boy to Middle School Students,” The Inch Boy (Morimoto 1991) is a picture book that discusses Issunboshi, a one-inch tall Japanese boy, and his quest to become a Samurai warrior and serve a noble lord. Another possibility for an outlier would be Tom Thumb.



Yao Ming is a professional basketball player who plays for the Houston Rockets of the National Basketball Association (NBA). He is currently the tallest player in the NBA, at 2.29 m (7 ft 6 in). Yao was the only child of 6 ft 7 in (2.01 m) Yao Zhiyuan and 6 ft 3 in (1.90 m) Fang Fengdi, both of whom were former professional basketball players. At 11 pounds (5.0 kg), Yao weighed more than twice as much as the average Chinese newborn, and he grew to be 5 feet 5 inches (1.65 m) by age ten.

The Inch Boy and Yao Ming

Record below the heights in inches of the people in your group in order from least to greatest. Calculate the mean, median, mode, and range for your group and record the results in the table on the next page. Create a box and whisker plot for your data on the next page.

Heights in order:

Issunboshi, the Inch Boy, who wants to become a Samurai warrior, joins your group. Add him to your group and recalculate the mean, median, mode, and range for your group with Issunboshi and record the results in the table at the bottom of this page. Create a box and whisker plot for your data.

Heights in order:

- What happened to the mean after Issunboshi joined the group?
- When a very small number is added to the data set the mean
- Why does this happen?
- Predict what would happen if a very large number is added to the data set?
- What happened to the median after Issunboshi joined the group?
- What happened to the mode after Issunboshi joined the group?
- How does the shape of the box and whisker change?

Yao Ming, the tallest player in the NBA wants to join your group. Issunboshi decides he is going to leave your group. Add Yao to your group and recalculate the mean, median, mode, and range for your group with Yao and record the results in the table at the bottom of this page. Create a box and whisker plot for your data.

Heights in order:

- What happened to the mean after Yao Ming joined the group?
- When a very large number is added to the data set the mean
- Why does this happen?
- What happened to the median after Yao Ming joined the group?
- What happened to the mode after Yao Ming joined the group?
- How does the shape of the box and whisker change?

Issunboshi decides he is up to the challenge and joins your group along with Yao. Recalculate the mean, median, mode, and range for your group with both Yao and Issunboshi and record the results in the table at the bottom of this page. Create a box and whisker plot for your data.

Heights in order:

- What happened to the mean when both Issunboshi and Yao Ming joined the group?
- Why?
- When a very large number and a very small number is added to the data set the mean
- Why does this happen?
- What happened to the median after both Issunboshi and Yao Ming joined the group?
- What happened to the mode after both Issunboshi and Yao Ming joined the group?
- How does the shape of the box and whisker change?

	Beginning Group	Group with “The Inch Boy”	Group with	Group with both
Number of people in group				
Mean Height				
Median Height				
Mode Height				
Ranges of Height				

An outlier is a very small or very large number when compared to the rest of the data. Both Yao and Issunboshi could be considered outliers for this group. What be some other examples of situations that might contain outliers? What is considered an outlier for a box and whisker?

Describe the effect that the outlier has on the:

Mean

Median

Mode

Range

General Questions:

- Does the mode always change when a very small outlier is added to the data set? Explain and give examples.
- Does the median always decrease when a very small outlier is added to the data set? Explain and give examples.
- Can a single outlier be added to the class list to change the mode? Why or why not?
- Which statistic, mean, median, or mode would best describe a set of scores with an outlier? Explain and give an example.

- How could a company use outliers to mislead the employees about how much salary the group is earning?

Create box and whisker plots for each group below.

