

Data Shift Detectives

Build before-and-after plots and track the centers.

GRADE 6 • 6.NR.2.6

6.NR.2.6 "Excerpt: Describe the impact that inserting or deleting a data point has on the mean and the median of a data set."

NAME _____

DATE _____

The big idea

The mean is the sum divided by the number of observations. The median is the middle ordered value, or the mean of the two middle values. Inserting or deleting a value can affect these centers differently. Use the same plot scale to compare groups.

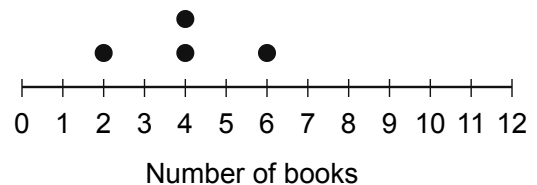
Worked example

The plot shows 2, 4, 4, 6 books. A student who read 4 books joins. What happens to the centers?

Before: mean = $16 / 4 = 4$; median = $(4 + 4) / 2 = 4$.

After: 2, 4, 4, 4, 6 has mean = $20 / 5 = 4$ and median = 4. Both centers stay at 4 books.

Books before insertion



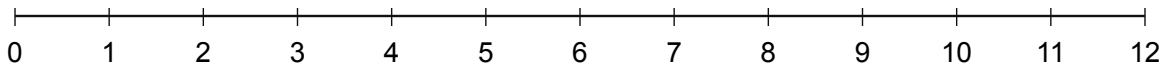
Key: one dot = one student

For Tasks 1-3, one dot represents one student. Use the same 0-12 scale and label the horizontal axis Number of books. Show calculations and comparisons on the ruled lines.

1. Original group

Values: 4, 4, 6, 8, 8. Create a dot plot of these five observations. Add a title, horizontal-axis label, and key. Stack dots for repeated values. Find the mean and median.

Plot title: _____



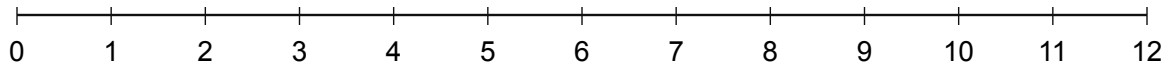
Horizontal axis: _____

Key: one dot = _____

2. Insert a data point

Start with the Task 1 group. Insert one student who read 12 books. The new values are 4, 4, 6, 8, 8, 12. Create the new dot plot. Find both centers and compare each with Task 1.

Plot title: _____



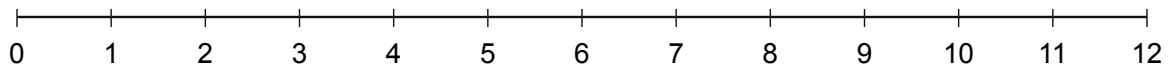
Horizontal axis: _____

Key: one dot = _____

3. Delete a data point

Start again with the Task 1 group. Delete ONE student who read 4 books, leaving 4, 6, 8, 8. Create the new dot plot. Find both centers and compare each with Task 1.

Plot title: _____



Horizontal axis: _____

Key: one dot = _____

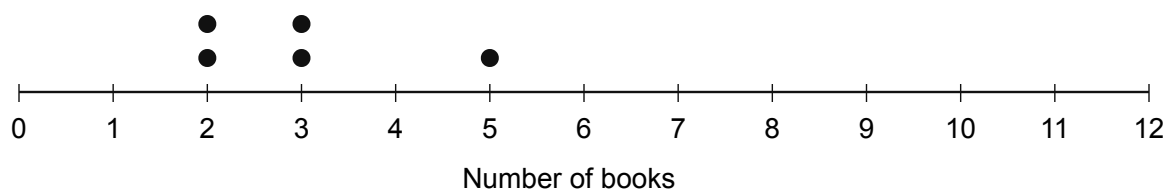
4. A middle insertion

Start again with 4, 4, 6, 8, 8. Insert one observation of 6. Without drawing another plot, find the new mean and median. Explain why both stay the same.

5. Club membership changes

The plot shows books read by five club members. A new member who read 9 books joins. Find the old and new mean and median. Which center changes? Explain using the sorted values.

Club books before the new member



Key: one dot = one student

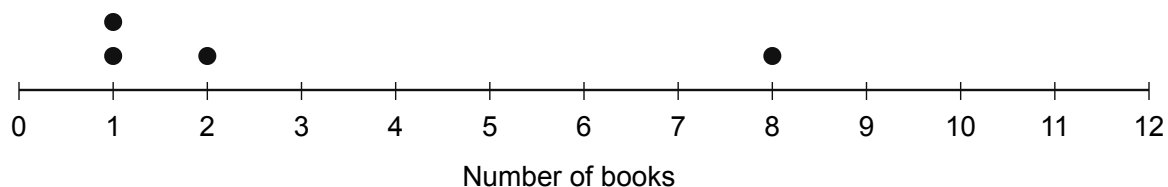
6. Delete a high value

A class records 1, 1, 2, 2, 4 books read. The student who read 4 books leaves the group. Find both centers before and after deletion. How does each change?

7. Same mean, different median

The plotted group has values 1, 1, 2, 8. Insert one observation equal to its mean. Find both centers before and after. Does an unchanged mean guarantee an unchanged median? Explain.

Before inserting the mean



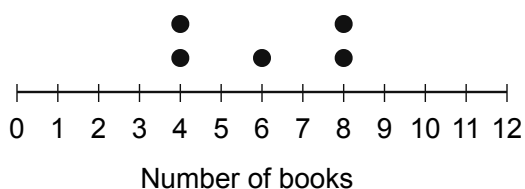
Key: one dot = one student

TEACHER NOTES

Tasks 2 and 3 separately change the original Task 1 group. Do not carry Task 2 data into Task 3. Require three student-built dot plots with correct stacked repeats, labels, and key. Accept means and medians in books; fractional centers are valid.

TASK 1

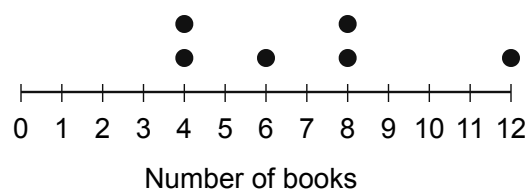
Mean = $30 / 5 = 6$ books; median = 6 books.

Original group

Key: one dot = one student

TASK 2

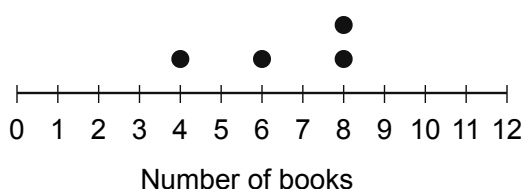
Mean = $42 / 6 = 7$ books; median = $(6 + 8) / 2 = 7$ books. Both increase by 1 book.

Insert a data point

Key: one dot = one student

TASK 3

Mean = $26 / 4 = 6.5$ books; median = $(6 + 8) / 2 = 7$ books. Mean increases by 0.5; median increases by 1.

Delete a data point

Key: one dot = one student

TASK 4

Mean = $36 / 6 = 6$ books; median = $(6 + 6) / 2 = 6$. The inserted value equals the old mean, and the middle values are both 6.

TASK 5

Old mean = 3; old median = 3. New mean = $24 / 6 = 4$; new median = $(3 + 3) / 2 = 3$. Only the mean changes. New ordered data: 2, 2, 3, 3, 5, 9. The high new value raises the mean, but not the middle pair.

TASK 6

Before: mean = 2, median = 2. After: mean = $6 / 4 = 1.5$, median = $(1 + 2) / 2 = 1.5$. Both decrease by 0.5 book. After deletion the sorted values are 1, 1, 2, 2. There are four observations.

TASK 7

Insert 3. Before: mean = 3, median = 1.5. After: mean = $15 / 5 = 3$, median = 2. No; the middle position changes even though the mean stays 3.