LESSON MAKER PRO

When Data Shift

Compare centers, spread, and extreme values.

HIGH SCHOOL · GDA.DSP.C.11

GDA.DSP.C.11 "Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers) on mean and standard deviation."

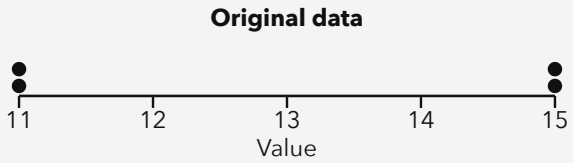
NAME _____ **DATE** _____

READ THE WHOLE DISTRIBUTION

The mean describes a data set's center. Population standard deviation measures spread: subtract the mean from each value, square each difference, find the average of those squares, then take the square root. An extreme value can pull the mean toward it and increase the standard deviation, so check the plot's shape as well as its numbers.

WORKED EXAMPLE

Use the dot plot. If one 15 changes to 23, how do the mean, population standard deviation, and shape change?

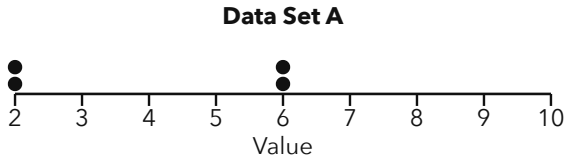


1. Original mean: (11 + 11 + 15 + 15) / 4 = 13.
2. Original standard deviation: √[(4 + 4 + 4 + 4) / 4] = 2.
3. New mean: (11 + 11 + 15 + 23) / 4 = 15.
4. New standard deviation: √[(16 + 16 + 0 + 64) / 4] = √24.

Answer: The mean rises from 13 to 15, and the population standard deviation rises from 2 to √24. The new data have a longer right tail.

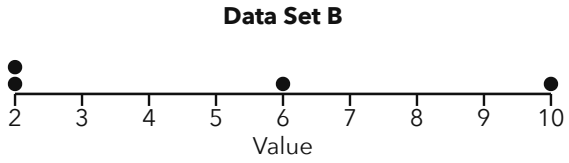
PRACTICE 6 problems

1 Use the dot plot to find the mean and population standard deviation.



ANSWER _____

2 Use the dot plot to find the mean and population standard deviation.



ANSWER _____

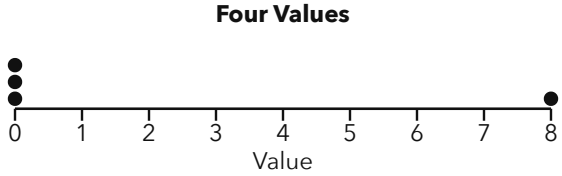
3 Compare the plots in problems 1 and 2. Which has a longer right tail? How do their means and standard deviations compare?

ANSWER _____

4 Find the population standard deviation of 1, 3, 5, 7.

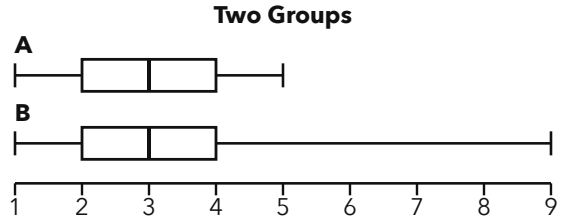
ANSWER _____

5 Use the dot plot. Find the mean and population standard deviation before and after removing the highest value.



ANSWER _____

6 Use the box plots. Which group has the wider overall range? Compare their medians.



ANSWER _____

APPLY IT Show your work

1 A student creator tracks views for four posts before and four posts after trying a new editing style. Views are measured in hundreds. Use the table to find each mean and population standard deviation. Which set has the longer right tail?

POST VIEWS

Post	Before	After
1	4	4
2	4	4
3	8	8
4	8	12

ANSWER _____

2 Two friends record their points in four rounds of a video game. Use the table to find each friend's mean and population standard deviation. Who scored more consistently?

GAME SCORES

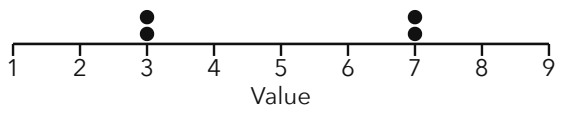
Round	Alex	Sam
1	6	4
2	6	4
3	10	12
4	10	12

ANSWER _____

CHALLENGE One step up

Use the dot plot. Replace one 3 with 1 and one 7 with 9. Find the original and new population standard deviations. Explain why the mean stays the same even though the spread changes.

Original Data



WORK SPACE AND ANSWER

When Data Shift

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the dot plot to find the mean and population standard deviation.	**Mean: 4. Population standard deviation: 2.**
2	Use the dot plot to find the mean and population standard deviation.	**Mean: 5. Population standard deviation: √11.**
3	Compare the plots in problems 1 and 2. Which has a longer right tail? How do their means and standard deviations compare?	**Data Set B has a longer right tail. Its mean is higher, 5 instead of 4, and its population standard deviation is higher, √11 instead of 2.**
4	Find the population standard deviation of 1, 3, 5, 7.	**√5**
5	Use the dot plot. Find the mean and population standard deviation before and after removing the highest value.	**Before: mean 2, population standard deviation √12. After: mean 0, population standard deviation 0.**
6	Use the box plots. Which group has the wider overall range? Compare their medians.	**Group B has the wider range, 8 compared with 4. Both medians are 3.**

PART 2 · APPLY IT

1. **Before: mean 6 hundred views, population standard deviation 2 hundred views. After: mean 7 hundred views, population standard deviation √11 hundred views. The after set has the longer right tail.** The means are 24 / 4 = 6 and 28 / 4 = 7. The averages of the squared distances from those means are 4 and 11, respectively.
2. **Both means are 8 points. Alex's population standard deviation is 2 points, and Sam's is 4 points. Alex scored more consistently.** Both totals are 32 points, so both means are 8. Alex's scores are 2 points from the mean, while Sam's are 4 points from it.

CHALLENGE

The original mean is 5 and the population standard deviation is 2. The new values are 1, 3, 7, 9, with mean 5 and population standard deviation √10. Lowering one value by 2 and raising another by 2 leaves the total unchanged, so the mean stays 5. Moving those values farther from 5 increases the spread.

Standard deviations use the population formula, dividing by the number of values. Accept equivalent exact forms, such as 2√3 for √12.