

Compare Center and Consistency

Use the whole distribution to support your conclusion.

HIGH SCHOOL • HSS-ID.A.2

CCSS.Math.Content.HSS-ID.A.2 "Excerpt: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets."

NAME _____

DATE _____

Let the question guide the summary

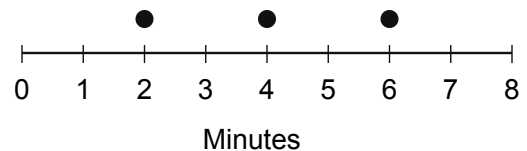
For symmetric data without extreme values, compare mean and SD. For skewed data, median and IQR resist extremes. Explain center and spread in context.

Worked example

For 2, 4, 6 minutes, calculate the population standard deviation.

Mean = 4. Squared deviations: 4, 0, 4. Population variance = $8 / 3$. Take its square root. Population standard deviation is about 1.63 minutes.

Practice times



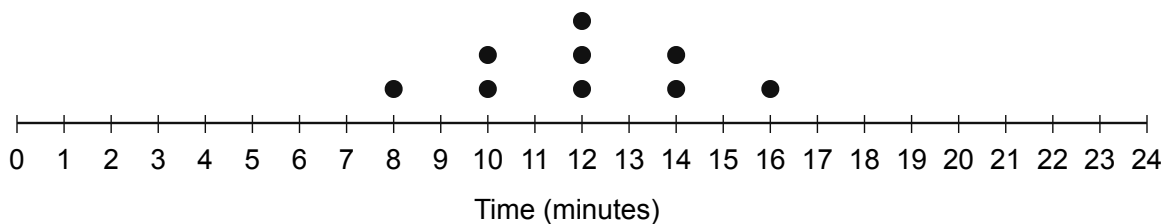
Key: one dot = one observation

Simulated data. Use a calculator. Treat each listed set as the complete population for SD. Show reasoning.

1. Summarize Route A

Count all nine observations, including repeats. Describe the shape; find the mean and population SD using the example method. Round SD to two decimals.

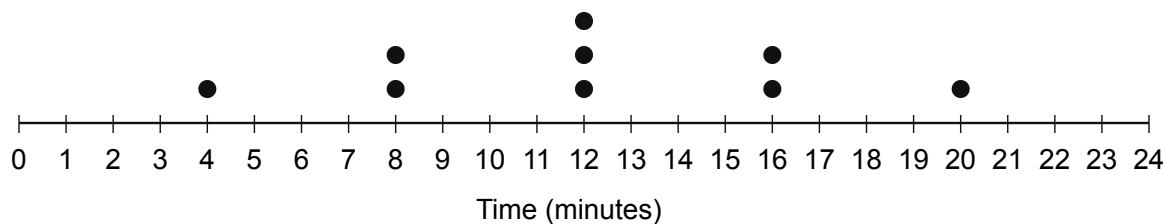
Route A delivery times



Key: one dot = one observation

2. Summarize Route B

Read all nine observations. Describe the shape and calculate the mean and population standard deviation, using the same method and rounding as task 1. These two plots use the same scale.

Route B delivery times

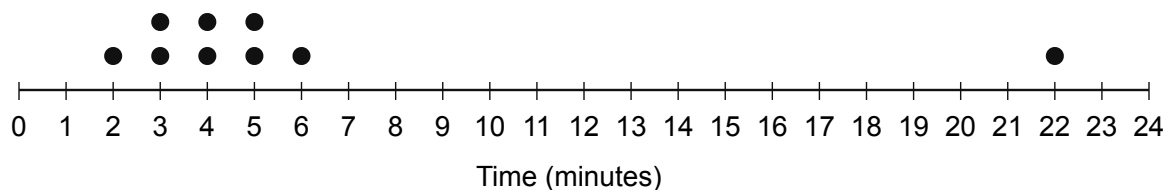
Key: one dot = one observation

3. Compare delivery consistency

Compare the routes using mean and SD, including numerical differences or ratios. Explain why these measures fit the shapes. Which route is more consistent, and does it have a lower average time?

4. Summarize Counter C

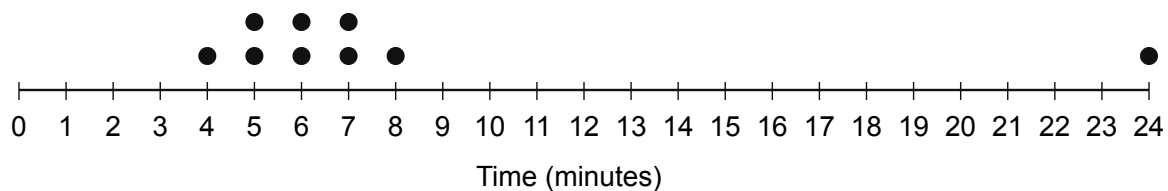
Describe the shape. Find the median, Q1, Q3 and IQR. Sort the observations; exclude the middle observation and find each half's median for Q1 and Q3. Explain why median and IQR fit this distribution.

Counter C customer waits

Key: one dot = one observation

5. Summarize Counter D

Use the same quartile convention to find the median, Q1, Q3 and IQR. Describe how this distribution compares with Counter C. These plots use the same scale.

Counter D customer waits

Key: one dot = one observation

6. Compare typical waits and spread

Compare C and D using median and IQR, with numerical evidence and units. A report says, "D has a larger median, so its waits must be more variable." Evaluate that claim. Explain why the isolated high waits make mean and SD less useful for describing typical waits here.

7. Change the report question

A manager now needs the total wait time across all nine customers at each counter. Calculate the totals and means, and explain why mean is useful for this question despite the skew. Does changing the reporting question change the raw observations or your earlier median/IQR comparison?

TEACHER NOTES

Accept equivalent titles and explanations supported by the data. Count repeated observations separately. Check units and the stated population SD and quartile conventions where applicable.

TASK 1

Route A is symmetric around 12 minutes. Mean = $108 / 9 = 12$ minutes. Squared deviations total 48; population SD = square root of $(48 / 9)$, about 2.31 minutes.

TASK 2

Route B is symmetric around 12 minutes. Mean = $108 / 9 = 12$ minutes. Squared deviations total 192; population SD = square root of $(192 / 9)$, about 4.62 minutes.

TASK 3

Both routes average 12 minutes, a difference of 0. Route B has twice the SD of A (about 4.62 versus 2.31 minutes), so A is more consistent. Both are symmetric without isolated extreme values, supporting mean/SD. A does not have a lower average time.

TASK 4

C is right-skewed with an isolated 22-minute wait. Median 4; $Q1 = 3$; $Q3 = (5 + 6) / 2 = 5.5$; $IQR = 2.5$ minutes. Median/IQR describe the typical wait and middle-half spread without being pulled toward the isolated high value.

TASK 5

D is right-skewed with an isolated 24-minute wait. Median 6; $Q1 = 5$; $Q3 = (7 + 8) / 2 = 7.5$; $IQR = 2.5$ minutes. Each observation is 2 minutes above the corresponding C value: same shape, shifted right. Use the named dataset and stated conventions.

TASK 6

D has a median 2 minutes longer (6 versus 4), but both IQRs are 2.5 minutes: the middle-half spreads are equal. A larger center does not imply more variability. Isolated high waits pull the means upward and strongly affect SD, so median/IQR better summarize typical waits and central spread. Compare numerical evidence with units.

TASK 7

C total = 54 minutes, mean = 6; D total = 72 minutes, mean = 8. For equal counts, total = count $\times$ mean, so mean directly supports the total-wait question and includes the long waits. Raw observations stay the same, and D still has median 2 minutes greater with equal IQR.