

What do I know already? (Do not look up the answers to these questions. The purpose is to assess your current level of knowledge on these topics.)

A. In your own words describe what a measure of variation (dispersion) reveals about a data set. Measures of dispersion indicate the spread in the data points. You might also say that measures of dispersion indicate the degree to which the data points are clustered together.

B. Why is the standard deviation generally preferred to the variance as a measure of dispersion (variation)? Two possible reasons: the units of the standard deviation are the same as the units of the original measurements, and Chebyshev's theorem and the empirical rule help us to use the standard deviation to know something important about the distribution of data sets.

C. What useful information can Chebyshev's theorem provide us with for a set of data? What assumptions about the shape of the distribution of the data does the theorem make? The theorem tells us the minimum percentage of data located within a given interval that is symmetric around the mean of the set of data. Chebyshev's theorem does not make any assumptions about the shape of the data set.

D. In a left-skewed distribution, is the value of the mean larger or smaller than the median? What about in a right-skewed distribution? The mean is less than the median in a left-skewed distribution. The mean is greater than the median in a right-skewed distribution.

Learning Objectives: (Click the learning objectives below for a short clip on the topic.)

[Define and Calculate the Range \(3\)](#)

[Determine when the Range is an Appropriate Measure of Dispersion \(2\)](#)

[Define the Standard Deviation in Relation to Variance \(1\)](#)

[Calculate the Sample Standard Deviation for a Set of Data \(3\)](#)

[Compare the Usefulness of Variance and Standard Deviation Regarding the Units \(2\)](#)

[State Chebyshev's Theorem \(1\)](#)

[Calculate the Minimum Percentage of Data Inside a Symmetric Interval \(3\)](#)

[Calculate the Maximum Percentage of Data Outside a Symmetric Interval \(3\)](#)

[Create an Interval that Captures At Least \$1-1/k^2\$ of the Data \(4\)](#)

[Locate the Mean, Median, and Mode in Skewed and Symmetric Distributions \(1\)](#)

[Categorize a Distribution as Either Left Skewed, Right Skewed, or Symmetric \(2\)](#)

Exercises:

1. In a left-skewed distribution, the median is 64. Which of the following values could be the mean for the distribution? (select all that apply)

A. 62.1

B. 61.3

C. 65.4

D. 67.0

E. 64.2

F. 62.9

2. Use the provided values {6, 2, 9, 1, -3, 5, 4} to find the following sum: $\sum_{i=1}^7 (x_i - 4)^2$

the sum is 92

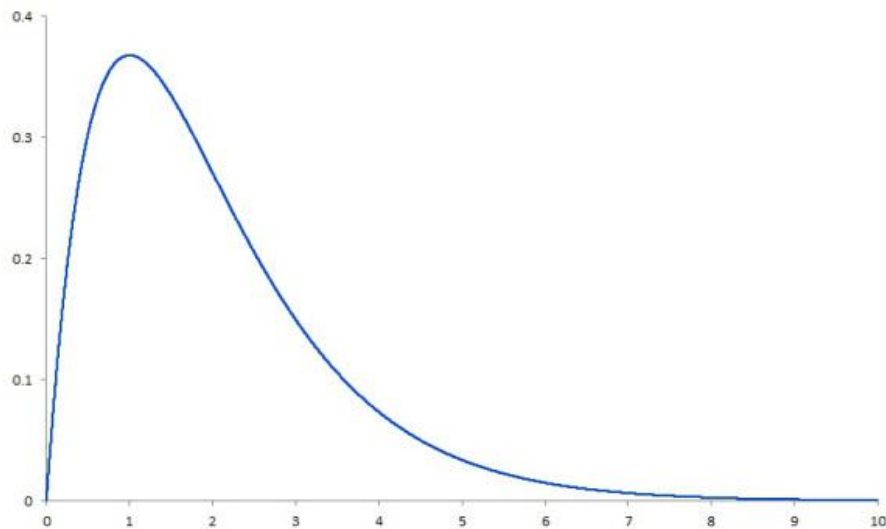
3. If the standard deviation for a sample of data is 1.3 ft, what is the variance for that sample of data? 1.69 feet squared
4. The following frequency distribution is for grades in a course that has a maximum of 130 available points. Find the relative frequency for the class that includes grades between 70 and 80 points. $54/200 = 0.27$

Frequency Distribution - Grades

| Grades | | | |
|--------|---|-------|-----------|
| lower | | upper | frequency |
| 20 | < | 30 | 1 |
| 30 | < | 40 | 0 |
| 40 | < | 50 | 13 |
| 50 | < | 60 | 26 |
| 60 | < | 70 | 53 |
| 70 | < | 80 | 54 |
| 80 | < | 90 | 31 |
| 90 | < | 100 | 15 |
| 100 | < | 110 | 5 |
| 110 | < | 120 | 1 |
| 120 | < | 130 | 1 |

5. In a right-skewed distribution, the median is 16.2. Which of the following values could be the mean for the distribution? (select all that apply)
A. 12.3 B. 17.8 C. 15.4 D. 18.1 E. 16.2 F. 13.4
6. A manufacturer that makes microprocessors for cellular phones randomly selects four microprocessors from their production line in order to test them. These tests are done to determine the length of time the microprocessors function under extreme use. The manufacturer would like to calculate some measure of dispersion (variation) for the measurements taken from each sample of four microprocessors selected. Would the range be an acceptable option under these circumstances? Why or why not? Yes, because there are only four measurements in the set of collected data.
7. The NHTSA (National Highway Traffic Safety Administration) conducted a study of accidents involving motorcycles. The data included the ages of motorcyclists involved in accidents. If the researchers want to describe the typical age of a motorcyclist involved in a crash, which measure of the center is likely most appropriate?
A. Mean
B. Median
C. Mode
D. Range
E. Mean Absolute Deviation
8. Calculate the standard deviation for a set of 34 values that have the following summary values: 6.86
- $$\sum_{i=1}^n x_i = 439 \text{ and } \sum_{i=1}^n x_i^2 = 7,223$$
9. According to a report by Common Sense Media, teens are spending an average of 9 hours per day in front of a screen for entertainment. The standard deviation for the time teens spend in front of a screen for entertainment is 2.2 hours. What is the minimum percentage of teens that spend between 5 and 13 hours in front of a screen for entertainment each day? at least 69.75%
10. The number of friends each Facebook user has is an example of: (select all that apply)
A. continuous data
B. discrete data
C. qualitative data
D. nominal level data
E. quantitative data

11. A camera manufacturer has produced a camera shutter that has an average lifespan of 150,000 actuations with a standard deviation of 12,030 actuations. What can be said about the percentage of these shutters that will last for more than 185,000 actuations? (hint: use Chebyshev's Theorem) **At most 11.8%**
12. Civil engineering graduate students weighed a random sample of vehicles passing over a small bridge here in Miami. The standard deviation for the weights of the sampled cars was 953 pounds. What unit of measurement would the variance of the data have?
A. Pounds B. Root Pounds C. **Pounds Squared** D. Kilograms
13. The average weight of cars on U.S. roads is 4,009 pounds. If we assume the standard deviation for the weights of the cars is 919 pounds, create an interval that would capture the weights of at least 75% of all cars on U.S. roads.
2,171 to 5,847
14. Salary data was collected for a local university. The average salary for faculty at the university was \$73,661. The median salary was \$86,810, and the most common salary (the mode) for the collected data set was \$89,200. Is the distribution likely **left skewed**, right skewed, or symmetric?
15. According to a report by Common Sense Media, teens are spending an average of 9 hours per day in front of a screen for entertainment. The standard deviation for the time teens spend in front of a screen for entertainment is 2.2 hours. What is the maximum percentage of teens that spend less than 4 hours in front of a screen for entertainment each day? **At most 19.36%**
16. The distribution below appears to be?



- A. Left skewed B. **Right skewed** C. Symmetric D. Uniform E. None of these