

The Empirical Rule



KEY

Name: _____

Section Number: _____

Background

A bell-shaped distribution is characterized by where it peaks (mean) and how spread out it is (standard deviation). We already know that a bell-shaped sampling distribution is important to the construction of a margin of error and the associated confidence interval. However, bell-shaped distributions also contain useful probabilistic information about the variable being described. The following well-known rule addresses this connection.

Empirical Rule:

Suppose a bell-shaped distribution has a mean μ and a standard deviation σ . Then:

- a. About 68% of all observations represented by that distribution will fall within one standard deviation of the mean.
- b. About 95% will fall within two standard deviations of the mean.
- c. About 99.7% will fall within three standard deviations of the mean.

Graphically:

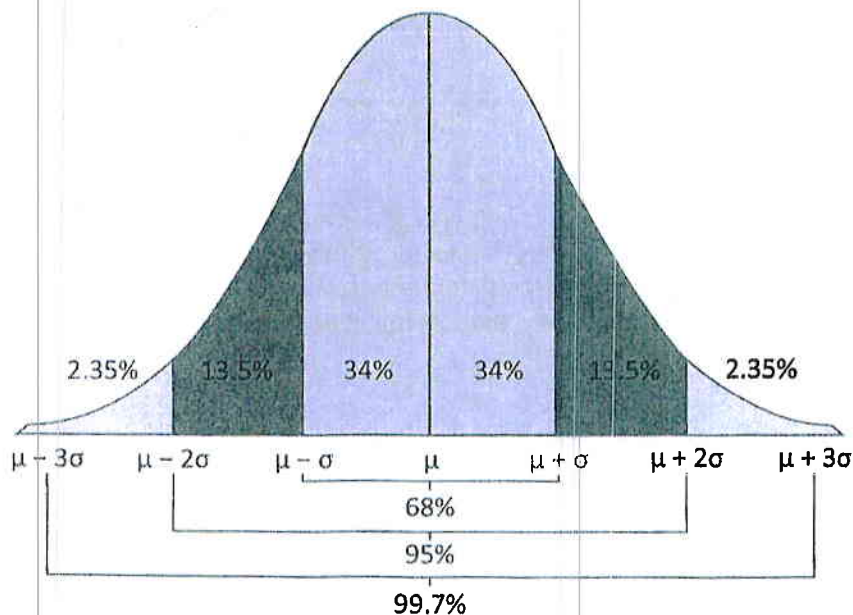


EXHIBIT 1

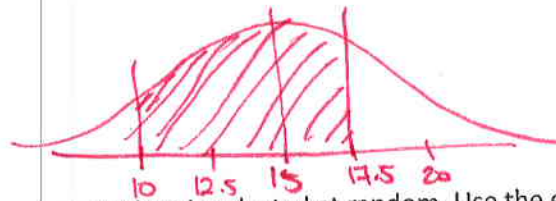
Face in Class Book

In a 2012 *Washington Post* article entitled "Is College Too Easy? As Study Time Falls, Debate Rises," Daniel de Vise reports that "over the past half-century, the [average] amount of time college students actually study—read, write and otherwise prepare for class—has dwindled from 24 hours a week to about 15 ..." No standard deviation is given, but let's assume that standard deviation is 2.5 hours.



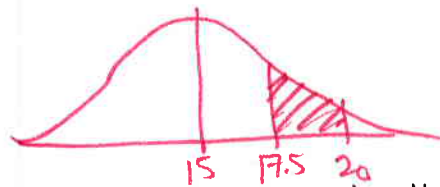
Questions

1. Suppose a college student is selected at random. Use the empirical rule to estimate how likely it is that this student studies between 10 and 17.5 hours per week.



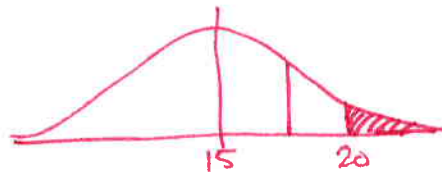
$$13.5 + 34 + 34 = 81.5\%$$

2. Suppose a college student is selected at random. Use the empirical rule to estimate how likely it is that this student studies between 17.5 and 20 hours per week.



$$13.5\%$$

3. Suppose a college student is selected at random. Use the empirical rule to estimate how likely it is that this student studies more than 20 hours per week.



$$2.35\%$$

$$\text{or } 100 - 95\% = \frac{5\%}{2} \approx 2.5\%$$

4. Estimate the average number of hours you study each week. How many standard deviations away from the mean do you fall?

Answers will vary depending on your answer, you may want to use normalcdf on your calculator