# The Empirical ("68-95-99.7") Rule for Normal Distributions

## Activity Instructions

The image and questions below can be used to engage students in critical thinking and in-class discussion around a key concept that will be tested during the AP exam. To help get you started, we have provided several suggestions on how to use this activity.

- Present the image of the empirical rule on-screen to the class or print copies to give to each student or pairs/groups of students.
- Discuss the image and brainstorm the meaning of the empirical rule.
- Begin the activity by directing the students to a data-gathering activity. There are different possibilities depending on time/resource constraints.

  **Easy Option:**
  - Students report their individual heights.
  - Students report shoe sizes.
  - Students report the distance from their home to school (in miles).
  - Students report the age of their guardians/parents.

  **Moderate Option:**
  - Have students roll a dice 10 times, compute, and report the average.

  **More Involved Option:**
  - Have students spin a quarter, record, and report the time until the coin drops.
  - Have students create and throw a paper airplane, and collect data on the time from launch until the plane touches ground.
  - Separate the class into groups of 2 students. Have students count the number of photos in their phones, calculate, and report the average.

- Have the students give the results of the activity to the instructor
- Visualize the data using a graph such as a stem-and-leaf plot, looking for features such as symmetry and "mound shape"
- Calculate the mean and standard deviation of the data
- Go through activity prompts with the students
- After the activity, print the empirical rule image as a poster to hang in your classroom to reinforce the lesson.

**UWorld | COLLEGE READINESS**

# The Empirical ("68-95-99.7") Rule for Normal Distributions

## Activity Prompts

1. What is the overall shape of the distribution of data? Is the overall shape "mound shaped"?
2. Approximately 68% of the data will be between what values?
3. Approximately 95% of the data will be between what values?
4. Approximately 99.7% of the data will be between what values?
5. What percentage of the data are between the values from Q2? Q3? Q4?
6. How well do the percentages match up with the percentages given by the empirical rule?
7. Do the percentages match up with the percentages given by the empirical rule? Explain why.

# The Empirical ("68-95-99.7") Rule for Normal Distributions



"68-95-99.7" rule
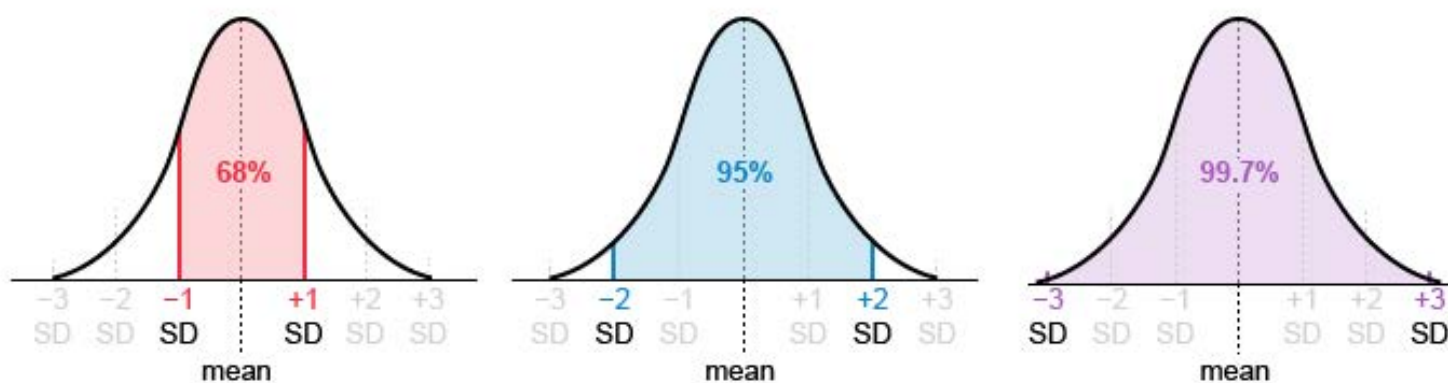
68% of the data is ±1 SD from the mean
(1 below + 1 above = 2 SDs total)

95% of the data is ±2 SDs from the mean
(2 below + 2 above = 4 SDs total)

99.7% of the data is ±3 SDs from the mean
(3 below + 3 above = 6 SDs total)