LESSON MAKER PRO

# Normal Curve Clues

*Estimate percentages with the empirical rule.*

**HIGH SCHOOL · A2S.DSP.C.25**

**A2S.DSP.C.25** "From a normal distribution, use technology to find the mean and standard deviation and estimate population percentages by applying the empirical rule. a..."

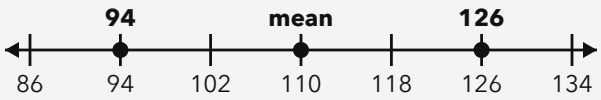
NAME _____ DATE _____

## THE EMPIRICAL RULE

For a normal distribution, about 68% of values are within 1 standard deviation of the mean, 95% are within 2, and 99.7% are within 3. The curve is symmetric, so half of each region lies on each side of the mean.

## WORKED EXAMPLE

A normal distribution has a mean of 110 and a standard deviation of 8. Estimate the percent of values from 94 to 126.




1. 2 × 8 = 16.
2. 94 and 126 are each 16 from the mean, so they are 2 standard deviations away.
3. About 95% of values lie within 2 standard deviations of the mean.

**Answer: About 95%**

## PRACTICE 4 problems

**1** A normal distribution has a mean of 40 and a standard deviation of 5. What percent of values lie from 40 to 45?

ANSWER _____

**2** A normal distribution has a mean of 72 and a standard deviation of 4. What percent of values lie from 64 to 76?

ANSWER _____

**3** A normal distribution has a mean of 120 and a standard deviation of 20. What percent of values are above 160?

ANSWER _____

**4** A normal distribution has a mean of 30 and a standard deviation of 3. What percent of values lie from 21 to 39?

ANSWER _____

## APPLY IT Show your work

**1** A gaming headset's battery life is approximately normal, with a mean of 24 hours and a standard deviation of 6 hours. About what percent of headsets last from 18 to 30 hours?

WORK SPACE

**ANSWER** _____

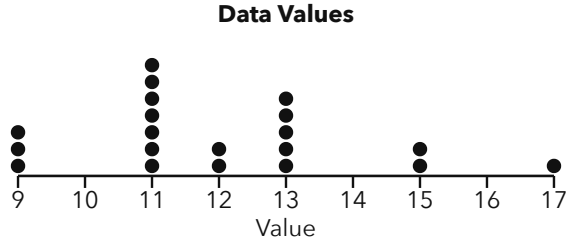
**2** Students' 5K finish times are approximately normal, with a mean of 27 minutes and a standard deviation of 3 minutes. About what percent finish in under 21 minutes?

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

A spreadsheet reports a mean of 12 and a standard deviation of 2 for these data, each rounded to the nearest whole number. What percent of values are within 1 standard deviation of the mean? What percent are within 2? Based only on those percentages, does the empirical rule support a normal model?




WORK SPACE AND ANSWER

**ANSWER KEY**

# Normal Curve Clues

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## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | A normal distribution has a mean of 40 and a standard deviation of 5. What percent of values lie from 40 to 45? | **About 34%** |
| 2 | A normal distribution has a mean of 72 and a standard deviation of 4. What percent of values lie from 64 to 76? | **About 81.5%** |
| 3 | A normal distribution has a mean of 120 and a standard deviation of 20. What percent of values are above 160? | **About 2.5%** |
| 4 | A normal distribution has a mean of 30 and a standard deviation of 3. What percent of values lie from 21 to 39? | **About 99.7%** |

## PART 2 · APPLY IT

1. **About 68%** The endpoints are 1 standard deviation below and above the mean. Apply the 68% part of the empirical rule.
2. **About 2.5%** 21 is 2 standard deviations below the mean. Half of the 5% outside that range is below 21.

## CHALLENGE

**14/20 = 70% are from 10 to 14, and 19/20 = 95% are from 8 to 16. These percentages are close to 68% and 95%, so they support, but do not prove, a normal model.**

Accept percentages written as decimals or fractions. The challenge checks whether the empirical-rule percentages are close, not whether the data prove normality.