LESSON MAKER PRO

# Bell Curve Estimates

*Use standard deviations to estimate percentages.*

**HIGH SCHOOL · HSS-ID.A.4**

**CCSS.Math.Content.HSS-ID.A.4** "Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets..."

NAME _____ DATE _____

## THE EMPIRICAL RULE

For data that are roughly bell-shaped and symmetric, about 68% of values are within 1 standard deviation of the mean. About 95% are within 2 standard deviations, and about 99.7% are within 3 standard deviations.

## WORKED EXAMPLE

A normal data set has mean 48 and standard deviation 6. Estimate the percent of values from 42 to 54.

1. 42 = 48 - 6, so 42 is 1 standard deviation below the mean.
2. 54 = 48 + 6, so 54 is 1 standard deviation above the mean.
3. Values within 1 standard deviation make up about 68%.

**Answer: About 68%**

## PRACTICE 5 problems

**1** A normal data set has mean 72 and standard deviation 4. Estimate the percent from 68 to 76.

**ANSWER** _____

**2** A normal data set has mean 80 and standard deviation 5. Estimate the percent above 85.

**ANSWER** _____

**3** A normal data set has mean 100 and standard deviation 10. Estimate the percent from 80 to 120.

**ANSWER** _____

**4** A normal data set has mean 30 and standard deviation 2. Estimate the percent from 32 to 34.

**ANSWER** _____

**5** A normal data set has mean 200 and standard deviation 25. Estimate the percent below 150.

**ANSWER** _____

## APPLY IT Show your work

**1** Typing speeds in a coding club are normally distributed with a mean of 60 words per minute and a standard deviation of 10 words per minute. Estimate the percent of members who type faster than 70 words per minute. If the club has 125 members, estimate how many type faster than 70 words per minute.

WORK SPACE

**ANSWER** _____

**2** Weekly homework time for 400 students is modeled by a normal distribution with a mean of 8 hours and a standard deviation of 2 hours. Estimate how many students spend from 6 to 10 hours on homework each week.

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

**CHALLENGE**

A data set of quiz scores has two groups, one clustered near 60 and one clustered near 90, with very few scores between them. Is a normal model appropriate? Explain.

_____

_____

ANSWER KEY

# Bell Curve Estimates

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## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | A normal data set has mean 72 and standard deviation 4. Estimate the percent from 68 to 76. | **About 68%** |
| 2 | A normal data set has mean 80 and standard deviation 5. Estimate the percent above 85. | **About 16%** |
| 3 | A normal data set has mean 100 and standard deviation 10. Estimate the percent from 80 to 120. | **About 95%** |
| 4 | A normal data set has mean 30 and standard deviation 2. Estimate the percent from 32 to 34. | **About 13.5%** |
| 5 | A normal data set has mean 200 and standard deviation 25. Estimate the percent below 150. | **About 2.5%** |

## PART 2 · APPLY IT

1. **About 16%, or about 20 members.** Seventy is 1 standard deviation above the mean, so about 16% are above it. 0.16 x 125 = 20.
2. **About 272 students.** The interval from 6 to 10 hours is within 1 standard deviation of the mean, or about 68%. 0.68 x 400 = 272.

## CHALLENGE

**No. The data are bimodal, with two clusters, not one symmetric bell-shaped distribution.**

Accept "approximately" or "about" with all percentage estimates. For the challenge, accept answers that identify the two clusters or lack of a single bell shape.