

Algebra 2 · Data, Normal Distributions and Statistical Inference · Quiz

Common Core S-ID.A.4, S-IC.A.1, S-IC.B.3, S-IC.B.4 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

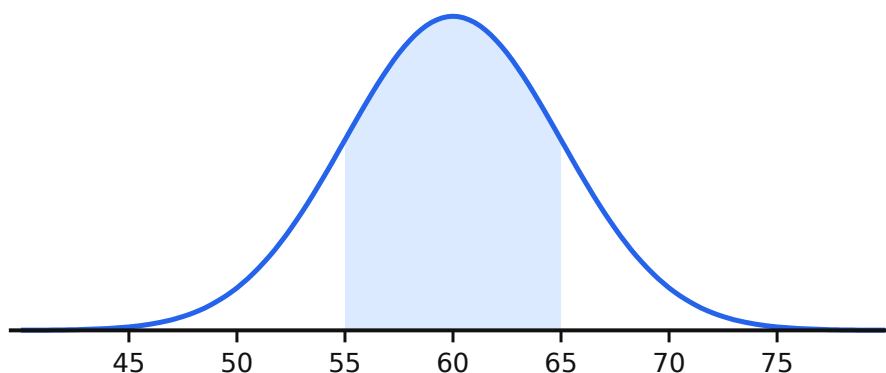
Ten multiple-choice questions check the main ideas: standard deviation, the 68-95-99.7 rule, z-scores, study design and margin of error. Pick the one best answer for each question, then read the explanation to see the typical mistake.

Algebra 2 Common Core: S-ID.A.4 · S-IC.A.1 · S-IC.B.3 · S-IC.B.4

Questions

Question 1

Values are approximately normal with mean 60 and standard deviation 5. What percent of values lie between 55 and 65?



Mean 60, standard deviation 5.

- A. 68%
- B. 34%
- C. 95%
- D. 50%

Question 2

A student scores 92 on a test with mean 80 and standard deviation 8. What is the z-score?

- A. $z = 12$
- B. $z = 0.67$

- C. $z = -1.5$
- D. $z = 1.5$

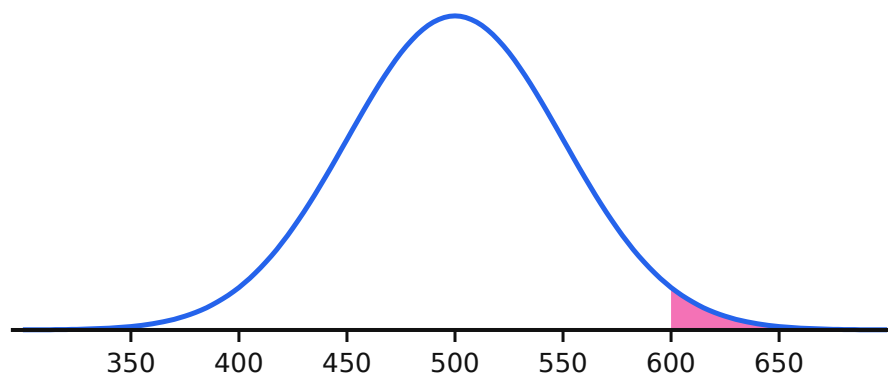
Question 3

Every value in a data set with mean 20 and standard deviation 4 is increased by 10. What are the new mean and standard deviation?

- A. mean 30, SD 4
- B. mean 30, SD 14
- C. mean 20, SD 14
- D. mean 30, SD 40

Question 4

About what percent of a normal distribution with mean 500 and standard deviation 50 lies in the shaded region above 600?



Mean 500, standard deviation 50; the tail above 600 is shaded.

- A. 2.5%
- B. 5%
- C. 13.5%
- D. 16%

Question 5

Researchers randomly assign 50 patients to take either a new medicine or a placebo and compare recovery times. What kind of study is this?

- A. a sample survey
- B. an experiment
- C. an observational study
- D. a census

Question 6

A study finds that students who eat breakfast have higher grades. The students chose whether

to eat breakfast. Which conclusion is justified?

- A. Eating breakfast causes higher grades.
- B. Eating breakfast is associated with higher grades.
- C. Skipping breakfast lowers grades.
- D. Every student should eat breakfast.

Question 7

A poll reports that 54% of voters support a measure, with a margin of error of 4 percentage points. Which statement is best supported?

- A. Exactly 54% of all voters support it.
- B. The poll proves that most voters support it.
- C. At most 4% of voters oppose the measure.
- D. The true percent is plausibly from 50% to 58%.

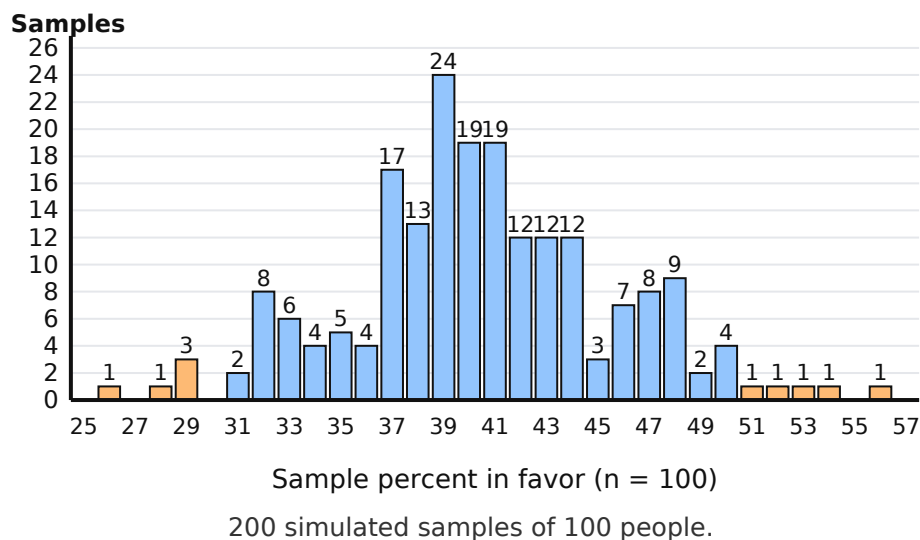
Question 8

A teacher wants to survey 40 of her 800 students. Which method gives a random sample?

- A. Survey the first 40 students who enter the cafeteria.
- B. Survey the 40 members of the chess club.
- C. Number all students and pick 40 numbers with a random number generator.
- D. Survey the 40 students who answer an online post.

Question 9

The histogram shows 200 simulated sample percents. The shaded bars, the middle 95% of results, run from 31% to 50%. What is the estimated margin of error?



- A. about 19 percentage points
- B. about 40 percentage points
- C. about 4.75 percentage points

D. about 9.5 percentage points

Question 10

Why do researchers use random assignment in an experiment?

- A. It guarantees that the results apply to a whole population.
- B. It makes the sample size larger so the margin of error is zero.
- C. It makes the groups comparable so differences can be credited to the treatment.
- D. It lets participants choose the treatment they prefer.

Answer key

1. **A** – 55 and 65 are one standard deviation below and above the mean, so about 68% lie between them. The mistake is to use only one side, which gives 34%.
2. **D** – $z = (92 - 80) / 8 = 1.5$. Dividing the standard deviation by the difference gives 0.67, and a negative sign would mean below the mean.
3. **A** – Adding a constant moves every value the same distance, so the mean becomes 30 but the spread is unchanged at 4.
4. **A** – 600 is two standard deviations above the mean. The outer 5% is split between two tails, so 2.5% is above 600.
5. **B** – The researchers assign the treatments at random, which defines an experiment.
6. **B** – The groups formed on their own, so this is an observational study. It shows association only, because other factors could explain the grades.
7. **D** – 54% plus or minus 4 gives 50% to 58%. Because 50% is in the interval, a majority is not proven.
8. **C** – Only the random number generator gives every student an equal chance. The other groups are convenience samples.
9. **D** – The margin of error is half the width of the middle 95%: $(50 - 31) / 2 = 9.5$. The full width, 19, is a common mistake.
10. **C** – Random assignment balances other factors across groups. Generalizing to a population depends on random sampling instead.

Remember:

- Standards S-ID.A.4, S-IC.A.1, S-IC.B.3 and S-IC.B.4: normal models, z-scores, study design and margin of error.
- Normal data follow the 68-95-99.7 rule: 68%, 95% and 99.7% within 1, 2 and 3 standard deviations.
- The z-score is $z = \frac{x - \mu}{\sigma}$; the table gives the area to the left of z .
- Only an experiment with random assignment can support a cause-and-effect conclusion.
- A margin of error can be estimated as half the width of the middle 95% of simulated sample results.