

Normal Curves, z-Scores and Study Design

Grade 11 – Algebra 2 math · Test · Standards: S-ID.A.4, S-IC.A.1, S-IC.B.3, S-IC.B.4

Name: _____ Date: _____ Class: _____

This 45-minute test covers standard deviation, z-scores, the Empirical Rule, study design and margin of error from a simulation. A calculator is allowed. Show your reasoning in each question.

Standards: S-ID.A.4, S-IC.A.1, S-IC.B.3, S-IC.B.4 · **Level:** Grade 11 Algebra 2

Time: 45 minutes · 9 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Mean and standard deviation (2 points)

Find the mean and the population standard deviation of 3, 7, 8, 10, 12. Round σ to the nearest hundredth.

Question 2 z-scores (2 points)

A distribution has mean 52 and standard deviation 4.5. Find the z-score of 61, and the value that has z-score -0.8 .

Question 3 Heights and the Empirical Rule (3 points)

Adult heights in a town are approximately normal with mean 66 inches and standard deviation 2.5 inches.

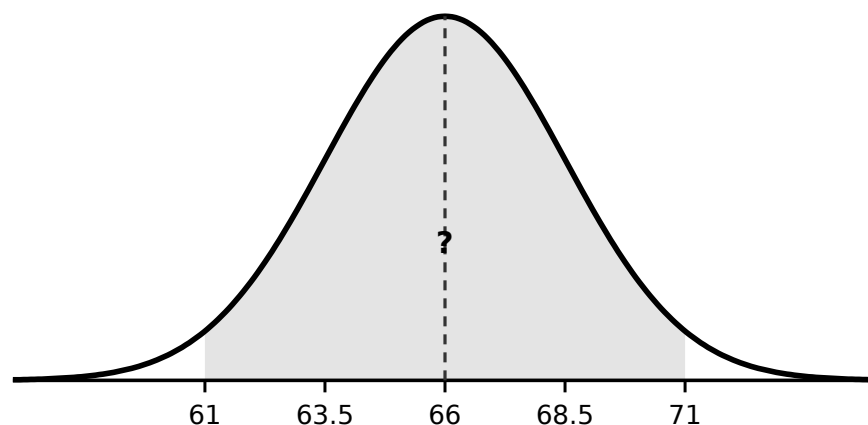


Figure for Question 3.

- What percent of adults are between 61 and 71 inches? (1 point)
- What percent are shorter than 63.5 inches? (1 point)
- What percent are taller than 71 inches? (1 point)

Question 4 Compare swimmers (3 points)

In the 100-meter freestyle, last season's boys' times had mean 60 seconds and standard deviation 1.5 seconds, and the girls' times had mean 52 seconds and standard deviation 1 second. Jo (boys) swam 58.2 seconds and Lee (girls) swam 50.5 seconds. Who did better relative to their group? A lower time is better.

Question 5 Classify the study (2 points)

Classify each study as a survey, an observational study or an experiment. (a) A gym randomly assigns 40 members to two workout plans and compares fitness gains. (b) A town clerk records the ages of everyone who attends a council meeting.

Question 6 Margin of error from a histogram (3 points)

A class simulated 100 random samples of 30 people from a population where half agree with a statement. The histogram shows the sample proportions.

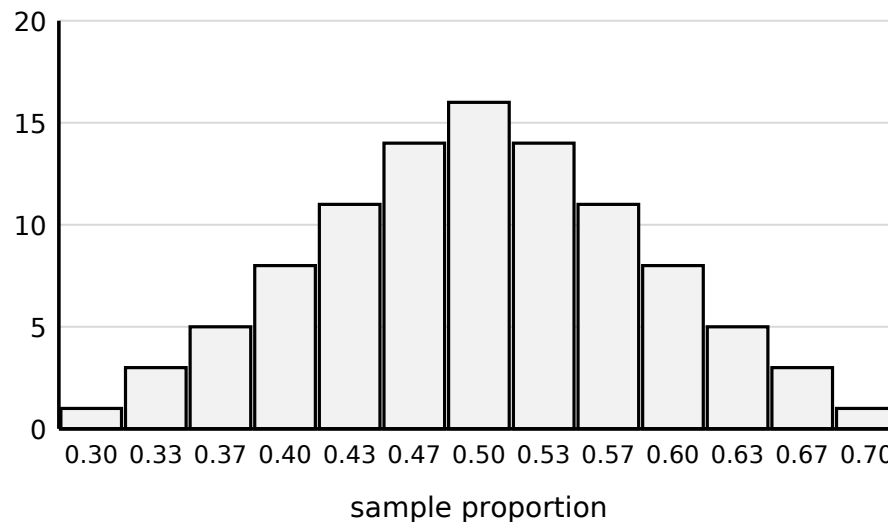


Figure for Question 6.

- Estimate the interval holding the middle 95% of the results. (2 points)
- Estimate the margin of error. (1 point)

Question 7 Counting students above a score (2 points)

Scores on a statewide test are approximately normal with mean 70 and standard deviation 8. About how many of 400 students scored above 78?

Question 8 Identify bias (2 points)

A principal surveys only students who stay after school for clubs to find out how students get to school. Explain the bias and suggest a better sampling plan.

Question 9 Cause and effect (1 point)

Which design can show that a new fertilizer causes taller plants: a survey or a randomized

