

Sampling Distributions of Proportions and Means

Grade 12 – AP Statistics math · Test · Standards: AP Statistics Unit 2 (2026-27)

Name: _____ Date: _____ Class: _____

This 45-minute test has eight AP-style questions worth 20 points. State and check conditions, show the standardizing step, and interpret results in context.

Standards: AP Statistics Unit 2 (2026-27) · **Level:** Grade 12 AP Statistics

Time: 45 minutes · 8 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Parameter and Statistic (2 points)

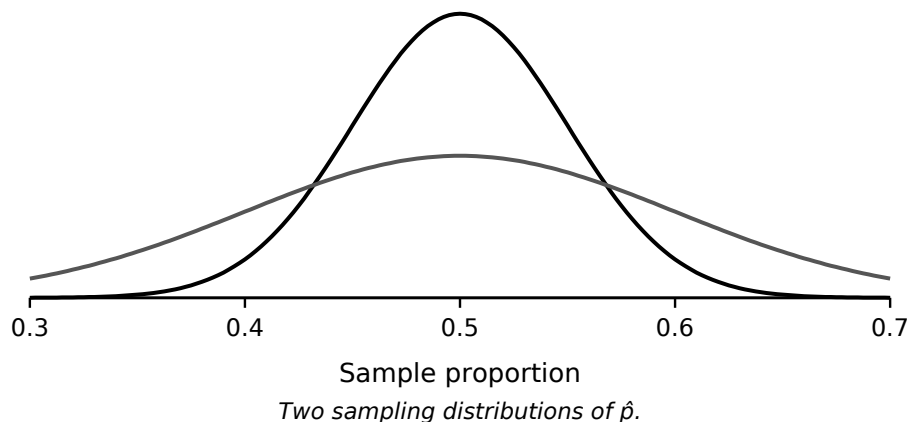
A school wants the mean commute time of all its 1,400 students. A random sample of 60 students has a mean of 24.5 minutes. (a) Identify the parameter and the statistic, with symbols. (b) Would another random sample of 60 students be expected to have exactly the same mean? Explain.

Question 2 Sampling Distribution of $\hat{p}$ (3 points)

In a state, 52% of voters support a ballot measure. A random sample of 180 voters is taken. (a) Verify that the sampling distribution of $\hat{p}$ is approximately normal. (b) Find its mean and standard deviation. (c) Find the probability that $\hat{p}$ is less than 0.47.

Question 3 Sample Size and Spread (2 points)

The figure shows the sampling distributions of $\hat{p}$ for samples of size 25 and size 100 from a population with $p = 0.5$. The narrow curve has the smaller spread.



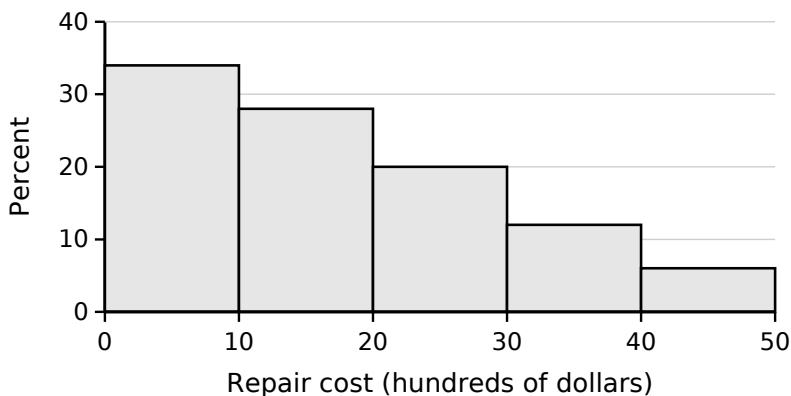
- Which sample size produced the narrow curve? Explain. (1 point)
- Find the standard deviation of $\hat{p}$ for each sample size. (1 point)

Question 4 Sample Mean from a Normal Population (3 points)

The lengths of steel rods are approximately normal with mean 125 mm and standard deviation 6 mm. A random sample of 9 rods is selected. (a) Find the mean and standard deviation of $\bar{x}$. (b) Justify using a normal model for $\bar{x}$. (c) Find $P(122 < \bar{x} < 128)$.

Question 5 Central Limit Theorem Shape (2 points)

The histogram shows a skewed right population.



Repair costs for a population of appliances.

- Describe the shape of the sampling distribution of $\bar{x}$ for samples of size 4. (1 point)
- Describe the shape for samples of size 50. Explain. (1 point)

Question 6 Difference of Proportions (3 points)

In district A, 60% of parents favor a later start time; in district B, 50% do. Independent random samples of 100 parents from A and 120 from B are taken. (a) Find the mean and standard

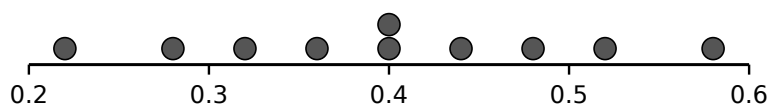
deviation of $\hat{p}_A - \hat{p}_B$. (b) Find the probability that $\hat{p}_A < \hat{p}_B$, assuming the sampling distribution is approximately normal.

Question 7 Difference of Means (2 points)

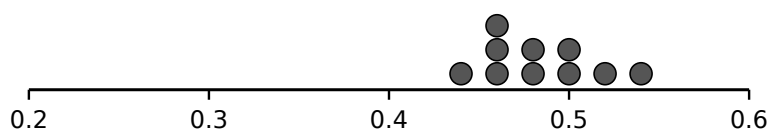
Delivery times for company A have mean 30 minutes and standard deviation 5; for company B, mean 27 minutes and standard deviation 4. Independent random samples of 25 deliveries from A and 36 from B are taken. Find the mean and standard deviation of $\bar{x}_A - \bar{x}_B$.

Question 8 Bias and Variability (3 points)

Two methods estimate a population proportion whose true value is 0.40. Each dotplot shows 10 estimates.



Method A (true parameter 0.40).



Method B (true parameter 0.40).

- Describe the bias and variability of method A. (1 point)
- Describe the bias and variability of method B. (1 point)
- Which method would you choose, and why? (1 point)