

AP Statistics · Sampling Distributions · Worksheet Answer Key

Common Core AP Statistics Unit 2 (2026-27) · mathovore.fr

This ap statistics sampling worksheet answer key solves all 23 problems of the sampling distributions worksheet step by step.

Each solution checks the conditions, gives the center and spread of the sampling distribution, and then standardizes. Normal areas use Table A values for z-scores rounded to two decimals, so a calculator may differ in the last digit. Compare your setup step by step.

AP StatisticsCommon Core: AP Statistics Unit 2 (2026-27)

AP Statistics Sampling Worksheet Answer Key: problems 1-5

Problem 1: Mean and SD of a sample proportion

$$\mu_{\hat{p}} = p = 0.60.$$

$$\sigma_{\hat{p}} = \sqrt{\frac{0.6(0.4)}{100}} = \sqrt{0.0024} \approx \mathbf{0.0490}.$$

Problem 2: Is it approximately normal?

(a) $np = 100(0.05) = 5 < 10$. **Not approximately normal**; it is skewed right.

(b) $np = 60(0.3) = 18 \geq 10$ and $n(1-p) = 60(0.7) = 42 \geq 10$. **Approximately normal**.

Problem 3: Probability for a sample proportion

Conditions: $np = 60 \geq 10$, $n(1-p) = 140 \geq 10$, and the city is far larger than 2,000 people.

$$\sigma_{\hat{p}} = \sqrt{\frac{0.3(0.7)}{200}} \approx 0.0324; \quad z = \frac{0.35 - 0.30}{0.0324} = 1.54.$$

$$P(\hat{p} > 0.35) = 1 - 0.9382 = \mathbf{0.0618}.$$

Problem 4: The 10% condition

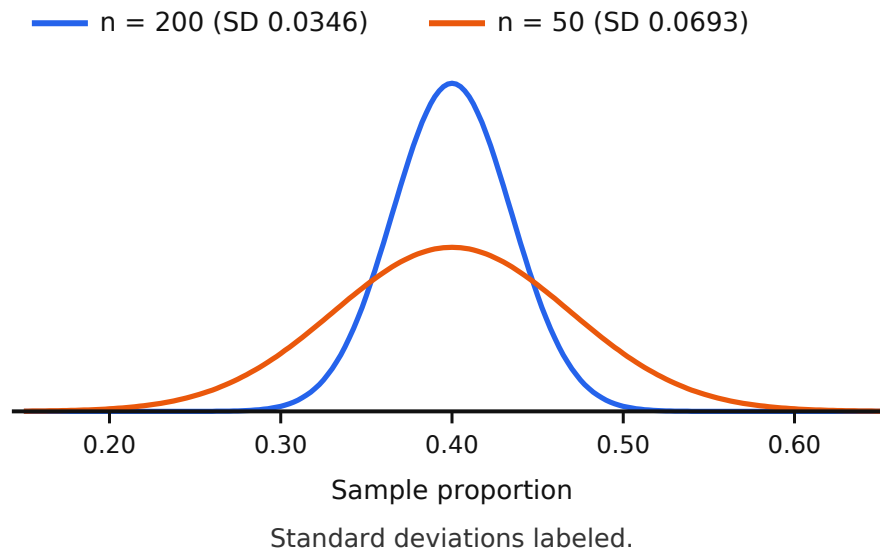
The formula needs independence, which requires $n \leq 10\%$ of the population. For 250 students, 10% is 25, and $40 > 25$. **No**: sampling without replacement makes the observations dependent.

For 2,500 students, 10% is $250 \geq 40$. **Yes.**

Problem 5: Effect of sample size

$$n=50: \sqrt{\frac{0.4(0.6)}{50}} \approx 0.0693. \quad n=200: \sqrt{\frac{0.4(0.6)}{200}} \approx 0.0346.$$

The sample size was multiplied by 4, so the standard deviation was divided by $\sqrt{4}=2$. **Both curves are centered at 0.40; the $n=200$ curve is half as wide.**



AP Statistics Sampling Worksheet Answer Key: problems 6-10

Problem 6: Bias and variability

A: centered at 0.40, so unbiased, with small spread (low variability).

B: centered at 0.40, so unbiased, but with large spread (high variability).

C: small spread but centered near 0.53, above the true value, so biased with low variability.

Method A is best: it is both accurate on average and consistent.

Problem 7: Mean and SD of a sample mean

$$\mu_{\bar{x}} = \mu = 68 \text{ ounces.}$$

$$\sigma_{\bar{x}} = \frac{12}{\sqrt{36}} = \frac{12}{6} = 2 \text{ ounces.}$$

Problem 8: Normal population

(a) $\sigma_{\bar{x}} = \frac{3}{\sqrt{9}} = 1$. The population is normal, so $\bar{x}$ is normal for any n .

$$(b) z = \frac{15.5 - 14.2}{1} = 1.30; P(\bar{x} > 15.5) = 1 - 0.9032 = \mathbf{0.0968}.$$

$$(c) z = \frac{15.5 - 14.2}{3} = 0.43; P(X > 15.5) = 1 - 0.6664 = \mathbf{0.3336}.$$

A single backpack that heavy is common, but an average of 9 that heavy is rare, because averages vary less.

Problem 9: Central Limit Theorem

The population is skewed, but $n = 40 \geq 30$, so by the Central Limit Theorem $\bar{x}$ is approximately normal (and 40 customers is under 10% of all customers).

$$\mu_{\bar{x}} = 4.2; \sigma_{\bar{x}} = \frac{3.6}{\sqrt{40}} \approx 0.5692; z = \frac{3.5 - 4.2}{0.5692} = -1.23.$$

$$P(\bar{x} < 3.5) \approx \mathbf{0.1093}.$$

Problem 10: Small sample, skewed population

The Central Limit Theorem needs a large sample (rule of thumb $n \geq 30$). With $n = 8$ the sampling distribution of $\bar{x}$ keeps much of the skewness of the population, so normal areas would be inaccurate.

Use a larger sample (at least 30), or confirm the population is approximately normal.

The center μ and the spread $\frac{\sigma}{\sqrt{n}}$ are still correct for any n ; only the shape is in doubt.

AP Statistics Sampling Worksheet Answer Key: problems 11-15

Problem 11: Choosing a sample size

Solve $\frac{20}{\sqrt{n}} = \text{target}$.

$$(a) \sqrt{n} = 10, \text{ so } n = 100.$$

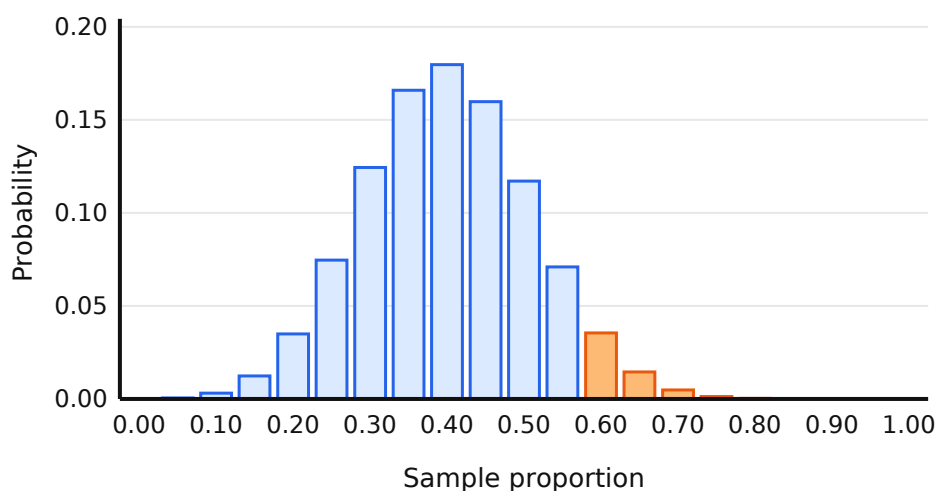
$$(b) \sqrt{n} = 20, \text{ so } n = 400. \text{ Cutting the standard deviation in half cost four times the sample.}$$

Problem 12: Exact sampling distribution

$$(a) \mu_{\hat{p}} = p = 0.40, \text{ the center of the graph.}$$

$$(b) \sigma_{\hat{p}} = \sqrt{\frac{0.4(0.6)}{20}} = \sqrt{0.012} \approx 0.1095.$$

$$(c) \hat{p} \geq 0.60 \text{ means } X \geq 12 \text{ of } 20, \text{ where } X \text{ is binomial with } n = 20, p = 0.4. \\ P(X \geq 12) = 1 - \text{binomcdf}(20, 0.4, 11) = \mathbf{0.0565}.$$



Problem 13: Difference of two proportions

Mean: $0.55 - 0.45 = 0.10$.

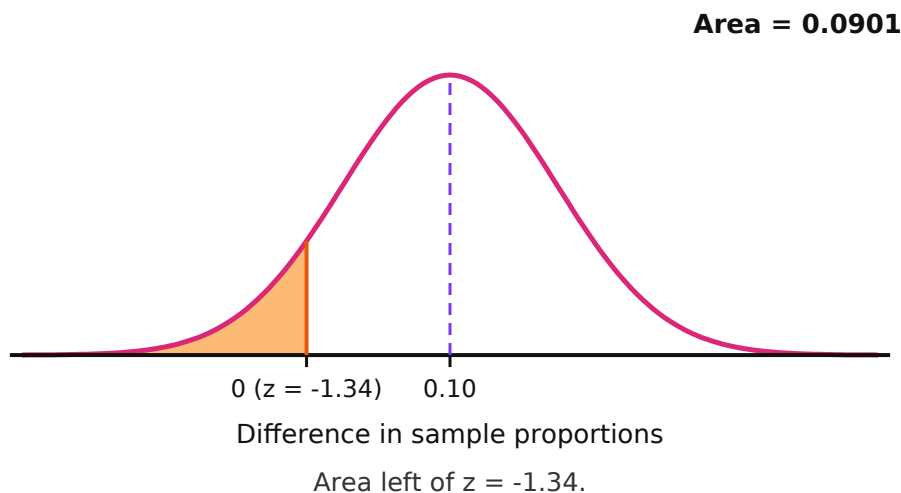
Standard deviation: $\sqrt{\frac{0.55(0.45)}{80} + \frac{0.45(0.55)}{100}} = \sqrt{0.0030938 + 0.002475} = \sqrt{0.0055688} \approx \mathbf{0.0746}$.

Problem 14: Probability of a reversed difference

Both groups meet the normal conditions (44,36,45,55 are all at least 10). $z = \frac{0 - 0.10}{0.0746} = -1.34$.

$P(\hat{p}_1 - \hat{p}_2 < 0) = \mathbf{0.0901}$.

About 9% of such pairs of samples would show the wrong ordering, even though the true difference is 0.10.



Problem 15: Conditions for a difference

(a) $n_1p_1 = 44$, $n_1(1-p_1) = 36$, $n_2p_2 = 45$, $n_2(1-p_2) = 55$. All are at least 10. **Approximately normal.**

(b) $n_1p_1 = 60(0.12) = 7.2 < 10$. **Not approximately normal**, even though the second sample passes.

AP Statistics Sampling Worksheet Answer Key: problems 16-20

Problem 16: Difference of two means

Mean: $82 - 78 = 4$.

Standard deviation: $\sqrt{\frac{10^2}{36} + \frac{12^2}{45}} = \sqrt{2.7778 + 3.2} = \sqrt{5.9778} \approx \mathbf{2.4449}$.

Problem 17: Probability for a difference of means

$$z = \frac{6-4}{2.4449} = 0.82.$$

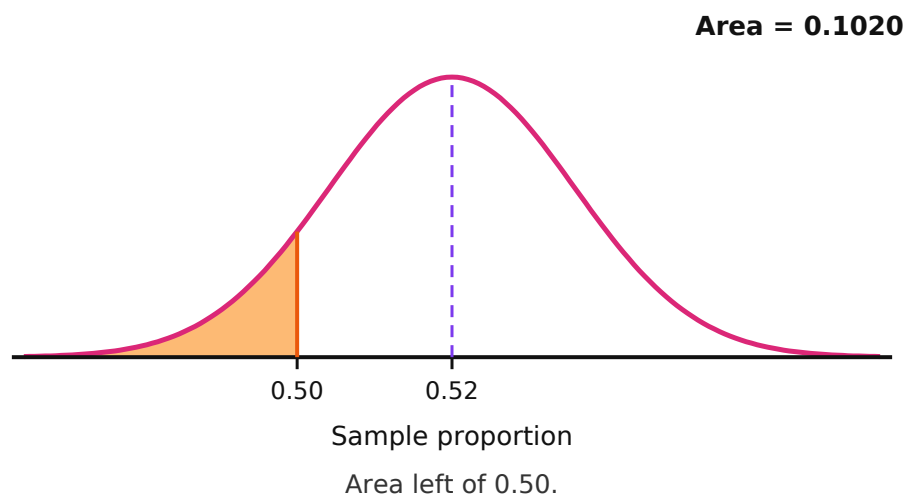
$$P(\bar{x}_1 - \bar{x}_2 > 6) = 1 - 0.7939 = \mathbf{0.2061}.$$

Problem 18: Poll accuracy

$$\sigma_{\hat{p}} = \sqrt{\frac{0.52(0.48)}{1000}} \approx 0.0158; z = \frac{0.50 - 0.52}{0.0158} = -1.27.$$

$$P(\hat{p} < 0.50) = \mathbf{0.1020}.$$

About 1 poll in 10 of this size would show the candidate trailing even though the candidate leads, so a single poll can mislead.



Problem 19: Bags of flour

$$\sigma_{\bar{x}} = \frac{0.06}{\sqrt{9}} = 0.02; z = \frac{5.00 - 5.02}{0.02} = -1.00.$$

$$P(\bar{x} < 5.00) = \mathbf{0.1587}.$$

Problem 20: Phone time

$n = 64 \geq 30$, so $\bar{x}$ is approximately normal by the Central Limit Theorem. $\sigma_{\bar{x}} = \frac{24}{\sqrt{64}} = 0.3$;
 $z = \frac{3.5 - 3.1}{0.3} = 1.33$.

$$P(\bar{x} > 3.5) = 1 - 0.9082 = \mathbf{0.0918}.$$

AP Statistics Sampling Worksheet Answer Key: problems 21-23

Problem 21: Margin of error idea

$n = 100$: $\sigma = \sqrt{\frac{0.5(0.5)}{100}} = 0.05$, interval 0.50 ± 0.10 , from 0.40 to 0.60.

$n = 400$: $\sigma = \sqrt{\frac{0.5(0.5)}{400}} = 0.025$, interval 0.50 ± 0.05 , from 0.45 to 0.55.

Four times the sample halves the width of the interval from 0.20 to 0.10.

Problem 22: Two bakeries

Mean of $\bar{x}_1 - \bar{x}_2$: $4.1 - 4.0 = 0.1$. Standard deviation: $\sqrt{\frac{0.30^2}{25} + \frac{0.25^2}{30}} = \sqrt{0.0036 + 0.002083} \approx 0.0754$.

$$z = \frac{0 - 0.1}{0.0754} = -1.33; P(\bar{x}_1 - \bar{x}_2 < 0) = \mathbf{0.0918}.$$

Even though Bakery 1 muffins are heavier on average, about 9% of such samples reverse the order.

Problem 23: Is the claim plausible?

Conditions: $np = 67.5 \geq 10$ and $n(1-p) = 82.5 \geq 10$. $\sigma_{\hat{p}} = \sqrt{\frac{0.45(0.55)}{150}} \approx 0.0406$; $z = \frac{0.38 - 0.45}{0.0406} = -1.72$.

$$P(\hat{p} \leq 0.38) = \mathbf{0.0427}.$$

A result this low happens about 4% of the time if the claim is true. That is unusual enough to cast some doubt, though it is not overwhelming evidence.

How to use this ap statistics sampling worksheet answer key

Read this ap statistics sampling worksheet answer key after trying each problem yourself, and redo any problem you missed.

