

Inference for Proportions: Intervals and Tests

Grade 12 – AP Statistics math · Test Answer Key · Standards: AP Statistics Unit 3 (2026-27)

The scoring guide shows how points are earned. Each inference answer needs conditions, correct calculations and a conclusion in context that refers to the p-value or the interval.

Standards: AP Statistics Unit 3 (2026-27) · **Level:** Grade 12 AP Statistics

Question 1 Confidence Interval (3 points)

(a) Random sample; 400 is less than 10% of a large county; 158 and 242 are at least 10. (b) $\hat{p} = 0.395$, $SE = 0.02444$, $ME = 0.0479$, interval (0.347, 0.443). (c) We are 95% confident that the true proportion of county voters who plan to vote for the bond is between 0.347 and 0.443.

(0.347, 0.443)

Scoring: 1 point conditions, 1 point interval, 1 point interpretation in context.

Question 2 Sample Size (2 points)

$n \geq (1.645/0.04)^2(0.5)(0.5) = 422.82$. Round up.

$n = 423$

Scoring: 1 point for the formula with $\hat{p} = 0.5$, 1 point for rounding up correctly.

Question 3 Interval Justification (2 points)

Program X: the interval (0.08, 0.20) does not contain 0 and is all positive, so there is convincing evidence that X improves the graduation rate. Program Y: the interval (−0.03, 0.11) contains 0, so a difference of 0 is plausible and there is not convincing evidence of a difference.

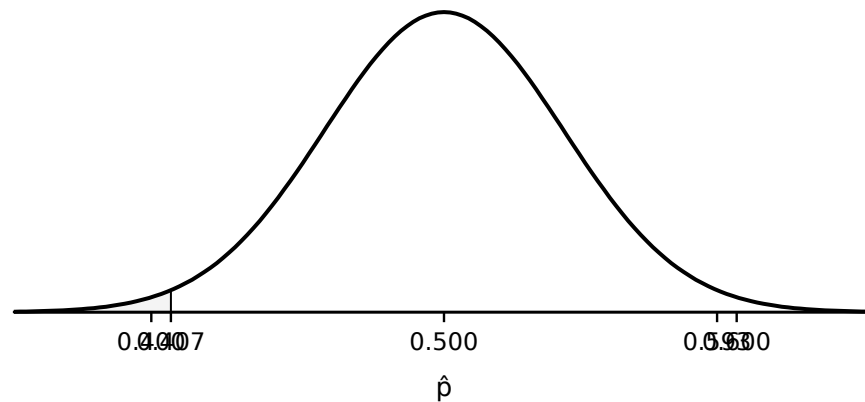
X: yes; Y: no

Scoring: 1 point each program, with the reason about 0.

Question 4 Significance Test (3 points)

(a) $H_0: p = 0.50$; $H_a: p \neq 0.50$. Random sample, 150 is under 10% of the plays, and $150(0.5) = 75$ for both counts. (b) $\hat{p} = 0.4067$, $SE = \sqrt{(0.25/150)} = 0.0408$, $z = -2.286$. The two-sided p-value is $2 \times 0.0111 = 0.0222$. (c) Since $0.0222 < 0.05$, we reject H_0 ; there is convincing

evidence that the true win proportion differs from 0.50 (it appears to be lower).



Two-sided p -value for $\hat{p} = 0.4067$.

$z \approx -2.29$, p -value ≈ 0.022 ; reject H_0

Scoring: 1 point each part: hypotheses and conditions, statistic and p -value, conclusion in context.

Question 5 p -Value and Decision (2 points)

(a) If the true proportion of students who work part-time were 0.30, the probability of getting a sample proportion as large as the one observed, or larger, would be 0.021. (b) Since $0.021 < 0.05$, reject H_0 : there is convincing evidence that the true proportion is greater than 0.30.

Reject H_0

Scoring: 1 point for a correct interpretation, 1 point for the decision with context.

Question 6 Errors in Context (2 points)

Type I: deciding that the defect rate is above 2% when it is actually 2% (rejecting a true H_0), which could stop production unnecessarily. Type II: not finding convincing evidence that the rate is above 2% when it is really higher, so defective items continue to be shipped.

Type I: reject true H_0 ; Type II: fail to reject false H_0

Scoring: 1 point for each error described in context.

Question 7 Difference of Two Proportions (3 points)

(a) Random and independent samples; counts 52, 78, 36 and 84 are all at least 10. (b) $\hat{p}_A = 0.400$, $\hat{p}_B = 0.300$, difference 0.100. SE = 0.0600, ME = 0.1175. Interval $(-0.018, 0.218)$. (c) The interval contains 0, so there is not convincing evidence of a difference.

(−0.018, 0.218); no convincing evidence

Scoring: 1 point each part.

Question 8 Power (3 points)

(a) Power is the probability of rejecting H_0 when a particular alternative value of the parameter is true ($1 - \beta$). (b) Increase the sample size, or use a larger α , or test an alternative that is farther from the null value. (c) A larger α raises the probability of a Type I error.

Power = P(reject H_0 | H_a true)

Scoring: 1 point each part.