

Inference for Means with t Procedures

Grade 12 – AP Statistics math · Test Answer Key · Standards: AP Statistics Unit 4 (2026-27)

The scoring guide shows how points are earned. Full credit requires checked conditions, correct calculations with degrees of freedom, and a conclusion linked to the p-value or the interval in context.

Standards: AP Statistics Unit 4 (2026-27) · **Level:** Grade 12 AP Statistics

Question 1 Margin of Error (2 points)

$SE = 7.5/\sqrt{20} = 1.677$. $df = 19$, $t^* = 2.093$. $ME = 2.093 \times 1.677 = 3.51$.

SE $\approx$ 1.68; ME $\approx$ 3.51 miles

Scoring: 1 point for SE, 1 point for t^* and margin of error.

Question 2 One-Sample t Interval (3 points)

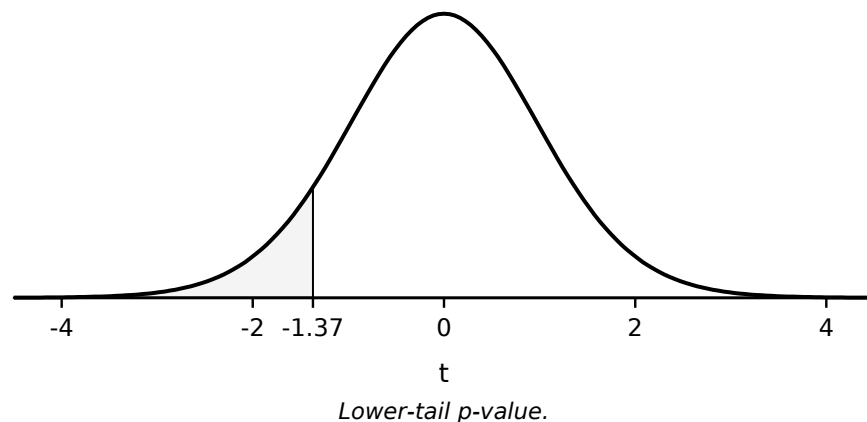
(a) Random sample; the harvest is much larger than 120 tomatoes; the dotplot is roughly symmetric with no outliers. (b) $df = 11$, $t^* = 2.201$, $SE = 1.462$, $ME = 3.22$: (123.78, 130.22). (c) We are 95% confident that the mean weight of all tomatoes in the harvest is between 123.8 and 130.2 grams.

(123.8, 130.2) grams

Scoring: 1 point each part.

Question 3 One-Sample t Test (3 points)

$t = (48.3 - 50)/(6.2/\sqrt{25}) = -1.371$, $df = 24$, $p\text{-value} = 0.0915$. Since $0.0915 > 0.05$, we fail to reject H_0 : there is not convincing evidence that the mean protein content is less than 50 grams.



$t \approx -1.37$, p -value ≈ 0.092 ; fail to reject H_0

Scoring: 1 point for t , 1 point for the p -value, 1 point for the conclusion in context.

Question 4 Paired or Independent (2 points)

(a) Option 1 is paired because each athlete is measured twice. (b) Option 1: a paired t procedure (one-sample t on the differences). Option 2: a two-sample t procedure for independent samples.

Option 1: paired t ; Option 2: two-sample t

Scoring: 1 point each part.

Question 5 Paired t Test from Summary (3 points)

$t = 2.8/(4.1/\sqrt{15}) = 2.645$, $df = 14$, p -value = 0.0096. Since $0.0096 < 0.05$, reject H_0 : there is convincing evidence that the mean time decreased after training.

$t \approx 2.64$, p -value ≈ 0.0096 ; reject H_0

Scoring: 1 point for the statistic, 1 point for the p -value, 1 point for the conclusion.

Question 6 Two-Sample t Test (3 points)

(a) Independent random samples; both boxplots are roughly symmetric without outliers, and each n is about 30. (b) $SE = \sqrt{(9.6^2/30 + 11.2^2/28)} = 2.748$; $t = (82.4 - 77.1)/2.748 = 1.929$. (c) Since $0.059 > 0.05$, fail to reject H_0 : not convincing evidence that the mean scores differ.

$SE \approx 2.75$, $t \approx 1.93$; fail to reject H_0

Scoring: 1 point each part.

Question 7 Using an Interval (2 points)

(a) Yes: the interval contains only positive values and does not include 0. (b) We are 95% confident that the mean weight loss with Plan A is between 0.6 and 3.4 pounds greater than with Plan B.

Yes; 0 is not in the interval

Scoring: 1 point each part.

Question 8 Choosing a Procedure (2 points)

(a) One-sample t interval for a mean; check that the sample is random and that the data show no strong skew (or $n \geq 30$). (b) Two-sample z procedure for a difference of proportions; check that all counts of successes and failures are at least 10.

(a) one-sample t; (b) two-proportion z

Scoring: 1 point each part with a valid condition.