

Inference for Means with t Procedures

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

Name: _____ Date: _____ Class: _____

These twenty problems train the Unit 4 skills of AP Statistics: t distributions, intervals and tests for one mean, paired data and a difference of two means, using intervals to justify claims, and choosing the correct procedure. Later problems use raw data and ask for complete write-ups.

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

Problem 1 Standard Error of a Mean (easy)

A random sample of 25 fitness-club members has a mean of 148 minutes of weekly cardio with a standard deviation of 30 minutes. Find the standard error of the sample mean.

Problem 2 Finding a Critical Value (easy)

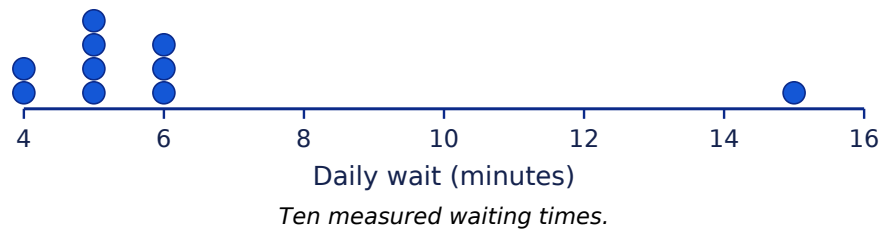
Find the critical value t^* for (a) a 95% interval with $n = 12$, (b) a 99% interval with $n = 20$, (c) a 90% interval with $n = 8$.

Problem 3 A One-Sample t Interval (medium)

A random sample of 16 bags of coffee beans has a mean weight of 4.62 pounds with a standard deviation of 0.85 pound. Assuming the conditions are met, find a 95% confidence interval for the mean weight of all bags.

Problem 4 Checking Conditions (medium)

A random sample of 10 customers was timed at the checkout. The dotplot shows the waiting times.



Is it appropriate to use a one-sample t interval for the mean waiting time? Explain.

Problem 5 Interpreting an Interval (medium)

A 95% confidence interval for the mean weekly screen time of students at a school is (18.47, 24.33) hours. Interpret the interval and the confidence level.

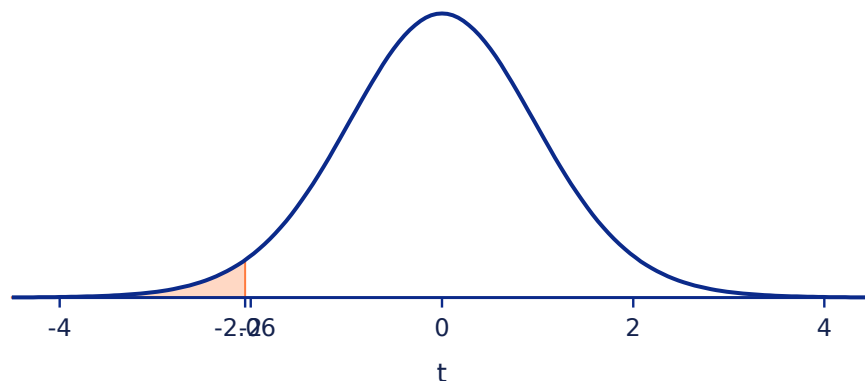
Problem 6 Writing Hypotheses for Means (easy)

Write the hypotheses for each claim, defining μ .

- A bakery says its loaves weigh 450 grams on average; an inspector suspects they weigh less.
- A school claims students sleep 8 hours on average on school nights; a nurse thinks that is not true.
- A battery maker says its batteries last 12 hours on average; a competitor suspects they last more.

Problem 7 Test Statistic and p-Value (medium)

A random sample of 22 loaves has a mean weight of 448.2 g with a standard deviation of 4.1 g. Test $H_0: \mu = 450$ against $H_a: \mu < 450$. Find the test statistic and p-value.



Problem 8 Two-Sided t Test (medium)

A school claims students sleep 8 hours on average on school nights. A random sample of 30 students has a mean of 7.4 hours and a standard deviation of 1.3 hours. Test $H_0: \mu = 8$ against $H_a: \mu \neq 8$ at $\alpha = 0.05$, assuming the conditions are met.

Problem 9 A Claim from an Interval (medium)

A 95% confidence interval for a mean (random sample of 24 students, $\bar{x} = 6.1$, $s = 1.5$) is computed. Does the interval give convincing evidence against the claim that the mean is 7 hours?

Problem 10 Sample Size and Interval Width (medium)

For $s = 12$, compare the margins of error of 95% t intervals for $n = 9$ and $n = 36$. Which is wider and why?

Problem 11 Paired or Two-Sample (easy)

Decide whether each study calls for a paired procedure or a two-sample procedure.

- Fifteen runners' times are recorded with and without a new insole.
- Heights of 40 randomly chosen women are compared with heights of 35 randomly chosen men.
- Twenty twin pairs, one twin randomly given tutoring and the other not, are compared on a final test.

Problem 12 Paired t Interval (medium)

Eight randomly chosen students took a quiz before and after a review session. The dotplot shows the changes (after minus before).



Find a 95% confidence interval for the mean change.

Problem 13 Paired t Test (hard)

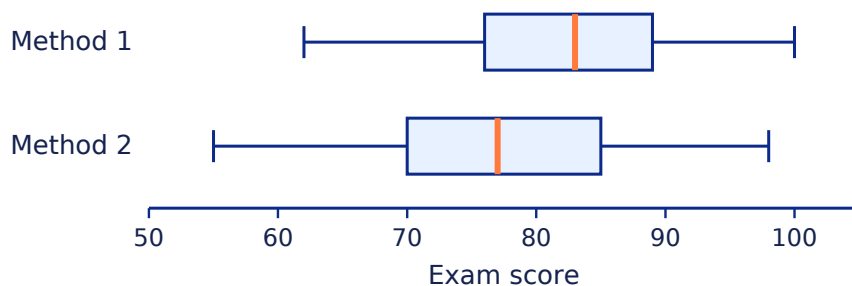
Ten randomly selected drivers had their braking reaction time (milliseconds) measured while texting and while not texting. The differences (texting minus not texting) are 12, 18, -7 , 22, 5, 9, 25, -4 , 19, 1. Test whether texting increases the mean reaction time, using $\alpha = 0.05$.

Problem 14 Two-Sample t Interval (hard)

Independent random samples of mice on two diets gave these weight gains (grams): Diet A, $n = 28$, mean 36.4, standard deviation 5.2; Diet B, $n = 31$, mean 32.9, standard deviation 6.1. Assuming the conditions are met, find a 95% confidence interval for $\mu_A - \mu_B$.

Problem 15 Two-Sample t Test (hard)

Students were randomly assigned to two teaching methods. The boxplots show the scores; summary statistics are Method 1: $n = 30$, mean 82.4, $s = 9.6$; Method 2: $n = 28$, mean 77.1, $s = 11.2$.



Exam scores under two teaching methods.

Do the data provide convincing evidence that the mean scores differ? Use $\alpha = 0.05$.

Problem 16 Interval and Test Agree (medium)

For the teaching-method data in Problem 15, a 95% confidence interval for $\mu_1 - \mu_2$ is calculated. Find it and explain how it agrees with the test result.

Problem 17 Selecting a Procedure (medium)

Name the appropriate inference procedure for each situation.

- a. Compare the proportion of voters favoring a bill in two states, using independent random samples.
- b. Estimate the mean number of hours worked by all students in a district using one random sample.
- c. Test whether a new drug lowers blood pressure using the same 30 patients before and after treatment.
- d. Test whether the distribution of favorite pet is the same among three age groups.

Problem 18 A Full Two-Sample Test (hard)

Two independent random samples of students took a timed puzzle test. Scores for Group A ($n = 9$): 72, 65, 80, 74, 69, 77, 70, 83, 68. Scores for Group B ($n = 10$): 63, 70, 61, 68, 59, 66, 72, 64, 60, 67. Is there convincing evidence that the mean scores differ? Use $\alpha = 0.05$ and complete all steps.

Problem 19 Confidence Level and Two-Sided Tests (hard)

A 99% confidence interval for a mean is (41.2, 48.6). (a) What can you conclude about $H_0: \mu = 50$ versus $H_a: \mu \neq 50$ at $\alpha = 0.01$? (b) What can you conclude about $H_0: \mu = 45$ at $\alpha = 0.01$? (c) Would a 90% interval from the same data be wider or narrower?

Problem 20 Why Pairing Matters (hard)

Eight randomly chosen adults had their resting pulse measured before and after a month of walking. Before: 62, 71, 55, 68, 74, 59, 80, 66. After: 58, 65, 54, 60, 66, 56, 71, 61. (a) Analyze the data as paired and find the t statistic and two-sided p-value. (b) Analyze incorrectly as two independent samples. (c) Compare the two analyses.