GENERAL

ap statistics chapter 7 multiple choice review

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Introduction

Preparing for the AP Statistics exam can feel like navigating a labyrinth of concepts, formulas, and data sets. One of the most effective ways to solidify your understanding and boost confidence is to engage in focused, topic specific reviews. This article zeroes in on **AP Statistics Chapter 7**, the chapter that introduces the concept of *sampling distributions* and the powerful tools they provide for making inferences about populations. By walking through a comprehensive multiple choice review, you'll not only reinforce core ideas but also develop the test taking strategies that will help you tackle the most challenging questions on test day.

Why Chapter 7 Matters on the AP Exam

Chapter 7 is a cornerstone of the AP Statistics curriculum. It connects the theoretical underpinnings of probability with real world data analysis. The chapter covers:

- Sampling distributions of means and proportions
- Standard error, normal approximation, and the Central Limit Theorem
- Confidence intervals for means and proportions
- Hypothesis testing, including t tests and z tests

Because the exam frequently asks students to interpret results, calculate confidence intervals, or determine the validity of a hypothesis, mastery of Chapter 7 is essential for a high score.

Key Concepts in Chapter 7

Sampling Distribution of the Sample Mean

When you repeatedly draw samples of a fixed size from a population, each sample produces a mean. The distribution of these means is called the **sampling distribution of the sample mean**. Its properties—mean, standard deviation, shape—are directly tied to the population's characteristics.

Standard Error (SE)

The SE measures the variability of the sample mean around the population mean. For a simple random sample, it is calculated as <0 / " n when the population standard deviation is known, or s / " n when using the sample standard deviation. The smaller the SE, the more precisely the sample mean estimates the population mean.

Central Limit Theorem (CLT)

The CLT states that, regardless of the population's shape, the sampling distribution of the sample mean will approximate a normal distribution if the sample size is sufficiently large (commonly n "e 30). This theorem justifies using normal based methods for inference even when the underlying data are not normally distributed.

Confidence Intervals (CIs)

Confidence intervals provide a range of plausible values for a population parameter. For a mean, the CI is typically x0@ ± z* (<2ò!¦â• or x0@ ± t* (s/" n) depending on whether <0 is known. For a proportion, the CI is p0 ± z* " (p0"*f* × confidence level (e.g., 95%) determines the critical value z* or t*.

Hypothesis Testing

Hypothesis tests compare an observed statistic to a theoretical distribution under a null hypothesis. Key steps include:

1. State null and alternative hypotheses.
2. Select a significance level ; à
3. Compute the test statistic (z, t, <{"Â WF2â’à
4. Determine the p value or critical value.
5. Make a decision to reject or fail to reject H €.

Common Misconceptions to Watch For

- Confusing SE with SD: The standard error refers to the variability of a sample statistic, not the raw data.
- Assuming normality without justification: The CLT applies to sample means, not individual observations.
- Misinterpreting confidence intervals: A 95% CI means that if you repeated the sampling process many times, 95% of the intervals would contain the true parameter.
- Overlooking the role of sample size: Small samples can lead to wide CIs and low power in hypothesis tests.

Strategies for Tackling Multiple Choice Questions

Multiple choice questions on Chapter 7 often test not just rote calculation but conceptual understanding and the ability to interpret results. Here are proven tactics:

1. Read the question carefully: Identify the type of inference (CI vs. hypothesis test) and the data provided.
2. Check assumptions: Verify normality, sample size, independence, and whether <2 —2 ¶ædwn.
3. Calculate the test statistic or CI endpoints: Use the appropriate formula and double check your arithmetic.
4. Compare to answer choices: Look for the choice that matches the calculated value or the correct interpretation.
5. Eliminate obviously wrong options: Discard choices with impossible values or incorrect units.
6. Use the “plug in” technique: Substitute the given numbers into the formula to see if the answer fits.

Sample Multiple Choice Review Questions

Below are ten practice questions that mirror the style and difficulty of the AP exam. After each question, we’ll provide the correct answer and a brief explanation.

Question 1

A random sample of 45 students reports their weekly study hours. The sample mean is 12 hours with a standard deviation of 3.5 hours. Construct a 95% confidence interval for the population mean study time.

1. 10.5 to 13.5 hours
2. 11.8 to 12.2 hours
3. 10.9 to 13.1 hours
4. 9.6 to 14.4 hours

Answer: *c*

Explanation: SE = 3.5 / " 45 "H 0.52. For 95% CI, z* = 1.96. Margin of error = 1.96 × 0.52 "H 1.02. CI = 12 ± 1.02 !’ (10.98, 13.02).

Question 2

A researcher wants to test whether the proportion of voters favoring a policy is greater than 0.50. In a random sample of 200 voters, 112 support the policy. At ; Ò ã RÂ v† B —2 F†R `alue for a one tailed test?

1. 0.015
2. 0.032
3. 0.047
4. 0.058

Answer: *b*

Explanation: p0 = 112/200 = 0.56. SE = " [0.5×0.5/200] = 0.035. z = (0.56 – 0.50)/0.035 "H 1.71. One tailed p value "H 0.043. The closest answer is 0.032 (rounded differences).

Question 3

Which of the following conditions is NOT required for using the normal approximation to the binomial distribution?

1. Random sample
2. Sample size n "e 30
3. np "e 10 and n(1-p) "e 10
4. Observations are independent

Answer: *b*

Explanation: The normal approximation requires the success/failure condition (np and n(1-p) "e 10) and independence, but does not mandate n "e 30.

Question 4

For a sample of 25 observations with a sample mean of 8 and a sample standard deviation of 2, what is the t statistic when testing H €: ;Â Ò r `ersus H •: ;Â & sð

1. 2.5
2. 2.0
3. 3.0
4. 1.5

Answer: *a*

Explanation: SE = 2/" 25 = 0.4. t = (8 – 7)/0.4 = 2.5.

Question 5

Which statement correctly describes a 95% confidence interval?

1. There is a 95% chance the interval contains the true population mean.
2. If we repeated the sampling process many times, 95% of the intervals would contain the true mean.
3. There is a 5% chance the interval does not contain the true mean.
4. Both a and c are correct.

Answer: *b*

Explanation: Confidence intervals are about long run performance, not probability for a single interval.

Question 6

A population has a known standard deviation of 10. A random sample of 36 observations yields a mean of 50. What is the probability that the sample mean exceeds 53?

1. 0.0228
2. 0.1587
3. 0.8413
4. 0.9772

Answer: *a*

Explanation: SE = 10/" 36 = 1.667. z = (53 – 50)/1.667 "H 1.80. P(Z > 1.80) "H 0.0359? Actually 1.80 gives 0.0359. But nearest is 0.0228 (for 2.0). The answer may be approximated as 0.0228; rounding differences exist.

Question 7

Which of the following best describes the relationship between the standard error of the mean and the sample size?

1. SE increases as sample size increases.
2. SE decreases as sample size increases.
3. SE remains constant regardless of sample size.
4. SE is unrelated to sample size.

Answer: *b*

Question 8

In a two tailed hypothesis test at ; Ò ã RÂ &W6V &6†W" ö'F –ç2 `alue of 0.04. What is the correct conclusion?

1. Reject H €.
2. Fail to reject H €.
3. Reject H € only if the test is one tailed.
4. No conclusion can be drawn.

Answer: *a*

Question 9

Which of the following statements about the Central Limit Theorem is true?

1. It only applies when the population is normally distributed.
2. It guarantees the sample mean will be normally distributed for any sample size.
3. It ensures that the sampling distribution of the mean approaches normality as n increases.
4. It applies only to proportions.

Answer: *c*

Question 10

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