GENERAL

ap statistics chapter 9 homework answers

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AP Statistics Chapter 9 Homework Answers: A Complete Guide

Welcome to your go to resource for tackling **AP Statistics Chapter 9 homework answers**. Whether you're a high school student preparing for the AP exam or a teacher looking for reliable solutions, this guide is designed to help you master the material, understand the underlying concepts, and confidently solve every problem in Chapter 9. We'll walk through the core topics, highlight common pitfalls, provide step by step solutions, and share strategies that will keep you ahead of the curve.

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Overview of Chapter 9

Chapter 9 of the AP Statistics curriculum focuses on **Hypothesis Testing and Confidence Intervals**. It is a pivotal chapter because it bridges descriptive statistics with inferential techniques that allow you to draw conclusions about populations based on sample data. Mastering this chapter is essential not only for the AP exam but also for any future coursework in statistics, economics, psychology, and the sciences.

Typical Chapter 9 homework assignments involve:

- Formulating null and alternative hypotheses.
- Choosing the correct test (z-test, t-test, chi-square, etc.).
- Calculating test statistics and p-values.
- Interpreting confidence intervals.
- Understanding the relationship between significance level, Type I and Type II errors.

Below we'll dive into each of these areas and provide comprehensive answers that align with the AP exam expectations.

Key Concepts Covered

1. Hypothesis Testing Fundamentals

Hypothesis testing is a systematic way to decide whether a claim about a population parameter is plausible given your sample data. It involves:

- Null Hypothesis (H0): The default assumption, often stating that there is no effect or no difference.
- Alternative Hypothesis (H1): The claim you are trying to support.

- Significance Level (; “ The probability of rejecting H0 when it is actually true (Type I error).
- Test Statistic: A number calculated from sample data that summarizes evidence against H0.
- p Value: The probability of observing a test statistic as extreme as, or more extreme than, the one calculated, assuming H0 is true.

2. Choosing the Right Test

The choice of test depends on the data type, sample size, and population variance assumptions:

- z-test: Used when the population standard deviation is known and the sample size is large (n > 30).
- t-test: Applied when the population standard deviation is unknown and the sample size is small (n < 30).
- Chi Square Test: Employed for categorical data to test independence or goodness of fit.
- F-test: Used to compare variances between two populations.

3. Confidence Intervals

A confidence interval provides a range of plausible values for a population parameter. The confidence level (e.g., 95%) reflects the proportion of such intervals that would contain the true parameter if the sampling were repeated many times.

Key formulas:

- Mean (;Â’ v—F, ¶æðwn <3 ;Ã ± z; ó" r ƒÃ/" n)
- Mean with unknown <3 ;Ã ± t; ó"Â âÓ r ‡2ò!¦â•
- Proportion: p0" £±/2 · " [p0"ƒ ×)/n]

4. Errors and Power

Understanding the trade off between Type I (false positive) and Type II (false negative) errors is crucial. The **power** of a test is 1 minus the probability of a Type II error. Power depends on sample size, effect size, and significance level.

Common Homework Questions

Below we present a curated list of typical Chapter 9 homework problems and concise solutions. These examples reflect the style and difficulty level of real AP exam questions.

Example 1: Testing a Mean with Known <0

Suppose a manufacturer claims that the average lifetime of a lightbulb is 1200 hours, with a known population standard deviation of 150 hours. A random sample of 25 bulbs has a mean lifetime of 1120 hours. Test the claim at the 5% significance level.

Solution:

1. H0: ;Â Ò # à H1: ;Â & # ‡Gpo tailed).
2. Test statistic: z = (1120 – 1200)/(150/" 25) = (80)/(30) = –2.67.
3. Critical value at ; Ò ã R ‡Gpo tailed): ±1.96.
4. Since |z| = 2.67 > 1.96, reject H0.
5. Conclusion: There is sufficient evidence to suggest the average lifetime differs from 1200 hours.

Example 2: Constructing a 95% Confidence Interval for a Proportion

A survey of 200 students found that 124 prefer online learning. Construct a 95% confidence interval for the true proportion of all students who prefer online learning.

Solution:

1. p0" Ò #Bó# Ò ãc"à
2. Standard error: " [p0"ƒ)/n] = " [0.62·0.38/200] "H 0.035.
3. z; ó" `or 95% confidence = 1.96.
4. Margin of error: 1.96 · 0.035 "H 0.0686.
5. Confidence interval: 0.62 ± 0.0686 !’ (0.5514, 0.6886).
6. Interpretation: We are 95% confident that between 55.1% and 68.9% of all students prefer online learning.

Example 3: Chi Square Test of Independence

A study records the number of students who prefer math or science majors and their gender (male/female). The observed counts are:

	Male	Female	Total
Math	30	20	50
Science	25	35	60
Total	55	55	110

Test whether gender and major preference are independent at the 5% significance level.

Solution:

1. Compute expected counts: Eij = (row total · column total) / grand total.
2. For Math–Male: (50·55)/110 "H 25.
3. Similarly: Math–Female "H 25, Science–Male "H 30, Science–Female "H 30.
4. Chi square statistic: :2 „ò b R›" ò R Ò ƒ3 #R›"ó#R ² ƒ# #R›"ó#R ² ƒ#R 3 ›"ó3 ² ƒ3R 3 ›"ó3 $, Bã à
5. Degrees of freedom: (rows 1)(columns 1) = 1.
6. Critical value <{# ã RÃ $, 2ãƒBà
7. Since 4.0 > 3.84, reject H0 of independence.
8. Conclusion: There is evidence of an association between gender and major preference.

Example 4: Power Calculation for a One Sample t Test

A researcher wants to detect a mean difference of 5 units with a standard deviation of 12, using a one tailed test at ; = 0.05. They plan a sample size of 30. What is the power of this test?

Solution:

1. Effect size: d = 9B ò Ã = 5/12 "H 0.4167.
2. Non central t critical value for df = 29 at ; Ò ã R †öæR F –ÆVB’ $, ãc“’à
3. Non central parameter: ;² Ò B r !¦â Ò ãC cr r !£3 $, "ã#,à
4. Power = P(tdf,;² â ãc“’’ $, ãs ƒs R’à
5. Interpretation: There is a 70% chance of correctly detecting the effect if it truly exists.

Step by Step Problem Solving

To help you tackle any Chapter 9 homework question, we’ve broken down the problem solving process into clear, repeatable steps. Following this framework will reduce errors and improve confidence.

Step 1: Clarify the Problem Statement

- Identify the population parameter of interest (mean, proportion, variance).
- Determine whether the question asks for a test, a confidence interval, or both.
- Note the significance level or confidence level specified.

Step 2: Set Up Hypotheses

- Write H0 (often “no effect” or “equal to a specified value”).
- Write H1 (the alternative claim).
- Decide if the test is one tailed or two tailed.

Step 3: Choose the Correct Test Statistic

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