

Ap Stats Quiz B Chapter 14 Answers

Ap Stats Quiz B Chapter 14 Answers AP Stats Quiz B Chapter 14 Answers This document provides comprehensive answers to a hypothetical AP Statistics Quiz B for Chapter 14 focusing on inference for categorical data It will cover the following topics 1 Understanding Proportions Confidence Intervals Question 1 Identifying the correct conditions for constructing a confidence interval for a population proportion Question 2 Calculating a confidence interval for a population proportion and interpreting the results Question 3 Explaining the meaning of a confidence level and the margin of error 2 Hypothesis Testing for Proportions Question 4 Formulating appropriate null and alternative hypotheses for a onesample proportion test Question 5 Performing a hypothesis test for a population proportion including calculating the test statistic and pvalue Question 6 Interpreting the results of a hypothesis test and drawing a conclusion about the population proportion 3 TwoSample Proportions Question 7 Identifying the conditions for performing a twosample proportion test Question 8 Calculating a confidence interval for the difference in two population proportions Question 9 Performing a hypothesis test for the difference in two population proportions 4 ChiSquare Test for Goodness of Fit Question 10 Identifying the conditions for performing a chisquare goodnessoffit test Question 11 Performing a chisquare goodnessoffit test calculating the expected counts and interpreting the results 5 ChiSquare Test for Independence Question 12 Identifying the conditions for performing a chisquare test for independence Question 13 Performing a chisquare test for independence calculating the expected counts and interpreting the results Answers Question 1 2 Scenario A researcher wants to estimate the proportion of adults in the US who believe in climate change They randomly sample 1000 adults and find that 720 believe in climate change Question Which of the following conditions must be met to construct a confidence interval for the population proportion of adults in the US who believe in climate change A The sample size must be less than 10 of the

population size B The sample must be a simple random sample C The number of successes and failures in the sample must both be at least 10 D Both A and B E Both B and C Answer E Both B and C Explanation B Simple random sample This ensures the sample is representative of the population C Successes and failures This ensures the sampling distribution of the sample proportion is approximately normal Question 2 Scenario In a survey of 250 randomly selected college students 180 reported that they regularly use social media Question Calculate a 95 confidence interval for the proportion of all college students who regularly use social media Answer 1 Sample proportion $\hat{p} = \frac{180}{250} = 0.72$ 2 Standard error $SE = \sqrt{0.72(1-0.72)/250} = 0.028$ 3 Margin of error $ME = 1.96(0.028) = 0.055$ 4 Confidence interval 0.72 ± 0.055 $(0.665, 0.775)$ Interpretation We are 95 confident that the true proportion of all college students who regularly use social media is between 66.5% and 77.5% Question 3 Question Explain the meaning of a 90 confidence level and the margin of error in the context of a confidence interval for a population proportion 3 Answer Confidence level A 90 confidence level means that if we were to repeat this process of constructing confidence intervals many times we would expect 90 of those intervals to contain the true population proportion Margin of error The margin of error represents the maximum likely difference between the sample proportion and the true population proportion In other words it gives us a range of plausible values for the population proportion Question 4 Scenario A company claims that at least 80% of its customers are satisfied with its products A consumer advocacy group wants to test this claim Question Formulate the null and alternative hypotheses for a hypothesis test to determine if the company's claim is accurate Answer Null hypothesis $H_0: p \geq 0.80$ The proportion of satisfied customers is at least 80% Alternative hypothesis $H_a: p < 0.80$ More than 50% of voters support the candidate 2 Test statistic $z = \frac{0.525 - 0.50}{\sqrt{0.50(1-0.50)/400}} = 1.00$ 3 P-value $P(z < 1.00) = 0.1587$ 4 Decision Since the p-value 0.1587 is greater than the significance level 0.05 we fail to reject the null hypothesis 5 Conclusion There is not enough evidence to conclude that a majority of voters in the district support the candidate 4 Question 6 Scenario A study found that 15% of children under the age of 5 have a peanut allergy A new treatment for peanut allergies is being tested In a clinical trial of 100 children with

peanut allergies 80 of them showed improvement after taking the new treatment

Question Interpret the results of a hypothesis test for the proportion of children who show improvement after taking the new treatment assuming a pvalue of 002 Answer The pvalue of 002 indicates that if the new treatment has no effect ie the proportion of children showing improvement remains at 15 there is only a 2 chance of observing 80 or more improvement in a sample of 100 children Since the pvalue is less than the significance level of 005 we reject the null hypothesis Conclusion There is strong evidence to suggest that the new treatment is effective in improving peanut allergies in children

Question 7 Scenario A company wants to compare the effectiveness of two different marketing campaigns They randomly assign 100 customers to each campaign and track the proportion of customers who make a purchase Question Which of the following conditions must be met to perform a twosample proportion test to compare the effectiveness of the two campaigns A The samples must be independent B The number of successes and failures in each sample must be at least 10 C The population sizes must be at least 10 times the sample sizes D Both A and B E Both A and C Answer D Both A and B Explanation A Independent samples This ensures that the results of one campaign do not influence the results of the other B Successes and failures This ensures the sampling distributions of the sample proportions are approximately normal Question 8 5 Scenario A study of two different types of diet plans for weight loss was conducted Plan A resulted in weight loss for 60 of the participants while Plan B resulted in weight loss for 75 of the participants The sample sizes for Plan A and Plan B were 120 and 100 respectively Question Calculate a 90 confidence interval for the difference in the proportions of participants who lost weight on the two diet plans Answer 1 Sample proportions $p_1 = 0.60$ $p_2 = 0.75$ 2 Standard error $SE = \sqrt{0.60 \cdot 0.40/120 + 0.75 \cdot 0.25/100} = 0.0643$ 3 Margin of error $ME = 1.645 \cdot 0.0643 = 0.1054$ 4 Confidence interval 0.75 ± 0.1054 0.60 ± 0.1054 0.45 0.255 Interpretation We are 90 confident that the true difference in the proportions of participants who lost weight on the two diet plans is between 45 and 255 Question 9 Scenario A survey of 200 college students found that 60 of those who lived on campus were satisfied with their housing while 70 of those who lived off campus were satisfied with their housing Question Perform a

hypothesis test to determine if there is a significant difference in the satisfaction levels of students living on campus and off campus Use a significance level of 0.01

Answer 1 Hypotheses $H_0: \mu_1 = \mu_2$ There is no difference in satisfaction levels $H_a: \mu_1 \neq \mu_2$ There is a difference in satisfaction levels

2 Test statistic $z = \frac{0.60 - 0.70}{\sqrt{0.65(0.35)/200 + 0.65(0.35)/200}} = -2.00$

3 P-value $P_z = 0.0455$

4 Decision Since the p-value 0.0455 is greater than the significance level 0.01 we fail to reject the null hypothesis

5 Conclusion There is not enough evidence to conclude that there is a significant difference in satisfaction levels between students living on campus and off campus

Question 10 Scenario A researcher wants to investigate whether the distribution of political affiliations in a particular city is different from the national distribution The national distribution is as follows 30 Democrat 25 Republican 15 Independent and 30 Other The researcher surveys 500 residents and finds the following results 150 Democrats 120 Republicans 80 Independents and 150 Others

Question Which of the following conditions must be met to perform a chi-square goodness of fit test to determine if the distribution of political affiliations in the city is different from the national distribution

A The expected counts for each category must be at least 5

B The sample size must be large enough

C The data must be categorical

D Both A and B

E Both A and C

Answer E Both A and C

Explanation A Expected counts This ensures that the chi-square distribution provides an accurate approximation to the sampling distribution of the test statistic

C Categorical data The chi-square goodness of fit test is used to compare observed frequencies with expected frequencies for categorical data

Question 11 Scenario A die is rolled 60 times and the following results are observed

Face	Observed Count	Expected Count
1	12	10
2	9	10
3	11	10
4	10	10
5	8	10
6	10	10

Question Perform a chi-square goodness of fit test to determine if the die is fair Use a significance level of 0.05

Answer 1 Hypotheses 7 H_0 The die is fair all faces have equal probability H_a The die is not fair at least one face has a different probability

2 Test statistic Calculate the chi-square statistic using the formula

Observed Count	Expected Count	Expected Count
12	10	10
9	10	10
11	10	10
10	10	10
8	10	10
10	10	10

08 3 Degrees of freedom df number of categories - 1 = 6 - 1 = 5

4 P-value $P = 0.08$ with df 5 0.97 using a chi-square table or calculator

5 Decision Since the p-value 0.08 is greater than the significance level 0.05 we fail to reject the null

hypothesis 6 Conclusion There is not enough evidence to conclude that the die is not fair

Question 12 Scenario A researcher wants to investigate if there is a relationship between gender and preference for a particular type of movie They survey 100 people and find the following results

	Action	Comedy
Male	30	20
Female	20	30

Question Which of the following conditions must be met to perform a chisquare test for independence to determine if there is a relationship between gender and movie preference

A The expected counts for each cell in the table must be at least 5
 B The sample size must be large enough
 C The data must be categorical
 D Both A and B
 E Both A and C

Answer E Both A and C

Explanation A Expected counts This ensures the chisquare distribution provides an accurate approximation to the sampling distribution of the test statistic
 C Categorical data The chisquare test for independence is used to examine the association between two categorical variables

8 Question 13 Scenario A study of 150 randomly selected students found the following relationship between class standing and opinion on a new campus policy

	Favor	Oppose
Freshman	30	20
Sophomore	40	30
Junior	20	10
Senior	10	10

Question Perform a chisquare test for independence to determine if there is a relationship between class standing and opinion on the new campus policy Use a significance level of 001

Answer 1 Hypotheses H_0 Class standing and opinion on the campus policy are independent
 H_a Class standing and opinion on the campus policy are dependent

2 Expected counts Calculate the expected counts for each cell assuming independence using the formula $\frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$

	Favor	Oppose
Freshman	60	50
Sophomore	80	60
Junior	40	20
Senior	20	20

3 Test statistic Calculate the chisquare statistic using the formula $\sum \frac{(\text{Observed Count} - \text{Expected Count})^2}{\text{Expected Count}}$

	Favor	Oppose
Freshman	30	20
Sophomore	40	30
Junior	20	10
Senior	10	10

Expected Count 60 50 40 30 20 20 10 10 10 10 667

4 Degrees of freedom df number of rows 1 number of columns 1 4 1 2 1 3 5

Pvalue P 667 with df 3 0084 using a chisquare table or calculator

6 Decision Since the pvalue 0084 is greater than the significance level 001 we fail to reject the null hypothesis

7 Conclusion There is not enough evidence to conclude that there is a relationship between class standing and opinion on the new campus policy

Note These answers are intended to provide a general structure and examples for a hypothetical AP Stats

Quiz B Actual quiz questions and answers may vary based on specific content and level of difficulty 9

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