

AP Statistics · Chi-Square Tests for Homogeneity and Independence · Quiz

Common Core AP Statistics Unit 3 (2026-27) · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This ap statistics chi square quiz asks 10 multiple-choice questions on chi-square tests for homogeneity and independence, and each answer comes with a short explanation.

Ten multiple-choice questions on expected counts, degrees of freedom, choosing between homogeneity and independence, conditions, p-values and conclusions. Pick the best answer for each question, then read the explanation to find any slip.

AP StatisticsCommon Core: AP Statistics Unit 3 (2026-27)

Questions

Question 1

In the table, what is the expected count for the Fall row and Track column if season and sport are independent?

Season	Soccer	Track	Tennis
Fall	24	36	20
Spring	16	24	30

Sport chosen by season.

- A. 36
- B. 25
- C. 70
- D. 32

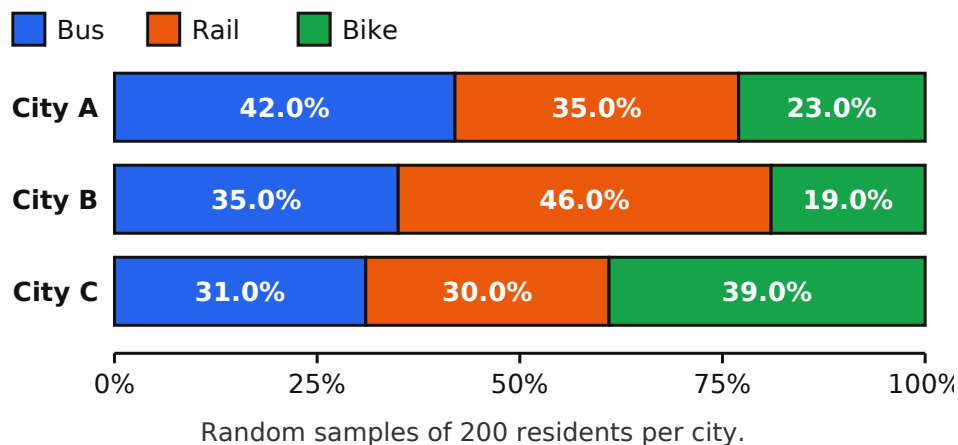
Question 2

How many degrees of freedom does a chi-square test have for a two-way table with 4 rows and 3 columns?

- A. 12
- B. 5
- C. 6

Question 3

Random samples of 200 residents were taken separately from each of three cities, and each resident chose a preferred transit mode. Which test fits?



- A. Chi-square test for independence
- B. Two-sample t test for means
- C. Matched-pairs t test
- D. Chi-square test for homogeneity

Question 4

A random sample of 300 adults is classified by age group and by preferred phone brand. What is the null hypothesis of the chi-square test of independence?

- A. Age group and preferred phone brand are associated in the population
- B. The mean age is the same for every phone brand
- C. The sample proportions of each brand are all equal
- D. Age group and preferred phone brand are independent in the population

Question 5

Each cell shows observed (expected). What is the contribution of the top-left cell to the chi-square statistic?

Counts	Column 1	Column 2
Row 1	36 (30)	24 (30)
Row 2	24 (30)	36 (30)

Observed (expected).

- A. 6

- B. 1.2
- C. 0.2
- D. 1

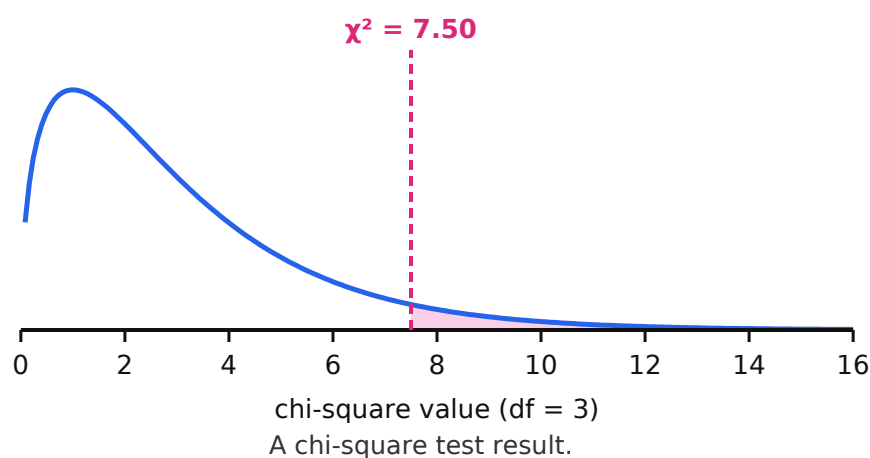
Question 6

A 2 by 2 table has row totals 10 and 90, column totals 20 and 80, and grand total 100. Which condition for the chi-square test fails?

- A. The expected count 2 in one cell is less than 5
- B. The observed counts are not all equal
- C. The row totals are not equal
- D. The degrees of freedom are less than 5

Question 7

The curve shows a chi-square statistic of 7.5 with 3 degrees of freedom, so the shaded area is the p-value. What is the decision at $\alpha = 0.05$?



- A. Reject H_0 , since $p \approx 0.058$ is close to 0.05
- B. Reject H_0 , since 7.5 is greater than $df = 3$
- C. Fail to reject H_0 , since $p \approx 0.058$ is greater than 0.05
- D. Accept H_0 , since $p \approx 0.058$ proves independence

Question 8

A homogeneity test comparing preferred lunch among grades 9, 10 and 11 gives $p = 0.03$. Which conclusion at $\alpha = 0.05$ is correct?

- A. There is convincing evidence that lunch preference is not distributed the same way in all three grades
- B. There is convincing evidence that lunch preference is distributed the same way in all three grades
- C. There is convincing evidence that every grade prefers a different lunch

D. There is convincing evidence that grade level causes lunch preference

Question 9

Every count in a 2 by 2 table is doubled. What happens to the chi-square statistic and the degrees of freedom?

- A. The statistic stays the same and df doubles
- B. The statistic doubles and df stays 1
- C. The statistic and df both double
- D. The statistic and df both stay the same

Question 10

A chi-square test on a 2 by 2 table gives a statistic of 6.2. What is the p-value?

- A. 0.0450
- B. 0.1023
- C. 0.0128
- D. 0.9872

Answer key

1. **D** - The row total is 80, the column total is 60 and the grand total is 150, so $E = \frac{80 \times 60}{150} = 32$. Using the observed 36 is the common slip.
2. **C** - $df = (4-1)(3-1) = 6$. Multiplying the dimensions gives 12, which is the number of cells, not the degrees of freedom.
3. **D** - Separate random samples from several populations, with one categorical response, call for homogeneity. Independence needs a single sample classified by two variables.
4. **D** - The null hypothesis states there is no association. The association statement is the alternative.
5. **B** - The contribution is $\frac{(36-30)^2}{30} = \frac{36}{30} = 1.2$. Forgetting to square gives 0.2, and dividing by the observed count gives 1.
6. **A** - The smallest expected count is $\frac{10 \times 20}{100} = 2$, so the large counts condition fails. Observed counts and totals do not need to be equal.
7. **C** - The shaded area is about 0.058, which is greater than 0.05, so fail to reject H_0 . A p-value near 0.05 is not below it, and failing to reject never proves H_0 .
8. **A** - Rejecting H_0 says at least one distribution differs, not that all do. Sample data alone do not show that grade level causes the preference.
9. **B** - Each term $\frac{(O-E)^2}{E}$ doubles when O and E double, so the statistic doubles. The table size is unchanged, so df stays 1.
10. **C** - A 2 by 2 table has $df = 1$, so the right-tail area beyond 6.2 is 0.0128. Using $df = 2$ gives 0.0450, $df = 3$ gives 0.1023, and 0.9872 is the area to the left.

How does this quiz work?

Read each question, choose one answer among A, B, C and D, then check it: a short explanation appears after every answer. Your score out of 10 is shown at the end, and you can restart the quiz as often as you like.

What should you review before the quiz?

Reread the key facts of the lesson and the worked example. If a question is hard, go back to the matching part of the lesson, then try the quiz again. Write your work on scrap paper: most mistakes come from skipping a step, not from the idea itself.

Remember:

- Unit 3 of AP Statistics: chi-square tests for homogeneity and independence use a two-way table of counts.
- Expected count: $E = \frac{\text{row total} \times \text{column total}}{\text{grand total}}$.
- Test statistic: $\chi^2 = \sum \frac{(O-E)^2}{E}$ with $df = (r-1)(c-1)$.

- Conditions: random sampling or assignment, the 10% condition, and all expected counts at least 5.
- A conclusion names the variables in context and states whether the evidence is convincing.

How to use this ap statistics chi square quiz

Retake this ap statistics chi square quiz until every answer is right, then move on to the worksheet and the test.

