

AP Statistics · Chi-Square Tests for Homogeneity and Independence · Test Answer Key

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

This ap statistics chi test answer key gives the full solution and the scoring guide for each of the 9 test questions on chi-square tests for homogeneity and independence.

Worked solutions with a scoring guide for each question. Award each point only when the work or the statement in context is shown. Follow-through credit applies when a later part uses an earlier incorrect value correctly.

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

AP Statistics Chi Test Answer Key: questions 1-5

Question 1: Expected count and df (2 points)

- a. Row total 80, column total 130, grand total 200: $E = \frac{80 \times 130}{200} = 52$.
- b. $df = (3-1)(2-1) = 2$.

Scoring: 1 point for the expected count 52 with correct use of row total, column total and grand total; 1 point for $df = 2$.

Question 2: Name the test and hypotheses (2 points)

- a. Chi-square test for homogeneity, because the three schools were sampled separately and one categorical variable is recorded.
- b. H_0 : The distribution of how students get to school is the same at Northside, Eastside and Westside. H_a : The distribution is not the same at all three schools.

Scoring: 1 point for homogeneity; 1 point for hypotheses that mention the three schools and the way students get to school (the alternative must say the distributions are not all the same).

Question 3: Check the conditions (2 points)

Random: the students were selected by random sampling. 10% condition: each sample of 150 is less than 10% of the more than 2,000 students at its school (10% of 2,000 is 200).

Large counts: the column totals are 153, 218 and 79, so every school has expected counts

$\frac{150 \times 153}{450} = 51$, $\frac{150 \times 218}{450} \approx 72.67$ and $\frac{150 \times 79}{450} \approx 26.33$. All are at least 5.

School	Walk	Bus	Driven
Northside	52 (51)	71 (72.67)	27 (26.33)
Eastside	40 (51)	83 (72.67)	27 (26.33)
Westside	61 (51)	64 (72.67)	25 (26.33)

Observed (expected).

All conditions are met.

Scoring: 1 point for random sampling and the 10% condition checked with the numbers; 1 point for computing expected counts and verifying that the smallest (26.33) is at least 5.

Question 4: Statistic and df (2 points)

Each school has the same expected counts: 51, 72.67 and 26.33.

Contribution	Walk	Bus	Driven
Northside	0.02	0.038	0.017
Eastside	2.373	1.469	0.017
Westside	1.961	1.034	0.068

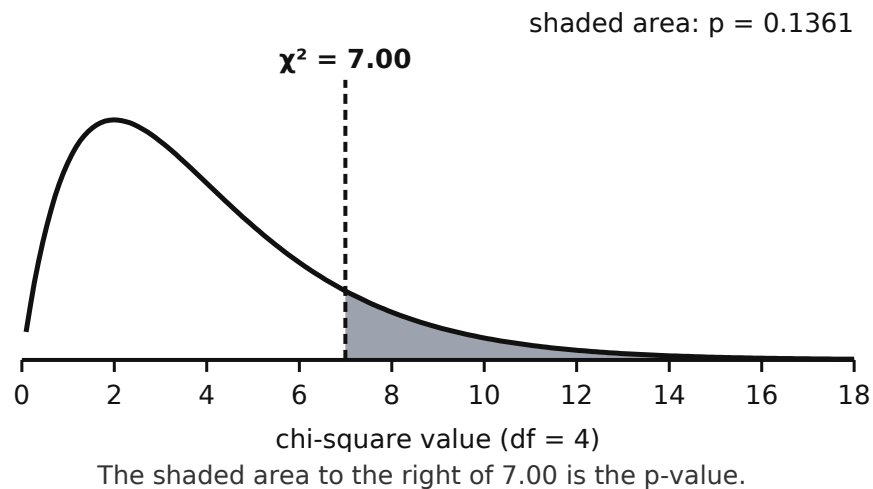
The sum is $\chi^2 \approx 6.995$, and $df = (3-1)(3-1) = 4$.

$\chi^2 \approx 6.995$, $df = 4$

Scoring: 1 point for a correct setup using $\sum \frac{(O-E)^2}{E}$ with the expected counts; 1 point for 6.995 (accept 7.0) and $df = 4$.

Question 5: P-value and conclusion (2 points)

- The area to the right of the statistic is $p \approx 0.136$ (for 6.995 exactly, 0.1361).
- Because the p-value (0.1361) is greater than $\alpha = 0.05$, fail to reject H_0 . There is not convincing evidence that the distribution of how students get to school differs among the three schools.



Scoring: 1 point for p-value between 0.13 and 0.14; 1 point for comparing p with 0.05, failing to reject, and a conclusion in context that does not claim the schools are proven equal.

AP Statistics Chi Test Answer Key: questions 6-9

Question 6: Complete test for an experiment (4 points)

State. H_0 : The distribution of falling asleep within 20 minutes (yes or no) is the same for the three apps. H_a : The distribution is not the same for all three apps. Use $\alpha = 0.05$.

Plan. Chi-square test for homogeneity. *Random*: adults were randomly assigned to the three apps. *Large counts*: every expected count is at least 5 (the smallest is 29).

Do. Expected counts use $E = \frac{\text{row total} \times \text{column total}}{\text{grand total}}$. Observed counts, with expected counts in parentheses:

App	Fell asleep	Did not
Sound app	41 (31)	19 (29)
Story app	30 (31)	30 (29)
Timer app	22 (31)	38 (29)

The cell contributions $\frac{(O-E)^2}{E}$ are 3.226, 3.448, 0.032, 0.034, 2.613, 2.793. Their sum is $\chi^2 \approx 12.147$. With $df = (3-1)(2-1) = 2$, the p-value is $p = 0.0023$.

Conclude. Because the p-value (0.0023) is less than $\alpha = 0.05$, reject H_0 . There is convincing evidence that the apps differ in the proportion of people who fall asleep within 20 minutes.

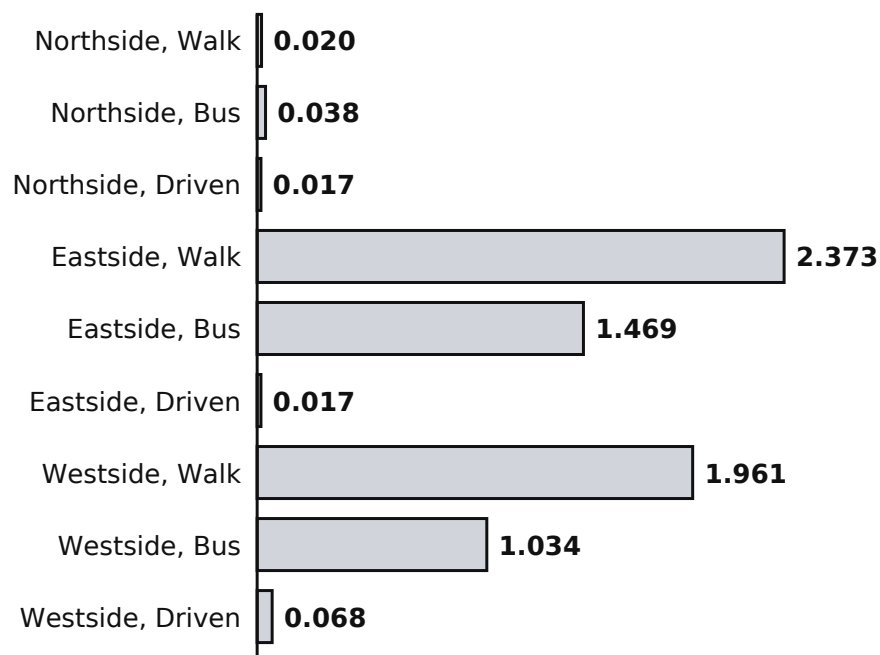
$\chi^2 \approx 12.147$, $df = 2$, $p \approx 0.0023$

Scoring: 1 point for hypotheses in context; 1 point for naming homogeneity and verifying

random assignment and expected counts (31, 29); 1 point for the statistic, df and p-value; 1 point for rejecting H_0 by comparing p with 0.05 and concluding in context.

Question 7: Largest contribution (2 points)

The contributions are in the table above and the chart below.



Cell contributions for the school data.

Eastside, walk contributes the most (about 2.373). The observed count 40 is below the expected count 51, so fewer Eastside students walk than expected if the three schools had the same distribution.

Scoring: 1 point for identifying Eastside walk; 1 point for observed above expected with an interpretation in context.

Question 8: Association and causation (2 points)

- Because 0.003 is less than 0.05, reject H_0 . There is convincing evidence that hours of sleep and grade-point average are associated among these teenagers' population.
- The data come from an observational study with no random assignment, so a lurking variable (such as study habits) could explain the association. Only a randomized experiment supports a cause-and-effect conclusion.

Scoring: 1 point for rejecting H_0 and stating an association in context; 1 point for identifying the lack of random assignment (or a lurking variable).

Question 9: Effect of sample size (2 points)

- a. Every expected count is $\frac{50 \times 50}{100} = 25$. Each cell contributes $\frac{(5)^2}{25} = 1$, so $\chi^2 = 4$.
- b. The expected counts become 75 and each cell contributes $\frac{15^2}{75} = 3$, so $\chi^2 = 12$. Multiplying every count by 3 multiplies χ^2 by 3, because the same percentages with more data are stronger evidence of a difference.

Scoring: 1 point for $\chi^2 = 4$; 1 point for 12 with the explanation that a larger sample with the same proportions gives a larger statistic.

Scoring summary

Total
20 points: add the points of every question of this ap statistics chi test answer key.

How to use this ap statistics chi test answer key

Use this ap statistics chi test answer key to score the test fairly and to see which skills need more practice.

