

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

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

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This ap statistics chi square worksheet gives 24 problems on chi-square tests for homogeneity and independence, ordered from easy to hard, with a separate answer key.

These 24 problems practice AP Statistics Unit 3: two-way tables of counts, expected counts, the chi-square statistic, degrees of freedom and p-values. They move from totals and single cells to complete tests of homogeneity and independence.

Every test ends with a conclusion in context, as the free-response section of the exam requires.

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

AP Statistics Chi Square Worksheet: problems 1-5

Problem 1: Totals in a two-way table

Maya asked random samples of sixth graders and seventh graders how they get to school.

Grade	Bus	Walk	Car
Sixth grade	34	21	15
Seventh grade	26	29	25

How students get to school.

Find the row totals, the column totals and the grand total.

Problem 2: One expected count

Use the table in the first exercise. If sixth and seventh graders had the same distribution of travel methods, find the expected number of sixth graders who ride the bus.

Problem 3: Degrees of freedom

Find the degrees of freedom of a chi-square test for each table.

- a. 3 rows and 4 columns
- b. 2 rows and 5 columns
- c. 4 rows and 4 columns
- d. A table with 4 rows has 12 degrees of freedom. How many columns does it have?

Problem 4: Conditional percentages

Ethan asked a random sample of 60 members of each of three clubs whether they own a bike.

Club	Owns bike	No bike
Chess Club	18	42
Band	33	27
Robotics	24	36

Random samples of 60 members from each club.

Find the percent of each sample that owns a bike. Which club has the largest percent?

Problem 5: Homogeneity or independence

Decide whether each study calls for a chi-square test for homogeneity or independence.

- a. A random sample of 400 adults is classified by age group and by preferred streaming service.
- b. Random samples of 200 customers are taken at each of four stores, and each customer rates service as satisfied or not satisfied.
- c. Ninety volunteers are randomly assigned to one of three diets, and each records whether he or she lost at least 5 pounds.

AP Statistics Chi Square Worksheet: problems 6-10

Problem 6: Hypotheses for homogeneity

Write the null and alternative hypotheses in context for a chi-square test using the bike data from the fourth exercise.

Problem 7: Hypotheses for independence

Priya selected a random sample of 250 students at her high school and recorded each student's grade level (9 through 12) and favorite sport (soccer, basketball or track).

- a. State the hypotheses in context.
- b. Find the degrees of freedom.

Problem 8: Expected counts for a 2 by 2 table

Liam recorded when 160 randomly chosen farmers market shoppers came and what they bought first.

Time of day	Produce	Baked goods
Morning	45	35
Afternoon	30	50

A random sample of 160 shoppers.

Find the table of expected counts for a test of independence.

Problem 9: Contribution of a cell

In a chi-square test, one cell has an observed count of 45 and an expected count of 37.5. A second cell has an observed count of 35 and an expected count of 42.5. Find each cell's contribution to χ^2 .

Problem 10: Chi-square statistic, 2 by 2

Use the shopper table from the eighth exercise. Find χ^2 , the degrees of freedom and the p-value.

AP Statistics Chi Square Worksheet: problems 11-15

Problem 11: Chi-square statistic, 2 by 3

Use the school-travel table from the first exercise (expected counts 28, 23.33, 18.67 and 32, 26.67, 21.33). Find χ^2 , the degrees of freedom and the p-value.

Problem 12: From statistic to p-value

For each result, find the p-value and state the decision at $\alpha = 0.05$.

- a. $\chi^2 = 7.82$ with $df = 3$
- b. $\chi^2 = 4.10$ with $df = 4$

Problem 13: Large counts condition

Noah surveyed a random sample of 35 commuters. Rows show morning or evening shift; columns show rail, bus or ferry.

Shift	Rail	Bus	Ferry
Morning	12	3	5
Evening	9	2	4

Find the expected counts. Does the large counts condition hold?

Problem 14: Conclusion for homogeneity

A chi-square test for homogeneity on the club bike data (Chess Club, Band, Robotics) gives $\chi^2 \approx 7.817$, $df = 2$ and $p \approx 0.0201$. Write a conclusion in context at $\alpha = 0.05$.

Problem 15: Conclusion for independence

In a random sample of 180 adults, a chi-square test of independence between age group (5 groups) and preferred pizza topping (2 types) gave $\chi^2 = 5.2$. Find the degrees of freedom and the p-value, then write a conclusion at $\alpha = 0.05$.

AP Statistics Chi Square Worksheet: problems 16-20

Problem 16: Largest contribution

Aisha polled random samples of 100 customers in each of three regions about tea or coffee.

Region	Tea	Coffee
North	40	60
South	55	45
West	75	25

Random samples of 100 customers per region.

Find the expected counts and each cell's contribution to χ^2 . Which cell contributes the most, and is its observed count above or below expected?

Problem 17: Doubling every count

Every count in the shopper table (45, 35, 30, 50) is doubled to 90, 70, 60 and 100. Without redoing the whole table, predict χ^2 , then verify it. How does the p-value change?

Problem 18: Working backward from totals

A two-way table has a grand total of 200. One cell is in a row with total 80 and a column with total 60.

- Find the expected count of that cell.
- The observed count is 33. Find the cell's contribution to χ^2 .
- Another cell has expected count 18, row total 72 and grand total 240. Find its column total.

Problem 19: Critical values

A chi-square table gives these critical values: for 4 degrees of freedom, 13.277 at $\alpha = 0.01$; for 2 degrees of freedom, 5.991 at $\alpha = 0.05$. Decide each test by comparing the statistic with the critical value.

- $\chi^2 = 14.2$, $df = 4$, $\alpha = 0.01$
- $\chi^2 = 5.2$, $df = 2$, $\alpha = 0.05$

Problem 20: Interpreting a p-value

The shopper test (time of day and first purchase) gave $p \approx 0.0175$. Explain what this p-value means in context.

AP Statistics Chi Square Worksheet: problems 21-24

Problem 21: Association is not causation

A chi-square test of independence on a random sample of 400 teenagers finds a significant association between the number of hours slept (three categories) and grade-point average (three categories). Jamal concludes that more sleep causes higher grades. Explain the flaw and describe a study design that could support a cause-and-effect conclusion.

Problem 22: Complete test of independence

Sofia selected a random sample of 210 adults from a city with more than 100,000 adults and recorded each person's age group and main news source.

Age group	TV	Online	Print
18 to 34	22	31	17
35 to 54	28	19	23
55 and up	10	25	35

A random sample of 210 adults.

Carry out a chi-square test at $\alpha = 0.05$ to see whether age group and main news source are associated.

Problem 23: Complete test of homogeneity

A restaurant chain took a random sample of 80 diners at each of four locations and asked whether they were satisfied.

Response	Downtown	Mall	Airport	Suburb
Satisfied	62	55	48	66
Not satisfied	18	25	32	14

Carry out a chi-square test at $\alpha = 0.05$ to decide whether the proportion of satisfied diners is the same at all four locations.

Problem 24: Test for an experiment

A clinic randomly assigned 120 patients with knee pain, 40 to each of three physical therapy plans, and recorded whether pain improved after six weeks.

Therapy	Improved	No change
Plan A	28	12
Plan B	22	18
Plan C	14	26

Patients were randomly assigned to plans.

Carry out a chi-square test at $\alpha = 0.05$. If the result is significant, can the clinic conclude that the plans cause different improvement rates? Explain.

How to use this ap statistics chi square worksheet

Print this ap statistics chi square worksheet as a PDF, solve every problem on paper, then compare with the answer key.

