

AP Statistics - Chi-Square Tests - Worksheet

Common Core AP STAT 8.1, AP STAT 8.2, AP STAT 8.3, AP STAT 8.4, AP STAT 8.5, AP STAT 8.6, AP STAT 8.7 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice AP Statistics topics 8.1 to 8.7. You will compute expected counts, chi-square statistics, degrees of freedom, and p-values, carry out goodness-of-fit and two-way table tests, and choose the right procedure for categorical data.

AP Statistics · Common Core State Standards: **AP STAT 8.1, AP STAT 8.2, AP STAT 8.3, AP STAT 8.4, AP STAT 8.5, AP STAT 8.6, AP STAT 8.7**

Exercise 1 - Expected counts for GOF

A company claims that its candy mix is 30% red, 30% blue, 20% green, and 20% yellow. In a random bag of 200 candies, find the expected count of each color under the claim.

Exercise 2 - Degrees of freedom

Find the degrees of freedom: (a) goodness-of-fit with 6 categories; (b) a two-way table with 3 rows and 4 columns; (c) a 2 by 2 table.

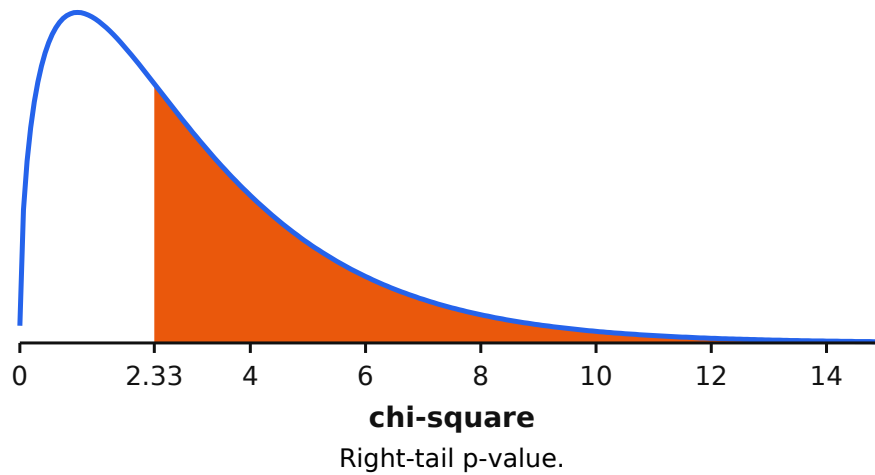
Exercise 3 - Compute chi-square

Category	Observed	Expected
Red	68	60
Blue	56	60
Green	42	40
Yellow	34	40

Candy colors.

The observed counts in the bag are red 68, blue 56, green 42, yellow 34. Compute the chi-square statistic.

Exercise 4 - p-value



For chi-square = 2.333 with df = 3, find the p-value and state a conclusion at $\alpha = 0.05$.

Exercise 5 - Largest contribution

In the candy test, which color contributes most to chi-square?

Exercise 6 - Hypotheses

Write the null and alternative hypotheses for a goodness-of-fit test of whether a die is fair, in context.

Exercise 7 - Check conditions

A random sample of 40 people is classified into 5 categories with claimed proportions 0.35, 0.30, 0.20, 0.10, 0.05. Is the condition for a chi-square test met?

Exercise 8 - Fair die

Category	Observed	Expected
1	14	20
2	21	20
3	17	20
4	22	20
5	19	20
6	27	20

120 rolls of a die.

A die is rolled 120 times: 14, 21, 17, 22, 19, 27 for faces 1 to 6. Test whether it is fair at $\alpha = 0.05$.

Exercise 9 - Expected counts in a table

	Library	Home	Cafe	Total
Sophomore	30	45	25	100
Senior	50	35	15	100
Total	80	80	40	200

Observed counts of study location by class (two-way table).

Using the observed table of study location by class, find the expected count for sophomores who study in the library.

Exercise 10 - Chi-square for the table

	Library	Home	Cafe	Total
Sophomore	30 (40.0)	45 (40.0)	25 (20.0)	100
Senior	50 (40.0)	35 (40.0)	15 (20.0)	100
Total	80	80	40	200

Observed (expected) counts. Expected = row total times column total over grand total.

Compute chi-square for the study location table using the expected counts shown, and find df.

Exercise 11 - Conclusion for the table

The p-value for the study location test is 0.0126. State the conclusion at $\alpha = 0.05$.

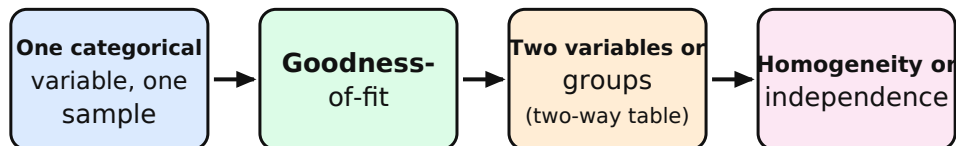
Exercise 12 - Homogeneity

	Support	Oppose	Total
Region A	40	60	100
Region B	55	45	100
Region C	35	65	100
Total	130	170	300

Poll results by region.

Independent random samples of 100 voters from each of three regions were asked about a proposal. Test whether the distribution of opinion is the same in all three regions ($\alpha = 0.05$).

Exercise 13 - Independence or homogeneity?



Choosing the test.

Name the test: (a) 300 randomly chosen adults are classified by age group and favorite social media app. (b) Three random samples of 100 students each from three schools are asked their favorite subject.

Exercise 14 - Missing expected count

Category	Observed	Expected
A	30	30
B	25	30
C	45	40

Three categories, 100 observations.

In a goodness-of-fit test with 100 observations, the null proportions are 0.30, 0.30, and 0.40. Find the expected counts, chi-square, and df.

Exercise 15 - Wrong test

A teacher gives a pretest and a posttest to 30 students, recording pass/fail on each. A student runs a chi-square test on the 2 by 2 table. Why is it inappropriate?

Exercise 16 - Small expected counts

A 2 by 2 table has expected counts 12.4, 3.6, 9.6, 2.4. Is a chi-square test appropriate? What could be done?

Exercise 17 - 2 by 2 table

	Under 30	30 or older	Total
Streams	48	22	70
Does not	32	98	130
Total	80	120	200

Streaming by age group.

In a random sample of 200 adults, streaming habits were recorded for two age groups. Test for an association at $\alpha = 0.01$.

Exercise 18 - Which procedure?

Choose the procedure: (a) compare the mean heights of two randomly chosen groups; (b) test whether a coin gives equal chances of heads and tails in 200 flips; (c) estimate the proportion of students who own a bike; (d) test whether grade level and club membership are related in one sample.

Exercise 19 - Multi-step

A random sample of 90 teens reports their favorite season: spring 15, summer 36, fall 24, winter 15. Test whether all four seasons are equally popular at $\alpha = 0.05$, and name the season with the biggest contribution.

Exercise 20 - Interpret the p-value

A chi-square test for independence has p-value 0.02. Interpret it in context for variables 'class level' and 'car type'.