# Practice Questions for the Chi-Square Test of Independence

How much knowledge do you have regarding the **chi-square test of independence**? The ideal and convenient method to find out how much you know is by asking yourself some practice questions for the chi-square test of independence.¹ Therefore, this post will explore some practice questions for the chi-square test of independence and their answers.

## Questions: Practice questions for the chi-square test of independence

A good practice question will help you determine if you have adequate knowledge of the chi-square test of independence. Let us look at some good practice questions for the chi-square test of independence.

### Practice Question 1

The first of our practice questions for the chi-square test of independence is as follows:

A soccer academy wants to find out if boys and girls are equally as good at learning how to play football. The academy trains 40 boys and 60 girls in some basic football skills and gathers the following information.

|  |  |  |
| --- | --- | --- |
|  | **Can play football** | **Cannot play football** |
| **Boys** | 20 | 20 |
| **Girls** | 50 | 10 |

**The practice questions for the chi-square test of independence in this case:**

Should the academy discard the **null hypothesis** that the players’ gender is unrelated to their abilities in playing soccer?

1. The academy should cast off the null hypothesis
2. The academy should fail to cast off the null hypothesis

### Practice Question 2

Here is the second of our practice questions for the chi-square test of independence.

A soda company wants to find out if three of their most popular soda flavors are equally recommended by their consumers. The company gives each of the soda flavors to 25 random people and asks them if they would recommend it. The following data is gathered:

|  |  |  |
| --- | --- | --- |
| **Soda flavor** | **Would recommend** | **Would not recommend** |
| **Flavor 1** | 20 | 5 |
| **Flavor 2** | 22 | 3 |
| **Flavor 3** | 18 | 7 |

**The practice questions for the chi-square test of independence in this case:**

Should the soda company cast off the null hypothesis that the proportion of customers recommending the restaurant is the same for the three restaurants?

1. The company should cast off the null hypothesis
2. The company should fail to cast off the null hypothesis

## Answers to the practice questions

The above questions are a great place to start when testing your knowledge on the chi-square test of independence.¹ Now let us look at the answers to the practice questions for the chi-square test of independence explained above:

### Answer 1

The correct answer to this practice is:

**A** - the academy should discard the null hypothesis.

How to draw this conclusion for the practice question to the chi-square test of independence:

**Step 1: Calculating the expected frequencies**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Can play soccer** | **Cannot play soccer** | **Raw total** |
| **Boys** | 20 (40 x 70) / 100 = 28 | 20 (40 x 20) / 100 = 12 | 40 |
| **Girls** | 50 (60 x 70) / 100 = 42 | 10 (60 x 30) / 100 = 18 | 60 |
| **Column total** | 70 | 30 | N = 100 |

**Step 2: Calculating chi-square**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Intervention** | **Outcome** | **Observed** | **Expected** |  **O – E** | **(O - E) 2** | **(O - E) 2/E** |
| **Boys** | Can play soccer | 20 | 28 | -8 | 64 | 2.29 |
| **Boys** | Can’t play soccer | 20 | 12 | 8 | 64 | 5.33 |
| **Girls** | Can play soccer | 50 | 42 | 8 | 64 | 1.52 |
| **Girls** | Can’t play soccer | 10 | 18 | -8 | 64 | 3.56 |

**Therefore:** X2 = 2.29 + 5.33 + 1.52 + 3.56 = 12.7

**Step 3: Determining the critical chi-square value**

Since there are two samples (genders) and two outcomes, the **degree of freedom** is (2 – 1) x (2 – 1) = 1.

**Therefore:** If the test of significance is α = .05 and df = 1, then the critical value (Χ2) is 3.84.

**Step 4: chi-square value and critical value comparison**

* Χ2 = 12. 7
* Critical value = 3.84

So, the chi-square value is more, compared to the critical value.

**Step 5: Determine whether to cast off the null hypothesis**

Since the Χ2 is more than the critical value, the academy should cast off the null hypothesis that gender is unrelated to how the players can learn basic soccer skills. The data should that a larger number of girls can learn to play soccer than boys.

### Answer 2

The correct answer to this question is:

**B** - The company should cast off the null hypothesis.2

Drawing this conclusion for these practice questions for the chi-square test of independence:

**Step 1: Calculating the expected frequencies:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Soda flavor** | **Would recommend** | **Would not recommend** | **Raw total** |
| **Flavor 1** | 20(25 x 60) / 75 = 20 | 5 (25 x 15) / 75 = 5 | 25 |
| **Flavor 2** | 22 (25 x 60) / 75 = 20 | 3 (25 x 15) / 75 = 5 | 25 |
| **Flavor 3** | 18 (25 x 60) / 75 = 20 | 7 (25 x 15) / 75 = 5 | 25 |
| **Column total** | 60 | 15 | 75 |

**Step 2: Calculating chi-square**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Intervention** | **Outcome** | **Observed** | **Expected** |  **O – E** | **(O – E)2** | **(O – E)2/E** |
| **Flavor 1** | Would recommend | 20 | 20 | 0 | 0 | 0 |
| **Flavor 1** | Would not recommend | 5 | 5 | 0 | 0 | 0 |
| **Flavor 2** | Would recommend | 22 | 20 | 2 | 4 | 0.2 |
| **Flavor 2** | Would not recommend | 3 | 5 | -2 | 4 | 0.8 |
| **Flavor 3** | Would recommend | 18 | 20 | -2 | 4 | 0.2 |
| **Flavor 3** | Would not recommend | 7 | 5 | 2 | 4 | 0.8 |

**Therefore:** X2 = 0 + 0 + 0.2 + 0.8 + 0.2 + 0.8 = 2

**Step 3: Determining the critical chi-square value**

In this case, there are three soda flavors and two outcomes. Therefore, the degree of freedom is: (3 - 1) \* (2 - 1) = 2

If the test of significance is α = .05 and df = 2, then the critical value (X2) is 5.99.

**Step 4: Chi-square value and critical value comparison**

* Χ2 = 2
* Critical value = 5.99

**Therefore**: The value of Χ2 is not more than the critical value.

**Step 5: Determining if you should discard the null hypothesis**

Since the Χ2 chi-square value is less than the critical value, the soda company should not cast off the null hypothesis that the number of customers that recommend the soda flavors is similar for the three flavors.

## Sources

¹ Libre Texts Statistics. “The Chi-Square Distribution (Exercises).” November 05, 2021. [https://stats.libretexts.org/Bookshelves/Introductory\_Statistics/Book%3A\_Introductory\_Statistics\_(OpenStax)/11%3A\_The\_Chi-Square\_Distribution/11.E%3A\_The\_Chi-Square\_Distribution\_(Exercises)](https://stats.libretexts.org/Bookshelves/Introductory_Statistics/Book%3A_Introductory_Statistics_%28OpenStax%29/11%3A_The_Chi-Square_Distribution/11.E%3A_The_Chi-Square_Distribution_%28Exercises%29).

² UNCW. “Chi Square Practice Answers.” Accessed on May 14, 2023. <http://people.uncw.edu/myersb/psy225/exam4fall2010/Chi%20Square%20Practice%20Problems.answers.pdf>.