

11.11: Practice

1.

If the number of degrees of freedom for a chi-square distribution is 25, what is the population mean and standard deviation?

2.

If $df > 90$, the distribution is _____. If $df = 15$, the distribution is _____.

3.

When does the chi-square curve approximate a normal distribution?

4.

Where is μ located on a chi-square curve?

5.

Is it more likely the df is 90, 20, or two in the graph?


 This is a nonsymmetrical chi-square curve which slopes downward continually.

Figure 11.13

Determine the appropriate test to be used in the next three exercises.

6.

An archeologist is calculating the distribution of the frequency of the number of artifacts they find in a dig site. Based on previous digs, the archeologist creates an expected distribution broken down by grid sections in the dig site. Once the site has been fully excavated, they compare the actual number of artifacts found in each grid section to see if their expectation was accurate.

7.

An economist is deriving a model to predict outcomes on the stock market. They create a list of expected points on the stock market index for the next two weeks. At the close of each day's trading, The economist records the actual points on the index. They want to see how well the model matched what actually happened.

8.

A personal trainer is putting together a weight-lifting program for their clients. For a 90-day program, they expect each client to lift a specific maximum weight each week. As the program goes along, the trainer records the actual maximum weights their clients lifted. They want to know how well their expectations met with what was observed.

Use the following information to answer the next five exercises: A teacher predicts that the distribution of grades on the final exam will be and they are recorded in Table 11.27.

Grade	Proportion
A	0.25
B	0.30
C	0.35
D	0.10

Table 11.27

The actual distribution for a class of 20 is in Table 11.28.

Grade	Frequency
A	7
B	7
C	5

Grade	Frequency
D	1

Table 11.28

9.

$df = df =$ presentation $df = df =$ _____

10.

State the null and alternative hypotheses.

11.

χ^2 test statistic = _____

12.

p -value = _____

13.

At the 5% significance level, what can you conclude?

Use the following information to answer the next nine exercises: The cumulative number of COVID-19 related cases reported for Santa Clara County for a certain time period is broken down by ethnicity as in Table 11.29.

Ethnicity	Number of Cases
White	2,229
Hispanic/Latino	1,157
Black/African-American	457
Asian, Pacific Islander	232
	Total = 4,075

Table 11.29

The percentage of each ethnic group in Santa Clara County is as in Table 11.30.

Ethnicity	Percentage of total county population	Number expected (round to two decimal places)
White	42.9%	1748.18
Hispanic/Latino	26.7%	
Black/African-American	2.6%	
Asian, Pacific Islander	27.8%	
	Total = 100%	

Table 11.30

14.

If the ethnicities of COVID-19 cases victims followed the ethnicities of the total county population, fill in the expected number of cases per ethnic group.

Perform a goodness-of-fit test to determine whether the occurrence of COVID-19 cases follows the ethnicities of the general population of Santa Clara County.

15.

H_0 : _____

16.

H_a : _____

17.

Is this a right-tailed, left-tailed, or two-tailed test?

18.

degrees of freedom = _____

19.

χ^2 test statistic = _____

20.

p -value = _____

21.

Graph the situation. Label and scale the horizontal axis. Mark the mean and test statistic. Shade in the region corresponding to the p -value.


 This is a blank graph template. The vertical and horizontal axes are unlabeled.

Figure 11.14

Let $\alpha = 0.05$

Decision: _____

Reason for the Decision: _____

Conclusion (write out in complete sentences): _____

22.

Does it appear that the pattern of COVID-19 cases in Santa Clara County corresponds to the distribution of ethnic groups in this county? Why or why not?

Determine the appropriate test to be used in the next three exercises.

23.

A pharmaceutical company is interested in the relationship between age and presentation of symptoms for a common viral infection. A random sample is taken of 500 people with the infection across different age groups.

24.

The owner of a baseball team is interested in the relationship between player salaries and team winning percentage. They take a random sample of 100 players from different organizations.

25.

A marathon runner is interested in the relationship between the brand of shoes runners wear and their run times. They take a random sample of 50 runners and records their run times as well as the brand of shoes they were wearing.

Use the following information to answer the next seven exercises: Transit Railroads is interested in the relationship between travel distance and the ticket class purchased. A random sample of 200 passengers is taken. Table 11.31 shows the results. The railroad wants to know if a passenger's choice in ticket class is independent of the distance they must travel.

Traveling Distance	Third class	Second class	First class	Total
1–100 miles	21	14	6	41
101–200 miles	18	16	8	42
201–300 miles	16	17	15	48

Traveling Distance	Third class	Second class	First class	Total
301–400 miles	12	14	21	47
401–500 miles	6	6	10	22
Total	73	67	60	200

Table 11.31

26.

State the hypotheses.

H_0 : _____

H_a : _____

27.

df = _____

28.

How many passengers are expected to travel between 201 and 300 miles and purchase second-class tickets?

29.

How many passengers are expected to travel between 401 and 500 miles and purchase first-class tickets?

30.

What is the test statistic?

31.

What is the p -value?

32.

What can you conclude at the 5% level of significance?

Use the following information to answer the next eight exercises: An article in the New England Journal of Medicine, discussed a study on smokers in California and Hawaii. In one part of the report, the self-reported ethnicity and smoking levels per day were given. Of the people smoking at most ten cigarettes per day, there were 9,886 Black people, 2,745 Native Hawaiian people, 12,831 Hispanic/Latino people, 8,378 Japanese American people and 7,650 White people. Of the people smoking 11 to 20 cigarettes per day, there were 6,514 Black people, 3,062 Native Hawaiian people, 4,932 Hispanic/Latino people, 10,680 Japanese American people, and 9,877 White people. Of the people smoking 21 to 30 cigarettes per day, there were 1,671 Black people, 1,419 Native Hawaiian people, 1,406 Hispanic/Latino people, 4,715 Japanese American people, and 6,062 White people. Of the people smoking at least 31 cigarettes per day, there were 759 Black people, 788 Native Hawaiian people, 800 Latino people, 2,305 Japanese American people, and 3,970 White people.

33.

Complete the table.

Smoking Level Per Day	Black	Native Hawaiian	Hispanic/Latino	Japanese American	White	TOTALS
1-10						
11-20						
21-30						
31+						
TOTALS						

Table 11.32 Smoking Levels by Ethnicity (Observed)

34.

State the hypotheses.

H_0 : _____

H_a : _____

35.

Enter expected values in Table 11.32. Round to two decimal places.

Calculate the following values:

36.

$df =$ _____

37.

χ^2 test statistic = _____

38.

p -value = _____

39.

Is this a right-tailed, left-tailed, or two-tailed test? Explain why.

40.

Graph the situation. Label and scale the horizontal axis. Mark the mean and test statistic. Shade in the region corresponding to the p -value.

 Blank graph with vertical and horizontal axes.

Figure 11.15

State the decision and conclusion (in a complete sentence) for the following preconceived levels of α .

41.

$\alpha = 0.05$

1. Decision: _____

2. Reason for the decision: _____

3. Conclusion (write out in a complete sentence): _____

42.

$\alpha = 0.01$

1. Decision: _____

2. Reason for the decision: _____

3. Conclusion (write out in a complete sentence): _____

43.

A math teacher wants to see if two of their classes have the same distribution of test scores. What test should they use?

44.

What are the null and alternative hypotheses for Exercise 11.43?

45.

A market researcher wants to see if two different stores have the same distribution of sales throughout the year. What type of test should they use?

46.

A meteorologist wants to know if East and West Australia have the same distribution of storms. What type of test should they use?

47.

What condition must be met to use the test for homogeneity?

Use the following information to answer the next five exercises: Do private practice doctors and hospital doctors have the same distribution of working hours? Suppose that a sample of 100 private practice doctors and 150 hospital doctors are selected at random and asked about the number of hours a week they work. The results are shown in Table 11.33.

	20–30	30–40	40–50	50–60
Private Practice	16	40	38	6
Hospital	8	44	59	39

Table 11.33

48.

State the null and alternative hypotheses.

49.

$df =$ _____

50.

What is the test statistic?

51.

What is the p -value?

52.

What can you conclude at the 5% significance level?

53.

Which test do you use to decide whether an observed distribution is the same as an expected distribution?

54.

What is the null hypothesis for the type of test from Exercise 11.53?

55.

Which test would you use to decide whether two factors have a relationship?

56.

Which test would you use to decide if two populations have the same distribution?

57.

How are tests of independence similar to tests for homogeneity?

58.

How are tests of independence different from tests for homogeneity?

Use the following information to answer the next three exercises: An archer's standard deviation for hits is six (data is measured in distance from the center of the target). An observer claims the standard deviation is less.

59.

What type of test should be used?

60.

State the null and alternative hypotheses.

61.

Is this a right-tailed, left-tailed, or two-tailed test?

Use the following information to answer the next three exercises: The standard deviation of heights for students in a school is 0.81.

A random sample of 50 students is taken, and the standard deviation of heights of the sample is 0.96. A researcher in charge of the study believes the standard deviation of heights for the school is greater than 0.81.

62.

What type of test should be used?

63.

State the null and alternative hypotheses.

64.

$df =$ _____

Use the following information to answer the next four exercises: The average waiting time in a doctor's office varies. The standard deviation of waiting times in a doctor's office is 3.4 minutes. A random sample of 30 patients in the doctor's office has a standard deviation of waiting times of 4.1 minutes. One doctor believes the variance of waiting times is greater than originally thought.

65.

What type of test should be used?

66.

What is the test statistic?

67.

What is the p -value?

68.

What can you conclude at the 5% significance level?

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