

10.2.1: Exercises

1. When performing a Goodness-of-Fit test, what distribution is used to find probabilities?
2. When performing a Goodness-of-Fit test, what type of test is used to find the P-value?
3. performing a Goodness-of-Fit test, what is the alternative hypothesis?
4. Use the Chi-Square distribution desmos graph, <https://www.desmos.com/calculator/bjohldwaym>, to find the P-value for the test statistic 9.28 using 5 degrees of freedom.
5. Use the Chi-Square distribution desmos graph, <https://www.desmos.com/calculator/bjohldwaym>, to find the critical value that obtains around 5% in the right tail using 8 degrees of freedom.

6. The marital status distribution of the U.S. male population, ages 15 and older, is as shown in the table below.

Marital Status	Percent
never married	31.3
married	56.1
widowed	2.5
divorced/separated	10.1

Suppose that a random sample of 400 U.S. young adult males, 18 to 24 years old, yielded the following frequency distribution. We are interested in whether this age group of males fits the distribution of the U.S. adult population.

Marital Status	Observed Frequency
never married	140
married	238
widowed	2
divorced/separated	20

a. State the null hypothesis:

$$H_0 : p_1 =$$

$$p_2 =$$

$$p_3 =$$

$$p_4 =$$

b. State the alternative hypothesis:

$$H_a :$$

c. Calculate the frequency one would expect when surveying 400 people. Fill in the table.

Marital Status	Percent	Expected Frequency
never married	31.3	
married	56.1	
widowed	2.5	
divorced/separated	10.1	

d. Explain why we can use the Chi-Square distribution to compute the P-value.

e. Use the observed frequencies provided in the table below and the expected frequencies you found in part c. to compute each term in the test statistic. Round each term to five decimal places.

Marital Status	Observed Frequency	Expected Frequency	$\frac{(O-E)^2}{E}$
never married	140		
married	238		
widowed	2		
divorced/separated	20		

f. Add all values in the fourth column of the table in e. to find the χ^2 test statistic.

g. How many degrees of freedom are there?

h. Use the Chi-Square distribution desmos graph, <https://www.desmos.com/calculator/bjohldwzwm>, to find the P-value for the test statistic.

i. What can you conclude about the null and alternative hypotheses?

j. State the conclusion in context.

7. Conduct a goodness-of-fit test to determine if the actual college majors of graduating males fit the distribution of their expected majors. Round expected counts to five decimal places. Use this desmos graph, <https://www.desmos.com/calculator/bjohldwaym>, to compute the P-value.

Major	Men – Expected Major	Men – Actual Major
Arts & Humanities	11.0%	600
Biological Sciences	6.7%	330
Business	22.7%	1130
Education	5.8%	305
Engineering	15.6%	800
Physical Sciences	3.6%	175
Professional	9.3%	460
Social Sciences	7.6%	370
Technical	1.8%	90
Other	8.2%	400
Undecided	6.6%	340