

## 11.8: Lab 1: Chi-Square Goodness-of-Fit (Worksheet)

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Student ID#: \_\_\_\_\_

*Work in groups on these problems. You should try to answer the questions without referring to your textbook. If you get stuck, try asking another group for help.*

### Student Learning Outcome

- The student will evaluate data collected to determine if they fit either the uniform or exponential distributions.

### Collect the Data

Go to your local supermarket. Ask 30 people as they leave for the total amount on their grocery receipts. (Or, ask three cashiers for the last ten amounts. Be sure to include the express lane, if it is open.)

You may need to combine two categories so that each cell has an expected value of at least five.

a. Record the values.

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

b. Construct a histogram of the data. Make five to six intervals. Sketch the graph using a ruler and pencil. Scale the axes.

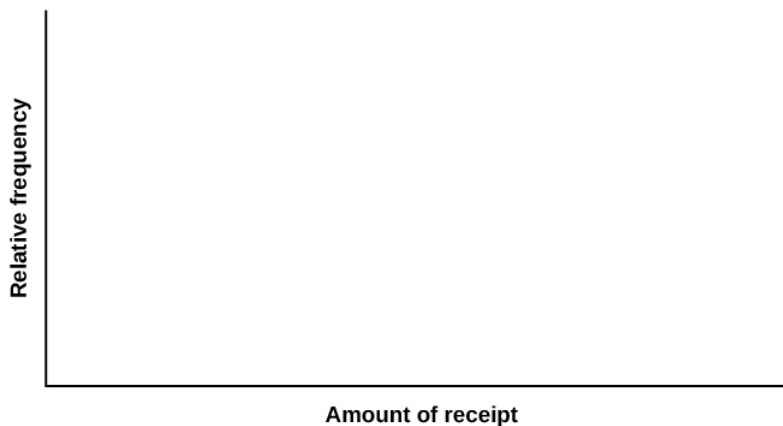


Figure 11.8.1.

c. Calculate the following:

- $\bar{x} =$  \_\_\_\_\_
- $s =$  \_\_\_\_\_
- $s^2 =$  \_\_\_\_\_

### Uniform Distribution

Test to see if grocery receipts follow the uniform distribution.

- a. Using your lowest and highest values,  $X \sim U(\text{_____, _____})$
- b. Divide the distribution into fifths.
- c. Calculate the following:
  - i. lowest value = \_\_\_\_\_
  - ii. 20<sup>th</sup> percentile = \_\_\_\_\_
  - iii. 40<sup>th</sup> percentile = \_\_\_\_\_
  - iv. 60<sup>th</sup> percentile = \_\_\_\_\_
  - v. 80<sup>th</sup> percentile = \_\_\_\_\_
  - vi. highest value = \_\_\_\_\_
- d. For each fifth, count the observed number of receipts and record it. Then determine the expected number of receipts and record that.

Fifth	Observed	Expected
1 <sup>st</sup>		
2 <sup>nd</sup>		
3 <sup>rd</sup>		
4 <sup>th</sup>		
5 <sup>th</sup>		

- e.  $H_0$ : \_\_\_\_\_
- f.  $H_a$ : \_\_\_\_\_
- g. What distribution should you use for a hypothesis test?
- h. Why did you choose this distribution?
- i. Calculate the test statistic.
- j. Find the  $p$ -value.
- k. Sketch a graph of the situation. Label and scale the  $x$ -axis. Shade the area corresponding to the  $p$ -value.

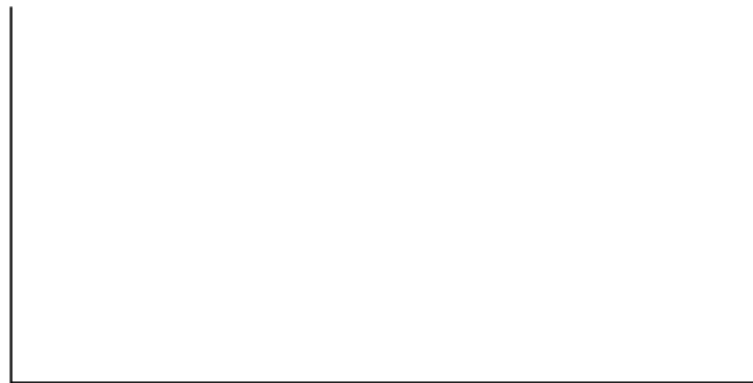


Figure 11.6.2.

- l. State your decision.
- m. State your conclusion in a complete sentence.

## Exponential Distribution

Test to see if grocery receipts follow the exponential distribution with decay parameter  $\frac{1}{x}$ .

- a. Using  $\frac{1}{x}$  as the decay parameter,  $X \sim \text{Exp}(\text{_____})$ .
- b. Calculate the following:
  - i. lowest value = \_\_\_\_\_
  - ii. first quartile = \_\_\_\_\_

- iii. 37<sup>th</sup> percentile = \_\_\_\_\_
- iv. median = \_\_\_\_\_
- v. 63<sup>rd</sup> percentile = \_\_\_\_\_
- vi. 3<sup>rd</sup> quartile = \_\_\_\_\_
- vii. highest value = \_\_\_\_\_

c. For each cell, count the observed number of receipts and record it. Then determine the expected number of receipts and record that.

Cell	Observed	Expected
1 <sup>st</sup>		
2 <sup>nd</sup>		
3 <sup>rd</sup>		
4 <sup>th</sup>		
5 <sup>th</sup>		
6 <sup>th</sup>		

- d.  $H_0$ : \_\_\_\_\_
- e.  $H_a$ : \_\_\_\_\_
- f. What distribution should you use for a hypothesis test?
- g. Why did you choose this distribution?
- h. Calculate the test statistic.
- i. Find the  $p$ -value.
- j. Sketch a graph of the situation. Label and scale the  $x$ -axis. Shade the area corresponding to the  $p$ -value.



Figure 11.6.3.

- k. State your decision.
- l. State your conclusion in a complete sentence.

## Discussion Questions

- a. Did your data fit either distribution? If so, which?
- b. In general, do you think it's likely that data could fit more than one distribution? In complete sentences, explain why or why not.

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