Practice Multiple Choice for Confidence Intervals and Tests of Significance for QUALITATIVE DATA

Use the following scenario for questions 1 – 2.
The college newspaper of a large midwestern university periodically conducts a survey of students on campus to determine their attitudes about certain issues. Students are interviewed by a reporter “roaming” the campus who asks them if they feel there is adequate student parking on campus. On a particular day the reporter interviews five students and asks them if they feel there is adequate student parking on campus. Four of the students say “no.”

1. What is the sample percentage of students who feel parking is not adequate on campus?
   A) 80%
   B) 20%
   C) 4%
   D) It is impossible to determine without interviewing all students on campus.

2. Is a confidence interval for the percent of students who feel there is adequate student parking on campus at this midwestern university appropriate?
   A) Yes, the data are an SRS from the population of interest.
   B) Yes, the population is large.
   C) No, the data are not an SRS and the sample size is too small.
   D) No, we have the parameters. We don’t need a confidence interval.

Use the following scenario for questions 3 – 5.
An inspector inspects large truckloads of potatoes to determine the percentage of potatoes in the shipment with major defects prior to using the potatoes to make potato chips. The shipment is rejected if at least 10% of the shipment has defects. She selects an SRS of 50 potatoes from over 2000 potatoes on the truck. Only 2 of the potatoes samples are found to have major defects.

3. Which of the following assumptions for a 95% confidence interval are violated, if any?
   A) The data are an SRS from the population of interest.
   B) The sample size is large.
   C) There appear to be no violations.
   D) Both A and B are violated.

4. Using the scenario above, what’s the SE%?
   A) 6.9%
   B) 4.24%
   C) .07%
   D) .3%

5. What’s the sample percentage? ______________
6. Using the scenario above, she wishes to test the following:

Null: There are at least 10% of potatoes with defects.
Alt: There are less than 10% of potatoes with defects

The inspector finds the z-statistic to be –1.40. What is the p-value?

A) 83.85%
B) 16.15%
C) 8.08%
D) 41.93%

Use the following scenario for questions 6 – 7.
A newspaper conducted a statewide survey concerning the 1994 race for state senator. The newspaper took an SRS of 1200 registered voters and found that 624 would vote for the Republican candidate. Let \( p \) represent the proportion of registered voters in the state that would vote for the Republican candidate.

7. What is a 90% confidence interval for \( p \)?

A) 52% ± 1.65%
B) 52% ± 2.38%
C) 52% ± 2.88%
D) 52% ± 2.49%

8. Using the scenario above, suppose you wished to see if the Republican candidate had a “clear” majority. To do this you test the hypotheses:

Null: The percentage of voters in the state that vote Republican is 50% or less.
Alt: The percentage of voters in the state that vote Republican is more than 50%

What is the P-value of your test?

A) 83.85%
B) 16.15%
C) 8.08%
D) 41.93%

Use the following scenario for questions 9 – 10.
An SRS of 100 of a certain popular 1993 model car found that 20 had a minor defect in the brakes. An SRS of 400 of this 1994 model car found that 50 had a minor defect in the brakes.

9. What is the SE for the difference of defects found in in 1993 and 1994?

A) 18.7%
B) 1.65%
C) 4%
D) 4.33%

10. Using the scenario above, is there evidence that the proportion of defects in 1994 is significantly different from the proportion in 1993? What is the P-value of your test?

A) \( P \approx 9\% \) B) \( P \approx 5\% \) C) \( P \approx 91\% \) D) \( P \approx 1\% \)
Use the following scenario for questions 11 – 16.

A study was performed to examine the personal goals of children in grades 4, 5, and 6. A random sample of students was selected for each of the grades 4, 5, and 6 from schools in Georgia. They were asked what they would most like to do at school: make good grades, be good in sports, or be popular. Combined results from all grades and schools are presented in the following $r \times c$ table.

<table>
<thead>
<tr>
<th></th>
<th>Make good grades</th>
<th>Be popular</th>
<th>Be good in sports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>96</td>
<td>32</td>
<td>94</td>
</tr>
<tr>
<td>Girls</td>
<td>295</td>
<td>45</td>
<td>40</td>
</tr>
</tbody>
</table>

A computer’s output for the above table is given below.

Expected counts are printed below observed counts

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>96</td>
<td>32</td>
<td>94</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>144.19</td>
<td>28.40</td>
<td>49.42</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>295</td>
<td>45</td>
<td>40</td>
<td>380</td>
</tr>
<tr>
<td></td>
<td>246.81</td>
<td>48.60</td>
<td>84.58</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>391</td>
<td>77</td>
<td>134</td>
<td>602</td>
</tr>
</tbody>
</table>

Chi-Sq = 16.105 + 0.458 + 40.226 + 9.409 + 0.267 + 23.501 = 89.966

11. How many columns are there in the 2 x 3 table above?
A) 2
B) 3
C) 6
D) 12

12. Using the scenario and tables above, what is the percentage of boys that would like to make good grades?
A) 16%
B) 25%
C) 43%
D) 96%

13. Suppose that we want to test the null hypothesis that there are no differences among the proportion of boys and the proportion of girls choosing each of the three personal goals in the scenario above. Under the null hypothesis, what is the expected number of boys that would select “make good grades”?
A) 96
B) 144.19
C) 246.81
D) 89.96
14. What are the degrees of freedom for the test of significance in question 13?
   A) 6
   B) 4
   C) 3
   D) 2

15. For the test of significance in question 13 and using the output in the scenario above, what do we conclude?
   A) Fail to reject the null hypothesis.
   B) Reject the null hypothesis.

16. Using the scenario above, which cell contributes the most to the chi-square statistic?
   A) Boys whose goal was to be popular.
   B) Girls whose goal was to make good grades.
   C) Girls whose goal was to be popular.
   D) Boys whose goal was to be good in sports.

Use the following scenario for questions 17 – 19.
An observational study was conducted near the primate exhibit at the Sacramento Zoo on weekends in 1988. The data are from 39 groups of three persons: one adult female, one adult male, and one toddler. Recorded below are which adult (male or female) was carrying the toddler and the gender of the toddler.

<table>
<thead>
<tr>
<th>Gender of adult person carrying toddler</th>
<th>Gender of toddler</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
</tr>
</tbody>
</table>

17. Suppose we wish to test the null hypothesis that there is no association between gender of adult person carrying a toddler and the gender of the toddler. Under the null hypothesis, what would be the expected number of times a female adult would be carrying a male toddler in the table?
   A) 5.03
   B) 6
   C) 8.97
   D) 14

18. Using the scenario above, what is the chi-square component for a male adult carrying a female toddler?
   A) 0.061
   B) 4.019
   C) 0.059
   D) 0.105
19. Using the scenario above, which of the following statements is true?

A) We cannot test this hypothesis because there is only one degree of freedom.
B) We cannot test this hypothesis because the expected counts are less than 5 in too many of the cells.
C) The test of the null hypothesis will have a very small P-value because the counts in each row are not identical.
D) This is an observational study and the sample taken is not an SRS. Therefore, this study is not a legitimate candidate for a test of significance.

Answers
1. A
2. C
3. B
4. B
5. 4%
6. C
7. B
8. C
9. D
10. A
11. B
12. C
13. B
14. D
15. B
16. D
17. C
18. D
19. D