Section D: Extending Your Comprehension  
(Answers below)

33. Is it possible to create a data set with two groups, five points in each group, so that an independent-sample $t$ test is significant but a Mann–Whitney $U$ test is not significant at $\alpha = .05$? If so, show such a data set.

34. Is it possible to create a data set with two groups, five points in each group, so that a $t$ test is not significant but a Mann–Whitney $U$ test is significant at $\alpha = .05$? If so, show such a data set.

35. Is it possible for two data sets, five points in each, to have identical means and yet have a significant independent-sample $t$ test? If so, show such a data set.

36. Is it possible for two data sets, five points in each, to have identical means and yet have a significant Mann–Whitney $U$ test? If so, show such a data set.

37. Is it possible for two data sets, five points in each, to have identical medians and yet have a significant independent-sample $t$ test? If so, show such a data set.

38. Is it possible for two data sets, five points in each, to have identical medians and yet have a significant Mann–Whitney $U$ test? If so, show such a data set.

Section E: From the Journals  
(Answers below)

39. Finkelhor and colleagues (1990) reported the results of a national survey of adults concerning their history of childhood sexual abuse. They concluded that “separation from a natural parent for a major portion of one’s childhood . . . was a risk factor . . . : girls showed markedly higher risk under all family circumstances except that of living with two natural parents” (pp. 24–25). The overall rate of sexual abuse in their sample of 1485 women was 27%. The rates of abuse broken down by predominant family structure are shown in the table. To determine whether the different family structures did in fact have a significant effect on rate of abuse, Finkelhor performed a $\chi^2$ test of independence, finding that $\chi^2 = 24.91, p < .0001$.

<table>
<thead>
<tr>
<th>Predominant Family Structure</th>
<th>Percent Victimized</th>
<th>$n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both natural parents</td>
<td>26</td>
<td>1209</td>
</tr>
<tr>
<td>Mother alone</td>
<td>35</td>
<td>98</td>
</tr>
<tr>
<td>Father alone</td>
<td>50</td>
<td>22</td>
</tr>
<tr>
<td>Both nonnatural parents</td>
<td>48</td>
<td>29</td>
</tr>
<tr>
<td>Natural mother/stepfather</td>
<td>40</td>
<td>53</td>
</tr>
<tr>
<td>Natural father/stepmother</td>
<td>44</td>
<td>16</td>
</tr>
<tr>
<td>Other</td>
<td>37</td>
<td>52</td>
</tr>
</tbody>
</table>

(a) Does the table correspond to Finkelhor’s statement that there were 1485 subjects?
(b) How many degrees of freedom are there for this test? (Finkelhor does not state this.)
(c) Compute $\chi^2$. [Hint: You will have to use the percentage column to create new columns corresponding to the number victimized and the number not victimized.] Does your computation agree with Finkelhor’s? If not, why not?
(d) Is your $\chi^2$ significant at $\alpha = .01$?
(e) State your conclusion in plain English.

40. Goldkamp and colleagues (1990) were interested in predicting drug use among 1820 felony defendants in Dade County, Florida. They developed a model that included 14 variables such as type of
offense, whether a weapon was used, age, whether drug charges had been filed, and whether the subject reported using cocaine. On the basis of this model, they classified defendants into four groups. Individuals in group 4 were predicted to have the highest risk of using cocaine, whereas individuals in group 1 had the lowest risk. They also conducted a urinalysis with either positive or negative results for cocaine use. The observed percentages of felony defendants with positive tests among the four groups are shown in the table.

Goldkamp et al. reported that “$\chi^2 = 361.95, 3 \text{ d.f.}, p \leq 0.00$” (p. 652).

<table>
<thead>
<tr>
<th>Relative Risk of Positive Test</th>
<th>Number of Defendants</th>
<th>Observed Percentages with Positive Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (lowest)</td>
<td>469</td>
<td>44.1</td>
</tr>
<tr>
<td>Group 2</td>
<td>431</td>
<td>74.0</td>
</tr>
<tr>
<td>Group 3</td>
<td>449</td>
<td>87.1</td>
</tr>
<tr>
<td>Group 4 (highest)</td>
<td>471</td>
<td>94.1</td>
</tr>
</tbody>
</table>

(a) Are the degrees of freedom stated correctly by Goldkamp?
(b) Perform the $\chi^2$ test. [Hint: You will need to create two columns headed “Number of positive tests” and “Number of negative tests.”] Do your results correspond with Goldkamp’s?
(c) What can be said about the statement “$p \leq 0.00$”?

41. Weintraub (1986) analyzed the verbal behavior of Presidents Jimmy Carter and Ronald Reagan during their news conferences and used his analysis to draw conclusions about the personalities of those presidents. For example, he counted the number of times the pronoun “I” occurred in samples of 1000 words taken from news conferences held during the first year of each presidency. “In general, clinical observers agree that the infrequent use of ‘I’ indicates an avoidance of intimacy, commitment, and candor; whereas a very high frequency suggests inordinate self-preoccupation” (p. 288). Is there a significant difference in the number of times Carter and Reagan used “I”?

Weintraub could identify 20 1000-word samples for Carter and 16 such samples for Reagan. The median number of “I” references for Carter was 31 and for Reagan 25. He performed a Mann–Whitney $U$ test on these data, finding that $U = 77$, which he reported was significant at $p < .01$.

(a) What are $n_1$ and $n_2$ in this study?
(b) What is $U_{cv}$ if $\alpha = .01$? Is the reported $U_{obs} = 77$ in fact significant at $p < .01$?
(c) Is there enough information to verify that $U$ was computed correctly?

42. Siddall and Conway (1988) investigated whether the type of admission to a residential drug treatment program affected the outcome of the program for the person. They recorded three types of admission: voluntary, involuntary (criminal justice referral), and involuntary (criminal charges pending). Each person’s outcome (“discharge disposition”) was rated on a seven-point scale that was rank-ordered from least successful to most successful: D1. Absence without authorization; D2. Drug abuse; D3. Criminal charge; D4. Sexual misconduct; D5. Withdrawal against advice; D6. Reached maximum therapeutic benefit; and D7. Completed all program requirements.

The records of 100 patients were examined and subjected to a Kruskal–Wallis analysis of variance where the discharge disposition was the dependent variable and the type of admission was the independent variable. Siddall and Conway reported that $\chi^2 = 3.78, p < .05$, but they did not specify the degrees of freedom used in this test.

(a) How many degrees of freedom are there for a Kruskal–Wallis test with three groups (three types of admission)? What is the critical value of $\chi^2$ in that case? Is Siddall and Conway’s reported observed value of $\chi^2$ significant at $p < .05$?
(b) Perhaps Siddall and Conway collapsed the two kinds of involuntary admission into one category, so that type of admission was divided into two groups (voluntary and involuntary) instead of three. Now how many degrees of freedom are there for the Kruskal–Wallis test with two groups? What is the critical value of $\chi^2$ in that case? Is Siddall and Conway’s reported observed value of $\chi^2$ significant at $p < .05$?
(c) Is there any other way to interpret Siddall and Conway’s results so that their observed value of $\chi^2$ is in fact correctly reported to be significant at $p < .05$?

43. Del Cerro and Borrell (1987) studied the effect of $\beta$-endorphin on memory processes in Wistar rats because much research had shown that such neurohumors can interfere with memory. They trained 56 rats as follows: On day 1, rats were given an injection (described below), and then 10 minutes later, they were placed in a cage that had a door on one side that led to a dark compartment. Rats were allowed to enter and explore freely the dark compartment. Day 2 was a repeat of day 1. Day 3 was a repeat of days 1 and 2 except that when the rat entered the dark compartment, it received an inescapable electric shock of 2 seconds duration. On day 4, each rat was given the injection, and then 10 minutes later, it was placed directly in the dark compartment for 5 minutes, during which time no shock was administered; this procedure is called “forced extinction.” Day 5 was the last day. The rat was given the injection and then placed in the original compartment that had the door leading into the dark compartment. The time (“latency”) was measured before the rat entered the dark compartment. This latency was the dependent variable in the study.

The 56 rats were divided into four groups, each of which received a different series of injections. Group I received saline solution (no $\beta$-endorphin); group II received .1 microgram per kilogram of body weight ($\mu$g/kg) $\beta$-endorphin; group III received 1.0 $\mu$g/kg; and group IV received 10 $\mu$g/kg. Did the different doses of $\beta$-endorphin affect the latencies?

Because the latencies are interval/ratio data, it would seem appropriate to use an analysis of variance to answer this question. However, the latencies varied greatly, from a few seconds to more than 300 seconds. Even though these latencies are interval/ratio data, a very long latency would have a great effect on the mean for that group, overshadowing all the other measurements, so the latencies were converted to ranks and a Kruskal–Wallis analysis of variance was performed. Del Cerro and Borrell reported that $H = 9.62$, $df = 3$, $p < .025$.

Del Cerro and Borrell also reported median latencies for each group presented as a graph. This graph can be interpreted to show that the median latency for group I (saline) = 20 seconds, the median latency for group II (.1 $\mu$g/kg) = 150 seconds, the median latency for group III (1 $\mu$g/kg) = 300 seconds, and the median latency for group IV (10 $\mu$g/kg) = 85 seconds.

(a) Did Del Cerro and Borrell report the degrees of freedom correctly?

(b) What is the critical value of $H$ (that is, of $\chi^2$) with 3 degrees of freedom when $\alpha = .05$? When $\alpha = .01$?

(c) Is Del Cerro and Borrell’s claim that their observed $H = 9.62$ is significant with $p < .025$ reasonable?

(d) Do the median latency data provide enough information to verify the computation of $H$? Does that information make it seem reasonable that $H$ was computed correctly?

Section F: Computer Explorations

44. (a) Verify that the text’s computation of $U$ for Table 18.9 is correct. [Hint: If using SPSS, you will need to define an independent variable (similar to the $t$ tests of Chapter 11). Then click Analyze, then Nonparametric Tests, and then 2 Independent Samples... .]

(b) Use $t$ to analyze the same data. Can you conclude anything about the comparative power of $U$ and $t$?

45. Verify that the text’s computation of $T$ for Table 18.10 is correct. [Hint: If using SPSS, click Analyze, then Nonparametric Tests, and then 2 Related Samples... . Note that SPSS uses a $z$ approximation for the Wilcoxon test, but the results are the same (remember that the text’s example is directional).]

46. (a) Verify that the text’s computation of $H$ for Table 18.11 is correct. [Hint: If using SPSS, click Analyze, then Nonparametric Tests, and then k Independent Samples... . Note that SPSS uses the $\chi^2$ approximation for $H$.]

(b) Use ANOVA to analyze the same data. Can you conclude anything about the comparative power of $H$ and the ANOVA’s $F$?
Answers to Selected Additional Exercises for Chapter 18

Section D: Extending Comprehension

33. Yes
34. Yes
35. No
36. Yes
37. Yes
38. Yes

Section E: From the Journals

39. (a) No; the table shows 1479 subjects, not 1485.
    (b) 6
    (c) We compute $\chi^2_{\text{obs}} = 22.93$, not 24.91 as stated.
    (d) Yes; $\chi^2_{\text{cv}} = 16.812$
    (e) Type of family structure does have a significant effect on percent of victimization.

40. (a) Yes
    (b) Yes
    (c) Apparently Goldkamp did not set a level of significance in advance and is reporting the exact probability provided by some computer package such as SPSS. It is a misleading statement because it makes it appear that $p$ is negative, which is impossible.

41. (a) 16 and 20
    (b) 79; yes
    (c) No

42. (a) 2; 5.991; no
    (b) 1; 3.841; no
    (c) Apparently not

43. (a) Yes
    (b) 7.815; 11.345
    (c) Yes
    (d) No; yes