

1. (17 pts)

- (a) (3 pts) The direction of extreme is to the left. That is because the smaller values are less likely under H_0 and more likely under H_1 .
- (b) (8 pts) $\alpha = \frac{3}{15}$ because under H_0 , there are three vouchers that are at or to the left of 10 (i.e., the rejection region). $\beta = \frac{7}{15}$ because under H_1 there are 7 vouchers that are to the right of 10 (i.e., the acceptance region).
- (c) (3 pts) The p -value of 15 is $\frac{5}{15}$ because there are 5 vouchers at or to the left of 15 under H_0 . Compute it just like α except use 15 instead of 10.
- (d) (3 pts) 15 is in the acceptance region, so it is not statistically significant.

2. (25 pts)

- (a) (8 pts) The best choice is

H_0 : Four-year-olds who watch 9 minutes of SpongeBob do the same on a test of mental functions as do 4-year-olds who watch Caillou or draw pictures.

H_1 : Four-year-olds who watch 9 minutes of SpongeBob do worse on a test of mental functions as do 4-year-olds who watch Caillou or draw pictures.

Other choices were acceptable. It is important that H_0 state the status quo, i.e., that there is no difference or no effect.

- (b) (4 pts) The alternative hypothesis was accepted. The best evidence of this is the sentence that says “those who had watched ‘SpongeBob’ did measurably worse than the others.” I accepted other answers if they implied the same thing, even if they were not as direct.
- (c) (5 pts) The sample consists of 60 four-year-olds taken from 74 counties.
- (d) (3 pts) This is designed to eliminate selection bias. By this method, everyone has the same chance of being in the SpongeBob group.
- (e) (5 pts) The researchers need to make a comparison between the SpongeBob group and other children. The children who drew pictures were the control group.

3. (15 pts)

- (a) (4 pts) There are several possible answers. The best one is whether the child watched SpongeBob or Caillou or drew pictures. Another possibility is whether the child watched TV or drew pictures. I accepted the length of time that the child watched SpongeBob, although that did not vary in the study, so it wasn't really a variable. Had they formed three groups and the groups watched SpongeBob for different lengths of time, then time would be a variable.

- (b) (4 pts) The response variable is the child's performance on the mental function test.
- (c) (3 pts) If your variable was which show was watched, then it was qualitative. If it was the length of time, then it was quantitative.
- (d) (4 pts) This study was experimental. The researchers controlled which show the children watched.
4. (10 pts)
- (a) (5 pts) There are many possible answers, but they must be variables and they must be ones that could reasonably affect the response variable, namely, the child abuse. Some possibilities are family income, parents' education, parents' alcohol or drug use, and whether the parents were abused as children.
- (b) (5 pts) This is a statistic because it is based on the sample data, not the entire population.
5. (20 pts)
- (a) (8 pts) Use `22→rand` to set the seed to 22. Then use `randInt(1,500)` five times to select 5 students from the 500. You should get 202, 415, 479, 162, and 54.
- (b) (4 pts) Each grade level is a stratum (a homogeneous group). So this is a stratified sample.
- (c) (4 pts) The individual classes are clusters and we are selecting two of those groups at random, so this is a cluster sample.
- (d) (4 pts) Self-selection always allows the possibility of selection bias. Perhaps those who are better behaved are more likely to volunteer. Perhaps those who are more poorly behaved are more likely to volunteer. Either way, it introduces bias into the sample.
6. (13 pts)
- (a) (8 pts) You must show each stem twice, once for the leaves 0 - 4 and again for the leaves 5 - 9.
- | | |
|---|-----------------|
| 6 | 4 4 |
| 6 | 6 |
| 7 | 3 |
| 7 | 7 5 7 |
| 8 | 4 4 0 4 4 4 |
| 8 | 7 7 9 7 7 6 7 9 |
- (b) (5 pts) The distribution is unimodal and skewed left.