

## 4. Five More Technical Principles

### SOLUTIONS

1. Identify the variable(s) as continuous or categorical, and single or multiple response.
  - a. Categorical, single response
  - b. Continuous, single response
  - c. Continuous, multiple response
  - d. Categorical, multiple response
  - e. Continuous, single response
  - f. Categorical, multiple response
3. “The model suggests that on average, girls grow approximately 5.07 centimeters per year between the ages of five and ten.”
5. All measurements must be converted into consistent units (scale and system of measurement). I chose to convert all measurements to kilograms (see revised table 4A), using the conversion factor 2.2 pounds/kilogram.

“Of the four specimens compared here, specimen 3 is the heaviest (0.70 kilograms). It is about twice as heavy as the lightest (specimen 4, 0.34 kg). The other two specimens were each about 70% as heavy as specimen 3.”

**TABLE 4A.2.** Mass of four specimens

Specimen	Weight (original units)	Weight (kg)
1	1.2 pounds	0.54
2	500 grams	0.50
3	0.7 kilograms	0.70
4	12 ounces	0.34

7. Identify pertinent standards or cutoffs.
  - a. The speed limit where he was driving and his actual speed
  - b. The weight-bearing capacity of the alloy (in weight per unit area) and the expected weight load (again, in weight per area) in the library

- c. Her current height and a growth chart (height for age) for girls
  - d. The odds ratio of a heart attack for Vioxx users versus non-Vioxx users, compared to an odds ratio of 1.0 (the null hypothesis of equal odds in both groups)
  - e. The rate of inflation, current tuition, and rates of tuition increase at Public U over the past few years
  - f. Today's ozone measurement and the cutoff for an ozone warning
9. a. Taken together, the two statements imply that 1 in 125,000 Americans are HIV positive and know it, clearly a misstatement of the facts.
- b. Rewrite the statement to clarify.
- i. "Half of HIV-positive Americans know they are infected."
  - ii. "One in 500 Americans is HIV positive and knows it."

11. Critique the commuting questionnaire question.

- a. First, the responses are not mutually exclusive. For example, "car" and "carpool" overlap, as do "public transportation" and "train." Second, the responses aren't exhaustive, excluding bus and bicycle, among other possibilities, and omitting an "other (specify)" response. Third, they don't provide a way for people to record more than one mode of transportation. Fourth, there is no appropriate response for people who don't work or those who work at home. And finally, there are no instructions given about how many responses are allowed.
- b. "How do you commute to work? (Mark all that apply.)  
 Car\_\_ Train\_\_ Bus\_\_ Bicycle\_\_ Walk\_\_  
 Other (specify) \_\_\_\_\_  
 I work at home\_\_ I do not work\_\_"

13. Identify the errors and rewrite.

- a. Proportion and percentage are not consistent units. Write "The proportionate increase in income during the 1990s was 0.20." or "Income increased by 20% during the 1990s."
- b. The reported sex ratio indicates a lower number in the numerator than the denominator. Either write "Male infants outnumbered females (sex ratio at birth = 1.05 males per female)" (flipping over the ratio to be consistent with the wording, and reporting units as males per female) or "There were slightly fewer male than female infants (sex ratio at birth = 0.95 males per female)" (revising the wording to be consistent with the numeric value, and reporting units as males per female).
- c. The value 0.67 does not indicate a majority unless labeled as a proportion. Better to express the value as a percentage. Write "A majority of respondents (67%) agreed that there should be a waiting period before buying a gun."

- d. A death rate is expressed relative to the population (e.g., number of living people), not as a percentage of deaths (e.g., relative to the total number of deaths). Unless the total population and number of deaths are known, the first half of the sentence doesn't include enough information to calculate the death rate. Write "Cancer accounted for two out of every ten deaths."