Crossen’s *Tainted Truth*. Understanding these practices will be extremely helpful in evaluating the statistical data found in everyday situations.

### 1-3 Basic Skills and Concepts

*In Exercises 1–4, use critical thinking to develop an alternative conclusion. For example, consider a media report that BMW drivers are healthier than adults who don’t drive. The conclusion that BMW cars cause better health is probably wrong. Here is a better conclusion: BMW drivers tend to be wealthier than adults who don’t drive, and greater wealth is associated with better health.*

1. **Weight and Trucks** A study showed that truck drivers weigh more than adults who do not drive trucks. Conclusion: Trucks cause people to gain weight.

2. **Homes and Longevity** A study showed that homeowners tend to live longer than those who do not live in their own homes. Conclusion: Owning a home creates inner peace and harmony that causes people to be in better health and live longer.

3. **Traffic Enforcement** A study showed that in Orange County, more speeding tickets were issued to minorities than to whites. Conclusion: In Orange County, minorities speed more than whites.

4. **Cold Remedy** In a study of cold symptoms, every one of the study subjects with a cold was found to be improved two weeks after taking ginger pills. Conclusion: Ginger pills cure colds.

*In Exercises 5–16, use critical thinking to address the key issue.*

5. **Chocolate Health Food** The *New York Times* published an article that included these statements: “At long last, chocolate moves toward its rightful place in the food pyramid, somewhere in the high-tone neighborhood of red wine, fruits and vegetables, and green tea. Several studies, reported in the *Journal of Nutrition*, showed that after eating chocolate, test subjects had increased levels of antioxidants in their blood. Chocolate contains flavonoids, antioxidants that have been associated with decreased risk of heart disease and stroke. Mars Inc., the candy company, and the Chocolate Manufacturers Association financed much of the research.” What is wrong with this study?

6. **Census Data** After the last national census was conducted, the *Poughkeepsie Journal* ran this front-page headline: “281,421,906 in America.” What is wrong with this headline?

7. **Mail Survey** When author Shere Hite wrote *Woman and Love: A Cultural Revolution in Progress*, she based conclusions on 4500 replies that she received after mailing 100,000 questionnaires to various women’s groups. Are her conclusions likely to be valid in the sense that they can be applied to the general population of all women? Why or why not?

8. **“900” Numbers** In an ABC *Nightline* poll, 186,000 viewers each paid 50 cents to call a “900” telephone number with their opinion about keeping the United Nations in the United States. The results showed that 67% of those who called were in favor of moving the United Nations out of the United States. Interpret the results by identifying what we can conclude about the way the general population feels about keeping the United Nations in the United States.
9. **Telephone Surveys** The Hartford Insurance Company has hired you to poll a sample of adults about their car purchases. What is wrong with using people with telephone numbers listed in directories as the population from which the sample is drawn?

10. **Crime and Buses** The *Newport Chronicle* claims that bus stops cause crime, because a study showed that crime rates are higher in cities with bus stops than in rural areas that have no bus stops. What is wrong with that claim?

11. **Motorcycle Helmets** The Hawaii State Senate held hearings when it was considering a law requiring that motorcyclists wear helmets. Some motorcyclists testified that they had been in crashes in which helmets would not have been helpful. Which important group was not able to testify? (See “A Selection of Selection Anomalies” by Wainer, Palmer, and Bradlow in *Chance*, Vol. 11, No. 2.)

12. **Merrill Lynch Client Survey** The author received a survey from the investment firm of Merrill Lynch. It was designed to gauge his satisfaction as a client, and it had specific questions for rating the author’s personal Financial Consultant. The cover letter included this statement: “Your responses are extremely valuable to your Financial Consultant, Russell R. Smith, and to Merrill Lynch. . . . We will share your name and response with your Financial Consultant.” What is wrong with this survey?

13. **Cigarette Nicotine** Refer to Data Set 5 in Appendix B and consider the nicotine content of the 29 different cigarette brands. The average (mean) of those amounts is 0.94 mg. Is this result likely to be a good estimate of the average (mean) of all cigarettes smoked in the United States? Why or why not?

14. **Bad Question** A survey includes this item: “Enter your height in inches.” It is expected that actual heights of respondents can be obtained and analyzed, but there are two different major problems with this item. Identify them.

15. **Longevity** You need to conduct a study of longevity for people who were born after the end of World War II in 1945. If you were to visit graveyards and use the birth/death dates listed on tombstones, would you get good results? Why or why not?

16. **SIDS** In a letter to the editor in the *New York Times*, Moorestown, New Jersey, resident Jean Mercer criticized the statement that “putting infants in supine position has decreased deaths from SIDS.” SIDS refers to sudden infant death syndrome, and the *supine* position is lying on the back with the face upward. She suggested that this statement is better: “Pediatricians advised the supine position during a time when the SIDS rate fell.” What is wrong with saying that the supine position decreased deaths from SIDS?

*In Exercises 17–22, answer the given questions that relate to percentages.*

17. **Percentages**
   a. Convert the fraction 17/25 to an equivalent percentage.
   b. Convert 35.2% to an equivalent decimal.
   c. What is 57% of 1500?
   d. Convert 0.486 to an equivalent percentage.

18. **Percentages**
   a. What is 26% of 950?
   b. Convert 5% to an equivalent decimal.
   c. Convert 0.01 to an equivalent percentage.
   d. Convert the fraction 527/1200 to an equivalent percentage. Express the answer to the nearest tenth of a percent.
19. **Percentages in a Gallup Poll**
   a. In a Gallup poll, 52% of 1038 surveyed adults said that secondhand smoke is “very harmful.” What is the actual number of adults who said that secondhand smoke is “very harmful”?
   b. Among the 1038 surveyed adults, 52 said that secondhand smoke is “not at all harmful.” What is the percentage of people who chose “not at all harmful.”

20. **Percentages in a Study of Lipitor**
   a. In a study of the cholesterol drug Lipitor, 270 patients were given a placebo, and 19 of those 270 patients reported headaches. What percentage of this placebo group reported headaches?
   b. Among the 270 patients in the placebo group, 3.0% reported back pains. What is the actual number of patients who reported back pains?

21. **Percentages in Campus Crime** In a study on college campus crimes committed by students high on alcohol or drugs, a mail survey of 1875 students was conducted. A *USA Today* article noted, “Eight percent of the students responding anonymously say they’ve committed a campus crime. And 62% of that group say they did so under the influence of alcohol or drugs.” Assuming that the number of students responding anonymously is 1875, how many actually committed a campus crime while under the influence of alcohol or drugs?

22. **Percentages in the Media**
   a. A *New York Times* editorial criticized a chart caption that described a dental rinse as one that “reduces plaque on teeth by over 300%.” What is wrong with that statement?
   b. In the *New York Times Magazine*, a report about the decline of Western investment in Kenya included this: “After years of daily flights, Lufthansa and Air France had halted passenger service. Foreign investment fell 500 percent during the 1990’s.” What is wrong with this statement?

1-3 **Beyond the Basics**

23. **Phony Data** A researcher at the Sloan-Kettering Cancer Research Center was once criticized for falsifying data. Among his data were figures obtained from 6 groups of mice, with 20 individual mice in each group. These values were given for the percentage of successes in each group: 53%, 58%, 63%, 46%, 48%, 67%. What is the major flaw?

24. **What’s Wrong with This Picture?** Try to identify each of the four major flaws in the following. A daily newspaper ran a survey by asking readers to call in their response to this question: “Do you support the development of atomic weapons that could kill millions of innocent people?” It was reported that 20 readers responded and 87% said “no” while 13% said “yes.”

25. **Biased Wording** Write a survey question that addresses a topic of your interest. First word the question objectively, then word it to encourage responses in one direction, then reword it a third time to sway responses in the opposite direction.

26. **Graphs** Currently, women earn about 74 cents for each dollar earned by men doing the same job. Draw a graph that depicts this information objectively, then draw a graph that exaggerates the difference. (*Hint: See Figure 1-1.*)