1. (5 points) A sample of households in a community is selected at random from the telephone directory. In this community, 4% of households have no telephone, 10% have only cell phones, and another 25% have unlisted telephone numbers. The sample will certainly suffer from

A. nonresponse.

B. false responses.

C. undercoverage.

2. (5 points) A study of voting chose 663 registered Canadian voters at random shortly after the 2008 elections. Of these, 72% said they had voted in the election. Election records show that only **58.8%** of registered voters voted in the election (a record low). The boldface, underlined number is a

A. statistic.

B. parameter.

C. sampling distribution.

3. (5 points) A laboratory scale is known to have a standard deviation of $\sigma = 0.001$ gram in repeated weighings. Scale readings in repeated weighings are Normally distributed, with mean equal to the true weight of the specimen. Three weighings of a specimen on this scale give 3.412, 3.416, and 3.414 grams.
   You want a 99% confidence interval for the true weight of this specimen. The margin of error for this interval will be

A. greater than the margin of error for 95% confidence.

B. about the same as the margin of error for 95% confidence.

C. smaller than the margin of error for 95% confidence.

4. (5 points) To give a 99.9% confidence interval for a population mean μ, you would use the critical value

A. $z^* = 2.576$.

B. $z^* = 3.291$.

C. $z^* = 1.960$.

5. (20 points) Here are the IQ test scores of 31 seventh-grade girls in a Midwest school district:

$$
\begin{array}{cccccccccc}
114 & 100 & 108 & 130 & 111 & 103 & 104 & 89 & 102 & 91 \\
120 & 132 & 111 & 128 & 74 & 112 & 107 & 103 & 114 & 118 \\
98 & 114 & 119 & 96 & 103 & 86 & 112 & 105 & 72 & 112 \\
93
\end{array}
$$

(a) These 31 girls are an SRS of all seventh-grade girls in the school district. Suppose that the standard deviation of IQ scores in this population is known to be $\sigma = 15$. We expect the distribution of IQ scores to be close to Normal. Make a stemplot of the distribution of these 31 scores (split the stems) to verify that there are no major departures from Normality. (If you prefer, you may make a histogram with a bin width of 5.) You have now checked the "simple conditions" to the extent possible.

(b) Estimate the mean IQ score for all seventh-grade girls in the school district, using a 99% confidence interval.

6. (20 points) A class survey in a large class for first-year college students asked, About how many minutes do you study on a typical weeknight? The mean response of the 463 students was $\bar{x} = 118$ minutes. Suppose that we know that the study time follows a Normal distribution with standard deviation $\sigma = 65$ minutes in the population of all first-year students at this university. Regard these students as an SRS from the population of all first-year students at this university. Does the study give good evidence that students claim to study less than 2 hours per night on the average?

(a) State null and alternative hypotheses in terms of the mean study time in minutes for the population.

(b) What is the value of the test statistic z?

(c) What is the P-value of the test? Can you conclude that students do claim to study less than 2 hours per weeknight on the average?

7. (20 points) Light vehicles sold in the United States must emit an average of no more than 0.07 grams per mile (g/mi) of nitrogen oxides (NOX). NOX emissions for one car model vary Normally with mean 0.05 g/mi and standard deviation 0.01 g/mi.

(a) What is the probability that a single car of this model emits more than 0.07 g/mi of NOX?

(b) A company has 25 cars of this model in its fleet. What is the probability that the average NOX level $\bar{x}$ of these cars is above 0.07 g/mi?

8. **Gulf oil spill.** (20 points) Two months after the Gulf oil spill began in April 2010, nearly half of Americans (49%) believed that at least some of the affected beaches will never recover, according to a Gallup Poll conducted June 11 to 13, 2010. Results are based on telephone interviews of a random sample of 1014 adults, aged 18 and older, selected using random digit dialing sampling. In the survey methods section, Gallup reports: "Interviews are conducted with respondents on landline telephones (for respondents with a landline telephone) and cellular phones (for respondents who are cell-phone-only). Each sample includes a minimum quota of 150 cell phoneonly respondents and 850 landline respondents, with additional minimum quotas among landline respondents for gender within region."

(a) What is automated random digit dialing? Why is it a practical method for obtaining (almost) an SRS of households with landline phones?

(b) The survey wants the opinion of an individual adult. Several adults may live in a household. In that case, the survey interviewed the adult with the most recent birthday. Why is this preferable to simply interviewing the person who answers the phone?

(c) The survey included both landline telephones and cellular phones. Why do you think this may be important? Sampling landline telephones and cellular phones separately corresponds to what type of sampling design?