Chapter 5 Solutions

5.1

- (a) 29777.
- (b) This is a *voluntary response sample*. It is biased in favor of those who feel most strongly about the issue being surveyed.

5.2

- (a) A voluntary response sample.
- (b) It is biased toward readers who feel most strongly about the issue. 85% is probably higher than the true percent because it's likely that readers who feel most strongly about this issue have in some way been involved in an accident caused by cell phone use while driving.

5.3

- (a) A convenience sample.
- (b) It's unlikely that the first 100 students to arrive at school are representative of the student population in general. 7.2 hours is probably higher since you might expect that the students who arrive first are those who got a good night's sleep the night before. Students who received less sleep the night before are probably more likely to run late the next morning.

5.4

- (a) Respondents are not likely to admit to not washing their hands when asked in a telephone survey.
- (b) If the adults under observation knew they were being observed, they would be more likely to wash their hands. This is also true if they see someone else washing. To obtain a more accurate sample of the population, it's also important not to count repeat users.
- 5.5 Answers will vary. For example:
- (a) Announce in daily bulletin that there is a survey concerning parking for students available in the main office for students who want to respond.
- (b) Personally interview a group of students having lunch in the center quad.

5.6

(a) In the second sample, 25/75=1/3 of the fish had been captured in the first sample. Thus, the original sample represented about 1/3 of the total population. The total population size, N, can then be found as follows:

$$N \cdot \frac{1}{3} = 50 \ (n_1) \Longrightarrow N = 150.$$

- (b) Probably not. It is an estimate only and is likely to vary slightly from the actual number.
- (c) The fish are sampled randomly for each sample.
- 5.7 Associate each of the apartment complexes with a two-digit number, with Ashley Oaks being 01, Bay Pointe being 02, continuing in alphabetical order

until you get to Williamsburg, which is assigned 33. Begin at line 117 and consider two-digit numbers 01 to 33, ignoring two-digit numbers 34 to 00. Move along the line until you find three *different* two-digit numbers in the range 01 to 33. That line reads 38**16**7 985**32** 62**18**3. The three selections are 16, 32, and 18, which correspond to Fairington, Waterford Court, and Fowler.

5.8

- (a) False. If the digits are truly random, there will be four 0s in each row of 40 digits *on average*, but not in *each* row.
- (b) True. Each of the pairs of digits, 01, 02, . . ., 99, 00 are equally likely to occur in a table of random digits. Since there are 100 possible pairs, each pair will occur, on average, one time out of 100. In particular, 00 have 1/100 chance of appearing, the same chance as any other pair.
- (c) False. Any four-digit group is as likely to appear as any other four-digit group.

5.9

- (a) Label each of the 440 voting precincts with a three digit number, 001, 002, .
 . ., 440. You could label up to 1000 precincts using this number of digits (including 000).
- (b) 395, 020, 118, 167, 300, 360, 241, 065, 188, 365.

5.10

- (a) Each member of the faculty, male or female, has 1 chance in 10 of being selected (100 of 1000 men, 50 of 500 women).
- (b) This is not an SRS since not every sample of 150 is equally likely. For example, it is not possible that the entire sample be female, yet that is one of the possible samples of 150 that could be drawn from the 1500 faculty members.
- 5.11 Alphabetically associate each name with a two-digit number: Agarwal = 01, Andrews = 02, . . . , Wilson = 25. Enter the table at line 101 (your answer may differ if you chose a different line to begin the selections) and proceed until you find three different pairs, 01–25. Those numbers are 19, 22, and 05. The volunteers are Petrucelli, Shen, and Brockman.

- (a) Assuming none of the phones can be shipped until after the inspection, inspecting a random sample of 20 phones could hold up the shipping process. Additionally, in order to obtain a random sample, the phones must be numbered in some way. Keeping track of the ordering of 1000 phones may be difficult.
- (b) It's possible that the quality of the phones produced changes over the course of the day so that the last phones manufactured are not representative of the day's production.
- (c) This is not an SRS because each sample of 20 phones does not have the same probability of being selected. In fact, the 20 phones that are sampled

will be the 50^{th} , 100^{th} , ..., 1000^{th} , the others have no chance of being sampled.

5.13

- (a) Assign 1 to heads and 2 to tails (or vice versa). Enter the number 2 next to "Population =1 to" and click Reset. Enter a sample size of 1 and click the Sample button. Whichever number is returned (1 or 2) determines whether you "flipped" a heads or tails.
- (b) Enter the number 52 next to "Population=1 to" and click Reset. Enter a sample of size 52 and click the Sample button. The 52 numbers will be randomly rearranged, which simulates shuffling a deck of 52 cards.
- (c) Assign each of the adults a distinct number between 1 and 500. Enter the number 500 next to "Population=1 to" and click Reset. Enter a sample of size 12 and click the Sample button. The jury consists of the residents corresponding to the 12 numbers from the sample.

5.14

- (a) Assign 1 to heads and 2 to tails (or vice versa). Enter the command randInt(1,2) on your calculator, whichever number is returned (1 or 2) determines whether you "flipped" a heads or tails.
- (b) This cannot be done easily using the randInt function on your calculator. This function only allows you to sample with replacement from your population.
- (c) Assign each of the adults a distinct number between 1 and 500. Enter the command randInt(1,500,25) to randomly sample 25 numbers between 1 and 500. Take the first 12 numbers that are distinct, the corresponding adults give you your jury. 25 was chosen randomly, it will probably take fewer than 25 random integers, but may take more, to obtain a distinct sample.

- (a) The population is black residents of Miami. The sample is an SRS of people living in predominately black neighborhoods.
- (b) People in minority neighborhoods are often afraid of the police and might not respond truthfully to questions about the police when asked by a membereven a black member-of the police department.
- 5.16 To the extent the random sample of 500 adults was representative of the population from which it was drawn, it is possible to generalize the findings, subject to sampling error, to the larger population. Since the 186,000 call-in voters were a voluntary response sample and not a random sample, there is no way to know just exactly whom they represent. It certainly cannot be concluded that they are more representative of "all Americans" than a random sample.
- 5.17 Answers will vary.

- (a) Yes, if you wanted every student who wants a ticket to have an equal chance. No, if you would prefer to give preference to, say, juniors and seniors.
- (b) No, not all persons have the same need. People waiting for transplants should be ordered in terms of the severity of their need. Among patients with equal need, date of entry onto the list should be considered.

- (a) Assign a four-digit number, 0001-3478, to each of the 3478 students in alphabetical order (so that 0001 is associated with the first name on the alphabetical list, etc.).
- (b) Enter the table at line 105 and consider groups of four digits at a time. The first five students selected are those with numbers 2940, 0769, 1481, 2975, and 1315.
- 5.20 In many households, the same person always answers the phone. But this person may not represent the views of all people in the household. To avoid bias, the sample survey is interested in a person chosen at random at the phone number selected.
- 5.21 The sampling method is likely biased because the woman is collecting a convenience sample, not a simple random sample. Since she is stopping students "now and then" in front of the cafeteria to ask about the quality of food in the cafeteria, it is unlikely that her sample is representative of the student body at large (for one, people who don't like the cafeteria food are unlikely to be at the cafeteria).
- 5.22 Associate 01 with A1109, 02 with A1123, . . ., 50 with B1201. Enter the random digit table at line 139 and consider groups of digits, 01-50 two at a time. Ignore the digits 51-00. Select the first five distinct two-digit numbers that correspond to the flat screen televisions. The selected digits are: 04, 10, 43, 35, and 34. These correspond to the televisions with serial numbers A1197, A2032, B0046, A2385, and B1195.
- 5.23 These are opinion polls and not a call to political action. The fact that people favor stronger laws does not necessarily mean that they are willing to lobby their legislators for new laws. The pressure on politicians from lobbyists is such that politicians tend to cater to them rather than to opinion polls about what the public wants.
- 5.24 Answers will vary. If the assumption is made that all of the patients wanting to enter the lottery are equally in need of the drug, then a lottery is a fair way of deciding who will receive it. Another method might involve grouping patients by their likelihood of being helped by the drug and then selecting randomly within groups.

- 5.25 It is likely to be biased on the high side since they surveyed persons who have library cards. People with library cards are more likely to be readers than those who do not have library cards.
- 5.26 The second survey is more likely to give an accurate view. This is likely to be the result of lower bias. The second survey, being random, can be generalized to the population from which it was drawn (working women). The first survey is only of women affiliated with one of the 1600 organizations listed. Further, even these women were not randomly sampled; rather, the organizations were asked to distribute the surveys. It suffers from many of the same defects as the Hite Report discussed in the text.
- 5.27 Population of interest: people who signed a card saying that they intend to quit smoking. Parameter of interest: proportion of the population who signed the card saying they would not smoke that actually quit smoking. Sample: a random sample of 1000 people who signed the cards. Sample statistic: 21%.
- 5.28 20 is a parameter; 19.6 is a statistic.
- 5.29 8% is a statistic; 10% is a parameter.
- 5.30 Both are statistics (there is no mention of a value for the population of all ducks).
- 5.31 It was a comparative experiment. The treatment, imposed by the researchers, was the location where the ducks slept.

- (a) To obtain a simple random sample, every tree would need to have an equal chance of being included in the sample. It's not practical to even identify every tree in the park.
- (b) This sampling method is biased because these trees are unlikely to be representative of the population. Trees along the main road are more likely to be damaged by cars and people and may be more susceptible to infestation.
- (c) The scientists can be confident that the actual number of pine trees in the area that are infected by the pine beetle is near 35% although there is always some error associated with using sampling to estimate population parameters.

- (a) High bias, high variability (systematically low, spread out).
- (b) Low bias, low variability (centered at parameter, tightly packed).
- (c) Low bias, high variability (centered at parameter, very spread out).
- (d) High bias, low variability (systematically high, tightly packed).

5.34 If the true population percentage were 60%, 57% would not be a surprising sample result, but 37% would be. In fact, looking at Figure 5.6, a value of 37% would almost never be observed.

5.35

- (a) Answers will vary. Some examples follow. The Hunter College survey was an observational study as opposed to a national survey. Students may have missed drivers who were using hands-free devices to talk on their phones. Intersections in New York are not likely representative of the nation as a whole.
- (b) No. The discrepancy is not due to sample size. See reasons given in (a).

5.36

- (a) A larger sample does not reduce the bias of a poll result. Random sampling *does* reduce bias. If the sampling technique results in bias, simply increasing the sample size will not reduce bias.
- (b) A larger sample will reduce the variability of the result. More people means more information which means less variability.

5.37

- (a) Answers will vary. For example, females are 02, 04, 05, 10, 12, 14, 15, 17, 18, and 21. One set of 20 random drawings yielded the following number of females: 1, 2, 3, 2, 1, 3, 2, 4, 1, 2, 2, 3, 2, 3, 2, 2, 2, 2, 1, and 2.
- (b) Answers will depend on the results in part (a). For the 20 samples given, the dot plot looks like this:



The average number of females is 2.1.

(c) It would be highly unusual to have none of the 5 tickets go to a woman. In this group of 20, at least one woman was selected in each group of 5. The club members might well suspect discrimination if none of the 5 tickets go to women.

- (a) The population is the residents of the Province of Ontario. The sample is 61,239 randomly selected residents.
- (b) It is likely these estimates are close to the truth. The fact that it is a random sample reduces bias so that we can be certain that the sample values will center around the true value. The large sample reduces variability about the

center. So, we have low bias due to randomization and low variability due to the large sample.

- 5.39 The approximate margin of error for 95% confidence for samples of size 25 is $\frac{1}{\sqrt{25}} = 0.2$ and for samples of size 100 is $\frac{1}{\sqrt{100}} = 0.1$. The larger sample size reduces the margin of error so that we can be 95% certain that the true population value lies within 0.1 of the sample value rather than within 0.2.
- 5.40 The approximate margin of error for 95% confidence is $\frac{1}{\sqrt{501}} = 0.045$; the

announced margin of error (5%) is somewhat higher.

5.41 For a sample of the same size, the margin of error would be larger. In order to have greater confidence in our estimate based on a sample of the same size, we would have to widen the interval describing how close the sample statistic lies to the parameter, i.e., the margin of error would be larger.

5.42

- (a) We are 95% confident that the true percentage of women in the population who would answer "yes" to the question is between 45% and 51%.
- (b) The 48% refers to a sample value. In this sample we know that 48% said "yes." The 48% is only an estimate of the population value and is subject to sampling variability. A different sample would undoubtedly give a different percentage estimate.
- (c) The procedure we have used will yield an interval that will "contain" the true population value 95% of the time on average.
- 5.43 The sample size was larger for women than for men. The margin of error $\approx \frac{1}{\sqrt{472}} = 0.046$ for men, and, for women, $\frac{1}{\sqrt{1025}} = 0.031$.

5.44

- (a) Margin of error $\approx \frac{1}{\sqrt{1108}} \approx 0.03$ for a 95% confidence interval.
- (b) We are 95% confident that the true percentage of adults who believe there is a heaven is in the interval 75% to 81%.
- 5.45 Since we are not told the adult populations of Chicago and Dayton, we will assume that the given populations are the adult populations. 1/10 of 1% of 2,800,000 persons in Chicago is 2800 people, which yields a margin of error of $\frac{1}{\sqrt{2800}} = 0.019$. 1/10 of 1% of 156,000 persons in Dayton is only 156 people, which gives a margin of error of $\frac{1}{\sqrt{156}} = 0.08$. The precision will be

greater in Chicago. In general, the margin of error will decrease as the sample size increases.

- 5.46 The results can be expected to be equally accurate in each state. The margin of error is not a function of the total population, but only of the sample size (as long as the population is much larger than the sample).
- 5.47 13% is a parameter; 16% is a statistic.
- 5.48 12.2 is a statistic; 15.1 is a statistic.

$$5.49 \quad \frac{1}{\sqrt{61,239}} = 0.004.$$

5.50 The student is wrong. We do not know what percentage of young men have scores between 267.8 and 276.2. The statement refers to the procedure used to obtain the confidence interval. Using this procedure results in an interval that contains the value of the parameter 95% of the time.

5.51

(a) $\frac{742}{1070} \approx 0.69$. The population parameter *p* is the proportion of teens aged 13 to 17 pationwide who have received personal messages online from people they

17 nationwide who have received personal messages online from people they don't know.

(b) We are 95% confident that the proportion of teens aged 13 to 17 nationwide who have received personal messages online from people they don't know is between 66% and 72%.

- (a) The margin of error would be larger. Based on the same sample size, greater confidence requires that the confidence interval, hence the margin of error, be wider. We cannot place more confidence in an interval estimate that is of the same or smaller width.
- (b) The sample size must be increased.
- 5.53
- (a) The approximate margins of error for 95% confidence are given by $\frac{1}{\sqrt{3024}} \approx 0.02$ and $\frac{1}{\sqrt{1046}} \approx 0.03$. These agree with the quoted margins of error.
- (b) We are 95% confident that the percentage of American adults who play computer or video games is between 38% and 42%. Of those American adults who play computer or video games, we are 95% confident that between 7% and 13% play for 10 or more hours per week.
- (c) Answers will vary. One possible source is the sampling method how were the adults selected, are they representative of the entire American adult population? Another possible source of error could be inaccurate responses. Depending on how the questions were worded, people may not have responded to the questions honestly.

- (d) Answers will vary.
- 5.54 5, 6, 5, 8, 6, 5, 6, 6, 5, 1, 7, 5, 7, 5, 4, 7, 4, 5, 5, 3, 5, 5, 6, 7, 4, 4, 4, 5, 2, 6, 9, 2, 8, 5, 6, 2, 5, 6, 5, 6, 3, 3, 2, 4, 5, 6, 3, 7, 3, and 6.



The histogram does center around the truth ((0.20)(25)=5) of the population. The smallest count is 1 and the largest count is 9. 12% were 4; 30% were 5; and 22% were 6.

5.55 Answers will vary. For example, Nonresponse: Some people will choose not to participate because they feel that the topic is too sensitive and they are afraid of sharing their opinions with a pollster.

5.56

- (a) Nonsampling error. People may lie in response to questions about past drug use. It is not an error due to the act of taking a sample, rather it is a response error.
- (b) Nonsampling error. This is an example of a processing error.
- (c) Sampling error. This will suffer from the same forms of bias as any voluntary response survey.

5.57

- (a) 11.3% (1468/13000)
- (b) $\frac{1}{\sqrt{1468}} = 0.026$. This is close to the 2.8% claimed.
- (c) No. The 2.6% margin of error is based on the assumption of a SRS, when in fact it was a voluntary response sample. There is only a response rate of 11.3%. We have no way of knowing the opinions of the 88.7% of those who did not respond.
- 5.58 This is an example of sampling error since variation from sample to sample is a consequence of taking a survey. The survey's announced margin of error does take this source of error into account.
- 5.59 Answers will vary.

- (a) Answers will vary.
- (b) Answers will vary.

- 5.61 Margin of error is a function of sample size, not of the fraction the sample is of the population. A SRS of 300 undergraduates was taken compared to a SRS of 200 graduate students. The larger sample will always give the smaller margin of error.
- 5.62 There are 19 basketball players on the list and 9 golfers. We need to randomly select 7 of the 19 basketball players and 3 of the 9 golfers. To select the 7 basketball players, alphabetically assign each player a two-digit number 01-19. Beginning at the start of line 101, consider two-digit numbers until you have obtained seven different numbers in the interval 01-19. Ignore digits in the range 20-00. The seven digits chosen are 19, 05, 13, 19 (repeated, so ignore), 17, 09, 13 (repeated), and 07. The players chosen are: Wade, Carter, Miller, Stoudamire, Gasol, and Farmar.

To select the 3 golfers, alphabetically assign each golfer a one-digit number 1-9. Ignore 0. Since we used lines 101-104 to select the basketball players, we will begin on line 105 of Table A. Move along the table until you find three different digits 1-9. The digits are 9, 5, 5, 9, and 2. The golfers chosen are Woods, Mickelson, and Els.

5.63

- (a) The sample is chosen in stages. That is, it is not a SRS of all Europeans. Seventeen countries were chosen and then 1000 adults were interviewed in each of those countries. This weights the countries equally.
- (b) The seventeen countries.
- (c) There is random probability sampling in at least one stage of the sampling process.
- 5.64 Paradoxically, many people would be in favor of "protecting the life of the unborn child" but would not be in favor of "prohibiting abortions." OF COURSE we should *protect* unborn children (hence the higher rating for this question) but it is less clear that we should *prohibit* abortion (hence the lower rating for this question). The American culture of freedom makes us oppose prohibitions on freedom of choice. The culture also wants to *protect* the rights of people, even those as yet unborn.
- 5.65 Open questions have the advantage of allowing the respondent a wide range of response. Shades of meaning can be inferred by analysis of the response. They have the disadvantage of being difficult to analyze if your point is to find out the extent to which a person likes or dislikes broccoli ("It depends on my mood. Sometimes I crave it; sometimes I don't.")

Closed questions have the advantage of being easy to analyze. By associating the choices with a numerical scale, the average response can be quantified. They have the disadvantage of not being able to discern nuances of response (as in the example above in which the mood of the respondent determines the answer).

- 5.66 Answers will vary.
- (a) An example of a question that is designed to get one answer rather than another might be, "Do you support a woman's right to make medical decisions concerning her own body?"
- (b) An example of a question that is confusing might be, "Does is seem likely to you or unlikely that the invasion of Iraq was not going to be successful?"

- (a) Entering the table at line 130 and proceeding as directed in Step 1 of the problem, we obtain 69 as our first number. The rest of the sample consists of the numbers 169, 269, 369, and 469.
- (b) 5/500 = 0.01. Until we begin the process of selecting the first number, every number in the interval 1-500 is equally likely to be chosen.
- (c) This is not an SRS since not all possible samples are equally likely. For example, a run of 5 consecutive digits is a possible sample in an SRS but is not possible under this stratified scheme.

5.68

(a) Assign each male alphabetically a number from 0001-2000. Begin on line 122 and note four-digit numbers, including in your sample numbers in the range 0001-2000 and ignoring everything else. The first five male numbers obtained are 1387, 0529, 0908, 1369, and 0815. For the women, assign each alphabetically a number from 001-500. Begin on line 124 and select the first five three-digit numbers in the range 001-500, ignoring all others. The numbers selected are 350, 143, 367, 494, and 271.

(b)
$$\frac{200}{2000} = 0.1; \frac{200}{500} = 0.4.$$

- (c) The conclusion is wrong because women are over-weighted in the sample. That is, 40% of the possible women are in the sample but only 10% of the males. The 240 "yeses" are mostly women and, although they comprise only 20% of the population, their responses are given equal weight to the men's.
- (d) 1/10. This is not an SRS since not all possible samples of size 250 are equally likely to be the sample (it is not possible, for example, to have the sample be all women, but that is one possible sample).

- (a) 40 (20% of 200).
- (b) A stratified sample. A sample size of 200 is too small to guarantee that women will be represented in proportion to their numbers in the school. If we use a stratified sample, we can obtain separate conclusions about men and women.
- 5.70 Who carried out the survey? The Wall Street Journal/NBC News hired the polling organization of Peter Hart and Robert Teeter. What was the population? Adult residents of the United States. How was the sample selected? Random selection drawn from a list of 520 randomly selected geographic points in the continental United States. How large was the sample? 2012.

What was the response rate? No answer given. How were the subjects contacted? By telephone. When was the survey conducted? Thursday through Sunday. What were the exact questions asked? No answer given.

5.71

- (a) We are told that "The sample was drawn from 520 randomly selected geographic points in the continental United States Each region was represented in proportion to its population."
- (b) The "geographic points" are not all the same size, and it's possible that some of the larger locations would be missed, resulting in bias.
- 5.72 Answers will vary.
- (a) *Advantages*: much detail about which programs were watched and who watched them.

Disadvantages: viewers may not be conscientious in keeping of their diary; they must remember to mail them in, which makes this like a voluntary response survey.

- (b) Advantages: clear data collection; easy to tally. Disadvantages: requires an accurate memory of which shows were watched; viewers may not always be honest with interviewers (do not want to admit, for example, that they watch a lot of soap operas).
- (c) Advantages: easy to collect data. Disadvantages: people may not tell the truth or refuse to answer a telephone poll.
- (d) *Advantages*: automated-will accurately list which programs the TV is tuned to.

Disadvantages: even though the set is on, no one may be watching it

(e) *Advantages*: ease of data collection; requires active viewer. *Disadvantages*: dependent on viewers remembering to use the remote.

5.73

(a) $\frac{1}{\sqrt{50,000}} \approx 0.004.$

(b) Probably because some people who did not vote told interviewers that they had voted. They didn't want to admit that they hadn't voted.

- (a) The 28% because it guarantees the greatest amount of anonymity. People reluctant to tell the truth about their cocaine use may be less than truthful to a personal interviewer.
- (b) Answers will vary. For example, questions about sexual behavior; questions about honesty in reporting income.
- 5.75
- (a) Sampling error. This can result in undercoverage, where some people in the population are left out of the actual sampling frame (those without telephones and those with unlisted numbers).

- (b) Nonsampling error. This is non-response and is not a function of sample selection.
- (c) Sampling error. This is non-random and can result in systematic bias due to the actions of the interviewers; e.g., the interviewer might choose to interview only "safe" looking persons.
- 5.76 Answers will vary.

- (a) You are sampling only from the lower priced ticket holders.
- (b) This is a sampling error. The sampling frame differs from the population of interest (undercoverage)
- 5.78 There are 30 members in the class. Assign a two-digit number, 01-30, alphabetically to each person in the class. Enter the random digit table on line 145 and move through the table until you find four two-digit entries in the interval 01-30. Ignore all others and repetitions. The four two-digit numbers selected are 19, 26, 06, and 09. The students corresponding to these numbers are Montoya, Rodriquez, Castillo, and Fernandez.

5.79

- (a) The population of West Lafayette, Indiana.
- (b) The proportion who favor one-way streets is almost certainly larger than the 14/98 in the sample. This is a voluntary response survey. Those who feel strongest about the issue are most likely to respond. In this case, opponents of change appear to feel more strongly about the issue than those who favor, or are at least ambivalent, about the change.

- (a) American college students.
- (b) Students in freshman psychology at one university.
- (c) The sampling frame does not come close to representing the population to which Dr. Iconu wants to generalize his findings.
- (d) The wording of the question seems somewhat slanted toward a "yes" answer. There is almost an implied subtext of "in all fairness, you can't expect to watch TV without commercials". It's not clear what question Dr. Iconu is actually trying to answer because of the discrepancy between the question and the announced result. Does he want to know whether students are in favor of having commercials on TV in order to keep their costs down or does he want to know whether students enjoy commercials in their own right?
- (e) The question is misleading and does not imply the announced result.
 - The sampling frame is not representative of the population of interest.
 - 82% is a statistic and, as such, is just a point estimate of a population value. He should provide an estimate together with a margin of error (which, in this case, is $\pm 10\%$!).
- (f) The defense is not relevant. The fact that he has selected an SRS from his sampling frame simply means that 82% is a point estimate of the percent of freshmen psychology students at a single university.

- (a) Associate each student on the list with a four-digit number in the range 0001-3500. Choose a line in the table of random numbers and begin moving through the table, identifying four-digit numbers in the given range, ignoring the others and ignoring duplications. Continue this process until you have identified 250 students. [An easier way to do this, using the TI-83, would be to use MATH PRB RandInt(1,3500) and pressing ENTER until you had obtained 250 different numbers].
- (b) For a systematic sample you would need every 14th name on an ordered list. Randomly select one of the first 14 students on the list and then every 14th name on the list from then on.
- (c) Choose an SRS of 200 students from the list of 2400 bussed students and another SRS of 50 students from the 1100 students who live nearby.
- (d) Answers will vary. For example, choose a stratified sample in order to be sure that attitudes of bussed and local students are represented fairly.
- 5.82 The advantage of bigger samples is a reduction in the amount of variability in the sampling distribution of the statistic being measured. That is, larger samples result in smaller margins of error.
- 5.83 The first question pictures a pugnacious president "fighting" to save his job rather than facing the consequences. The second question portrays a more reasonable alternative: allow a process to occur that will determine the outcome. It is easier to support than "fight or quit."
- 5.84 By "95% certainty," Harris means that the procedure that produced the interval with this margin of error will result in an interval that captures the true population value 95% of the time.

5.85

- (a) The population is adults who used the Internet in the week prior to the survey.
- (b) $\frac{1}{\sqrt{586}} = 0.041$. $\frac{152}{586} = 0.26$. We are 95% confident that the true proportion of all adults who used the Internet in the week prior to the survey who believe that the Internet has made their life "much better" is in the interval 0.22 to 0.30 (0.26 ± 0.04).
- 5.86 *Who carried out the survey? New York Times/*CBS News.

What was the population? Adults throughout the United States.

How was the sample selected? "The sample of telephone numbers called was randomly selected by a computer from a list of more than 42,000 active residential exchanges across the country. In each exchange, random digits were added to form a complete telephone number, thus permitting access to both listed and unlisted numbers. In each household, one adult was designated by a random procedure to be the respondent for the survey." *How large was the sample*? 1067.

What was the response rate? Not given.

How were the subjects contacted? By telephone. *When was the survey conducted*? March 15 through March 18, 2008. What were the exact questions asked? Not given.