Statistics: Chapter 4 Solutions

Lesson 4.1.1

4-1.   a.   Ideas vary.

   b.   Questions should be sufficiently sophisticated to allow for multiple survey questions.

   c.   Plans should reflect various ideas, many of which will involve asking people questions.

4-2.   a.   Possible response: use of the word "poor" may bias responders to think that this is something that gets worried about. Possible revision: Do teenagers worry about their grades?

   b.   Every reasonable person wants students to be more successful but not everyone may agree with the Governor's approach.

   c.   Use of the words "frequent" and "brutal" may bias responders.

   d.   It is implied that the current system is not effective. Why else would the question be on a survey?

   e.   The question implies that teachers are underpaid. Is a teacher asking this question?

   f.   Responders may feel that to answer "no" is to say they are not healthy.

4-3.   a.   Questions (c) and (d): Once people are thinking about the level of violence common in movies, they are more likely to think the rating system is not effective.

   b.   By prefacing the question with a statement that exercise is healthy, question (f) can create bias.

   c.   Question (b): A person might not support or know about the Governor's education plan but may support success for all students in school. Using two separate questions would reduce bias.

   d.   Question (a): The word "poor" suggests that the teenagers would be worried. Question (c): The words "frequent" and "brutal" are likely to influence responses.

   e.   It could be argued that all of the questions could create this sort of bias.

4-4.   Sample responses, each of which biases to receive more "yes" answers than normal. Question Order: "Do you think students should learn more in school? Do you think students should attend school for 200 days to give them time to learn more?" Preface: "Students in the highest achieving countries go to school as many as 250 days a year. Do you think students should attend school for 180 days, as they do now, or for 200 days?" Two Questions in One: "Do you support the President's education plan of giving students 20 more days to learn each year?" Biased Wording: "Do you think that students could benefit from 20 more days each year in a supportive educational environment?" Desire to Please: "Do you agree that students need another 20 days each year to learn?"

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4-5.   a.   Arm span is important in sports like basketball, swimming, and weightlifting. It has also been found to be useful in predicting height.

           b.   Measurements were taken for only one arm, or from the center of the back to the tip of the fingers.

           c.   Responses might be given in inches and centimeters.

           d.   What is your arm span? (Open arms wide and measure the distance across your back from tip of right hand middle finger to tip of left hand middle finger.) Answer to the nearest centimeter.

4-6.   a.   Answers may include: The government may use the information to decide which programs to offer to meet the needs of a changing population. Businesses may use the information to choose where to expand or reduce their market size.

           b.   The definition of family varies from person to person. While the definition of household is clearer, it is still subject to interpretation.

4-7.   a.   Questions will vary.

           b.   Feedback will vary.

           c.   Revisions will vary.

4-8.   a.   Answers vary. Question 1 is likely to give you more accurate information for each person that responds, but it may be harder to combine responses, since each person might word things differently or say many different things. Question 2 will be easier to analyze, but it is less likely to represent people's actual preferences.

           b.   Open questions will give more accurate information, but may be less convenient to analyze. You might want to ask a closed question when you are only interested in particular responses.

           c.   Answers vary.

4-9. **a.** Variable: Minutes it takes to commute. Population: U.S. employees; the population is too large to conveniently measure so sampling should be used.

b. Variable: Time in hours and minutes, as reported on a clock. Population: students in the class. A census can be taken.

c. Variable: Milligrams (or IUs) of Vitamin A. Population: All carrots. To measure the Vitamin A in a carrot, it must be destroyed, so even if it were possible to measure all carrots, it would not be wise. Sampling must be used.

d. Variable: Whether you approve or disapprove of the Governor. Population: The public (the media does not generally make this population very clear). It could be all voting adults, all adults, or all people in the state. In any case, the population is too large, so sampling must be used.

e. Variable: Weight in pounds. Population: Elevator cables. To find this, elevator cables must hold greater and greater weight until they break. If all elevator cables were tested, there would be none left to use for elevators. Sampling must be used.

f. Variable: Answers vary but should include the names of specific movies. Population: Your friends. A census can be taken.

4-10. **a.** Desire to Please: Students will most likely not raise their hands for fear of looking bad in front of their teacher.

b. Preface. Getting kicked out of college is a serious threat. Students will be more likely to circle "No."

4-11. Counts in each category:

	Dog	No Dog	
Cat	82	42	124
No Cat	55	21	76
	137	63	200

Percentage table (two ways):

	Cat	No Cat
Dog	66%	72%
No Dog	34%	28%
	100%	100%

	Dog	No Dog
Cat	60%	67%
No Cat	40%	33%
	100%	100%

There appears to be a weak association between cat and dog ownership. The probability of owning a cat is slightly lower if you own a dog. Only 60% of dog owners have a cat, while 67% of non-dog owners have a cat. Either way of setting up the table gives the same conclusion that there is a weak association. You are less likely to own a dog if you own a cat.

4-12. **a.** The typical number of tardy students (center) is the median, 3 students, because 50% of the students fall at 3 or below. The shape is single-peaked and symmetric, with no gaps or clusters. The IQR (spread) is 1 student, because Q1 is 2 and Q3 is 3. There are no apparent outliers.

b. $(0.43 + 0.13 + 0.07)(30) = 19$ days

c. $\approx 3\%$

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