
Lesson 4.1.3

- 4-25. b. Samples and means will vary.
c. Histograms will vary but centered around 47.2 lbs.
- 4-26. a. So large dogs are not overrepresented and medium dogs under represented. 5:7:3 is roughly the same ratio as the population of dog sizes 39:55:24.
b. Answers vary.
c. The histogram should be centered around $\mu = 47.2$ lbs and have MUCH less variation than the SRS.
- 4-27. a. Answers vary.
b. This method should produce a distribution with more variability than the other methods. The disadvantage to cluster sampling is that the resulting statistics are less precise than with other methods.
c. The dogs in each cluster are similar in weight and therefore do not accurately represent the population. If the toy and the terrier clusters are randomly chosen, the resulting mean weight will seriously underestimate the true mean. Likewise, if the working and herding clusters are chosen, the resulting mean will overestimate the true mean.
- 4-28. David plans to take a systematic sample of dogs by randomly selecting a number between 1 and 6, inclusive. Using the alphabetized list of dogs, David will select the dog that corresponds to that number. He will then include every 8th dog on the list in his sample.
a. It will result in a sample of 15 dogs most of them with a nearly equal chance ($\frac{1}{8}$) of being chosen, although the first six dogs have a $\frac{1}{6}$ chance and the 7th and 8th dogs are systematically eliminated.
b. Answers vary.
c. The histogram should be centered around $\mu = 47.2$ lbs.
- 4-29. a. Answers vary.
b. The histogram should be centered around $\mu = 47.2$ lbs.
c. Answers will vary depending upon how large your class is and the number of sample means you are able to generate. While the sample means resulting from simple random samples will produce a histogram that is centered at $\mu = 40.0$ lbs., the means of the stratified random samples should show less variability. The least useful method will most likely be the cluster sample because the clusters are not heterogeneous with respect to the weight of the dogs.
- 4-30. Plans vary.

4-31. See answers in bold in table below.

| Method of Sampling | Description of Actual Population |
|--|--|
| Call every hundredth name in the phone book. | People with phones who also have their numbers listed |
| Survey people who come to the “Vote Now” booth at the high school football game. | Football fans that are interested enough in the topic to stop. |
| Ask every tenth student entering a high school football game. | A much better survey than above, but still limited only to football fans. |
| Haphazardly survey students during the morning break. | All students at the school. |
| Text response to an online “instant” poll. | People who are using a computer and also a cell phone, who care strongly enough about the issue to respond. |
| Hand out surveys in the library before school. | Studious students. |
| Survey all students in Period 1 English classes. | Could represent all students at school, depending on how students are assigned to English class periods. |

- 4-32. a. Closed b. Open
 c. Open d. Closed

4-33. Sample answers: a: If someone exercised more than once a day, students would not know; b: “outdoor activities”, “jogging and then playing basketball”; c: “winter”, “sunny days”, “holiday season”; d: Students do not learn the region of the country.

- 4-34. a.

| | | |
|---------------|---------------|---------------|
| parents | niece | boyfriend |
| $\frac{1}{3}$ | $\frac{1}{6}$ | $\frac{1}{2}$ |

| | parents | niece | boyfriend |
|-----------|----------------|----------------|----------------|
| parents | $\frac{1}{3}$ | $\frac{1}{6}$ | $\frac{1}{2}$ |
| niece | $\frac{1}{9}$ | $\frac{1}{18}$ | $\frac{1}{6}$ |
| boyfriend | $\frac{1}{18}$ | $\frac{1}{36}$ | $\frac{1}{12}$ |

b. $\frac{\frac{1}{4}}{\frac{1}{2}} = 0.5$

c. $\frac{1}{9} + \frac{1}{6} + \frac{1}{6} + \frac{1}{4} = \frac{25}{36} \approx 69\%$

d. $\frac{\frac{1}{9}}{\frac{1}{6} + \frac{1}{9}} = \frac{2}{5} = 40\%$

- 4-35. a. There is a strong negative linear association between the pressure and volume of these three gases. There are no apparent outliers. The residual plot indicates a curved model might be better than the linear model. About 82% of the variation in the volume of the gases is explained by a linear relationship with pressure. On average for every increase of one atmosphere (at a constant temperature) the volume decreases by 1.65 liters.
- b. The “largest” residual value is about 2.3 liters and it belongs to oxygen at 2 atmospheres of pressure.
- c. 9.40 liters, 6.10 liters, and 2.82 liters
- d. A different model would be better. There is a curved pattern in the residual plot.
- 4-36. mean = 3.75 miles, median = 3.5 miles