STAT 157 – Test 1: Version A

November 12, 2019 **Name:** Solution Set

Instructor: Patricia Wrean

Total: 30 points

1. (5 points) The National, CBC's news broadcast, wants to conduct a poll of its viewers to find out their average age. To do this, they ask people watching the latest broadcast to go to the CBC website and give their age to the nearest year.

   (a) The data are (circle one)

   (i) qualitative ← -1
   (ii) quantitative and discrete
   (iii) quantitative and continuous ← -½

   (b) Consider the following list:

   (i) ages of all Canadians
   (ii) ages of all viewers of the National
   (iii) ages of all viewers of the latest National broadcast
   (iv) ages of all people who answered the question on the website
   (v) the age of a person who answered the question on the website
   (vi) average age of viewers of the National
   (vii) none of the above

   Which entry from the above list is the sample? (iv)

   Which entry from the above list is the experimental unit? (vii)

   (c) Would you expect the distribution of ages from this poll to be the same as the distribution for the general population of Canada? Circle all correct answers (you may choose more than one).

   (i) Yes, because it is a simple random sample.
   (ii) Yes, provided that many people go to the website and answer the question.
   (iii) No, it is a convenience sample.
   (iv) No, because, for example, babies and very young children would not be represented.
   (v) There is not enough information to say.

2. (2 points) State whether the following study is experimental or observational by circling the correct choice.

   Civil engineers examined the statistics for the number of car accidents at a certain intersection in Victoria that used stop signs. They then turned the intersection into a roundabout and examined the statistics for the number of car accidents at that intersection afterwards.

   (Expt) / Observ

3. (3 points) The manager for a large hotel chain wishes to survey guests who stayed at hotels in that chain within the last year. For the following situations, identify the sampling plan used to pick these guests.

   (a) The manager makes a list of all of the guests who stayed at any of the chain's hotels within the past year and randomly chooses a certain number of guests from that list.

   simple random

   (b) For each hotel in the chain, the manager chooses a random selection of guests who stayed within the last year.

   stratified

   (c) The manager makes a list of all guests who stayed at any of the chain's hotels within the past year, then chooses the 37th guest and then every 50th guest thereafter.

   1-in-50 systematic

4. (4 points) You have a set of sample data which consists of temperatures in degrees Fahrenheit. The mean is 50.0°F with a standard deviation of 4.5°F. Each temperature is converted to degrees Celsius by the following procedure:

   (a) You first subtract 32 from each data point. What are the new mean and standard deviation of the data set after this step?

   1 each

   mean: 18.0 standard deviation: 4.5

   (b) You then multiply each data point by $\frac{5}{9}$.What are the new mean and standard deviation of the data set after this step?

   mean: 10.0°F standard deviation: 2.5°F

5. (6 points) A small warehouse employs a supervisor at \$1200 a week, an inventory manager at \$700 per week, eight stock workers at \$400 per week, and two drivers at \$500 a week. 400, 400, 400, 400, 400, 400, 400, 400, 500, 500, 700, 1200

   (a) Calculate the following.

   (i) mean: $\frac{\text{sum}}{\text{number}} = \frac{8\cdot 400 + 2\cdot 500 + 700 + 1200}{12} = 508.\overline{3}$ \$ 508.33 (1)

   (ii) median: average of two middle values \$400 (1)

   (iii) range: \$1200 - \$400 = \$800 \$800 (1)

   (-½ if work 400 - 1200)

   (b) How many employees earn more than the mean wage?

   2 (1)

   (c) Which measure of centre best describes a typical wage at this company? Explain briefly.

   the median is better because the mean is pulled in the direction of the outliers at the high end of the data set (2)

6. (2 points) The following graph is taken from a website giving results of an Australian election in a particular district while the votes were still being counted. In the graph, the politician from the L/NP party has received 16 votes, the ALP politician has received 36 votes, and the politician marked "Other" has received zero votes. Describe briefly the main reason that this graph is badly designed.

this bar should be zero units long - right now it looks like it is half the length of the 16-vote bar

so, bad horizontal scale

7. (2 points) An ad for an exercise product stated that "Using this product will burn 74% more calories." What is misleading about this statement? Explain briefly.

74% more than what? What the product is being compared to is not stated.

(2)

8. (4 points) The time it takes to drive from the Lansdowne campus to the Interurban campus during the day is unimodal and symmetrical, and has a mean of 28.7 minutes and a standard deviation of 3.6 minutes. If you were to make this drive repeatedly, calculate the following information. Show your work.

   (a) For about 99.7% of your trips, the time it takes to drive between campuses will fall within the following interval:

   from 17.9 min to 39.5 min

(2) Empirical: ~99.7% lies within $\bar{x} \pm 3s$

so interval is $\bar{x} \pm 3s = 28.7 \pm 3(3.6) =$ 17.9 to 39.5 min

   (b) For at least 75% of your trips, the time it takes to drive between campuses will fall within the following interval:

   from 21.5 min to 35.9 min

(2) Tcheby: $\geq$ 75% lies within $\bar{x} \pm 2s$

$\bar{x} \pm 2s$: $28.7 \pm 2(3.6) =$ 21.5 to 35.9 min

9. (2 points) A professor has recorded exam grades for 20 students in his class, but one of the grades is no longer readable. If the mean score on the exam was 82 and the mean of the 19 readable scores is 84, what is the value of the unreadable score?

for the 19 readable scores:

$\mu_r = \frac{\Sigma x_i}{n_r}$

$\mu_r \cdot n_r = \Sigma x_i$

$84 \cdot 19 = x_1 + x_2 + x_3 + \ldots x_{19}$

$1596 =$ "

then $\mu_{class} = \frac{\Sigma x_i}{n_{class}}$

$\mu_{class} \, n_{class} = x_1 + x_2 + x_3 + \ldots x_{19} + x_{20}$ (where $x_1 + \ldots x_{19} = 1596$)

$82 \cdot 20 = 1596 + x_{20}$

$x_{20} = 1640 - 1596 = 44$

The unreadable score is 44.