Term: Winter 2024

Instructor: Patricia Wrean

Name: Solution Set

MATH 156
Test 4, Version A

Total = $\frac{\quad}{25}$

- **All of the work on this test must be your own.**
- You may use a scientific calculator. You may not use a calculator with graphing capability or a smartphone app. You may not share calculators between students.

GOOD LUCK!

1. (3 points) Zack, the Learning Skills instructor, is interested in understanding the study habits of Camosun students. To do this, he surveyed 250 Camosun students and recorded the amount of time, rounded to the nearest hour, that each student said that they had studied in the last week.

   For the following questions, choose the best answer.

   (a) The population Zack is interested in is

   (i) the 250 Camosun students measured
   (ii) all Camosun students
   (iii) all college students

   (b) The time studied is

   (i) qualitative
   (ii) quantitative and discrete ← variable is rounded
   (iii) quantitative and continuous

   (c) The data collected is

   (i) univariate ← one variable
   (ii) bivariate
   (iii) multivariate

2. (6 points) Yesterday, the number of cars travelling to Vancouver from Victoria on each BC Ferries sailing is tabulated below:

   105 137 137 156 205 301 368 sum = 1663

   105, 137, 254, 368, 205, 301, 137, 156

   (a) State the mean, median, and range of this data set. If appropriate, round to one decimal place.

   mean = $1663/8 = 207.875$

   median = $\frac{156+205}{2} = \frac{361}{2}$

   range = $368 - 105$

   mean: 207.9

   median: 180.5

   range: 263

   (b) The standard deviation of this data set is 92.4. Calculate the z-score of the lowest data point, rounding your answer to two decimal places, and state whether that value is likely or unlikely.

   $z = \frac{x - \bar{x}}{s} = \frac{105 - 207.9}{92.4}$

   $= -1.1136$

   $|z| < 1$ so likely

   z-score: -1.11

   likely / unlikely

3. (4 points) Heidi is running a small business with five employees, including herself. Initially, each person is making a different salary from everyone else, with Heidi making the highest salary and Judith making the second highest.

   (a) If Heidi gives everyone a \$1000 raise (including herself), what happens to the following quantities? Be as specific as you can!

   median: increase by \$1000

   standard deviation: same

   (b) If Heidi raises Judith's salary to match her own while keeping all other salaries the same (including her own), what happens to the following quantities? Do they increase, decrease, or stay the same?

   mean: increase

   range: same

4. (2 points) Consider the following sets of data. Without calculating any values, indicate which set will have the higher standard deviation (or will they be the same?).

   (a) Set A: 10, 20, 30, 40, 50
   Set B: 20, 30, 40, 50, 60

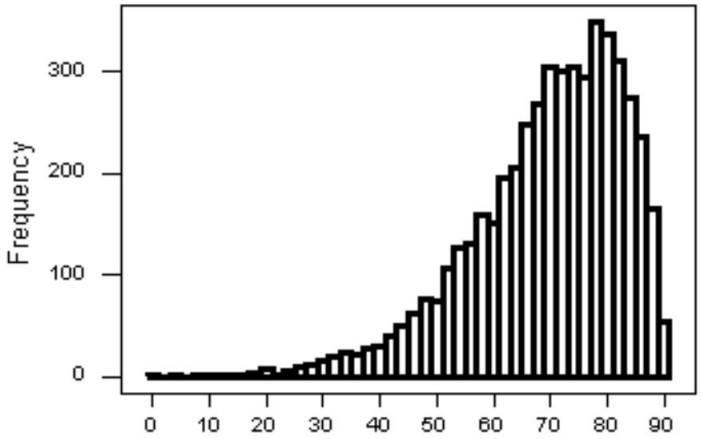
   same

   (b) Set C: 10, 20, 30, 40, 50
   Set D: 5, 10, 15, 20, 25

   C

5. (4 points) Consider the following histogram.



(a) Describe the shape and symmetry of this histogram. If appropriate, include the direction of the skew.

unimodal and skewed to the left

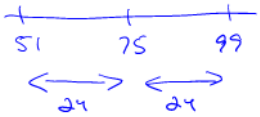
(b) Does Tchebysheff's theorem apply to this data set? Does the Empirical Rule? Explain briefly.

Tcheby: yes, always works

Empirical: no, not symmetrical

6. (4 points) The mean of a sample data set is 75 and the standard deviation is 8. The histogram of the data set shows that it is bimodal. Answer the questions below and show your work.

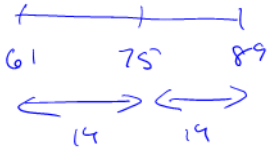
(a) What can you say about the percentage of measurements that will fall within the interval 51 to 99?



$k = \frac{24}{8} = 3$ $\quad 1 - \frac{1}{k^2} = 1 - \frac{1}{9} = 0.\overline{8}$

at least 89%

(b) What can you say about the percentage of measurements that will fall within the interval 61 to 89?



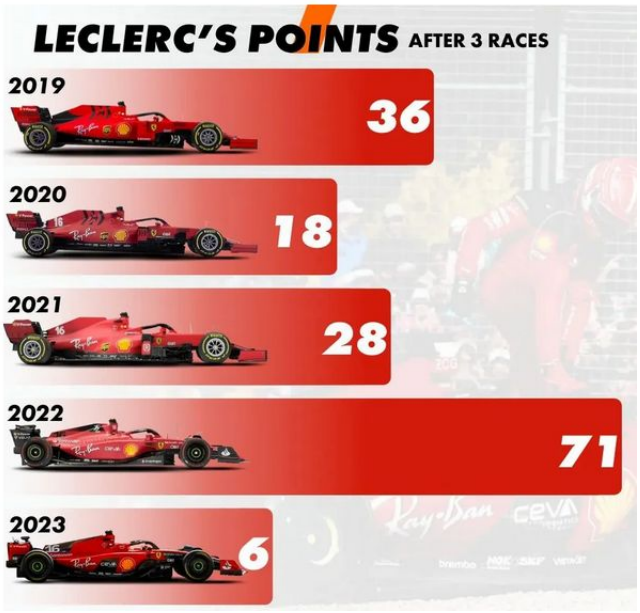
$k = \frac{14}{8} = 1.75$ $\quad 1 - \frac{1}{k^2} = 1 - \frac{1}{1.75^2} = 0.673$

at least 67%

7. (2 points) The following graph shows the points scored by the Formula One racing driver Charles LeClerc. From top to bottom, the bars are labeled 36, 18, 28, 71, and 6 points, respectively. There is one main reason why this graph is misleading. Give that reason.

inconsistent scale

this bar should be 3× length of the "6" bar



this bar should be more than 10× the length of the "6" bar