

Midterm 1

Show all your work

Name: _____
Number: _____
Signature: _____
Score: ___/41

A TI-83/84 calculator allowed.

Problem 1: Use your calculator to evaluate the following. Round your answers to 6 decimal places.

a. $\frac{\sqrt{3.17} - 11.8}{423.9 - 3.2^4} \approx$

-0.031 405

b. $\left(\frac{15}{7}\right)^{2.14} - 31.4 \times \left(\frac{2}{11}\right)^{1.32} \approx$

1.800 227

Score: /3

Problem 2: Circle the variable type or data type in each of the following.

a. i. The monthly rain fall record in North Vancouver from environment Canada.

i. quantitative and continuous

ii. quantitative and discrete

iii. qualitative

b. iii. The type of car parked in the parking lots at Capilano University this month.

Score: /2

Problem 3: A biologist studying hot birds in South Africa would like to know how the birds cope with global warming. From the national park where the research station was, around 4000 hot birds frequent the park. Suppose they tagged 200 birds to track,

a. what is the population in this study?

4000 hot birds

b. and what is the sample?

200 tagged

Score: /2

Problem 4: Identify the sampling method used in each example below as random, simple random, systematic, stratified, cluster, or convenience. Provide a one-sentence rationale for your choice.

a. Conduct a road check stopping every fifth car on a street.

Systematic sampling because every 5th car in traffic on the street is checked.

c. Draw a sample of three students from each program at university to form a student council.

Stratified sampling because programs are the subgroups, and a sample of three is drawn from each subgroup.

b. Hand out survey forms to all customers seated in the cafeteria at Capilano University, asking about university dormitory extensions.

Convenience sampling because the results are easy to get.

d. Put all students' names in a box and draw three names out of the box to win a Capilano University hoodie each.

Simple random sample because a sample of 3 has the same chance of being chosen.

Score: /6

/13

Problem 5: Brian broke his hip while playing hockey one night. To take his mind off the pain, he noted the following. Determine the level of measurement for each as nominal, or ordinal, or interval, or ratio.

a. The number of red lights on the way to the hospital.

ratio

b. The time he waited in the emergency before a doctor could examine him.

ratio

c. Assessing the severity of his hip pain on the 7-point scale where 0 means no pain, and 6 means incapacitating.

ordinal

d. Looking at all the other patients in the waiting area and grouping them into three groups: independent, dependent but not dying, dependent and dying.

nominal

Score: /4

Problem 6: Given below is a summary of the exam scores for 20 statistics students in one of Lily's classes. Answer the following questions.

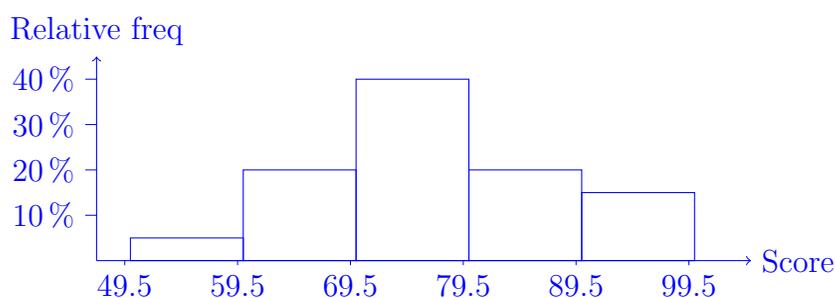
Class	Frequency	Relative Frequency
50–59	1	1/20
60–69	4	1/5
70–79	8	2/5
80–89	4	1/5
90–99	3	3/20
Total	20	

a. Estimate the average score of the students.

Use class midpoints to estimate.

$$\frac{1 \times 54.5 + 4 \times 64.5 + 8 \times 74.5 + 4 \times 84.5 + 3 \times 94.5}{20} = 76.5$$

b. Sketch the relative frequency histogram. Clearly label axes.



Score: /4

Problem 7: The following data represent the amount of time (rounded to the nearest minute) 10 randomly chosen students spent finishing a box of Timbits in the Cafeteria in Birch:

7, 9, 7, 4, 9, 4, 3, 6, 8, 7

a. Find the mean.

6.4 min

b. Find the median.

7.0 min

c. Find the 40th percentile.

6.5 min

d. Find the sample standard deviation. Use the computational formula

$$s = \sqrt{\frac{n \sum x^2 - (\sum x)^2}{n(n-1)}}$$

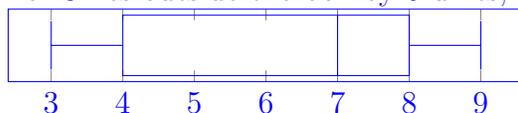
and clearly show the substitution of the values of $\sum x$ and $\sum x^2$ into the formula.

2.1 min

$$\sum x = 64 \text{ and } \sum x^2 = 450, \text{ so } s = \sqrt{\frac{10 \cdot 450 - 64^2}{10 \cdot 9}} = \sqrt{\frac{4500 - 4096}{90}} = \sqrt{\frac{404}{90}} \approx 2.1$$

e. Sketch a complete boxplot. Identify outliers (if any).

$Q_1 = 4$, $Q_2 = 7$, $Q_3 = 8$, $IQR = Q_3 - Q_1 = 8 - 4 = 4$. Since $1.5 \times IQR = 6$, neither 9 nor 3 lies outside the box by 6 units, so we have no outliers.



Score: /9

Problem 8: Suppose university students' body temperatures have a mean of 37.3 degrees Celcius and a standard deviation of 0.39 degrees Celcius. Elena's temperature can be described by $z = -1.2$. What is Elena's temperature in degrees Celcius? Round your answer to the nearest hundredth.

Let x denote Elena's temperature. Then $\frac{x-\mu}{\sigma} = z$, so $x - \mu = z\sigma$, so $x = \mu + z\sigma = 37.3 - 1.2 \cdot 0.39 \approx 36.83^\circ\text{C}$.

Score: /2

Problem 9: Comment on each graph below regarding the central message and its presentation; if the presentation is biased, suggest how to make it unbiased.

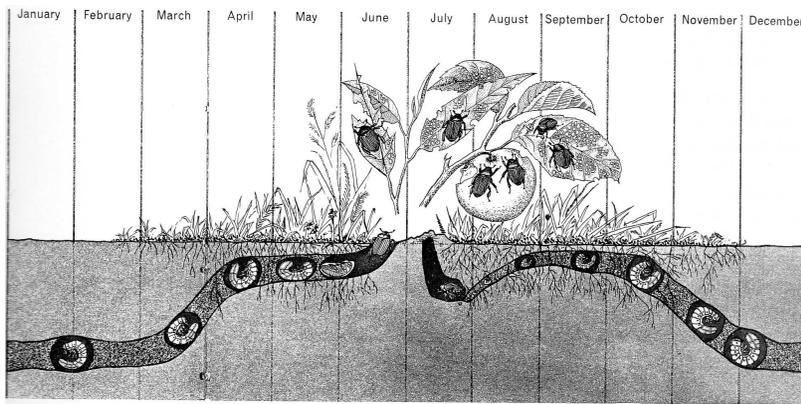


Figure A: The life cycle of the Japanese beetle



Figure B: Industrial output of the Soviet Union

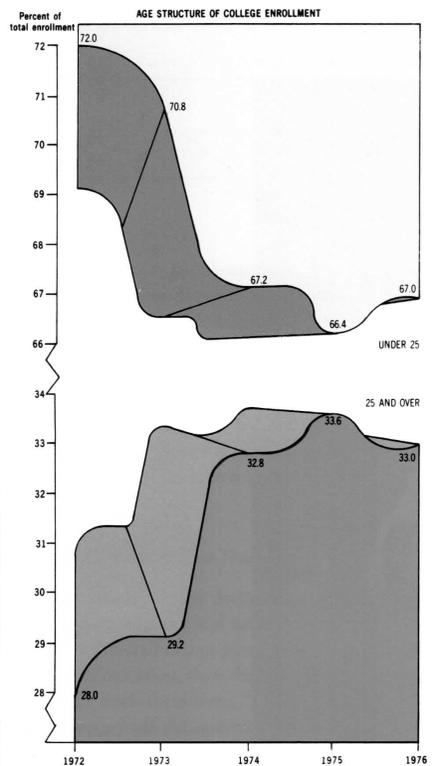


Figure C: American Education magazine

- Figure A: Time series graph for the life cycle of beetles is shown as a function of month. The beetle's life cycle from underground to a plant communicates the information succinctly.
- Figure B: The diagram shows the increase of industrial output from 1922 to 1982. This time series graph has a biased time axis where the space between 1981 and 1982 is larger than that between 1940 and 1970. The industrial output expressed in the bubble is also biased because the area around 1 is not $1/537$ of the area around 537 in the last bubble. Since only five data points are present, use a table or a histogram instead.
- Figure C: Only five data points are present to show the age of students in college enrollment, but the 3-D graph was redundant because students older than 25 can be computed from the group under 25, unnecessarily 3-D. Use a table instead.

Score: /9