

Exam 1

Ch 1, 2, 3

Jan_16

PASADENA
CITY COLLEGE

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Honesty Pledge

On my honor, by printing and signing my name below, I vow to neither receive nor give any unauthorized assistance on this examination:

SOLUTIONS

NAME (PRINT): _____ SIGNATURE: _____

Directions

- YOU ARE ALLOWED TO USE A CALCULATOR ON THIS EXAM. (Ti83/Ti83+/Ti84/Ti84+/Ti84+CE-T, or scientific calculator)
- You have 80 minutes to complete this exam.
- The exam totals **100 points**
- There are 12 problems, many of them with multiple parts.
- Place all of your belongings in the front of the classroom and I will assign you a seat. Bring with you your writing utensils.
- Cell phones must be turned off and put away in with your items in the front of the classroom.
- Handwriting should be neat and legible. If I cannot read your writing, zero points will be given.
- Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credits unless work is clearly shown. *If in doubt, ask for clarification.*
- Leave answers in exact form (as simplified as possible), unless told otherwise.
- Put a box around your final answer where applicable.
- **PLEASE CHECK YOUR WORK!!!**
- If you need extra space, there is extra space on the back of the cover page and clearly indicate that you are continuing your work there in the original location.
- If you finish early, make sure to double- and triple-check your work. If you're done with that, then you may leave.
- I will take attendance at the end of class

Score	Grade

This page is intentionally blank. It may be used for scratch paper. If you wish for me to grade your work on this page, please (i) label the problem you are working on, (ii) box your answer, (iii) indicate in the original problem's location that you will continue your work on this page.

Problem 1: 12 pts

(Don't forget units!)

Refer to the data set of body temperatures in degrees Fahrenheit given in the accompanying table to answer the following questions.

tri-modal
4 99.5
4 98.7
4 96.8

97.5	96.6	97	98.6	97.2	98.8	99	98
97.6	98.7	98.8	97	97.6	97.8	96.8	98.7
98.2	97.2	96.8	96.8	97.1	98.5	98.4	97.4
99.5	97.5	96.6	99.5	98.7	98.3	99.5	97.9
96.8	97.7	99.5	98.7	99.3	99.4	96.8	99.2

(1 pt) (a) Find the **sample mean**: $\bar{x} = 98.09^{\circ}\text{F}$ (starts law of rounding, round to hundredths)

(1 pt) (b) Find the **median**: $\text{Med} = 98.1^{\circ}\text{F}$

(1 pt) (c) Find the **mode**: $99.5, 96.8, 98.7^{\circ}\text{F}$

(1 pt) (d) Find the **sample standard deviation**: $s = 0.96^{\circ}\text{F}$

(1 pt) (e) Find the **sample variance**: $s^2 = 0.92^{\circ}\text{F}^2$ (recall: variance has units squared!)

(1 pt) (f) Find the **minimum**: 96.6°F

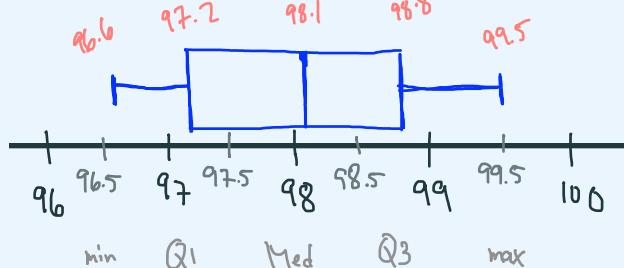
(1 pt) (g) Find the **maximum**: 99.5°F

(1 pt) (h) Find the **range**: $2.9^{\circ}\text{F} = \text{max} - \text{min}$

4 pt) (i) Create a **box plot**. Be sure to scale your axis appropriately and give the 5 number summary.

5 # Summary

$\text{min} = 96.6$
 $\text{Q1} = 97.2$
 $\text{Med} = 98.1$
 $\text{Q3} = 98.8$
 $\text{max} = 99.5$



*Key: draw & scale axis first!

Problem 2: 4 pts

Identify whether the given data set is **discrete** or **continuous** data:

(a) continuous Weights of vintage GI Joes

(b) discrete Number of people that can speak 5 or more languages

(c) discrete Number of contestants on 'Naked and Afraid'

(d) continuous Amount of water you can drink in an hour

Problem 3: 20 pts

The following **frequency distribution** shows the number of fountain pens that mathematicians own.

(8 pt) (a) Fill out the rest of the table:

Class	Frequency	$\sum f = 57$ (f)	Relative Frequency	Cumulative Relative Frequency	Midpoint	Class Boundary	$f \cdot x$
1-5	3	$3/57 = 0.053$	$3/57 = 0.053$	$3/57 = 0.053$	3	5.5	$3 \cdot 5.5 = 16.5$
6-10	15	$15/57 = 0.263$	$18/57 = 0.316$	$18/57 = 0.316$	8	10.5	$15 \cdot 8 = 120$
11-15	20	$20/57 = 0.351$	$38/57 = 0.667$	$38/57 = 0.667$	13	15.5	$20 \cdot 13 = 260$
16-20	12	$12/57 = 0.211$	$50/57 = 0.878$	$50/57 = 0.878$	18	20.5	$12 \cdot 18 = 216$
21-25	6	$6/57 = 0.105$	$56/57 = 0.983$	$56/57 = 0.983$	23	25.5	$6 \cdot 23 = 138$
26-30	1	$1/57 = 0.018$	$57/57 = 1.000$	$57/57 = 1.000$	28	30.5	$1 \cdot 28 = 28$

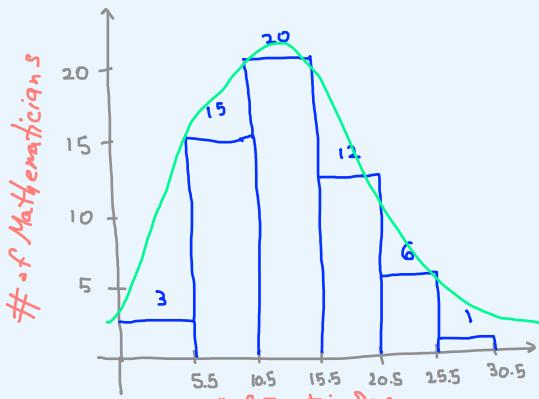
$$\sum f = 57$$

NOTE: Give only the class boundaries on the right (first one is not needed).

$$\sum [f \cdot x] = 771$$

NOTE: Give the relative frequency as decimals rounded to the nearest thousands (3 decimal places).

(3 pt) (b) Construct a **histogram** of the frequency distribution.



(2 pt) (c) How many mathematicians were surveyed?

$$\sum f = 57$$

57 mathematicians

(1 pt) (d) Determine the shape of the histogram from part (a) by stating the skewness.

Approximately normal | bell-shaped | symmetric

or Slightly skewed right

(2 pt) (e) What is the relative frequency of mathematicians that have at most 15 fountain pens?

Count up to 15 fp so use classes 1-5, 6-10, 11-15

so $3+15+20=38$. relative frequency is $\frac{38}{57} = 0.667$

(2 pt) (f) How many mathematicians own at least 21 fountain pens?

use classes 21-25 and 26-30

7 mathematicians have at least 21 fountain pens.

$$so 6+1=7$$

(2 pt) (d) Calculate the mean number of fountain pens owned by mathematicians:

$$\text{mean} = \frac{\sum [f \cdot x]}{\sum f} = \frac{771}{57} = 13.526\ldots = 13.5 \text{ fountain pens}$$

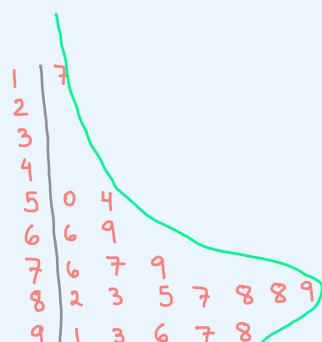
Recall use class midpoints to approximate x

Problem 4: 8 pts

(4 pt) (a) The scores for a statistics test are as follows:

87	76	91	77	93	96	88	85	66	17
89	79	97	50	98	83	88	82	54	69

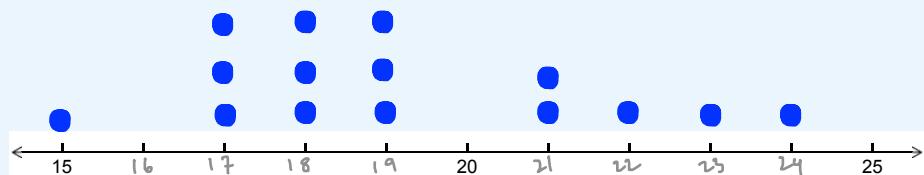
Create a **stem-leaf plot** display for the data.



(4 pt) (b) The following data represent the number of cars passing through a toll booth during a certain time period over a number of days.

18 19 17 17 24 18 21 18 19 15 22 19 23 17 21

Create a **dot plot** display for the data.



Problem 5: 6 pts

Write down the notation we use for:

(a) sample mean: \bar{x}

(d) population mean: μ

(b) sample standard deviation: s

(e) population standard deviation: σ

(c) sample size: n

(f) population size: N

Problem 6: 6 pts

A test is used to assess readiness for college. In a recent year, the mean test score was 21.5 and the standard deviation was 5.3.

(a) Celeste got a test score that was 2.5 standard deviations above the mean. What was her test score?

$$z = 2.5 \quad \text{her score is } x$$

$$\text{z-score for Celeste} \quad z = \frac{x - \bar{x}}{s} \quad \text{or} \quad x = \bar{x} + z \cdot s = 21.5 + (2.5) \cdot 5.3 = 34.75 \quad \text{Celeste's Score}$$

(b) What test scores are significantly low?

$$\text{scores} < \bar{x} - 2s = 21.5 - 2(5.3) = 10.9$$

scores below 10.9 are significantly low

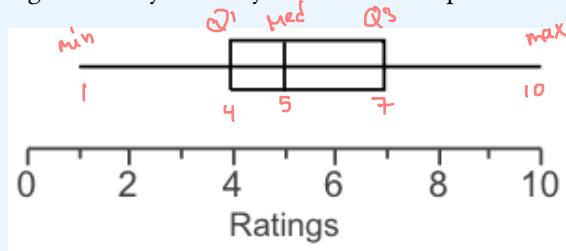
(c) What test scores are significantly high?

$$\text{scores} > \bar{x} + 2s = 21.5 + 2(5.3) = 32.1$$

scores above 32.1 are significantly high

Problem 7: 8 pts

The following box-plot represents the ratings of twenty males by females in an experiment involving speed dating.



- (a) What is the median rating of the males?

$$\text{Med} = 5 \text{ rating}$$

- (b) How many males were rated a 4 or higher?

$Q_1 = \text{wt off for lower } 25\%$, thus ratings of 4 or higher represent 75% of males.
 $75\% \times 20 = 0.75 \times 20 = 15$. There are 15 males with ratings 4 or higher.

- (c) Jesse was rated the lowest, what was he rated?

Jesse was rated a 1 ::

- (d) Taylor is rated higher than 75% of the other males and lower than 25% of the others. What is Taylor's rating?

↳ greater than Q_3 ↳ less than Q_1

Taylor's rating must be exactly $Q_3 = 7$.

Taylor was rated a 7

Problem 8: 14 pts

We want to know the average (mean) amount of money spent on school supplies each year by families with children at Hogwarts School of Witchcraft and Wizardry. We randomly survey 30 families with children in the school. To ensure fairness, we sampled proportional amounts from low, middle, and high income families. From the survey, we found that families spent an average of \$376.55 on school supplies. Identify the following:

- (a) population

Families with kids at Hogwarts.

- (b) sample

30 families sampled

- (c) parameter

mean money spent on school supplies by all families w/ kids at Hogwarts.

- (d) statistic

mean money spent on school supplies by 30 families sampled.

- (e) variable

amount of money spent on school supplies (by a single family)

- (f) data

\$376.55 = \bar{x} (& values spent by families - not given)

- (g) What type of sampling was used (simple random, cluster, stratified, systematic, or convenience)?

stratified: group into low-middle-high income groups
select randomly from each

Problem 9: 9 pts

Malik took the SAT test and scored in the 97th percentile. Please give your answers in complete sentence(s) ($M \rightarrow E$).

- (a) Did he do well relative to all people who took the SAT test? Interpret this result.

Yes! Malik did great! He scored higher than 97% of all people who took the SAT test.

- (b) If 500 students took the same test at Malik's school, how many people had a score higher than his?

Only 3% scored higher, so $500 \times 0.03 = 15$. So only 15 people out of 500 had a higher test score than Malik.

Problem 10: 5 pts

Abraham scored 92 on his stat's test where his class had a mean of 71 and a standard deviation of 15. Whereas Amadi scored 688 on his stat's test with a mean of 493 and a standard deviation of 150. Who did better on their test?

Justify your answer with statistical reasoning. Please give your answers in complete sentence(s) ($M \rightarrow E$).

$$\begin{array}{ll} \text{Abraham} & \text{Amadi} \\ x = 92 & x = 688 \\ \bar{x} = 71 & \bar{x} = 493 \\ s = 15 & s = 150 \end{array}$$

Use z-scores

$$z = \frac{x - \bar{x}}{s}$$
$$\begin{aligned} z &= \frac{92 - 71}{15} \\ z &= 1.4 \end{aligned}$$
$$\begin{aligned} z &= \frac{688 - 493}{150} \\ z &= 1.3 \end{aligned}$$

Abraham did better than Amadi because his score was slightly higher than Amadi's in relation to their tests. By using z-scores we see Abraham scored $z=1.4$ and Amadi scored $z=1.3$.

Problem 11: 4 pts

Identify whether the given data set is **qualitative** or **quantitative** data:

- (a) QN: quantitative Collection of grams of fat in the cheese pizza served at PCC cafeteria
- (b) QL: qualitative Collection of nations of origin of PCC students
- (c) QL: qualitative Collection of jersey numbers of the PCC football team
- (d) QN: quantitative Collection of number of days you studied for this test

Problem 12: 4 pts

Identify appropriate **level of measurement** (nominal, ordinal, interval, ratio):

- (a) ratio Assessed value of a house (has true zero value)
- (b) nominal Zip codes
- (c) ordinal T-shirt Sizes (S, M, L, XL)
- (d) interval Temperature of Pasadena (no true zero)

Formula Sheet

- $\bar{x} = \frac{\sum x}{n}$
- $\bar{x} = \frac{\sum(f \cdot x)}{\sum f}$
- $s = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$
- $z = \frac{x - \bar{x}}{s}$ or $x = \bar{x} + s \cdot z$

- **k^{th} Percentile:**

$$P_k = \frac{\text{\# scores < given score}}{\text{total \# scores}}$$

- **Finding the score L given a percentile k :**

$$L = \frac{k}{100} \cdot n$$

- if L is a decimal, round up
- if L is whole, then average the k^{th} score and the next higher score

Post Exam Survey

Now that you have finished the exam, please take a few minutes to reflect on how you prepared for the exam and how you think you did. Then answer these questions.

1. When taking the exam I felt
 - Rushed. I wanted more time.
 - Relaxed. I had enough time.
 - Amazed. I had tons of extra time.
2. The week before the test I did all my homework on time: YES NO
3. The week before the test, in addition to the homework I followed a study plan. YES NO
 - I think this helped: YES NO
4. The day before the test I spend _____ hours studying and reviewing.
 - I think that was enough time: YES NO
5. The night before the test:
 - I stayed up very late cramming for the test
 - I stayed up very late, but I wasn't doing math
 - I didn't need to cram because I was prepared
 - I got a good night's sleep so my brain would function well.
6. I think I got the following grade on this test: _____
7. Strategies that worked well for me were (please elaborate):
8. Next time I will do an even better job preparing for the test by: