

**Exam 1****Ch 1, 2, 3****March\_12****Dr. Jorge Basilio****gbasilio@pasadena.edu****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:*

NAME (PRINT): Solutions SIGNATURE: \_\_\_\_\_**Directions**

- YOU ARE ALLOWED TO USE A CALCULATOR ON THIS EXAM. (Ti83/Ti83+/Ti84/Ti84+/Ti84+CE-T, or scientific calculator)  
*← dont forget your 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, you may take a break but you must come back to class by 2:45 and we will have class.
- I will take attendance at the end of class

Score	Grade
100	

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

→ UNITS!

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

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
97.7	99.3	99.5	98.7	99.3	99.4	96.8	99.2

(x)  $98.09^{\circ}\text{F}$

$98.0975 \rightarrow \text{round } 98.09^{\circ}\text{F}$  units!

Use calculator!

(1 pt) (a) Find the sample mean: \_\_\_\_\_

$98.1^{\circ}\text{F}$

(1 pt) (b) Find the median: \_\_\_\_\_

$99.5^{\circ}\text{F}, 96.8^{\circ}\text{F}, 98.7^{\circ}\text{F}$

(1 pt) (c) Find the mode: \_\_\_\_\_

$98.7^{\circ}\text{F}$

(1 pt) (d) Find the sample standard deviation: \_\_\_\_\_

$0.9568^{\circ}\text{F}$

(1 pt) (e) Find the sample variance: \_\_\_\_\_

$0.9155^{\circ}\text{F}^2$

(1 pt) (f) Find the minimum: \_\_\_\_\_

$96.6^{\circ}\text{F}$

(1 pt) (g) Find the maximum: \_\_\_\_\_

$99.5^{\circ}\text{F}$

(1 pt) (h) Find the range: \_\_\_\_\_

$2.9^{\circ}\text{F}$  = max - min

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

5 # summary

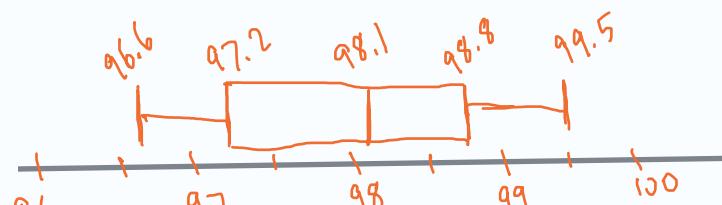
min =  $96.6^{\circ}\text{F}$

Q1 =  $97.2^{\circ}\text{F}$

Med =  $98.1^{\circ}\text{F}$

Q3 =  $98.8^{\circ}\text{F}$

max =  $99.5^{\circ}\text{F}$



★ 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:

$$\sum = 57$$

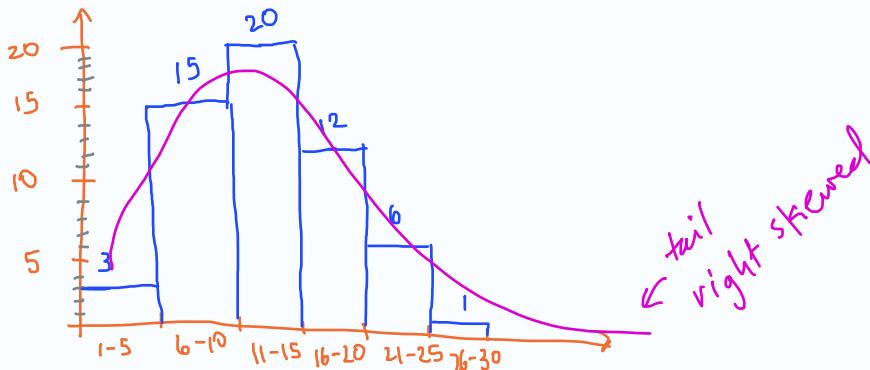


Class	Frequency	Relative Frequency	Cumulative Relative Frequency	Midpoint	Class Boundary	<i>just the "right" ones</i>	$f \cdot x$
1-5	3	$\frac{3}{57} = 0.053$	$\frac{3}{57} = 0.053$	3	5.5	9	
6-10	15	$\frac{15}{57} = 0.263$	$\frac{18}{57} = 0.316$	8	10.5	120	
11-15	20	$\frac{20}{57} = 0.351$	$\frac{38}{57} = 0.667$	13	15.5	260	
16-20	12	$\frac{12}{57} = 0.211$	$\frac{50}{57} = 0.878$	18	20.5	216	
21-25	6	$\frac{6}{57} = 0.105$	$\frac{56}{57} = 0.983$	23	25.5	138	
26-30	1	$\frac{1}{57} = 0.018$	$\frac{57}{57} = 1.000$	28	30.5	28	

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

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

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



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

$$\sum f = 57 \quad [57 \text{ mathematicians}]$$

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

right skewed (accept also "nearly symmetric" or "nearly bell shaped")

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

$$[38/57 \text{ or } 0.667]$$

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

(For fun,  
guess the class I'm in 😊)

$$6+1=7 \text{ mathematicians} \quad \text{have at least 21 fountain pens}$$

(2 pt) (d) Calculate the **mean**:

$$\text{mean} = \bar{x} = \frac{\sum [f \cdot x]}{\sum f} = \frac{771}{57} = 13.526\dots$$

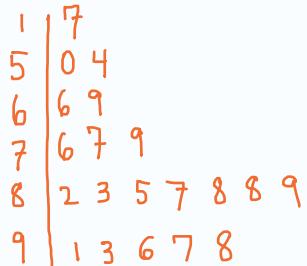
$$\boxed{\bar{x} = 13.5 \text{ fountain pens}}$$

## 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

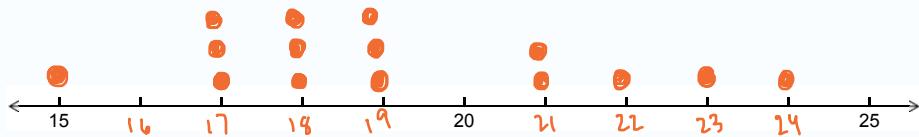
Create a **stem-leaf plot** display for the data.



(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:  $\mu$

(b) sample standard deviation:  $s$

(e) population standard deviation:  $\sigma$

(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?

$$\text{Celeste's score} = \bar{x} + (2.5)s = 21.5 + 2.5(5.3) = 34.75 \quad \boxed{\text{Celeste's score}}$$

(b) What test scores are significantly low?

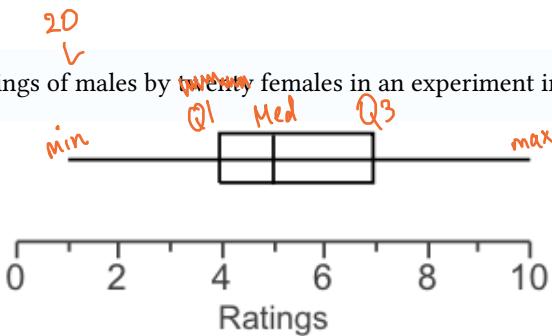
$$\text{Scores} < \bar{x} - 2s: 21.5 - 2(5.3) = 10.9 \quad \boxed{\text{scores below 10.9 are significantly low}}$$

(c) What test scores are significantly high?

$$\text{Scores} > \bar{x} + 2s: 21.5 + 2(5.3) = 32.1 \quad \boxed{\text{scores above 32.1 are significantly high}}$$

### Problem 7: 8 pts

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



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

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

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

since Q1 was lower 25% & upper 75%

$$\text{so there are } 75\% \cdot 20 = 15 \text{ males rated 4 or higher}$$

- (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?

below Q3

above Q3

Taylor 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 @ Hogwarts

- (b) sample

30 families surveyed

- (c) parameter

mean money spent on school supplies of all families w/ kids @ Hogwarts.

- (d) statistic

mean money spent on school supplies of 30 families sampled.

- (e) variable

amount of money spent on school supplies

- (f) data

$\$376.55 = \bar{x}$  & the values spent by each of 30 families surveyed.

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

group into low/middle/high income gaps & select randomly from each

## Problem 9: 9 pts

Malik took the SAT test and scored in the 97th percentile.

- (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 student test takers.

- (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 only 15 students had a higher score than Malik.

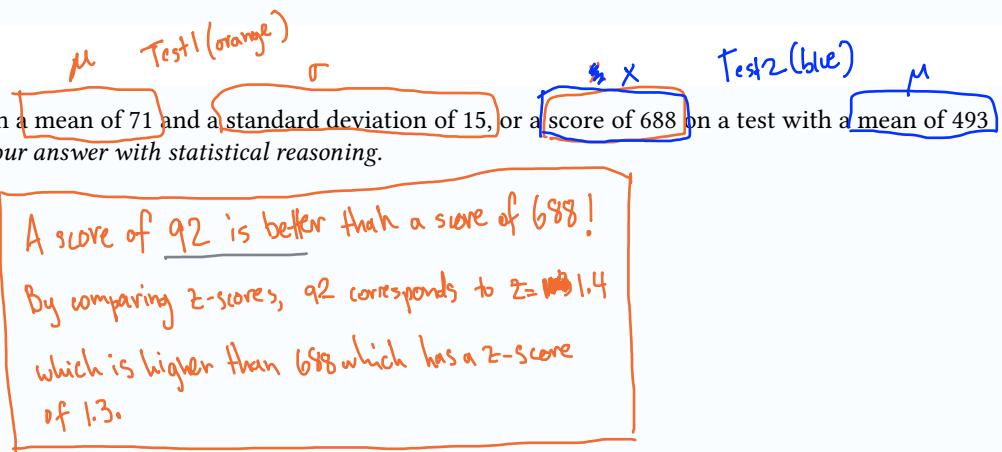
$$500 \times 0.03 = 15$$

## Problem 10: 5 pts

Which is better, a score of 92 on a test with a mean of 71 and a standard deviation of 15, or a score of 688 on a test with a mean of 493 and a standard deviation of 150? Justify your answer with statistical reasoning.

Test 1  $\mu = 71$   $\sigma = 15$   $x = 92$  z-score  $= \frac{92-71}{15} = 1.4$

Test 2  $\mu = 493$   $\sigma = 150$   $x = 688$  z-score  $= \frac{688-493}{150} = 1.3$



## Problem 11: 4 pts

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

- (a) Quantitative Collection of grams of fat in the cheese pizza served at PCC cafeteria
- (b) Qualitative Collection of nations of origin of PCC students
- (c) Qualitative Collection of jersey numbers of the PCC football team
- (d) 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
- (b) Nominal Zip codes
- (c) Ordinal T-shirt Sizes (S, M, L, XL)
- (d) Interval Temperature of Pasadena

## Formula Sheet

- $$\bar{x} = \frac{\sum(f \cdot x)}{\sum f}$$
- $$z = \frac{x - \bar{x}}{s}$$

Solving for  $x$ :  
 $s(z) = (x - \bar{x})^2$   
 $\underline{s^2} = x - \bar{x}$   
 $\underline{+\bar{x}} \quad \underline{+\bar{x}}$   
 $\bar{x} + s^2 = x$

- $k^{th}$  Percentile:

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

- 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.

- When taking the exam I felt
  - Rushed. I wanted more time.
  - Relaxed. I had enough time.
  - Amazed. I had tons of extra time.
- The week before the test I did all my homework on time: YES NO
- The week before the test, in addition to the homework I followed a study plan. YES NO
  - I think this helped: YES NO
- The day before the test I spent \_\_\_\_\_ hours studying and reviewing.
  - I think that was enough time: YES NO
- 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.
- I think I got the following grade on this test: \_\_\_\_\_
- Strategies that worked well for me were (please elaborate):
- Next time I will do an even better job preparing for the test by: