

Try to keep your work on these sheets. Show or explain ALL work for full credit.
 Staple extra work, done on white paper, to the back of these test sheets.

1. (10 pts) A company that manufactures batteries is testing a new type of battery designed for laptop computers. They measure the lifetimes, in hours, of six batteries, and the results are 3, 4, 6, 5, 4, and 2.

(a) Find the mean of the battery lifetimes: $\bar{x} = \frac{3+4+6+5+4+2}{6} = \boxed{4.0}$

3

(b) Find the sample variance, $s^2 = \frac{\sum(x - \bar{x})^2}{n - 1}$, of the battery lifetimes. Populate the table below to assist you.

x	x - mean	(x - mean) ²
3	3 - 4 = -1	1
4	4 - 4 = 0	0
6	6 - 4 = 2	4
5	5 - 4 = 1	1
4	4 - 4 = 0	0
2	2 - 4 = -2	4
		\oplus 10

$s^2 = \frac{10}{6-1} = \frac{10}{5} = \boxed{2.0}$

5

(c) What is the sample standard deviation:

$s = \sqrt{2.0} = \boxed{1.414}$

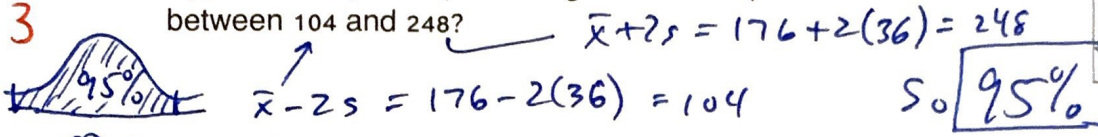
2

(10)

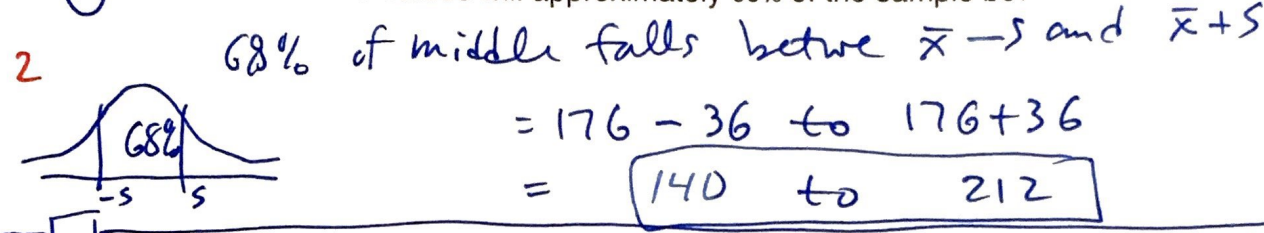
2. (5 pts) The following display presents some sample statistics:

1-Var. Stats	
\bar{x}	= 176
Σx	= 6336
Σx^2	= 1160496
S_x	= 36
σ_x	= 35.4964787
n	= 36
minX	= 20
Q1	= 176

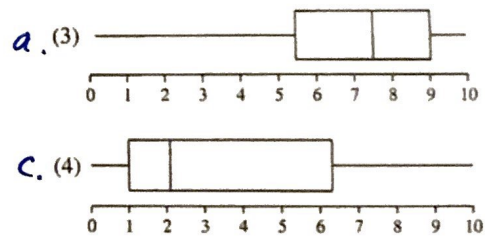
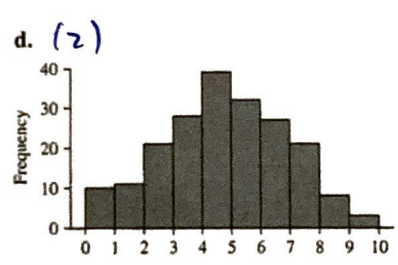
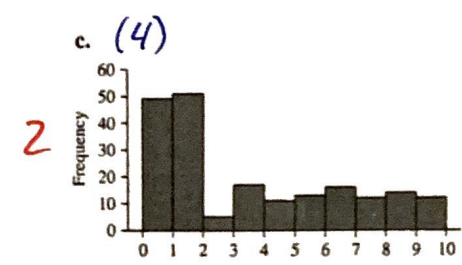
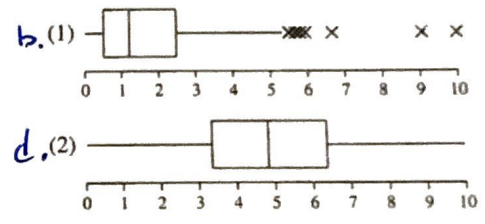
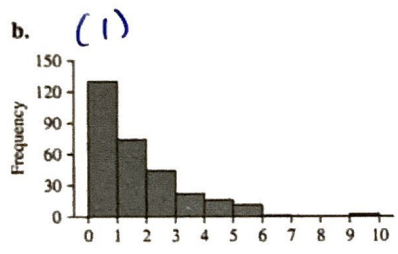
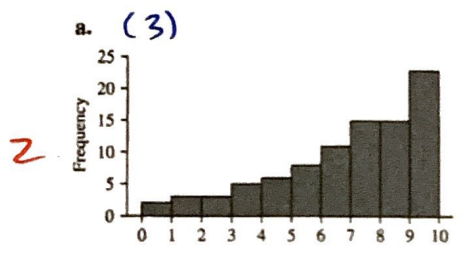
(a) Assume that a histogram of the sample is bell-shaped. Approximately what percentage of the sample values are between 104 and 248?



(b) Between what two values will approximately 68% of the sample be?



3. (5 pts) Match the following box plots with their corresponding histograms. Write the box-plot's number next to the histogram's letter.



4. (10 pts) Answer the questions below the following passage. (Note that the following data is already ordered.) Show calculations for the outlier boundaries requested.

Weights of soap: As part of a quality control study aimed at improving a production line, the weights (in ounces) of 50 bars of soap are measured. The results are shown below, sorted from smallest to largest.

(1)

	11.6	12.6	12.7	12.8	13.1	13.3	13.6	13.7
25	13.8	14.1	14.3	14.3	14.6	14.8	15.1	15.2
	15.6	15.6	15.7	15.8	15.8	15.9	15.9	16.1
	16.2	16.2	16.3	16.4	16.5	16.5	16.5	16.6
	17.0	17.1	17.3	17.3	17.4	17.4	17.4	17.6
25	17.7	18.1	18.3	18.3	18.3	18.5	18.5	18.8
	19.2	20.3						

$$Q_2 = \frac{16.2 + 16.2}{2} = 16.2$$

(2)

3 a. Q_1 14.6, Q_3 17.4, IQR $17.4 - 14.6 = 2.8$

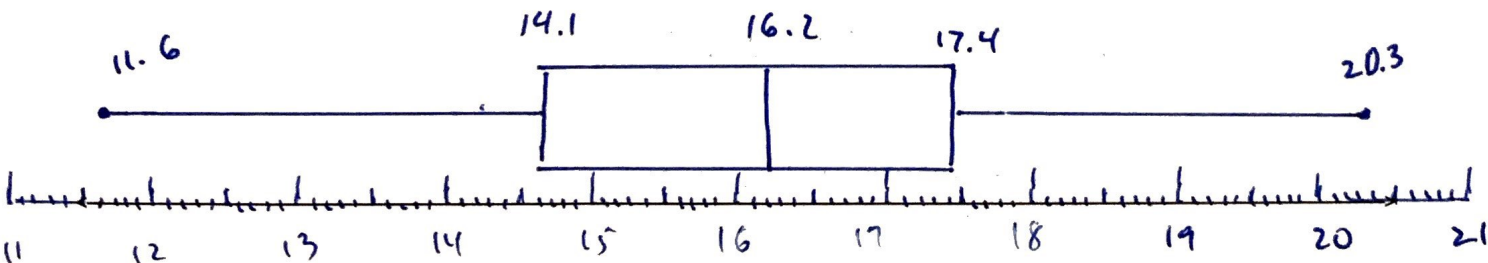
1 b. Median 16.2

1 c. Lower outlier boundary 10.4
 $Q_L = Q_1 - 1.5 IQR = 14.6 - 1.5(2.8) = 10.4$

1 Upper outlier boundary 21.6
 $Q_U = Q_3 + 1.5 IQR = 17.4 + 1.5(2.8) = 21.6$

1 d. List outliers No lower outliers, No upper outliers

3 e. Create a Modified Box plot - place hash marks on the line below (your ruler) then make the box-plot:



$21 - 11 = 10$

(10)

Procedure for Computing the Data Value Corresponding to a Given Percentile

Step 1: Arrange the data in increasing order.

Step 2: Let n be the number of values in the data set. For the p th percentile, compute the value

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

Step 3: If L is a whole number, then the p th percentile is the average of the number in position L and the number in position $L + 1$.

If L is not a whole number, round it up to the next higher whole number. The p th percentile is the number in the position corresponding to the rounded-up value.

5. (10 pts) Using the procedure above compute the 60th percentile of the the data below

68 80 38 83 73 98 75 95 93 88 85 60 80 85 78 85 90 100

98 75 70 62 93 65 100 88 93 95 65 95 85 88 68 90 100

(18) } 35
(17) }

1. ordered: 38, 60, 62, 65, 65, 68, 68, 70, 73, 75, 75, 78, 80, 80, 83, 85, 85, 85, 85, 88, 88, 88, 88, 90, 90, 93, 93, 93, 95, 95, 95, 98, 98, 100, 100, 100

4

Helps me order faster

3	8
4	
5	
6	80 2558
7	35850
8	0385055858
9	8530833550
10	000

2. $Pointer = \frac{60}{100} \cdot 35 = \frac{60}{4} = 21$ whole #

3. $L = 21$ is 88
 $L = 22$ is 88
 $\frac{88 + 88}{2} = 88$

6. (5 pts) A population has mean $\mu = 30$ and standard deviation $\sigma = 6$.

(a) Find the z-score for a population value of 21.

$z = \frac{21 - 30}{6} = \frac{-9}{6} = -1.5$

(b) Find the z-score for a population value of 42.

$z = \frac{42 - 30}{6} = \frac{12}{6} = 2.0$

(c) What number has a z-score of 0.5?

$z = 0.5 = \frac{x - 30}{6}$

$(0.5)6 = x - 30$

$x = 30 + 6(0.5)$
 $= 30 + 3.0$

$x = 33.0$

3

2

15

7. (5 pts) The following table presents the results of a survey of 400 students when asked "Do you listen to music while studying?" Remember to show the fractions before dividing.

	Listen	Do Not Listen	
Male	121	78	199
Female	147	54	201
	268	132	400
		$\frac{268}{400}$	

2 (a) Find the probability that a randomly selected student does NOT listen to music while studying?

$$P(\text{Not music}) = 1 - P(\text{music}) = 1 - \frac{268}{400} = \frac{132}{400}$$

OR $= \frac{132}{400}$

3 (b) Find the probability that a randomly selected student listens to music while studying or is male?

$$P(\text{listens or male}) = P(\text{listens}) + P(\text{male}) - P(\text{listens AND male})$$

$$= \frac{268}{400} + \frac{199}{400} - \frac{121}{400} = \frac{346}{400}$$

8. (5 pts) There were 30 students in last semester's stats class. Of these 6 received a grade of A and 12 a grade of B.

$$\frac{6}{A} \quad \frac{12}{B} \quad \frac{12}{CDE}$$

2 (a) What is the probability that a randomly chosen student received a grade of A or B?

$$P(A \text{ or } B) = \frac{6}{30} + \frac{12}{30} = \frac{18}{30} \text{ mutually exclusive}$$

$$\frac{3}{5} = \frac{60}{100}$$

3 (b) What is the probability that a randomly chosen student did NOT received a grade of A or B?

$$= 0.60$$

$$P(\text{not A or B}) = 1 - P(A \text{ or } B)$$

$$= 1 - \frac{18}{30}$$

$$= \frac{12}{30} = 0.40$$

9. (10 pts) The table below presents the results of a survey in which 1000 adults were asked whether they favored a law that would provide more government support for higher education. Each person was also asked whether he or she voted in the last election. Those who had voted were classified as "Likely to vote," and those who had not were classified as "Not likely to vote."

		F	O	U	
		Favor	Oppose	Undecided	
V	Likely to vote	372	262	87	721
N	Not likely to vote	151	103	25	279
		523	365	112	1000

Answer the following questions, show the answer as fractions involving the numbers, or sums of the numbers, in the table:

3 (a) What is the probability that a randomly selected adult is likely to vote and favors the law?

$$P(V \text{ and } F) = \frac{372}{1000} = 0.372$$

3 (b) What is the probability that a randomly selected adult is likely to vote?

$$P(V) = \frac{721}{1000} = 0.721$$

3 (c) What is the probability that a randomly selected adult favors the law?

$$P(F) = \frac{523}{1000} = 0.523$$

10. (15 pts) The following table presents the number of hospitalizations for myocardial infarction (heart attack) for men and women in various age groups.

Age	Male	Female	Total
18-44	26,828	9,265	36,093
45-64	166,340	68,666	235,006
65-84	155,707	124,289	279,996
85 and up	35,524	57,785	93,309
Total	384,399	260,005	644,404

(e)

(f)

Answer the questions below. Give the answers in fractions using the values in the table, when possible, then divide.

2 (a) What is the probability that a randomly chosen patient is a woman?

$$P(W) = \frac{260,005}{644,404} = 0.40348$$

2 (b) What is the probability that a randomly chosen patient is aged 45-64?

$$P(45-64) = \frac{235,006}{644,404} = 0.364688$$

2 (c) What is the probability that a randomly chosen patient is a woman and aged 45-64?

$$P(W \& 45-64) = \frac{68,666}{644,404} = 0.10656$$

3 (d) What is the probability that a randomly chosen patient is a woman or aged 45-64?

$$P(W \text{ or } 45-64) = P(W) + P(45-64) - P(W \& 45-64)$$

$$= \frac{260,005}{644,404} + \frac{235,006}{644,404} - \frac{68,666}{644,404} = \frac{426,345}{644,404} = 0.661611$$

$0.40348 + 0.364688 - 0.10656$

3 (e) What is the probability that a randomly chosen patient is a woman given that the patient is aged 45-64?

$$P(W | 45-64) = \frac{68666}{235,006}$$

limited universe is now 45-64

OR

$$\frac{P(W \& 45-64)}{P(45-64)} = \frac{68,666 / 644,404}{235,006 / 644,404} = \frac{68666}{235,006} = 0.292188$$

0.10656
 0.364688

3 (f) What is the probability that a randomly chosen patient is aged 45-64 given that the patient is a woman?

$$P(45-64 | W) = \frac{68,666}{260,005}$$

limited universe is now Women

OR

$$\frac{P(W \& 45-64)}{P(W)} = \frac{68,666 / 644,404}{260,005 / 644,404} = \frac{68,666}{260,005}$$

0.10656
 0.40348

11. (10 pts) Show all work for full credit. A group of eight people must choose a president, a vice president, and a secretary.

(a) In how many ways can this be done?

$$\frac{8}{P} \cdot \frac{7}{VP} \cdot \frac{6}{Sec} = \boxed{336} \text{ ways}$$

calc:

$$\boxed{8P_3} = 336$$

Two of the group members are Ellen and Jose. Assume the assignments are made at random.

(b) What is the probability that Jose is president and Ellen is vice president?

Jose → $\frac{1}{P} \cdot \frac{1}{VP} \cdot \frac{6}{Sec}$ ← Ellen

$$= \boxed{6 \text{ ways}}, \quad \boxed{P = \frac{6}{336}}$$

(c) What is the probability that either Ellen or Jose is president and the other is vice president?

$$J \in P \text{ or } E \in P$$

$$1 \cdot 1 \cdot 6 + 1 \cdot 1 \cdot 6 = 2 \cdot 6 = \boxed{12 \text{ ways}} / 336$$

12. (10 pts) Thirty people attend a certain event, and 5 will be chosen at random to receive prizes. The prizes are all the same, so the order in which the people are chosen does not matter. Of the 30 people in attendance, 12 are men and 18 are women. Show all parts of your counting computations as well as the fractions for your probability calculations.

(a) How many different recipients of 5 people can be chosen from the gathering?

12M / 18W

$$\boxed{30C_5} = \underline{\underline{142,506}}$$

(b) What is the probability that all the prize winners are men?

$$P(\text{all men}) = \frac{\# \text{ ways to select 5 men from 12 w/o order}}{\# \text{ ways to select 5 ppl from 30 w/o order}}$$

$$= \frac{12C_5}{30C_5} = \frac{792}{142,506} = 0.00555 \text{ or } \boxed{0.56\%}$$

(c) What is the probability that at least one prize winner is a woman?

very very slim

$$P(\text{at least 1 W}) = 1 - P(\text{no W})$$

$$= \boxed{1 - 0.00555}$$

$$= 0.99444$$

or $\boxed{99.4\%}$ a Woman will be amongst the chosen