

79 81

76.

69 = 73.14/

106

Math 273 -- Applied Statistics I
Midterm Exam A

Name

2

1. (6 points) Identify the population and the sample and the variable of interest:
The Gallup Organization contacts 1019 adult residents of the United States aged 18 or older and asks whether the events of September 11, 2001 were a life-altering experience.

a) Population:

All adult filled on September 11

b) Sample:

50 adult selected

-6

c) Variable of Interest:

How many adults are correctly filled

2. (4 points) Determine if the numerical value describes a parameter or a statistic:

a) The average price of a sample of 25 houses in a subdivision is \$135,000.

Statistic

b) The students in the Allen School have an average of 1.8 siblings.

Parameter

c) A recent poll of 611 corporate executives showed that the average price of a corporate executive's car is \$47,200.

Statistic

d) The mean weight in ounces of all the ripe peaches in Virginia.

Parameter

4

3. (6 points) In each scenario, please indicate if the given data are qualitative or quantitative. Also indicate the highest level of measurement associated with the given data.

a) The height of orchids on a windowsill.

Qualitative

Quantitative

Nominal

Ordinal

Interval

Ratio

b) The types of pets reported in a recent survey.

Qualitative

Quantitative

Nominal

Ordinal

Interval

Ratio

c) The IQ scores, reported in whole numbers, of research scientists.

Qualitative

Quantitative

Nominal

Ordinal

Interval

Ratio

4. (2 points) Determine whether each situation is an observational or experimental study:

a) A study comparing the effects of two different doses of an experimental drug on rats with cancer.

observational study

b) A study of whom likely voters plan to vote for in the upcoming election.

experimental

5. (6 points) In each scenario, identify the sampling technique used for the study described.
- a) In order to estimate the percentage of defects in a recent manufacturing batch, a quality control manager at Intel selects every 8th chip that comes off the assembly line.
- ☐ Census ☐ Simple Random Sampling
- ☐ Stratified Sampling ☐ Cluster Sampling
- ☒ Systematic Sampling ☐ Convenience Sampling
- b) A farmer divides his orchard into 50 subsections, randomly selects 4 and samples all the trees within the 4 subsections in order to approximate the yield of his orchard.
- ☐ Census ☐ Simple Random Sampling
- ☐ Stratified Sampling ☒ Cluster Sampling
- ☐ Systematic Sampling ☐ Convenience Sampling
- c) A survey regarding download time on a certain web site is administered on the internet by a market research firm to anyone who would like to take it.
- ☐ Census ☐ Simple Random Sampling
- ☐ Stratified Sampling ☐ Cluster Sampling
- ☐ Systematic Sampling ☒ Convenience Sampling
- d) A lobbyist for a major airspace firm contacts each legislator.
- ☒ Census ☐ Simple Random Sampling
- ☐ Stratified Sampling ☐ Cluster Sampling
- ☐ Systematic Sampling ☐ Convenience Sampling
- e) A school official divides the student population into five classes: freshman, sophomore, junior, senior, graduate student. The official takes a random sample from each class and asks the members' opinions regarding student services.
- ☐ Census ☐ Simple Random Sampling
- ☒ Stratified Sampling ☐ Cluster Sampling
- ☐ Systematic Sampling ☐ Convenience Sampling
- f) In an effort to identify whether an advertising campaign has been effective, a marketing firm conducts a nation-wide poll by randomly selecting individuals from a list of known users of the product.
- ☐ Census ☒ Simple Random Sampling
- ☐ Stratified Sampling ☐ Cluster Sampling
- ☐ Systematic Sampling ☐ Convenience Sampling

6

6. (12 points) The data below represent the percentage of divorces for selected countries.

68 56 43 38 24 15 65 55 43 35
21 15 64 53 41 34 19 13 63 52
41 28 18 13 63 49 40 26 18 12

$68 - 12 = 56$ $\div 6 = 10$ mean

Complete the extended frequency distribution below, using 6 classes.

scale off (2)

(2)

Divorces					
Class	Freq	Midpoint	Relative Frequency	Cumulative Frequency	Class Boundaries
12-22	9	17	7	9	11.5 - 22.5
23-33	3	28	18	12	22.5 - 33.5
34-44	8	39	29	20	33.5 - 44.5
45-55	7	50	40	24	44.5 - 55.5
56-66	5	61	51	29	55.5 - 66.5
67-77	1	72	62	30	66.5 - 77.5

30

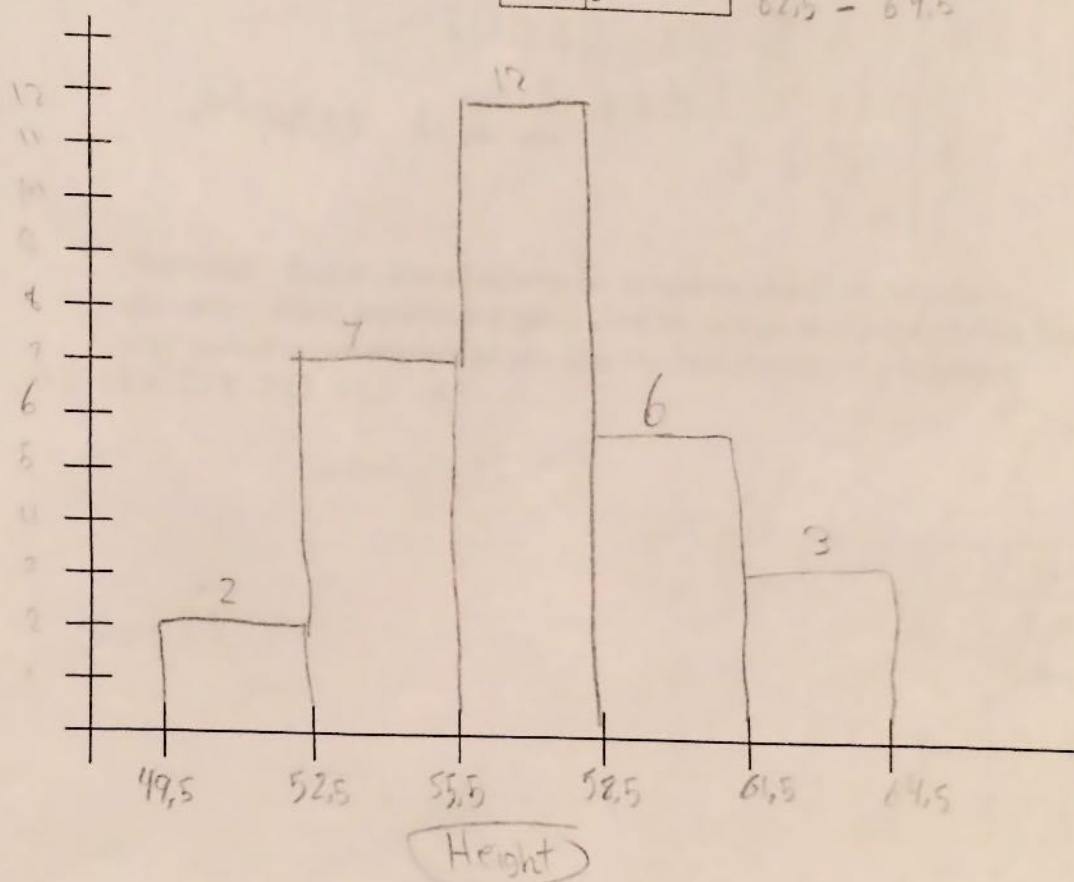
(2)

10

7. (7 points) Construct a histogram that represents the following height data.

Height (in inches)	
Class	Frequency
50 - 52	2
53 - 55	7
56 - 58	12
59 - 61	6
62 - 64	3

49.5 - 52.5
 52.5 - 55.5
 56.5 - 58.5
 59.5 - 61.5
 62.5 - 64.5



8. (1 point) Choose the best description of the shape of the distribution:

Approximately Symmetrical

Definitely Skewed to the Left

Definitely Skewed to the Right

Bimodal



9. (7 points) A doctor randomly selects 30 of his 20-29-year-old patients and obtains the following data regarding their serum HDL cholesterol:

70 56 48 48 53 52 66 48 36 49
 28 35 58 62 45 60 38 73 45 51
 56 51 46 39 56 32 44 60 51 44

Draw up a Stem and Leaf Plot of the data.

```

2 | 8
3 | 2 5 6 8 9
4 | 4 4 5 5 6 8 8 8 9
5 | 1 1 1 2 3 6 6 6 8
6 | 0 0 2 6
7 | 0 3
  
```

7

10. (1 point) Suppose a new HDL number of 134 is added to the data set in problem 9. Would this value be an example of an outlier?

~~No~~ yes

11. (6 points) Find the mean, median and mode (if one exists) for the following data:
2, 5, 4, 6, 7, 2, 4, 3

mean = 4.125
Median = 4

miss
-2

Modes 4 & 2.

12. (10 points) Sample annual salaries (in thousands of dollars) for public elementary school teachers are listed. Find the sample standard deviation. Round your answer to two decimal places. Use the chart provided if you need it.

23.3 19.9 27.8 25.3 41.3 19.3

mean = 26.15

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

-4

x	$x - \bar{x}$	$(x - \bar{x})^2$
23.3	-2.85	8.12
19.9	-6.25	39.06
27.8	1.65	2.72
25.3	-0.85	0.72
41.3	15.15	229.52
19.3	-6.85	46.92

10

13. (8 points) A class of 25 students had the following ACT scores:
 14, 16, 17, 18, 18, 18, 19, 19, 19, 20, 20, 21, 21, 23, 24, 24, 27, 27, 28, 29, 30, 31, 33, 33, 35.

Find the five-number summary and draw a boxplot that represents the data.

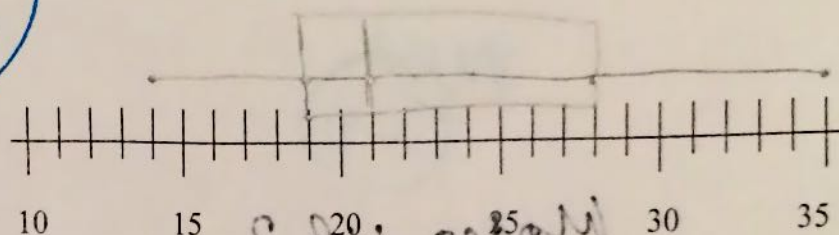
min = 14

$Q_1 = 19$

$M = 21$

$Q_3 = 28$

max = 35



14. (6 points) Find the area under the normal curve:

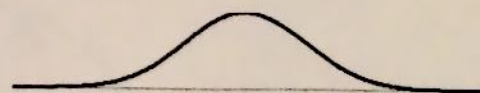
- a) to the left of $z = -1.47$

.0708



- b) to the right of $z = -2.06$

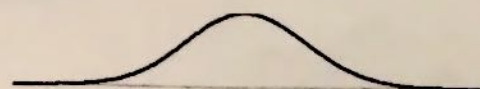
$1 - .0197$



- c) between $z = -0.07$ and $z = 1.98$

$.4721 - .0761$

$= .3960$



13

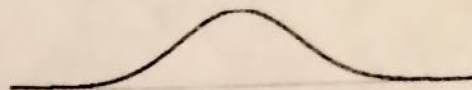
9

15. (6 points) The weights of steers in a herd are distributed normally. The standard deviation is 150 lbs and the mean steer weight is 1200 lbs.

- a) Find the probability that the weight of a randomly selected steer is less than 1136 lbs.

$$\frac{1136 - 1200}{150} = -0.43$$

$$P = .3336$$

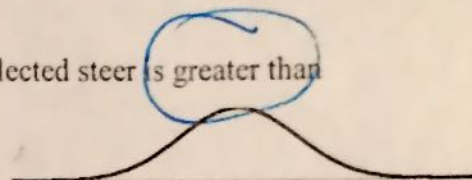
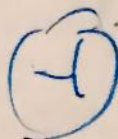


- b) Find the probability that the weight of a randomly selected steer is greater than 1160 lbs.

$$\frac{1160 - 1200}{150} = -0.27$$

$$z = -0.27$$

$$P = .3936$$



- c) Find the probability that the weight of a randomly selected steer is between 1300 and 1459 lbs.

$$\frac{1300 - 1200}{150} = 0.67$$

$$z = 0.67$$

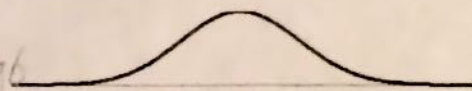
$$P = .7486$$

$$\frac{1459 - 1200}{150} = 1.73$$

$$z = 1.73$$

$$P = .9582$$

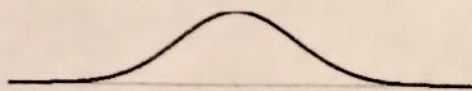
$$P = 0.2096$$



16. (6 points) Using the normal distribution table,

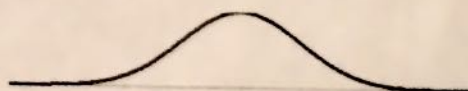
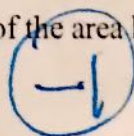
- a) find the value of z such that 0.7389 of the area lies to the left of z.

$$z = 0.64$$



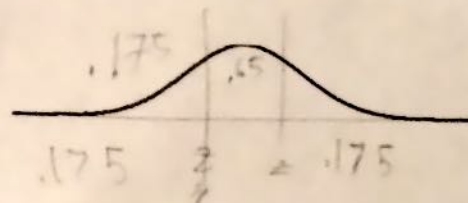
- b) find the value of z such that 0.1131 of the area lies to the right of z.

$$z = -1.21$$



- c) find the value of z such that 65% of the area lies between -z and z.

$$.65$$



$$-1.93 \text{ to } 1.93$$

17. (6 points) A sample of size $n = 80$ is taken from a population with mean $\mu = 52$ and standard deviation $\sigma = 22$.

a) Find the mean and standard deviation of the sampling distribution:

$$\mu_{\bar{x}} = 52$$

$$\sigma_{\bar{x}} =$$

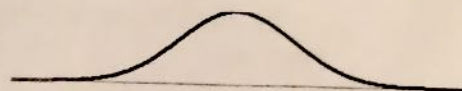
$$\frac{22}{\sqrt{80}} = 2.46$$

b) Find the probability that the sample mean $\bar{x}$ is more than 51.

$$z = \frac{51 - 52}{2.46}$$

$$P = .4801$$

(-1)

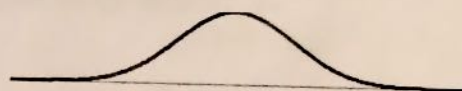


c) Find the probability that the sample mean $\bar{x}$ is between 50 and 53.

$$z = \frac{50 - 52}{2.46}$$

$$P = .4602$$

(-1)



$$z = \frac{53 - 52}{2.46}$$

$$P = .5199$$

$$.4602 - .5199 = -.0597$$

(-2)

4.