

MATH 1040

REVIEW (EXAM I)

Chapter 1

1. For the studies described, identify the population, sample, population parameters, and sample statistics:
 - a) The Gallup Organization conducted a poll of 1003 Americans in its household panel to determine what percentage of people plan to cancel their summer vacation because of the increase in gasoline prices.
 - b) Harris Interactive surveyed 2435 U.S. adults nationwide and asked them to rate quality of American public schools.
 - c) The American Institute of Education conducts an annual study of attitudes of incoming college students by surveying approximately 261,000 first-year students at 462 colleges and universities. There are approximately 1.6 million first-year college students in this country.
2. Determine whether the numerical value is a parameter or a statistics (and explain):
 - a) A survey of 1103 students were taken from the university with 19,500 students.
 - b) The 2006 team payroll of the New York Mets was \$101,084,963.
 - c) In a recent study of physics majors at the university, 15 students were double majoring in math.
3. Identify whether the statement describes inferential statistics or descriptive statistics:
 - a) Based on previous clients, a marriage counselor concludes that the majority of marriages that begin with cohabitation before marriage will result in divorce.
 - b) 78% of electricity used in France is derived from nuclear power.
4. Determine whether the data are qualitative or quantitative:
 - a) the social security numbers of the employees in the law firm
 - b) the zip codes of a sample of 270 customers at a local grocery store
 - c) the number of complaint letter received by the USPS in a given month
5. Identify the data set's level of measurement (nominal, ordinal, interval, ratio):
 - a) numbers of touchdowns scored by a major university in five randomly selected games : 1 2 5 1 2
 - b) the average daily temperatures (in degrees Fahrenheit) on seven randomly selected days
 - c) manuscripts rated as "acceptable" or "unacceptable"
 - d) the lengths (in minutes) of the top ten movies with respect to ticket sales in 2007
 - e) the size-class for a sample of automobiles:
subcompact compact midsize large compact large
 - f) the four departments of a car dealership:
sales financing parts and service customer service
 - g) the years of birth for students in this class
6. Decide which method of data collection you would use to collect data for the study (observational study, experiment, simulation, or survey):

- a) A study where a drug is given to 57 patients and placebo to another group of 57 patients to determine if the drug has an effect on a patient's illness.
 - b) The ages of people living within 300 miles of your home
 - c) The effect of stopping the cooling process of a nuclear reactor
7. Identify the sampling technique used (random, cluster, stratified, convenience, systematic):
- a) 32 sophomores, 35 juniors and 49 seniors are randomly selected from 230 sophomores, 280 juniors, 577 seniors at a certain high school.
 - b) To ensure customer satisfaction, every 35th phone call received by customer service will be monitored.
 - c) A journalist goes to a campground to ask people how they felt about air pollution.
 - d) Calling randomly generated telephone numbers, a study asked 855 U.S. adults which medical conditions could be prevented by their diet.
 - e) A pregnancy study in Chicago, randomly selected 25 communities from the metropolitan area, then interviewed all pregnant women in these communities.
8. Would sampling technique used in 7c) lead to a biased study? Explain why.
9. A report by the California Citrus Commission stated that cholesterol levels can be lowered by drinking at least one glass of a citrus product each day. Determine whether the survey questions is biased and why.

SOLUTIONS:

1. a) population: all Americans; sample: 1003 Americans surveyed;
population parameter: percentage of all Americans who plan to cancel their vacation;
sample statistic: percentage of those in the sample who plan to cancel their vacation
 - b) population: all Adult Americans; 2435 selected adults
population parameter: opinions of all American adults on public schools;
sample statistics: opinions of those in the sample on public schools
 - c) population: 1.6 million first-year college students; sample: 261,000 selected first-year college students; population parameters: attitudes of all first-year college students;
sample statistics: attitudes of those in the sample (261,000 selected)
2. a) statistics – only 1103 students were surveyed (not all students)
 - b) parameter – the entire team payroll is included
 - c) parameter – all physics majors were included in the study
3. a) inferential b) descriptive
 4. a) qualitative b) qualitative c) quantitative
 5. a) ratio b) interval c) ordinal d) ratio e) ordinal f) nominal g) interval
 6. a) experiment b) survey c) simulation
 7. a) stratified b) systematic c) convenience d) random e) cluster
8. Yes – most likely people who go camping do not approve of air pollution.
 9. Yes – a report sponsored by the citrus industry is much more likely to reach conclusions favorable to the industry.

Chapter 2

1. The Highway Patrol, using radar, checked the speeds (in mph) of 30 passing motorists at a checkpoint. The results are listed below:

44 38 41 50 36 36 43 42 49 48
 35 40 37 41 43 50 45 39 45 38
 50 41 47 36 35 40 42 43 48 33

Construct frequency distribution, a relative frequency distribution, and a cumulative frequency distribution using six classes. Find the midpoint of each class.

Construct a frequency histogram, a relative frequency histogram and a frequency polygon using six classes.

Construct an ogive using six classes.

If the policeman writes a ticket to anyone driving over 41 miles per hr, what percent of the cars will get a ticket?

2. Use the given frequency distribution to a) construct a cumulative frequency distribution and an ogive, b) approximate the mean of the grouped data.

Phone calls (per day)

Class	Frequency, f
8-11	18
12-15	23
16-19	38
20-23	47
24-27	32

3. Listed below are the ACT scores of 40 randomly selected students at a major university:

18 22 13 15 24 24 20 19 19 12
 16 25 14 19 21 23 25 18 18 13
 26 26 25 25 19 17 18 15 13 21
 19 19 14 24 20 21 23 22 19 17

Construct a frequency distribution table of the data, using eight classes.

If the university wants to accept the top 90% of the applicants, what should the minimum score be?

If the university sets the minimum score at 18, what percent of the applicants will be accepted?

4. The data below represent the infant mortality rates (per 1,000 births) and the life expectancies for seven selected countries in Africa. Use a scatter plot to display the data.

<u>Infant Mortality</u>	<u>63</u>	<u>199</u>	<u>71</u>	<u>61</u>	<u>67</u>	<u>35</u>	<u>194</u>
Life Expectancy	45	31	51	47	39	70	37

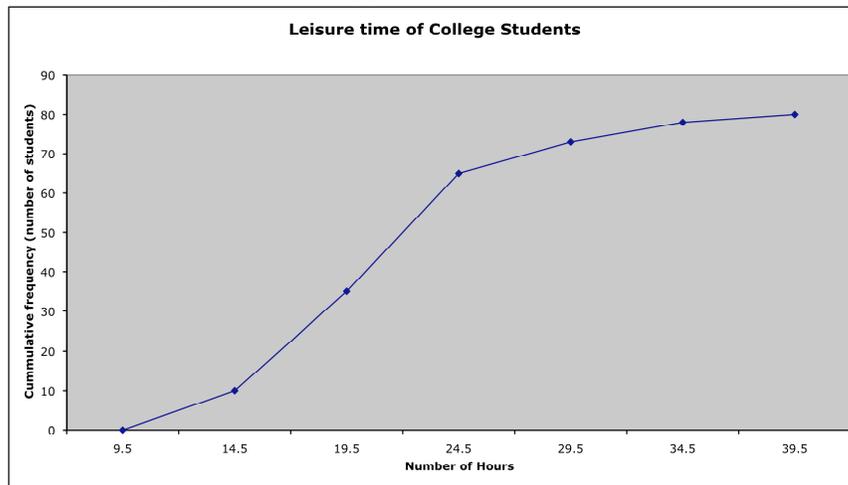
Is there a relationship between the infant mortality and the life expectancy?

5. A study was conducted to determine how people get jobs. Four hundred subjects were randomly selected and the following are the results:

Job Sources of Survey Respondents	Frequency
Newspaper want ads	69
Online services	124
Executive search firms	72
Mailings	32
Networking	103

Construct a pie chart and a Pareto chart of the data.

6. Use the ogive below to approximate the number in the sample



Use the ogive to approximate the number of students who said that their leisure time is at least 19.5 hrs.

7. For example 1 construct a stem-and-leaf plot and a dot plot. What can you conclude about the data? Find the mean, the median, and the mode.

8. Data set: systolic blood pressure of 17 randomly selected patients at a blood bank

135 120 115 132 136 124 119 145 98
113 125 118 130 116 121 125 140

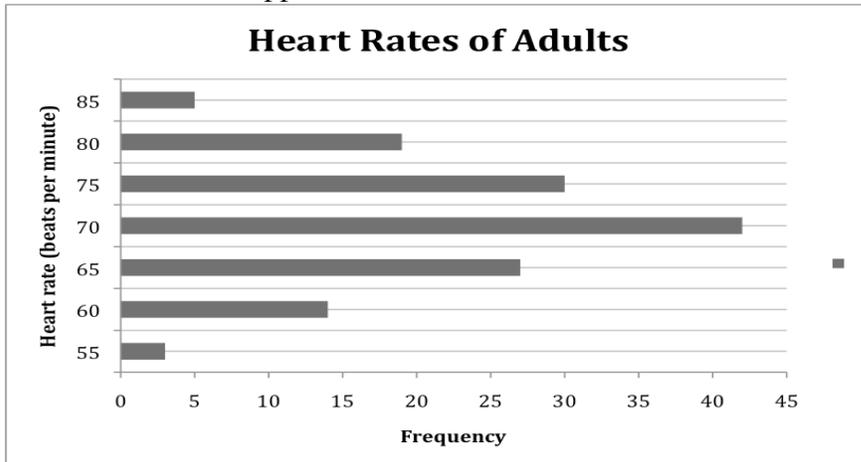
Construct a frequency distribution and frequency histogram of the data using five classes. Approximate the mean using five classes.

Find the mean, the median and mode. Are there any outliers?

9. Grade points are assigned as follows: A=4, B=3, C=2, D=1, AND F=0. Grades are weighted according to credit hours. If a student receives an A in four-unit class, a D in a two unit-class, a B in 3-unit class and a C in a three-unit class, what is the student's grade point average?

10. A student receives test scores of 78 and 82. The student's final exam score is 88 and quiz grades are 72, 81, 95, 84. Each test is worth 20% of the final grade, quizzes (total) count 25% of the final grade, and the final exam is 35% of the final grade. What is the student's mean score in class?

11. Use the data to approximate the mean heart rate of adults in the gym.



12. For the stem-and leaf plot below, find the range of the data set:

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

13. Find the sample standard deviation:

a) 15 42 53 7 9 12 14 28 47

b) 70 72 71 70 69 73 69 68 70 71

14. In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed below. Compute the range, variance and standard deviation of the data

1.1 5.2 3.6 5.0 4.8 1.8 2.2 5.2 1.5 0.8

15. You are the maintenance engineer for a local high school. You must purchase fluorescent light bulbs for the classrooms. Should you choose Type A with $\mu = 3000$ hours and $\sigma = 200$ hours, or Type B with $\mu = 3000$ hours and $\sigma = 250$ hours?

16. Adult IQ scores have a bell-shaped distribution with mean of 100 and a standard deviation of 15. Use the Empirical Rule to find the percentage of adults with scores between 70 and 130.

If 250 adults are randomly selected, about how many of them have an IQ between 85 and 130? (answer: about 204 adults)

17. The average IQ of students in a particular class is 110, with a standard deviation of 5. The distribution is roughly bell-shaped. Find the percentage of students with an IQ above 120.

18. Heights of adult women have a mean of 63.6 in. and a standard deviation of 2.5 in. Does Chebychev's Theorem say anything about the percentage of women with heights between 58.6 in and 68.6 in? What about the heights between 61.1 in and 66.1 in?

What about the heights between 56.1 in and 71.1 in?

If 300 women are randomly selected, using Chebychev's Theorem determine about how many are between 56.1 and 71.1 inches tall? (answer: at least 267 women)

19. Use the data given in #2. Approximate the sample standard deviation of phone calls per day.

①

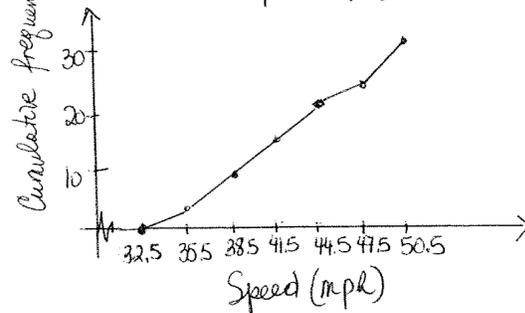
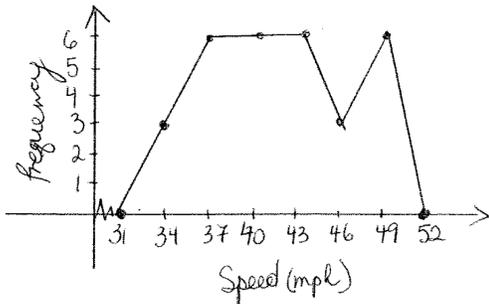
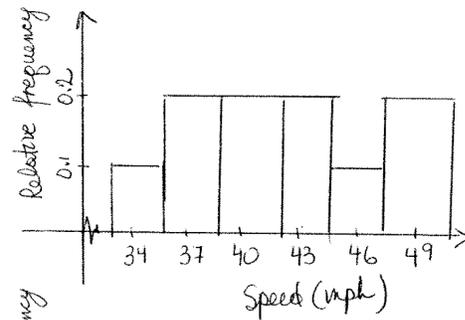
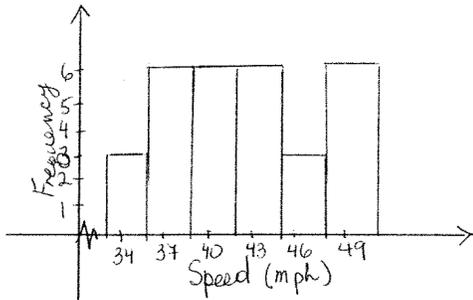
SOLUTIONS (Chapter 2)

min = 33

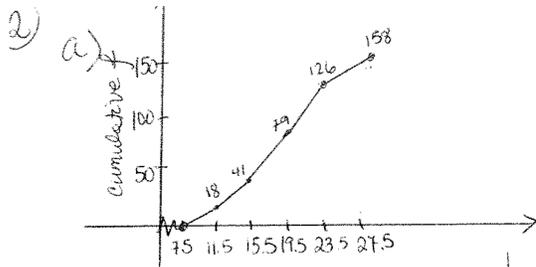
max = 50

$$\frac{50-33}{6} = \frac{17}{6} = 2.5 \rightarrow 3$$

CLASS Speed (mph)	Frequency	Relative f	Cumulative f	Midpoint
33-35	3	$\frac{3}{30} = 0.1$	3	34
36-38	6	$\frac{6}{30} = 0.2$	9	37
39-41	6	0.2	15	40
42-44	6	0.2	21	43
45-47	3	0.1	24	46
48-50	6	0.2	30	49



over 41 mph \rightarrow add relative frequencies for classes: 42-44, 45-47, 48-50
 $0.2 + 0.1 + 0.2 = 0.5 = \boxed{50\%}$



b) use midpoints. (9.5, 13.5, 17.5, 21.5, 25)

$$\bar{x} = \frac{9.5 \times 18 + 13.5 \times 23 + 17.5 \times 38 + 21.5 \times 47 + 25.5 \times 32}{158}$$

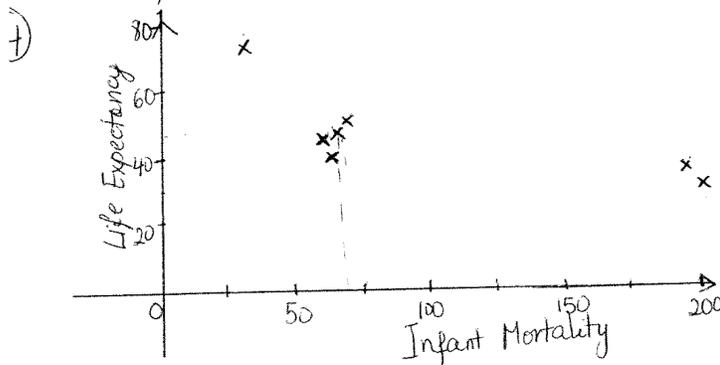
$$\bar{x} = \frac{2973}{158} = 18.81$$

3) min = 12
max = 26
 $\frac{26-12}{8} = 1.75 \rightarrow 2$
class width

Class	Tally	Frequency	Cumulative Freq.	Relative freq.
12-13		4	4	4/40 = 0.1
14-15		4	8	0.1
16-17		3	11	0.075
18-19	#	11	22	0.275
20-21		5	27	0.125
22-23		4	31	0.1
24-25	#	7	38	0.175
26-27		2	40	0.05

top 90% → all but class 12-13; minimum score = 14

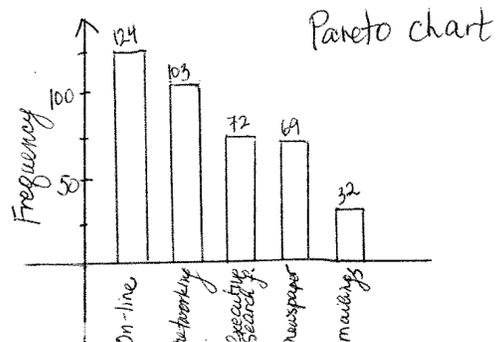
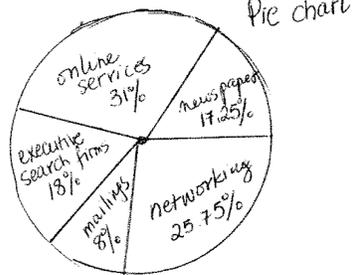
$$\frac{29}{40} = 0.725 = 72.5\%$$



As the number of infant mortality decreases, the life expectancy increases
OR
as infant mortality ↑, the life expectancy ↓

5) Find relative frequencies/angles;
then:

in order
% angle
7.25 62.1°
31 111.6°
8 64.8°
8 28.8°
15.75 92.7°



⑥ a) 80
b) $80 - 35 = 45$

⑦ 3 | 8 6 6 5 7 9 8 6 5 3

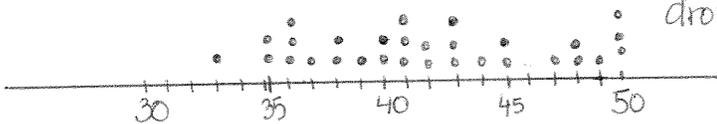
4 | 4 1 3 2 9 8 0 1 3 5 5 1
7 0 2 3 8
5 | 0 0 0

More than 50% of the cars drove 40-49 mph.

You can order the data & have 2 stems.

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

$11/30 = 36.7\%$ of the cars drove 40-44 mph



mean = $\frac{1255}{30} = 41.8\bar{3}$
= 41.8 mph

median = $\frac{41+42}{2} = 41.5$ mph

mode - does not have much meaning since there are 4 values with $f=3$

⑧ - to approximate the mean using 5 classes → use midpoints approximation: mean = 124.3
- mean = 124.2
median = 124
mode = 125
98 is an outlier

⑨ 2.75

⑩ 83.6

⑪ 70.6

⑫ 31

⑬ a) $\bar{x} = \frac{227}{9} = 25.2$
 $s = 17.8$

b) $\bar{x} = 70.3$
 $s = 1.49$

⑭ range = 4.4, $\bar{x} = 3.12$
 $s^2 = 3.3124$
 $s = 1.82$

⑮ lower standard deviation → data more consistent
Choose Type A

⑯ 95%

⑰ 2.5%

⑱ a) At least 75% of the heights should fall between 58.6 in & 68.6 in.

b) NO
c) At least 88.9% between 56.1 & 71.1 in.

⑲ $s = 5.1$