

The following data give the prices of textbooks randomly selected from a university bookstore. Use the data to answer questions 1 - 4.

\$89, \$75, \$104, \$113, \$111, \$157, \$67, \$75

67 75 | 75 89 | 104 111 | 113 157

1. Find the mean.

$$\bar{x} = \frac{791}{8} \approx \$98.88$$

2. Find the median.

$$\frac{89+104}{2} = \frac{193}{2} = 96.5 = Q_2$$

3. Find the mode.

\$75

4. Would any of the data values be

considered an outlier? Show mathematically.

IQR

$Q_3 - Q_1$

$$112 - 75 = 37$$

$$37 \times 1.5 = 55.5$$

$$(75 - 55.5, 112 + 55.5) = (19.5, 167.5)$$

NO

OUTLIERS

5. **Explain** which measure of central tendency, the mean, median, or mode, is best to use to describe each type of data set.

a) A data set in which data is collected about favorite tv show. *mode because data is nominal + qualitative*

b) A data set in which most people watch between 12-16 hours of TV each week, except one person who watched 58 hours each week *median because it would be skewed*

c) A data set in which the top speeds of cars ranges from 119 mph to 125 mph.

*mean because the data*

*is symmetric*

*by the outlier who watches too much tv*

6. The following data set shows daily commuting times for all the employees of a company. Find the mean driving time.  $\bar{x}$

Daily Commuting Times (minutes)	mid	Number of Employees	$xw$
1 to 10	5.5	4	22
11 to 20	15.5	12	186
21 to 30	25.5	19	484.5
31 to 40	35.5	8	284
41 to 50	45.5	2	91

$$\mu = \frac{\sum xw}{\sum w} = \frac{1067.5}{45}$$

$$\sum w = 45 \quad \sum xw = 1067.5$$

$$\mu \approx 23.72$$

\*Describe the mean in terms of this problem.

\* Since midpoint was to the 10ths place, we rounded to the 100ths place for our answer because of the Round Off Rule

The average drive time for the employees of the company is about 23.72 minutes.

7. Determine the following student's GPA based on the classes and grades below if A = 4 points, B = 3 points, C = 2 points, D = 1 point. How would this grade be different if all classes counted equally?

**Class--Credit**

Biology--4 credits

Intro to Fiction--3 credits

Sociology--3 credits

Computer Programming--2 credits

French--3 credits

Unweighted

$$\frac{3+4+4+2+3}{5} = \frac{16}{5} = 3.2 \text{ B}$$

**Grade**

B

A

A

C

B

CLASS	CR HRS	GRADE	XW
BIO	4	3	12
FICTION	3	4	12
SOC	3	4	12
COMP. PROG	2	2	4
FRENCH	3	3	9

$$\sum W = 15$$

$$\sum XW = 49$$

Weighted  
GPA  
 $\mu = \frac{49}{15}$   
 $\mu \approx 3.3$   
B+

8. To determine a student's physics grade, a teacher uses 4 categories. Tests are 60% of the grade, the midterm is 25% of the grade, homework is 10% of the grade and attendance is 5% of the grade. A student has a test average of 92, received an 88 on the midterm, has a 100 for homework, and an 85 for attendance. Calculate their grade for this class. Make a chart.

CATEGORY	WEIGHT	Avg	XW
TESTS	.60	92	55.2
MIDTERM	.25	88	22
HW	.10	100	10
ATTENDANCE	.05	85	4.25

The student would  
earn a 91.3% in  
class (A-)

$$\sum W = 1.0 \quad \sum XW = 91.25$$

9. In a particular law firm, 12 lawyers make \$125,000 each while the 3 partners make \$180,000 each. Find the average salary for that law firm. Make a chart.

JOB	SALARY (V)	WEIGHT (W)	XW
LAWYER	125,000	12	1500000
PARTNER	180,000	3	540000

$$\mu = \frac{2,040,000}{15} = \$136,000$$

The average salary  
at this firm is

$$\sum W = 15 \quad \sum XW = 2,040,000$$

10. Find the mean temperature for Philadelphia over a 1-year period using the frequency distribution below

Temperature	Frequency	XW
9-19	14	98
20-30	25	300
31-41	36	1548
42-52	47	3196
53-63	58	4002
64-74	69	5106
75-85	80	5440
86-96	91	2184

$$\sum W = 365 \quad \sum XW =$$

$$\mu = \frac{21874}{365} \approx 59.9$$

The average yearly  
temp for Philadelphia  
that year was  
59.9°F.

2.3: Measures of Variation

- \*Mean, Median, Mode
- \*Weighted Mean
- \*Mean of a Frequency Distribution
- \*Describing the Shape of a Distribution
- \*Determining an Outlier (beyond 2 std. dev. of the mean)

2.4: Measures of Variation

- \*Finding and Interpreting Standard Deviation
- \*Using the Empirical Rule
- \*Using Chebychev's Theorem

2.5: Measures of Position

- \*Finding the 5-number summary
- \*Creating a Box and Whisker plot
- \*Determining an Outlier (beyond 1.5(IQR) from  $Q_1$  and  $Q_3$ )
- \*Interpreting Fractiles
- \*Finding and explaining a Z-Score
- \*Comparing Z-Scores

Use the data below to answer questions 1 – 6.

Total Philanthropic Givings in Lifetime:

Donors	Givings (millions of dollars)
Bill and Melinda Gates	27,976
Warren Buffet	2730
George Soros	5171
Michael and Susan Dell	1230
Walton Family	1000
Ted Turner	1200

1. Find the mean of the data set to the nearest whole number.

$$\bar{x} = 6551$$

2. Find the median of the data set.

$$Q_2 = 1480$$

3. Find the mode of the data set. none

4. Is the mean, median or mode a better measure of central tendency? Explain.

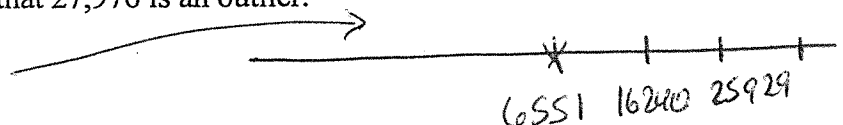
Median because the Gates' donation is an outlier

5. Find the population standard deviation. Round to the nearest whole number.

$$\sigma = 9689$$

6. Use the mean/SD definition of outlier to show that 27,976 is an outlier.

$$27976 > 25929$$



7. A college professor gives 3 exams throughout the semester. The first exam is worth 20% of the grade, the second worth 30% and the third test worth 50% of the grade. Calculate a student's grade if their test scores were 85, 90, and 75. Use the right for your table.

$$\sum w = 1.0$$

$$\sum xw = 81.5$$

$$\bar{x} = \frac{81.5}{1.0} = 81.5\%$$

B-

Exam	(w)	(x)	xw
1st	.20	85	17
2nd	.30	90	27
3rd	.50	75	37.5

Use the data below to answer questions 8 -11.

Number of Car Thefts in 12 US Cities in 2003

City	Number of Car Thefts
Phoenix-Mesa, AZ	40,769
Washington, DC	33,956
Miami, FL	21,088
Atlanta, GA	29,920
Chicago, IL	42,082
Kansas City, KS	11,669
Baltimore, MD	13,435
Detroit, MI	40,197
St. Louis, MO	18,215
Las Vegas, NV	18,103
Newark, NJ	14,413
Dallas, TX	26,343

$$20818.5 \times 1.5 = 31227.75$$

$$Q_1 - 31227.75 = 0$$

(no car thefts)  
negative

$$Q_3 + 31227.75 = 68304.25$$

(0, 68304.25)  
no outliers

$$\min = 11669$$

$$Q_1 = 16258$$

$$Q_2 = 23715.5$$

$$Q_3 = 37,076.5$$

$$\max = 42082$$

8. Find the 5-number summary of the data.

9. Sketch a box and whisker plot of the data to the right of the table.

10. Find the IQR of the data set.  $37076.5 - 16258 = 20818.5$

11. Use the IQR definition of outlier to show that none of the values are outliers.

12. The data below shows a sample of computers sold at one branch of "Buy More" stores. Calculate the mean number of computers sold at that branch.

Computers Sold	Frequency	$xw$
4 to 9	2	13
10 to 15	4	60
16 to 21	10	155
22 to 27	6	147
28 to 33	3	91.5

$$4 + 9 = \frac{13}{2}$$

$$\bar{x} = \frac{\sum xw}{\sum w} = \frac{486.5}{25} = 19.46$$

computers

$$\sum w = 25$$

$$\sum xw = 486.5$$

$$15 \quad 235 \quad 13.5 \quad 34 \quad 34 \quad 13.5 \quad 235 \quad 15$$

4 26 28 40 52 64 76

13. 5000 people entering a mall to Christmas shop were surveyed and found to have ages with a mean of 40 years and a standard deviation of 12 years. Use this to answer (a) and (b).

a) Using the Empirical Rule, approximately what percent of people were between the ages of 16 and 52?

$$34 + 34 + 13.5 = 81.5\%$$

b) Using the Empirical Rule, approximately what percent of people were less than 28 years old?

$$16\% \quad 15 + 235 + 13.5$$

c) Using the Empirical Rule, approximately what percent of people were between 52 and 76?

d). Using Chebychev's theorem, approximately what percent of people were between the ages of 16 and 64?

$$k = 2 \quad 75\%$$

$$2.35 + 13.5$$

14. IQ scores usually have a mean of 100 with a standard deviation of 15. Albert Einstein reportedly had an IQ of 160.

a) Convert Einstein's IQ to a z-score.

a)

b) Is Einstein's IQ usual or unusual? Explain.

$$z = \frac{160 - 100}{15} = \frac{60}{15} = 4$$

Highly unusual  
273

c) What would an unusual IQ score be?

$$\frac{x - 100}{15} \geq 2$$

less than 70 or more than 120

$$x - 100 > 30$$

$$x > 130$$

$$\frac{x - 100}{15} < -2$$

$$x - 100 < -30$$

$$x < 70$$