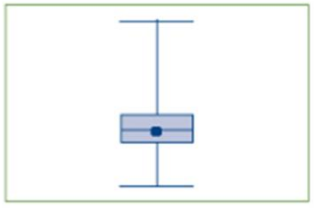
MATH 4740/MSSC 5740
Chapter 4 Problem Solving # 1,

4.4 Summary

Variable Type	Statistic/Graphical Display	Definition
Dichotomous, Ordinal, or Categorical	Relative Frequency	Frequency/n
Dichotomous or Categorical	Frequency or Relative Frequency Bar Chart	
Ordinal	Frequency or Relative Frequency Histogram	
Continuous	Mean	$\bar{X} = \frac{\sum X}{n}$
	Standard Deviation	$s = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} = \sqrt{\frac{\sum X^2 - \frac{1}{n}\left(\sum X\right)^2}{n-1}}$
	Median	Middle value in ordered dataset
	First Quartile	Q_1 = Value holding 25% below it
	Third Quartile	Q_3 = Value holding 25% above it
	Interquartile Range	$IQR = Q_3 - Q_1$
	Criteria for Outliers	Values below $Q_1 - 1.5 \times (Q_3 - Q_1)$ or above $Q_3 + 1.5 \times (Q_3 - Q_1)$
	Box-Whisker Plot	

Q_1 is the 25^{th} percentile. Median of lower half.

Q_2 is the 50^{th} percentile AKA median

Q_3 is the 75^{th} percentile. Median of upper half.

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4.1 Practice Problems

1. A study is run to estimate the mean total cholesterol level in children 2 to 6 years of age. A sample of nine participants is selected and their total cholesterol levels are measured as follows:

185	225	240	196	175
180	194	147	223	

a. Compute the sample mean.
b. Compute the sample standard deviation.
c. Compute the median.
d. Compute the first and third quartiles.
e. Which measure, the mean or median, is a better measure of a typical value? Justify.
f. Which measure, the standard deviation or the interquartile range, is a better measure of dispersion? Justify.

X	X^2
147	21,609
175	30,625
180	32,400
185	34,225
194	37,636
196	38,416
223	49,729
225	50.625
240	57,600
1765	352,865

a. $\overline{X} = \frac{\Sigma X}{n} = \frac{1,765}{9} = 196.1$

b. $s = \sqrt{\frac{\Sigma X^2 - (\Sigma X)^2/n}{n-1}} = \sqrt{\frac{352,865 - (1,765)^2/9}{9-1}} = \sqrt{\frac{352,865 - (3,115,225/9)}{8}}$

$= \sqrt{\frac{352,865 - 346,136.1}{8}} = \sqrt{\frac{6,728.89}{8}} = \sqrt{841.1} = 29.0$

c. 147, 175, 180, 185, 194, 196, 223, 225, 240

d. Q_1 = ((175 + 180)/2 =177.5 Q_3 = (223 + 225)/2 =224

e. No outliers, therefore the best measure of a typical value is the sample mean, 196.1.
Check for outliers: IQR = 224 – 177.5 = 46.5
Lower Limit = 177.5 – 1.5(46.5) = 107.8
Upper Limit = 224 + 1.5(46.5) = 293.8

f. Because there are no outliers, the best measure of dispersion is the sample standard deviation, *s* = 29.0.