

UNIVERSITY OF SOUTH AUSTRALIA
2018 - 2019

STUDY GUIDE

MATH1053

QUANTITATIVE METHODS FOR BUSINESS



NUMERICAL DATA & CHARTS

- TOPIC REVISION -

Variables	Explanation	Formula
Mean	A measure of central tendency	$\mu = \frac{\sum_{i=1}^N x_i}{N}$
Median	50 th percentile or midpoint of the sorted sample data	Find value at n th position $n^{\text{th}} = \frac{n+1}{2}$
Mode	The most frequently occurring data value	Find value with highest frequency
Maximum	Maximum value in data set	Find maximum value in data set
Minimum	Minimum value in data set	Find minimum value in data set
Variance	Dispersion or spread of data around the mean	$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$
Standard Deviation	Squared root of Variance	$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$
First Quartile (Q1)	25 th percentile of the sorted sample data	Find value at n th position $n^{\text{th}} = 0.25 * \frac{n+1}{2}$
Second Quartile (Q2)	Median value	Find value at n th position $n^{\text{th}} = 0.50 * \frac{n+1}{2}$
Third Quartile (Q3)	75 th percentile of the sorted sample data	Find value at n th position $n^{\text{th}} = 0.75 * \frac{n+1}{2}$
Interquartile Range	Difference between 3 rd - and 1 st Quartile	$\text{IQR} = Q3 - Q1$
Lower Fences	Lower Limit using IQR	$\text{LF} = Q1 - 1.5 \text{ IQR}$
Upper Fences	Upper Limit using IQR	$\text{UF} = Q3 + 1.5 \text{ IQR}$

PRACTICE EXAM & SOLUTIONS

Expenditures of 15 randomly customers in XYZ Company during the year 2015:

\$19 \$19 \$20 \$25 \$22 \$41 \$22 \$15 \$72 \$118 \$69 \$33 \$53 \$14

Question a. Descriptive Statistics of the given data

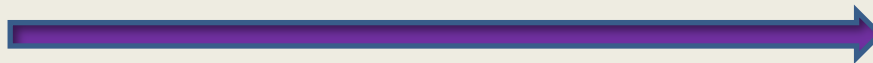
Question b. Find First Quartile, Second Quartile, Third Quartile, Interquartile Range

Question c. Draw Frequency Histogram

ANSWERS

Rearrange the data series from lowest to highest value:

\$14 \$15 \$16 \$19 \$19 \$20 \$22 \$22 \$25 \$33 \$41 \$53 \$69 \$72 \$118



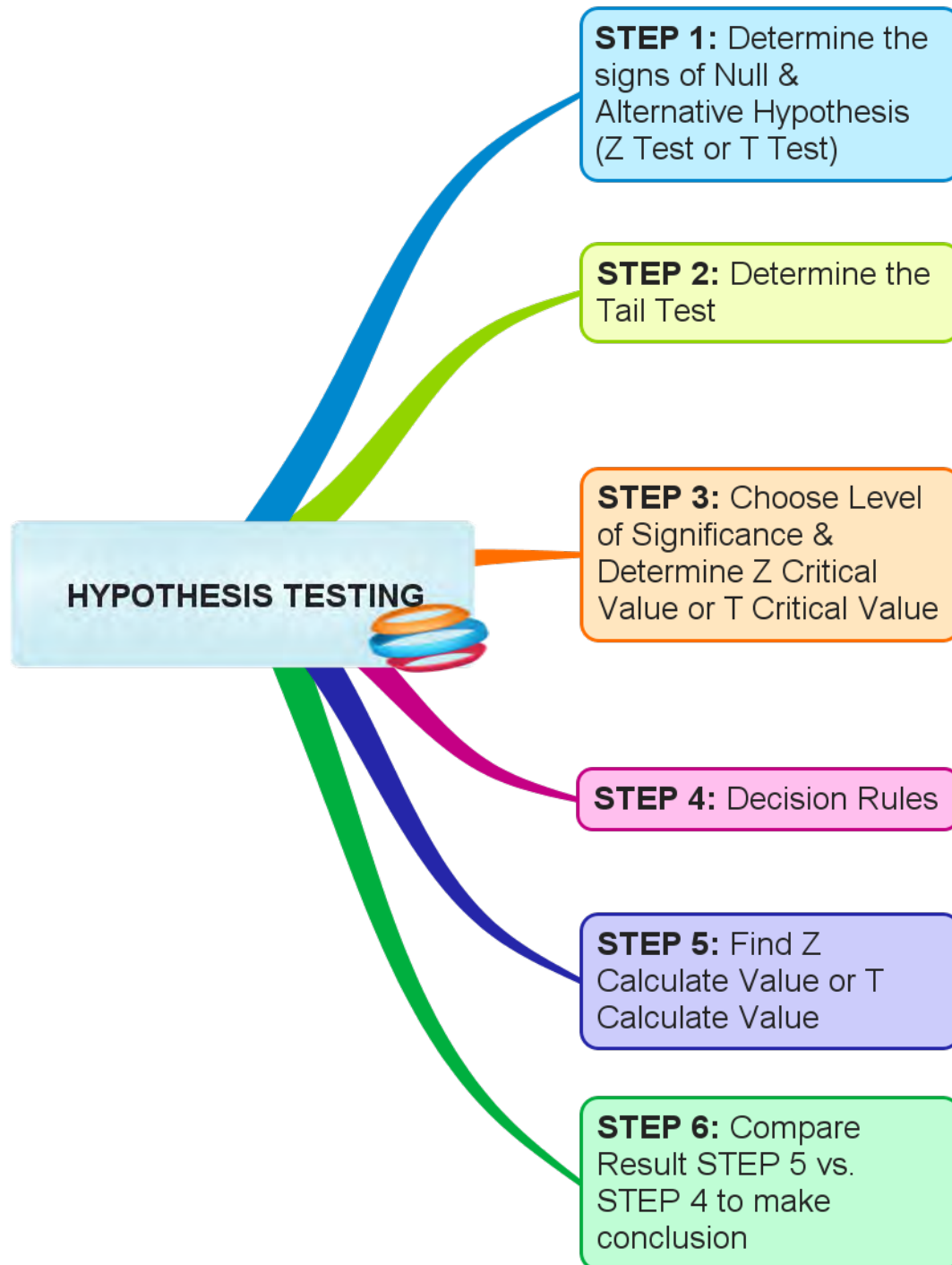
<i>Calculation 1</i>	Mean	$\bar{x} = \frac{\$14 + \$15 + \$16 + \$19 + \$19 + \dots + \$118}{15} = 37.2$
<i>Calculation 2</i>	Median	Find the position of median: $n^{\text{th}} = \frac{15+1}{2} = 8^{\text{th}}$ 8 th position, value = median = \$22
<i>Calculation 3</i>	Mode	Modes: 19 & 22
<i>Calculation 4</i>	Maximum	118
<i>Calculation 5</i>	Minimum	14
<i>Calculation 6</i>	Variance	$\frac{(14 - 37.2)^2 + (15 - 37.2)^2 + \dots + (118 - 37.2)^2}{15 - 1} = 863$
<i>Calculation 7</i>	Standard Deviation	$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}} = \sqrt{863} = 29.38$
<i>Calculation 8</i>	1st quartile	Find the position of median: $n^{\text{th}} = 0.25 \frac{15+1}{2} = 4^{\text{th}}$ Q1 is 4th value in array = 19

FINAL EXAM TECHNIQUES, TIPS & TRICKS

HYPOTHESIS TESTING PROCESS

EXAMINABLE
- TOPIC -

FOLLOW 6 SIMPLE STEPS



PRACTICE EXAM QUESTIONS & SOLUTIONS

Simple Linear Regression -

The following data set relates to the starting Annual Income of Information Technology graduates against their Weighted Average Mark (WAM):

WAM (100)	ANNUAL INCOME	WAM (100)	ANNUAL INCOME
50	42	72	87
98	103	39	50
67	41	43	81
58	75	56	66
67	80	41	58
63	87	69	74
43	36	52	61
54	39	85	73
61	61	32	55
78	71	74	61

Data Visualisation - Question 1

Part a. Which variable would be the dependent variable, independent variable?

Part b. Plot the data on a scatter diagram.

Part c. Describe the relationship between WAM (Weighted Average Mark) & Annual Income

Technical Analysis - Question 2

Part d. Find the correlation coefficient

Part e. Find the regression model & write it down & discuss how good it is (Goodness-of-Fit)

Part f. Interpret the meaning of estimated coefficients of the model

Part g. Estimate the average annual income of a graduate with WAM of 70

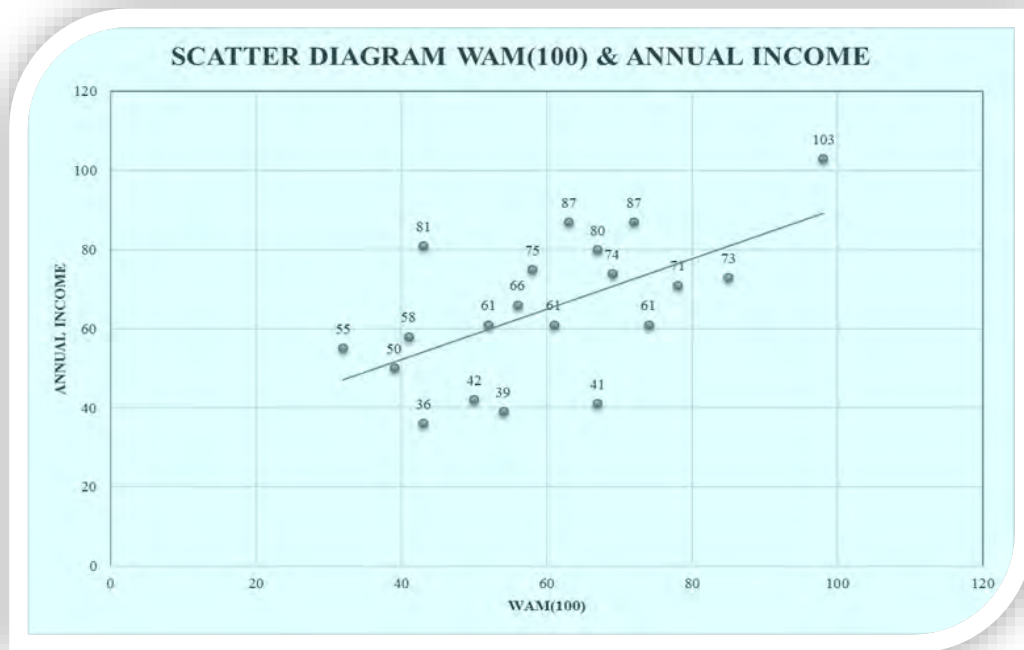
ANSWERS & EXPLANATIONS

Part
a.

The annual salary of IT graduates might depend on their WAM (WAM depending on the salary does not make sense).

- WAM (100): independent variable
- ANNUAL INCOME: dependent variable

Part
b.



Part
c.

There is a moderate positive linear relationship between *Annual Income* and WAM.

Part
d.

**CORRELATION COEFFICIENT (EXCEL – CORREL
FUNCTION)**
 $r = 0.59$

$$r = \frac{Cov(X, Y)}{\sigma_X \sigma_Y}$$

Part
e.

$$\widehat{Annual\ Income} = 26.73 + 0.638 * WAM$$

- R^2 value is 0.3468, which indicates 34.68% of the variation in graduates starting salaries is explained to the variation in their WAM.
- The remaining 65.32% would be explained by other factors not considered in the model.

SAMPLE EXAMINATION QUESTIONS

+ DETAILED ANSWERS

Question 1

Following are the expenditures of 15 randomly selected Woolworth customers from the last time they shopped at a Woolworth's supermarket

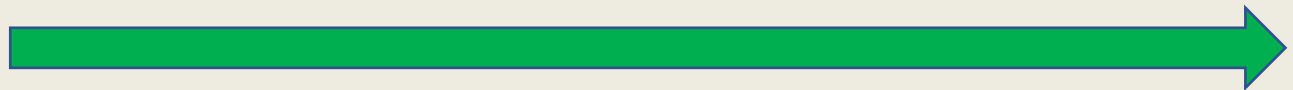
EXPENDITURES (\$)				
\$19	\$19	\$20	\$25	\$22
\$41	\$22	\$15	\$72	\$118
\$69	\$33	\$53	\$14	\$16

Part a.

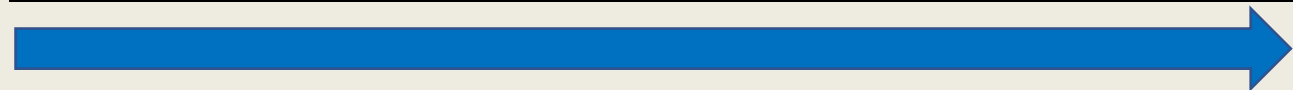
Draw a frequency histogram for the expenditure data. From your diagram, how would you describe the shape of the data? Without performing any calculations, does there appear to be any outliers?

Step 1 – Array Data

\$14	\$15	\$16	\$19	\$19
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\$20	\$22	\$22	\$25	\$33
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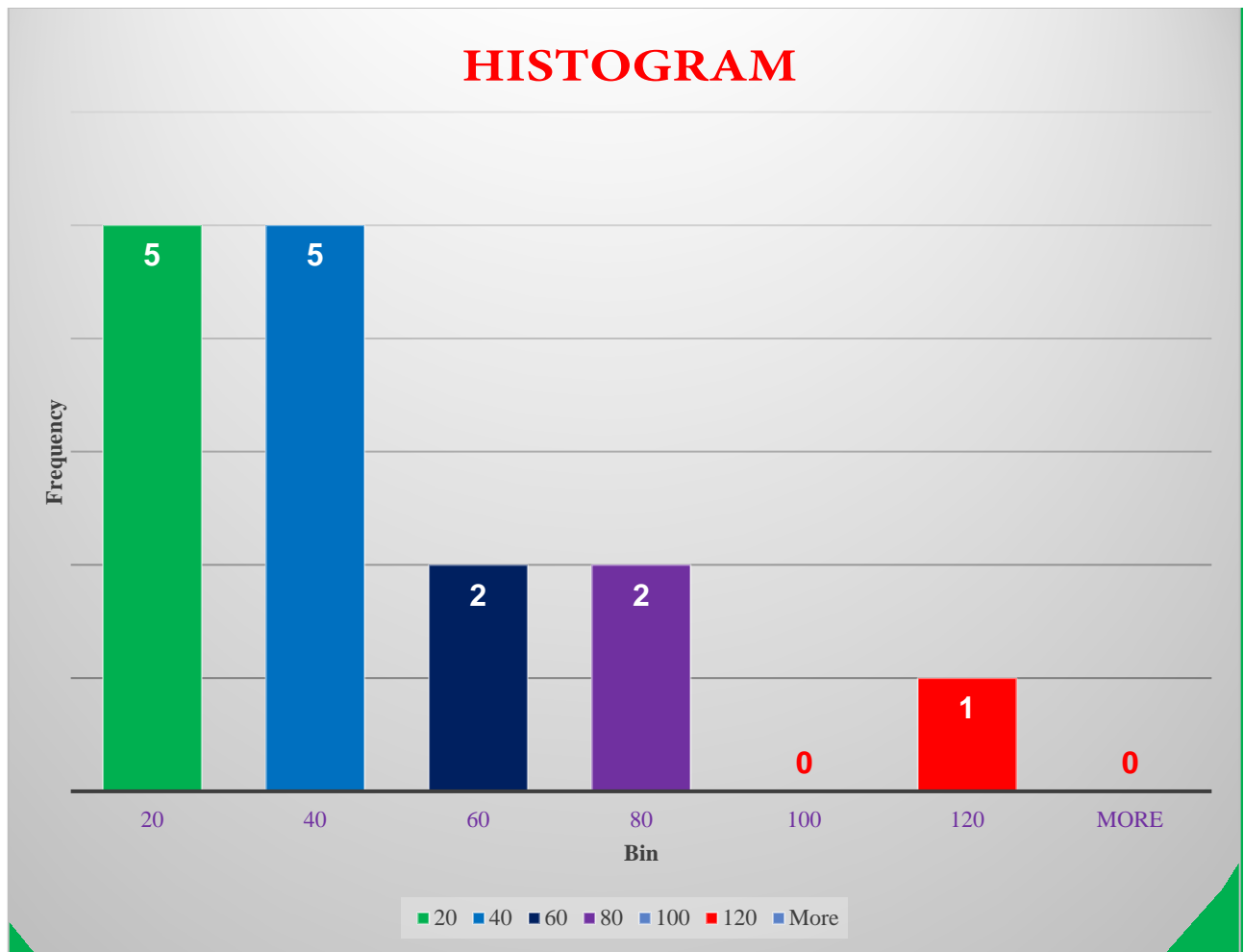
\$41	\$53	\$69	\$72	\$118
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Construct a frequency distribution:

Range	Count
\$0 to less than \$20	5
\$20 to less than \$40	5
\$40 to less than \$60	2
\$60 to less than \$80	2
\$80 to less than \$100	0
\$100 to less than \$120	1

Draw Histogram:



The histogram is clearly positively skewed

Yes, there seems to be 1 outlier: **\$118**