

MATHEMATICS APPLICATIONS

Test 4 2018 Statistics

Section A-Resource Free

Marks: 20 Time Allowed: 20 minutes

TOTAL : 57

Name: Solutions

ALL working must be shown for full marks.

For any answers that do not exist an explanation must be given.

Question 1

[4 marks]

a) Classify the following data by placing it into the correct section of the table:

Times recorded in a running race, car colours, baby weight, gender, hotel star rating, number of goals kicked in a football game, report grades, height, language spoken at home.

(-1/2 each error)

Categorical		Numerical	
Nominal	Ordinal	Discrete	Continuous
Car Colours	Hotel Star Rating	Goals Kicked.	Race times
Gender	Report Grades		Baby weight
Language			Height

Question 2

[4, 4 = 8 marks]

Calculate the mean, median, mode and range for the following sets of data.

a) 3, 7, 10, 3, 11, 0, 6, 8 → 0, 3, 3, 6, 7, 8, 10, 11

$$\bar{x} = \frac{48}{8}$$

$$= 6 \quad (\checkmark)$$

$$\text{Mode} = 3 \quad (\checkmark)$$

$$\text{Median} = 6.5 \quad (\checkmark)$$

$$\text{Range} = 11 - 0$$

$$= 11 \quad (\checkmark)$$

b)

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

$$\bar{x} = \frac{350}{10}$$

$$= 35 \quad (\checkmark)$$

No Mode (✓)

$$\text{Median} = \frac{27 + 40}{2}$$

$$= 33.5 \quad (\checkmark)$$

$$\text{Range} = 58 - 13$$

$$= 45 \quad (\checkmark)$$

Question 3

[3, 5 = 8 marks]

- a) Given the set of nine scores below, give a possible value for a 10th score x if it is a maximum score and an outlier. Justify your answer by showing all calculations.

~~16, 5, 7, 3, 12, 20, 16, 11, 2, x~~

2, 3, 5, 7, 11, 12, 16, 16, 20, x . (✓) (Quartiles)
 Q_1 Q_3

To be an outlier it will have to be $> Q_3 + 1.5 \times IQR$

$$IQR = 16 - 5 = 11$$

$$1.5 \times 11 = 16.5 \quad (\checkmark) IQR.$$

$$\text{Outlier} > 16 + 16.5 > 32.5$$

So any number bigger than 32.5 (✓) Answer.

- b) Describe how removing the outlier above will affect the

i) Mean

(✓) Reduce the mean

ii) Median

(✓) Slightly reduce the median to 11 from 11.5

iii) Mode

(✓) No change

iv) Standard deviation

(✓) Reduce

v) Range

(✓) Greatly Reduce.

MATHEMATICS APPLICATIONS

Test 4 2018 Statistics

Section B-Resource Assumed

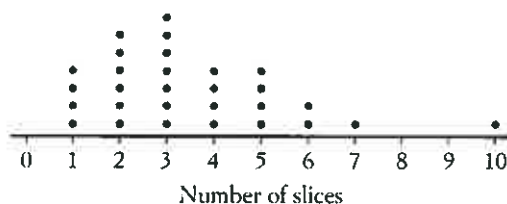
Marks: 37 Time Allowed: 35 minutes

ALL working must be shown for full marks.

Question 1

[1, 2, 5, 4 = 12 marks]

The following dot plot represents the number of pizza slices eaten per person at a teenager's 16th birthday.



a) What is the total number of pizza slices consumed?

102

b) Is 10 an outlier? Explain.

$$Q_1 = 2, Q_3 = 5$$

$$IQR = 3 \quad (\checkmark)$$

$$Q_3 + 1.5 \times IQR$$

$$= 5 + 4.5$$

$$= 9.5 \quad \therefore \text{yes 10 is an outlier. } (\checkmark)$$

c) Ignoring any outliers, calculate the Mean, Mode, Median and Range and Inter Quartile Range for the number of slices of pizza eaten.

$$\text{Mean} = \frac{102}{32} = 3.1875 \approx 3.2$$

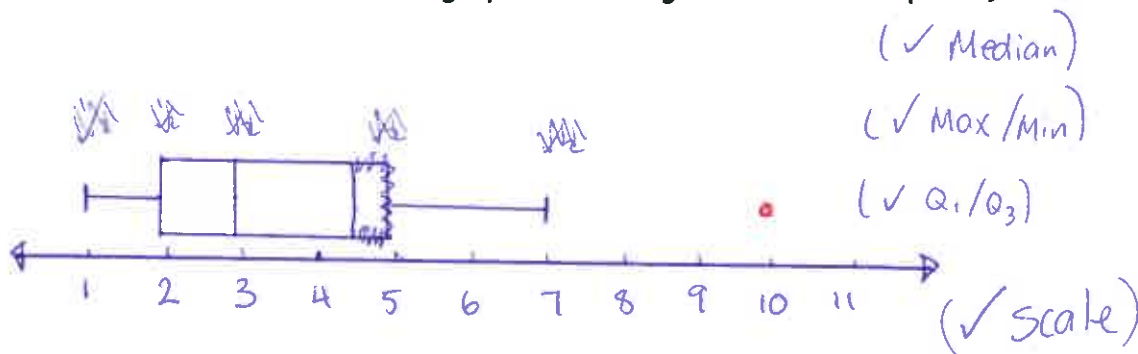
$$\text{Mode} = 3$$

$$\text{Median} = 3$$

$$\text{Range} = 6$$

$$IQR = 3 \quad Q_1 = 2, Q_3 = 5$$

d) Create a Box and whisker graph below using the statistics in part c)



Question 2

[3, 2, 1 = 6 marks]

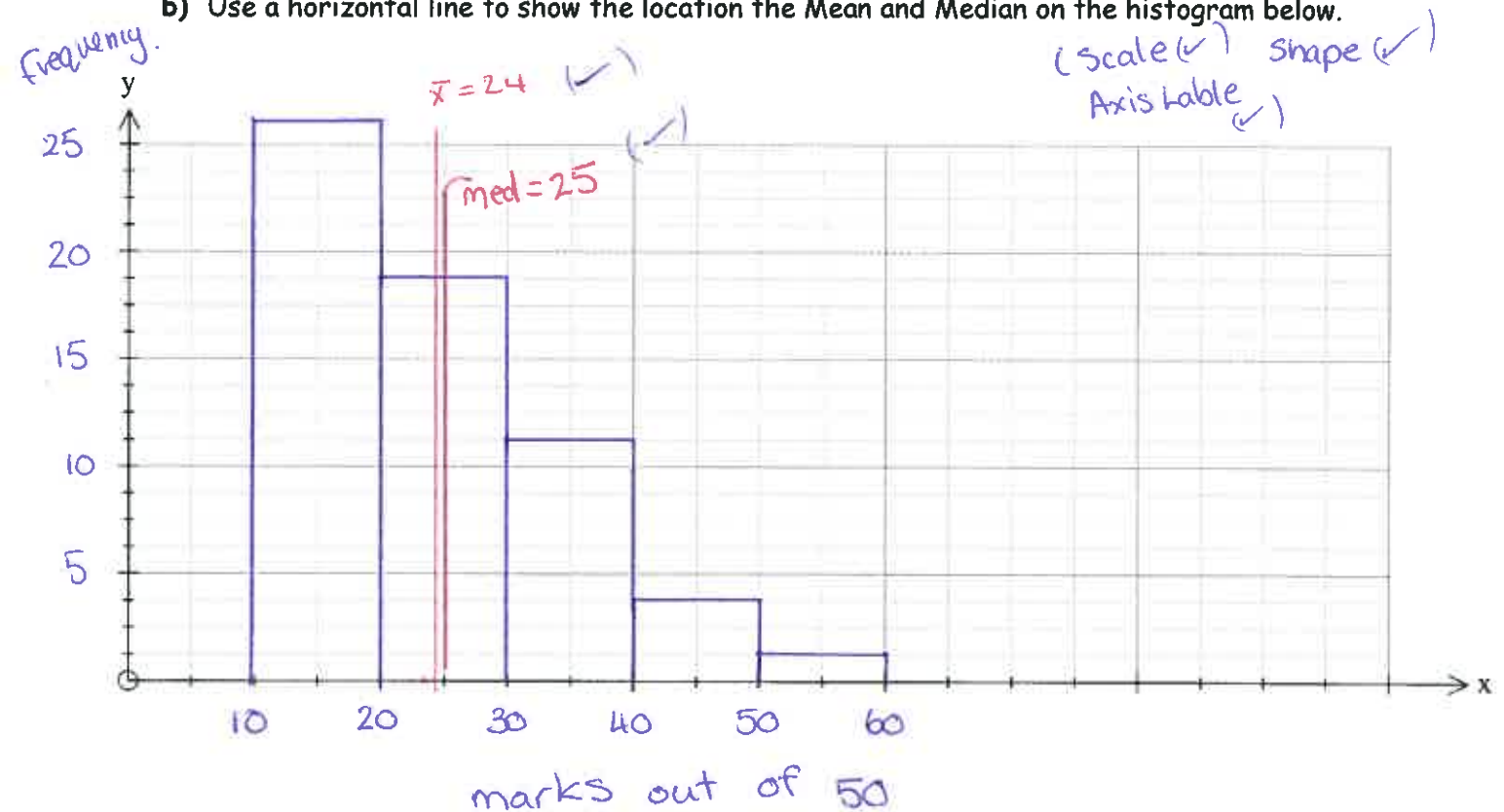
The sixty Mathematics students at City Senior High School sat for a Data Analysis test. The table below shows the results on the test, which was marked out of 50.

Marks (x)	Number of students (n)
$10 \leq x < 20$	26
$20 \leq x < 30$	19
$30 \leq x < 40$	11
$40 \leq x < 50$	3
$x \geq 50$	1

Midpt
15
25
35
45
55

a) Plot this information as a histogram on the grid below.

b) Use a horizontal line to show the location the Mean and Median on the histogram below.



c) Describe the shape of the histogram you have drawn.

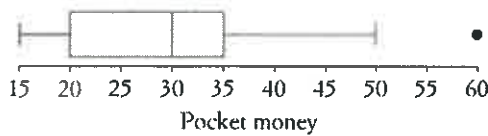
Skewed Positively. ✓

skewed to the right.

Question 3

[1, 1, 1, ³2 = 5 marks]

The following boxplot shows the amount of pocket money (\$) children were paid per month.



a) What is the median pocket money paid?

\$30

b) What percentage of children were given pocket money of \$35 dollars or less?

75%

c) What is represented by the dot at the end of the graph?

Outlier.

d) Describe the data found in the box plot.

- Describe Spread

Middle 50% have a range of \$15
Top 25% have range of \$15
bottom 25% has a range of \$5.

- Describe Centre

Median at \$30.

1 each for correct statement

- Shape - Skewed Positively with outlier.

Question 4

[4 marks]

The scores below are in ascending order and have a median of 26, a range of 38 and an interquartile range of 28. Find the values of a, b and c.

$$\text{Range} = 40 - a = 38$$

$$\therefore a = 2 \quad (\checkmark)$$

$$a, 6, 10, 22, b, 28, c, 38, 40.$$

$$\downarrow$$

26

$$b = 26 \quad (\checkmark)$$

$$\text{IQR} = Q_3 - Q_1$$

$$28 = Q_3 - 8$$

$$Q_3 = 36 \quad (\checkmark)$$

$$\frac{c + 38}{2} = 36$$

$$c = 34 \quad (\checkmark)$$

Question 5

[5, 3, 2 = 10 marks]

The data below shows the English essay results out of 50 for two different classes.

a) Calculate the mean, mode, median, IQR and standard deviation for each class.

Class A Results	Frequency
24.5 20-29	4
34.5 30-39	5
44.5 40-49	6
54.5 50-59	5
64.5 60-69	5
74.5 70-79	3
84.5 80-89	4

Mean: 52.9

Mode: 40-49

Median: 50-59

IQR: $64.5 - 34.5 = 30$

St Dev (s_x): 19.19

1/2 each

Class B Results	Frequency
20-29	2
30-39	1
40-49	7
50-59	11
60-69	10
70-79	0
80-89	1

Mean: 53.9

Mode: 50-59

Median: 50-59

IQR: $64.5 - 44.5 = 20$

St Dev (s_x): 12.4

b) Comment on the results for each class and how they compare.

- Centre: Both sets have their centre at a similar position. Same Median & very close mean. (✓)
- Spread: Class B is much closer to the centre with smaller IQR and St dev (✓)
- Shape: Both sets are symmetrical (✓)
However there is a possible outlier in Class B.
Not possible using $Q_3 + 1.5 IQR$

- c) Calculate the mean and standard deviation for the combined group A and B and use the information below to calculate the number of A's and B's for the combined group.

A- given to any mark 1.5 standard deviations above the mean.

B- given to any mark between 0.5 and 1.5 standard deviations above the mean.

C- given to any mark between 0.5 standard deviations above or below the mean.

D- given to any mark between 0.5 and 1.5 standard deviations below the mean.

E- given to any mark 1.5 standard deviations below the mean.

$$\bar{x} = 53.4 \quad s_x = 16.05 \quad \frac{1}{2} \text{ each.}$$

$$A > 53.4 + 16.05 \times 1.5$$

$$A > 77 \quad (1+4+3 = \underline{8}) \quad \left(\frac{1}{2}\right)$$

$$\text{OR using Midpoint} = (4+1) = \underline{5}$$

$$B > 53.4 + 16.05 \times 0.5$$

$$B > 61 \quad (5+10 = \underline{15}) \quad \left(\frac{1}{2}\right)$$

$$\text{OR using Midpoint} = (\underline{18})$$