VCE General Mathematics Units 1&2

AT2.1 – OUTCOMES 1 and 2

Thursday Feb 9, 2023 - Period 1

You have 75 minutes to complete this test.

Calculators and notes are permitted.

Univariate Data Test

Name: Solutions

Circle teacher's name: Ms Jabeen Mr Rossignolo Ms Le Ms Yang

Note: *The grade or score for this task is only part of the internal assessment for this Unit. Your* ***total*** *School-assessed Coursework score may change as a result of statistical moderation.*

Section A _____/15 Section B _____/30 Total _____/ 45

Satisfactory Completion? S/N: _____

Assessment Criteria

Students should be able to:

- Define and explain key concepts and apply a range of related mathematical routines and procedures.
- Apply mathematical processes in non-routine contexts, including situations requiring problem-solving, modelling or investigative techniques or approaches, with a view to analyse and discuss these applications of mathematics.
- Use numerical, graphical and symbolic functionalities of technology to develop mathematical ideas, produce results and carry out analysis in situations requiring problem-solving, modelling or investigative techniques or approaches.

Instructions
A single bound reference and a CAS and scientific calculator permitted.
Answer all questions in the spaces provided.
Round values to 2 decimal places where not specified.
In questions where more than one mark is available, appropriate working must be shown.
Multiple choice questions are worth one mark each.

Section A — Multiple Choice Questions — 15 marks

Circle the letter corresponding to the correct response.

The following information relates to Questions 1, 2, 3 and 4.

The number of lollies in a selection of packets are recorded below:

16 21 18 15 19 17 24 15 32 13

1. The mean of the data set is:

A. 17
B. 17.5
C. 18
D. 18.5
E. 19

2. The median of the data set is:

A. 17
B. 17.5
C. 18
D. 18.5
E. 19

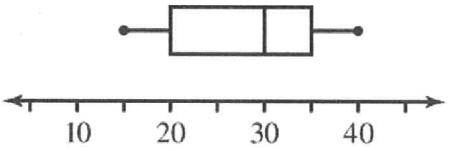
3. The standard deviation of the data set is:

A. 5.58
B. 5.29
C. 19
D. 190
E. 3890

4. The percentage frequency of packs containing 15 lollies is:

A. 2%
B. 6.7%
C. 10%
D. 15%
E. 20%

5. Examine the following boxplot



For the distribution shown in the boxplot **it is true** to say that:

A. The range is 35
B. The interquartile range is 15
C. The mean is 20
D. The interquartile range is 24
E. The median = interquartile range

The following information relates to Questions 6, 7 and 8.

The marks gained by two classes X and Y on a test are given below:

Class X		**Class Y**
8 2	5	8 9
5 3 2 1	6	0 3 4 6
8 5 3 1 0	7	0 2 6 6 7
2 1 0	8	1 4 8
8 0	9	2 8

Key: 5|8 = 58

6. The interquartile range for Class X is:

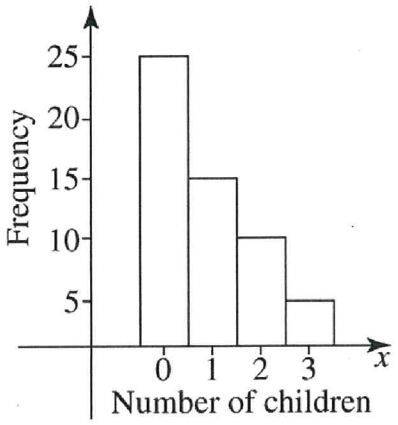
A. 16
B. 17
C. 18
D. 19
E. 20

7. The distribution of the grades for Class Y can best be described as:

A. Symmetric
B. Positively skewed
C. Negatively skewed
D. Bimodal
E. Clustered

The following information relates to Questions 8 and 9.

Consider the following graph. It displays the number of children in various households.



8. Based on the graph, it can be said that:

A. 50 families were surveyed and the data is negatively skewed.
B. 50 families were surveyed and the data is positively skewed.
C. 55 families were surveyed and the data is negatively skewed.
D. 55 families were surveyed and the data is positively skewed.
E. 55 families were surveyed and the data is symmetrical.

9. Which of the following statements is NOT true regarding the distribution of children in households.

A. Less than 50% of households had fewer than one child
B. More than 10% of households had one child.
C. 10% of families had 2 children.
D. 15 families had one child.
E. 15 families had more than one child.

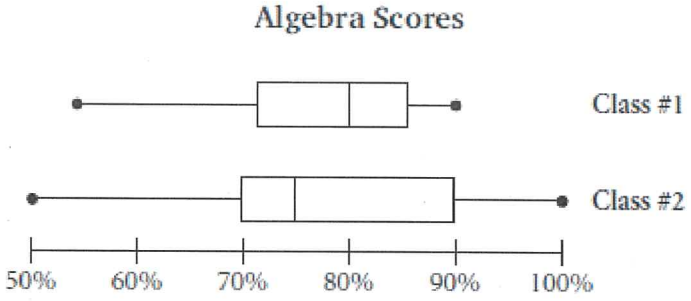
10. The level of *water usage* of 250 houses was rated in a survey as **low**, **medium** and **high**, and the *corresponding size of the houses* as **small**, **standard** or **large**.

The variables, level of *water usage* and *size of house*, as recorded in this survey are:

A. Both nominal variables
B. Both ordinal variables
C. Categorical and numerical variables respectively
D. Numerical and categorical variables respectively
E. Neither categorical nor numerical variables.

The following information relates to Questions 11 and 12.

The following parallel box and whisker plot below, showing the Algebra Scores for Classes 1 and 2.



11. On the Algebra test, the students in the top half of Class 1 scored at least:

A. 50%
B. 72%
C. 80%
D. 85%
E. 90%

12. When comparing Class 1 to Class 2, which of the following statements is **true**.

A. The median mark of Class 2 is greater than the median mark for Class 1.
B. The interquartile range of Class 1 is greater than the interquartile range of Class 2.
C. The range of both classes was the same.
D. The middle 50% of students in Class 2 did better than the top 75% of Class 1.
E. The top 25% of students in Class 2 did better than the top students in Class 1.

13. The stem plot below shows the *height*, in centimetres, of 20 players in a junior football team.

key: 14|2 = 142 cm $n = 20$

14	2	2	4	7	8	8	9	
15	0	0	1	2	5	5	6	8
16	0	1	1	2				
17	9							

A player with a height of 179 cm is considered an outlier because 179 cm is greater than:

A. 162 cm
B. 169 cm
C. 172.5 cm
D. 173 cm
E. 175.5 cm

The following information relates to Questions 14 and 15.

800 participants auditioned for a stage musical. Each participant was required to complete a series of ability tests for which they received an overall score.
The overall scores were approximately normally distributed with a mean score of 69.5 points and a standard deviation of 6.5 points.

14. The percentage of participants who scored between 56.5 and 82.5 points is:

A. 50%
B. 68%
C. 95%
D. 99.7%
E. 100%

15. Only the participants who scored at least 76.0 points in the audition were considered successful. Using the 68-95-99.7% rule, how many of the participants were considered unsuccessful?

A. 127
B. 128
C. 272
D. 672
E. 673

Section B **Short Answer Questions** **30 marks**

Include working throughout.

Question 1 (7 marks)

A group of Year 11 students were surveyed for shoe size. Their results are listed below:

7	9	10	8	7	8	9	6	6	7
9	9	8	8	8	10	9	9	8	7

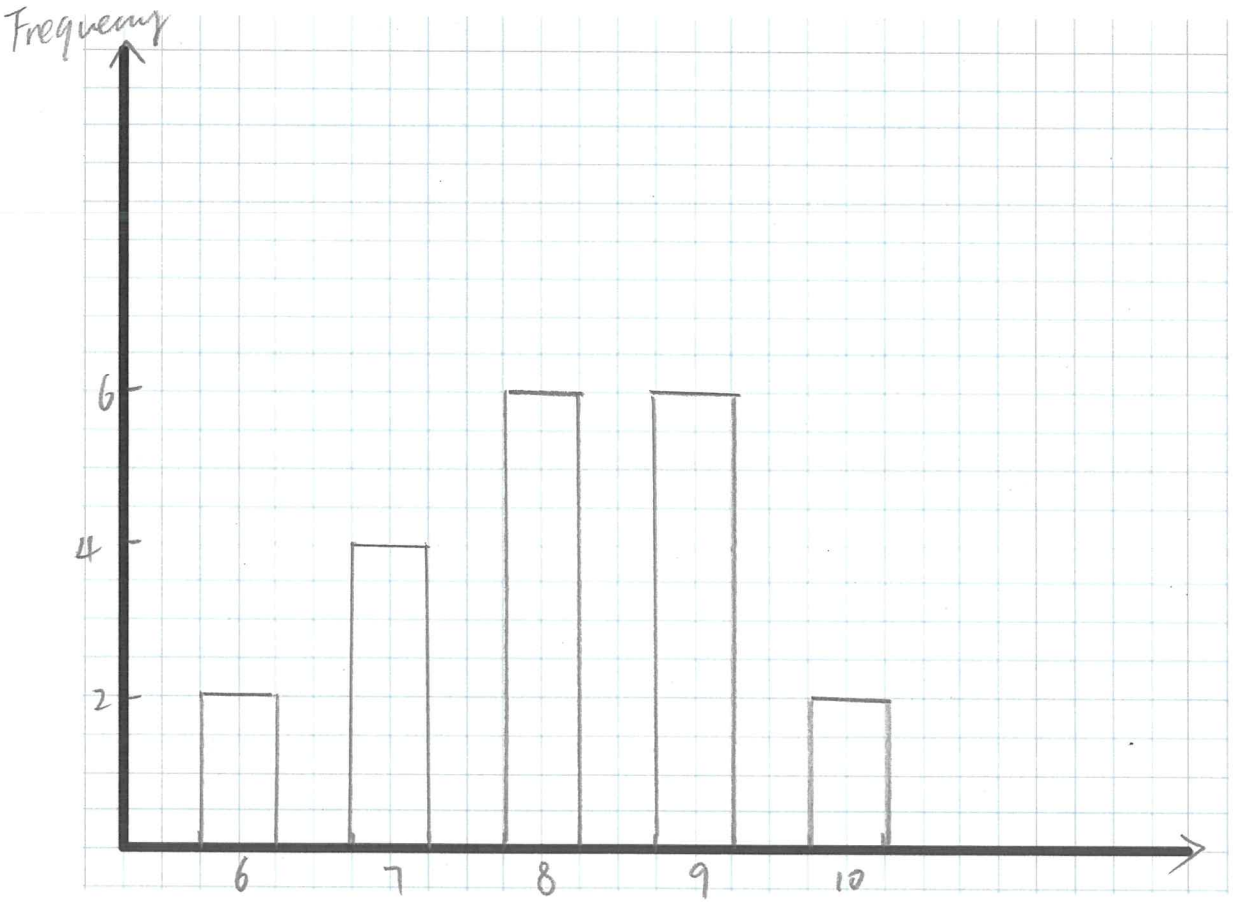
(a) Complete the following frequency table. Correct your answer to one decimal place.

Shoe Size	***Frequency***	***Percentage Frequency***
6	2	10%
7	4	20%
8	6	30%
9	6	30%
10	2	10%
Total	20	100%

-1 per error

3 marks

(b) Draw a bar chart for the data on the grid below:



3 marks

(1A) correctly labeled x- and y-axis

-1 per incorrect column

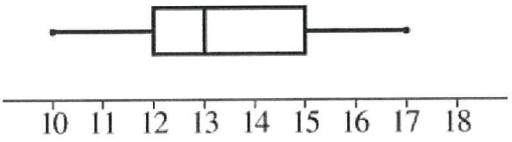
(c) What percentage of students had a shoe size greater than 7? Round your answer to the nearest whole number.

$\frac{14}{20} \times 100\% = 70\%$

1 mark

Question 2 (10 marks)

The VCE student population at St Leonard's college were surveyed for the number of hours spent on homework (rounded to the nearest whole hour) for the week beginning 1 February 2023. The mean of the data is 13.2 and the mode is 13. The number of hours spent on completing the homework is summarised in the boxplot below:



(a) Write down the five-number summary for the data.

X_{min} 10

Q_1 12

Q_2 13

Q_3 15

X_{max} 17

-1 per error

5 marks

(b) Find the value of the interquartile range (IQR)

$15 - 12 = 3$

1 mark

(c) Write down the percentage of students who spent more than 12 hours on homework in that week.

75%

1 mark

(d) Given that 166 students spent between 12 and 15 hours on homework, how many students were surveyed?

$166 \times 12 = 332$

1 mark

(e) Determine the upper fence and the lower fence for this boxplot.

lower fence: $12 - 1.5 \times 3 = 7.5$ (1A)

upper fence: $15 + 1.5 \times 3 = 19.5$ (1A)

2 marks

Question 3 (13 marks)

The *age* of the patients (in years) admitted to a small hospital during one week, and their *gender* were recorded:

Females: 9, 10, 15, 27, 31, 37, 40, 43, 50, 79

Males: 13, 16, 21, 24, 25, 26, 27, 34, 40, 47

(a) Construct a back-to-back stem and leaf plot of these data sets by using the key given.

Females		Males
9	0	
5 0	1	3 6
7	2	1 4 5 6 7
7 1	3	4
3 0	4	0 7
0	5	
	6	
9	7	

-1 per error.

Key: 2|1=21

4 marks

(b) Determine the median for:

Females: 34.

Males: 25.5.

2 marks

(c) Determine the IQR for:

Females: 28

Males: 13.

2 marks

(e) Calculate the percentage of patients who were admitted to the hospital aged over 40, for both genders.

Females: $\frac{3}{10} \times 100 = 30\%$ (1A)

Males: $\frac{1}{10} \times 100 = 10\%$ (1A)

2 marks

(e) Do the back-to-back plots support the contention that the age of the patients is associated with their gender? Write a brief explanation that compares the distributions in terms of centre and spread.

The age of the people admitted to the hospital was associated with their gender. The median age of the females (34 years) was higher than males (25.5 years). The variability of the ages was also higher for the females (IQR = 28) compared with the males (IQR = 13).

3 marks

(1) mark to state the association

(1) mark for using median

(1) mark for using IQR

END OF TEST